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# The Validity of Race and Hispanic Origin Reporting on Death Certificates in the United States



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Center for Health Statistics

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## The Validity of Race and Hispanic Origin Reporting on Death Certificates in the United States

Data Evaluation and Methods Research

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Center for Health Statistics

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# Contents

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Abstract .....	1
Introduction .....	1
Background .....	2
Data and Methods .....	3
Evaluation of Race and Hispanic Origin Reporting on Death Certificates .....	3
Effect of Death Certificate Race and Hispanic Origin Misclassification on Mortality Measures .....	5
Results .....	7
Evaluation of Race and Hispanic Origin Reporting on Death Certificates .....	7
Death Certificate Misclassification Effects on Mortality Estimates .....	9
Discussion .....	11
Summary and Conclusions .....	11
References .....	11
Appendix I .....	17
Hispanic Origin Reporting on Death Certificate and Percentage Unknown for Reporting States by Year .....	17
Appendix II .....	19
Tables 1–3 Study Sample Sizes by Selected Variables .....	19
Appendix III .....	24
Listing of Counties and State of Death During the 1990–1998 Period for Hispanic Origin Subgroups .....	24

## Text Figures

1. Race distribution on death certificate among self-identified American Indian or Alaska Natives and Asian or Pacific Islanders: United States, 1979–1989 and 1990–1998 .....	7
2. Assignment to nonspecific Hispanic status (other Hispanic) on the death certificate for self-identified specific Hispanic subgroup origin: United States, 1979–1989 and 1990–1998 .....	8
3. Ratios of age-specific death rates, uncorrected and corrected: Hispanic and non-Hispanic white .....	10

## Detailed Tables

1. Sensitivity, predictive value positive, and classification ratios, by race and Hispanic origin: National Longitudinal Mortality Study, for deaths occurring in 1979–1989 and 1990–1998 .....	13
2. Classification ratios by age and race, Hispanic origin, and sex: National Longitudinal Mortality Study, for deaths occurring in 1990–1998 .....	14
3. Classification ratios by race and Hispanic origin by region, urban-rural status, coethnic concentration, and nativity: National Longitudinal Mortality Study, for deaths occurring in 1990–1998 .....	15
4. Age-specific and age-adjusted death rates and rate ratios by race and age: Uncorrected and corrected for death certificate misclassification .....	15
5. Age-specific and age-adjusted death rates and rate ratios to non-Hispanic white, by Hispanic origin and age, uncorrected and corrected for death certificate misclassification: United States, 1999–2001 .....	16

## Appendix Tables

I.	Table I. Appendix for Table 1, Number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, and period: National Longitudinal Mortality Study for deaths occurring in 1979–1989 and 1990–1998. . . . .	19
II.	Appendix for Table 2, number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, age, and sex: National Longitudinal Mortality Study for deaths occurring in 1990–1998 . . . . .	20
III	Appendix for Table 3, number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, region, urban-rural status, geographic concentration, and nativity: National Longitudinal Mortality Study for deaths occurring in 1990–1998. . . . .	23

**Objectives**

This report presents the results of an evaluation study of the validity of race and Hispanic origin reporting on death certificates in the United States and its impact on race- and Hispanic origin-specific mortality estimates.

**Methods**

The National Longitudinal Mortality Study (NLMS) was used to evaluate death certificate classification of race and Hispanic origin by comparing death certificate with survey race-ethnicity classifications for a sample of decedents identified in NLMS. NLMS consists of a series of annual Current Population Survey files (1973 and 1978–1998) linked to death certificates for years 1979–1998. To identify and measure the effect of race-ethnicity misclassification on death certificates on mortality estimates, pooled 1999–2001 vital statistics mortality data and population data from the 2000 census were used to estimate and compare observed and corrected (for death certificate misclassification) race-ethnicity specific death rates.

**Results**

Race and ethnicity reporting on the death certificate continues to be excellent for the white and black populations. It remains poor for the American Indian or Alaska Native (AIAN) population but is reasonably good for the Hispanic and Asian or Pacific Islander (API) populations. Decedent characteristics such as place of residence and nativity have an important effect on the quality of reporting on the death certificate. The effects of misclassification on mortality estimates were most pronounced for the AIAN population, where correcting for misclassification reverses a large AIAN over white mortality advantage to a large disadvantage. Among the Hispanic and API populations, adjustment for death certificate misclassification did not significantly affect minority-majority mortality differentials.

**Keywords:** race • hispanic origin • death certificate • death rates • mortality • health disparities

# The Validity of Race and Hispanic Origin Reporting on Death Certificates in the United States

by *Elizabeth Arias, Ph.D., National Center for Health Statistics; William S. Schauman, M.S., U.S. Census Bureau; Karl Eschbach, Ph.D., University of Texas at San Antonio; Paul D. Sorlie, Ph.D., National Heart, Lung, and Blood Institute; and Eric Backlund, M.S., U.S. Census Bureau*

## Introduction

Death certificates are the primary source of mortality data in the United States. They provide the numerator for death rates, whereas census population estimates provide the denominator. In turn, death rates serve as the basic measure of the impact of mortality on a population. Race- and Hispanic origin-specific death rates are used to calculate all-cause and cause-specific mortality differentials between the numerous racial and ethnic subgroups in the United States. Incongruence between race and Hispanic origin classification on numerators and denominators of death rates has the potential to seriously bias race- and ethnicity-specific mortality differentials.

Inconsistency between race and Hispanic origin classification on numerators and denominators of death rates is inherent in a statistical system that relies on two distinct data sources

for the estimation of vital rates. Each of these data sources, population censuses and death certificates, employ distinct race and ethnicity reporting procedures. On the one hand, reporting of race and ethnicity for a census is left to a respondent, who answers the question for him- or herself and other members in the household through self-administered questionnaires. On the other hand, reporting on a death certificate is typically the responsibility of a funeral director who must gather this information from next of kin or often rely on personal observation. Differences in reporting of race or ethnicity for the same person across the two systems may be especially problematic for racial and ethnic populations for which a large share of all marriages is intergroup marriages. In the United States, these include American Indian or Alaska Natives (AIAN), Native Hawaiians or Other Pacific Islanders (NHOPI), Asians, and Hispanics.

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Indeed, previous evaluation studies of the agreement between census (or survey) self-report and death certificate proxy report of race and ethnicity have shown that the level of agreement between the two sources varies significantly by racial or ethnic grouping (1,2,3). According to these studies, agreement between the two sources has been found to be excellent for the white and black race groups but less than ideal for other race groups or for the Hispanic population. For groups other than the white and black race groups, the problem has primarily been one of net underascertainment on the death certificate. Persons who self-identified with a particular group while alive are sometimes classified as belonging to a different group on their death certificates. These findings are now quite dated. The most recent refer to deaths that took place during the 1980s (2,3).

This report presents the results of an evaluation study of the validity of race and Hispanic origin reporting on death certificates in the United States and its impact on race- and Hispanic origin-specific death rates. The National Longitudinal Mortality Study (NLMS) is used to evaluate death certificate reports of race and ethnicity compared with survey race-ethnicity classifications for members of Current Population Survey (CPS) cohorts (1973 and 1978–1998) linked to death certificates for deaths occurring in years 1979–1998. This study updates and expands on the evaluation studies carried out by Sorlie, Rogot, and Johnson and Rosenberg et al. that used an earlier release of NLMS (2,3).

Drawing on the increased sample size and longer follow-up period of the more recent NLMS release, this study adds to extant knowledge on the topic in two significant ways. First, change over time in the quality of reporting on the death certificate is explored. Second, the study explores the relationship between the quality of reporting on the death certificate and selected decedent characteristics, such as age, sex, nativity, geographic region of residence, and county-level racial and ethnic population concentration. The hypothesis is that for some race groups and for the entire

Hispanic population, these characteristics profoundly influence the quality of race and ethnicity classification on the death certificate.

To identify and measure the effect of death certificate race-ethnicity misclassification on mortality estimates, two sets of race- and Hispanic origin-specific death rates are estimated and compared. Using pooled 1999–2001 vital statistics mortality data and data from the 2000 census, both observed death rates by race and Hispanic origin and death rates that have been corrected for death certificate misclassification are estimated. The role of census data quality and its effect on race- and ethnicity-specific death rates is also briefly reviewed and evaluated.

## Background

### Previous studies of race and ethnicity misclassification on death certificates in the United States

Evaluation studies of race misclassification on the death certificate date back to the 1960s. Hambright (1969) was the first study to examine the congruence between death certificate and census race classification at the national level and was based on the 1960 Census-Death Certificate Matched Record Study that consisted of a sample of 340,000 death certificates linked to the 1960 decennial census (1). Agreement between census self-report and death certificate proxy report was found to be very high for the white and black race groups but considerably lower for other race groups. Using census self-identification as the standard for comparison, the study found that 99.8% of self-identified whites, 98.2% of self-identified blacks, 79.2% of self-identified American Indians, and 86.9% of self-identified “others” were correctly identified on the death certificate.

National level evaluation studies were not carried out again until the 1990s, primarily because of the lack of appropriate data. The creation of NLMS provided the opportunity to examine this issue once again. Using NLMS, which

at the time consisted of nine annual CPS files (1973 and 1978–1985) linked to mortality data for the years 1979–1985, Sorlie, Rogot, and Johnson (2) found similar results as the Hambright study (1). Sorlie and coauthors found that 99.2% of self-identified whites, 98.2% of self-identified blacks, 73.6% of self-identified AIAN, and 82.4% of self-identified Asian or Pacific Islanders (API) were correctly classified on the death certificate. Using NLMS with CPS files (1973 and 1978–1989) with an additional 4 years of mortality follow-up (1979 through 1989), Rosenberg et al. (3) reported the following percentage of correct identification on the death certificate: white (99.8), black (98.6), AIAN (57.4), and API (82.5).

The only exception to the consistent findings of these three studies appears to be the quality of reporting for the AIAN population. Between the Hambright and the Rosenberg et al. studies (1,3), agreement between census self- and death certificate proxy reporting for this population declined from 79.2% to 57.4%. However, the populations studied were slightly different: the Hambright study did not include Aleut or Eskimo in the American Indian category, whereas the NLMS AIAN category does. Nevertheless, a sharp decline was observed in the agreement between self-report and proxy report for the AIAN population between the two NLMS-based studies; from 73.6% to 57.4% agreement. This large change is likely a result of the unprecedented growth in the number of persons identifying themselves as AIAN since the 1960s, an increase that did not primarily occur through natural increase, but rather a rise over time in the acceptability of claiming AIAN racial identity among persons of mixed AIAN and non-AIAN ancestry (4).

Hispanic origin classification issues did not come to the national fore until the 1980s. The 1980 census was the first decennial census that included a Hispanic origin question on the questionnaire distributed to all households. Similarly, states did not begin to include a Hispanic origin question on their death certificates until 1978. In 1978, only 18 states included this item on their death certificates (5).



As a result, the first study to evaluate the quality of Hispanic origin reporting on death certificates at the national level included only deaths occurring in a select number of states. In addition to race classification, Sorlie, Rogot, and Johnson (2) used NLMS with mortality follow-up for the years 1979 through 1985 to evaluate death certificate coverage by Hispanic origin (for the 1979–1985 period, an item on Hispanic origin was included on the death certificate of 21 states). They found that among self-identified Hispanics, 89.7% were correctly identified on the death certificate. The percentage correctly identified by Hispanic subgroups was found to be the following: Mexican (84.9), Puerto Rican (85.9), Cuban (80.0), and “other Hispanic” (47.6). Based on the unweighted samples presented in Sorlie, Rogot, and Johnson, Rosenberg et al. reported the following ratios of CPS to death certificate counts: Hispanic (1.07, (600/563)), Mexican (1.11, (417/375)), Puerto Rican (1.04, (71/68)), Cuban (1.07, (30/28)), and other Hispanic (0.89, (82/92)) (2,3).

In summary, these studies all find that incongruence between race-ethnicity self-report in either a decennial census or the CPS and proxy report on death certificates has been very low for the white and black populations but more substantial for other racial and ethnic groups. The expansion of NLMS has now made it possible to re-examine this problem and answer some important questions. Did the problem increase or decrease during the 1990s for the various racial and ethnic groups? What factors are associated with death certificate misclassification? How seriously are death rates biased by race and ethnicity misclassification on death certificates?

## Data and Methods

### Evaluation of Race and Hispanic Origin Reporting on Death Certificates

#### Data

NLMS consists of data from the CPS Annual Social and Economic Supplement and a sample of the 1980 decennial census combined with death certificate information from the National Vital Statistics System (NVSS) to identify mortality status and cause of death. CPS is a multistage stratified probability sample of the U.S. noninstitutionalized civilian population, with a response rate of approximately 95% (6). NVSS consists of a voluntary contractual agreement between the National Center for Health Statistics (NCHS) and individual registration areas to collect the U.S. birth and death information. NVSS coverage includes over 99% of deaths that occur in all 50 states, the District of Columbia, and the U.S. territories (7).

To date, NLMS includes 26 files covering years 1973 and 1978–1998 that add up to 2.3 million records. Through linkage to NCHS’ National Death Index for the 1979 through 1998 period, 252,627 deaths have been identified. The Hispanic origin-specific analysis is based on the sample of decedents identified in the March 1973, February 1978, March 1979, April 1980, August 1980, December 1980, and March 1981–March 1998 CPS files. The race-specific analysis excludes CPS files March 1973, February 1978, March 1986, and March 1987 because the CPS race variable is incomplete in these files.

The race categories used in this study include white, black, AIAN, and API and are based on the Office of Management and Budget’s (OMB) 1977 Statistical Policy Directive 15, “Race and Ethnic Standards for Federal Statistics and Administrative Reporting” (8). This directive required federal agencies to collect, tabulate, and report at a minimum the four single-race categories listed above. Hispanic origin

categories used in this study include total Hispanic, Mexican, Puerto Rican, Cuban, Central and South American, and other Hispanic. The latter group includes persons not falling in any of the previous Hispanic categories, such as Dominicans and Spaniards, as well as Hispanic persons for whom specific country of origin was not ascertained in either the CPS or the death certificate. The separation of Hispanic origin as a distinct “ethnic” rather than “racial” attribute that crosscuts race and is measured using a separate item is also consistent with the requirements of the 1977 directive (8).

The race and ethnicity classification system employed in federal population surveys and censuses differs from that employed by NVSS in an important way. Both systems are guided by OMB’s Statistical Directive regarding the race and ethnicity categories that should be used to obtain, tabulate, and report data by federal statistical and administrative systems. However, the two systems differ in the procedures used to collect the information. CPS, like the decennial census, relies on the report of persons responding for themselves and other members of their household, whereas the NVSS mortality data system relies on a proxy report provided by a funeral director. (Demographic information on the death certificate, including race and ethnicity, is recorded by a funeral director, who is responsible for assuring the completion of the death certificate and registering it with state vital statistics offices. Information about cause of death is provided by the attending physician, medical examiner, or coroner.)

CPS has collected information on race since 1946. The original CPS race classification was based on the interviewer’s determination of the subject’s race as white, Negro, or other. Following OMB’s 1977 Statistical Directive 15, CPS expanded the race categories to include white, black, AIAN, and API and switched from interviewer observation to interviewee report (self-report and report by other household members). Beginning with the October 1978 survey, respondents have been asked to identify their race

and that of other household members, while being presented with a flashcard with a list of choices (9). Similarly, CPS interviewers were instructed to show respondents a flashcard with a list of choices to identify their ethnicity (9).

NVSS includes mortality data compiled by NCHS through cooperative agreements with individual registration areas, including the 50 states, the District of Columbia, New York City, American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the Virgin Islands (10,11). To attain maximum comparability across the registration areas and produce national-level vital statistics data, U.S. standard certificates and reports that contain the basic elements necessary for the collection and publication of comparable national and local vital statistics are produced and periodically revised (10,11).

A race item has been a part of the U.S. Standard Death Certificate since the first standard was issued in 1900. Between the 1900 and 1989 revisions, the race item underwent some minor changes from a simple fill-in box labeled “color” to a fill-in box labeled “race,” as well as the inclusion of sample terms for guidance and a request for specificity. The greatest change in this item took place with the 2003 revision, which incorporated the requirements of OMB’s 1997 “Revision to Standards for the Classification of Federal Data on Race and Ethnicity” (12). The 1997 OMB revision introduced two major changes. First, it increased the minimum number of race categories that can be presented from four to five by breaking up the API category into two new categories: Asian and NHOPI. Second, it required that federal statistical data systems allow respondents to select more than one race (12). As of data year 2006, only 23 states had adopted the 2003 Standard Death Certificate revision.

A Hispanic origin item did not become a part of the U.S. Standard Death Certificate until the 1989 revision. However, prior to this revision, some states included a Hispanic origin item on the death certificate. For instance, in 1979 (the first year of mortality follow-up in NLMS), 20 states recorded

Hispanic origin on the death certificate, although a significant number of these reported high rates of missing information on this item. By 1990, only Louisiana, New Hampshire, and Oklahoma still did not include a Hispanic origin item on their death certificates, and the majority of reporting states had missing rates substantially below 1% on this item. State coverage was complete beginning in 1997 (see [Appendix I](#) for distribution of Hispanic origin reporting on death certificates by year and state).

### Reporting and allocation of missing race and Hispanic origin

After accounting for incomplete race information (as noted above), the percentage of NLMS records with a race assignment not falling into any of the OMB categories, mainly “some other race,” was 0.06% on the CPS and 0.27% on the death certificate. The percentage of records with an unclassified race on the CPS is practically zero because missing or unknown race is imputed. CPS uses a complex hot deck procedure in which race is allocated based on a hierarchy of highly correlated variables. Race is imputed in approximately 5% of records (13). The percentage of unknowns on race on death certificates is less than 0.5% as a result of the NVSS practice of imputing unknown race and, beginning in 1992, “all other races” (14). The imputation technique employed is to use the preceding record as the donor. The level of missing race information on original death certificate records has consistently been minimal, ranging from a high value of 0.30% to a low value of 0.08% between 1979 and 1998 (15).

After removing records from states that did not include a Hispanic origin item on their death certificates (see [Appendix I](#)), the percentage of records in the study sample with unknown Hispanic origin was 0.29% on the CPS and 0.59% on the death certificates. CPS began imputing unknown Hispanic origin in the mid-1980s using the same hot deck method used for imputing unknown race (13). NVSS imputes

unknown Hispanic origin subgroups for reporting states by using the state of birth item as a source of information. If birth place is Mexico, Puerto Rico, or Cuba, then the Hispanic origin is accordingly assigned. If birth place is elsewhere, then the code is “Other and Unknown Hispanic” or “Unknown” (14).

No adjustments were made for the imputation procedures used by CPS and NVSS, but the small fraction of records with unknown or unclassified race or Hispanic origin information was excluded from the analyses. The final study samples include 161,302 matched records for the race-specific analysis and 114,869 matched records for the Hispanic origin-specific analysis.

### Methods

As in previous studies, race and Hispanic origin reported on the CPS were used as the standard for comparison with the death certificate classification. Survey and census race and ethnicity classification are not without error (16,17). However, the assumption is made that the information provided by a respondent to a survey questionnaire about race or Hispanic origin is, on average, more valid than proxy reporting conducted by a funeral director who has little personal knowledge of the decedent. This decision is also based on public policy embodied in the 1997 OMB revision, which emphasizes self-identification as the standard for collection of racial and ethnic identities.

To evaluate race and Hispanic origin classification on the death certificate, two statistical estimates of death certificate misclassification were produced. First, ratios were estimated of CPS race and Hispanic origin counts to death certificate counts for the sample of identified NLMS decedents described above (referred to hereafter as “classification ratios”). For example, the classification ratio for the white population is estimated as the number of decedents identified as white on the CPS to the number identified as white on the death certificate. This is basically a ratio of row to column totals in a bivariate table of CPS (row) by death

certificate (column) classification. It can be interpreted as the net difference in assignment of white between the two data collection systems. The classification ratios are the same as the ratios reported by Rosenberg et al. (3) and can be easily interpreted as adjustment factors to correct for the bias found in death certificates. Second, record-level agreement was estimated between CPS and the death certificates for individual decedents through a measure of sensitivity and predictive value positive. Sensitivity is the percentage of respondents in a CPS self-identified race-ethnicity group who are correctly identified on the death certificate; predictive value positive is the percentage of decedents identified by the death certificate in a specific race-ethnicity group who are self-identified in the same group on the CPS (all statistics presented are weighted by CPS sample weights).

The classification ratios were estimated by decedents' age, sex, nativity, urban-rural status, region of residence, and degree of coethnic geographic concentration at time of death for the 1990–1998 period only. The bivariate analyses were restricted to this period because the state coverage of Hispanic origin is substantially better in the 1990s than in the 1980s. As discussed above, over the 1979–1998 period, the number of states that included a Hispanic origin item on their death certificates increased significantly; from 20 states in 1979 to all 50 states and the District of Columbia by 1997 (see [Appendix I](#)). Additionally, more recent estimates of death certificate misclassification were preferred for use as death rate adjustment factors.

The variables chosen for bivariate analyses are derived from the death certificate and include age (0–24 years, 25–44 years, 45–54 years, 55–64 years, 65–74 years, and 75 years and over), sex, nativity (U.S. born compared with foreign born), urban-rural status, census region of residence, and degree of coethnic geographic concentration (see [Appendix II](#) for sample sizes by analysis variables). “Degree of coethnic concentration” is a dichotomous variable indicating whether the decedent died in a county with high concentrations of

coethnic populations, and it is used in the analysis of total Hispanic (and subgroups) and AIAN populations because it was hypothesized that for these groups more than any other, reporting on the death certificate varies significantly by whether the death occurred in an area with a significant number of the coethnic population or not. Because race and Hispanic origin reporting on the death certificate is often based on the personal observation of the funeral director, correct identification for populations where the OMB race-ethnicity categories are problematic is probably improved if the funeral director is coethnic or familiar with the population in question because of its high local concentration.

For the Hispanic population and component subgroups, the coethnic concentration indicator is defined as 1) decedent died in a county that falls within the first 50th percentile of ethnic-specific ranked number of deaths by county during the 1990s, and 2) decedent died outside this list of counties (see [Appendix III](#) for a list of counties). For the AIAN population, the measure was constructed by focusing on counties in the service area of the U.S. Indian Health Service in the 1990s. These counties contain Indian reservations and adjacent areas. From this group, 276 counties were selected where, in the 2000 census, AIANs reporting a single-race only were at least 70% of persons reporting an AIAN race in combination with another race (the list of 276 counties are available from authors upon request). The concentration measure for AIANs is therefore defined as 1) decedent died in one of these 276 counties during the 1990s and 2) decedent died elsewhere.

## Effect of Death Certificate Race and Hispanic Origin Misclassification on Mortality Measures

To assess the effects of race and ethnicity misclassification on the death certificate on mortality measures, age-specific and age-adjusted death rates uncorrected and corrected for racial and

ethnic misclassification on the death certificate are estimated and compared.

## Data

Pooled number of deaths for years 1999–2001 from NVSS were used for death rate numerators, and NCHS bridged April 1, 2000, population census estimates for the four race groups and the total Hispanic population were used for rate denominators. Because the U.S. Census Bureau implemented OMB's 1997 revision with the 2000 decennial census but the NVSS registration areas had not, NCHS adopted a bridging algorithm that reassigns multiple-race persons in census-based denominators to single-race categories in order to make comparable the two systems and produce race-specific mortality estimates (18). This bridging algorithm uses empirically derived probabilities of identification with 1977 OMB-standard race categories for persons reporting multiple racial ancestries, which is calculated from data from a question about primary racial identification posed to multiracial subjects of the National Health Interview Survey (18).

For rate denominators for Hispanic subgroups, the Census 2000 Summary File 2 was used. The NCHS bridged population file does not break down the Hispanic population by country of origin (18). The 1% Public Use Microdata Sample (PUMS) of the 2000 decennial census was also used to estimate adjusted population counts for Hispanic subgroups. Other analyses have shown that the 2000 census contained a significant level of underenumeration of Hispanic subgroups (this problem is discussed fully below).

The validity and reliability of death rates is also affected by biases in population counts (the denominators of the rates). Racial and ethnic biases in census population counts can result from question nonresponse, question wording effects, and underenumeration (or net undercounts) (16,17,19). For the 2000 census, the U.S. Census Bureau reported an imputation rate for missing information of 4.4% for the Hispanic origin item and 4.1% for the race item (20). A related problem with the race data is that some respondents have

preferred to check “some other race” instead of one of the listed options on the census form. Following imputation of missing race and Hispanic origin, the U.S. Census Bureau produces a Modified Race Data Summary File that imputes records where the race response was “some other race” alone or in combination with another race into one of the OMB race groups. For the 2000 census, the substitution rate for “some other race” was 6.6% of the total population (21). The Modified Race Data Summary File is the data that has been traditionally used by NCHS to estimate death rates and was used to produce the bridged-race file for data years 2000 and later (18). The impact of census allocation procedures on vital rate calculations was not evaluated.

Unlike the case in previous decennial censuses, no significant net undercount was found in the 2000 census for the major race groups or the total Hispanic population. The 2000 census postenumeration survey (Accuracy and Coverage Evaluation Survey (ACE)) revealed minimal and statistically insignificant net undercounts by race and Hispanic origin (19). For example, net undercounts were found to be statistically different from zero for only the non-Hispanic white (-1.13% (overcount)) and non-Hispanic black populations (1.84%). The net undercount estimates for other race groups and the total Hispanic population were found to be not statistically different from zero (net undercounts: Hispanics, 0.71%; non-Hispanic Asian, -0.75%; NHOPI, 2.12%; AIAN on reservations, -0.88%; and AIAN off reservations, 0.62% (19). ACE also produced some unexplained results that led the U.S. Census Bureau to decide against adjusting the census population count, which is used for intercensal population estimates (19). Following the U.S. Census Bureau’s example, the census-based denominators were not adjusted for net undercount for the four race groups or the total Hispanic population.

On the other hand, there appears to have been a significant degree of underenumeration of specific Hispanic subgroups in the 2000 census (16,22,23). A postcensus evaluation study (Alternative Questionnaire

Experiment) revealed that the 2000 census Hispanic origin question produced a significantly greater proportion of Hispanics reporting a general term (Hispanic, Latino, or Spanish) rather than a specific country of origin than did the 1990 census Hispanic question (23). Changes in question wording is suspected as a cause for the increase. The 2000 question removed examples of countries from the write-in section and replaced the word “origin” with the word “Latino” (23).

Cresce and Ramirez used 2000 census questions on birthplace and ancestry to estimate the proportion of respondents giving a general Hispanic term that could be recategorized into a specific country of origin category (23). Among Hispanics responding with a generic term in 2000 (16% of the total Hispanic population), they found that 28.8% could be recategorized by using birthplace and 25.2% by using ancestry, leaving 7.5% in the nonspecific Hispanic category (23). (The percentage giving a generic response in 2000 after adjustment (7.5%) closely matches the percentage giving a similar response in pooled 1990–2005 CPS data (8.0%). The CPS question can be assumed to elicit better responses because respondents are given a country-specific list from which to select. Furthermore, both analysis of CPS and the 2000 census revealed that the majority of these respondents were born in California, Texas, New Mexico, and Colorado. CPS shows that these are predominantly third or higher generation Hispanic Americans who are descendants of early Spanish immigrants or a segment of the Mexican population who were never technically immigrants because they resided in what used to be Mexico. These Hispanic Americans probably no longer identify with a specific country of origin.)

Confirming the effect of removal of country-specific examples from the 2000 census Hispanic question, the groups gaining the most numbers when birthplace and ancestry were considered were those who did not have a country-specific checkbox and who were expected to write in their country of origin. The percentage increase in numbers for these groups was as

follows: Spaniards (68.7%), Central Americans (34.4%), South Americans (30.1%), and Dominicans (25.0%). Gaining significantly smaller numbers when birthplace and ancestry were taken into account, as expected, were Mexicans (6.9%), Puerto Ricans (4.0%) and Cubans (5.0%) because the 2000 census Hispanic origin question included country-specific check boxes for these three populations.

## Methods

Age-specific and age-adjusted death rates by race and Hispanic origin were estimated as follows:

$$\text{Age-specific death rate (ASDR}_i) = [D_{i1999} + D_{i2000} + D_{i2001}] / [P_{i2000} * 3]$$

and

$$\text{Age-adjusted death rate (AADR)} = \sum_i \{ ([D_{i1999} + D_{i2000} + D_{i2001}] / P_{i2000} * 3) * W_i \},$$

where  $D_{iyr}$  are number of deaths in specific age group  $i$  and specific year  $yr$ ,  $P_{i2000}$  is population in specific age group  $i$  and year 2000, and  $W_i$  is the age-specific weight based on the U.S. standard population (24).

Observed age-specific death rates were corrected with the age-specific classification ratios derived from NLMS, and then age-adjusted death rates were reestimated. The correction was limited to age because of the sample size restrictions posed by the study sample (see Appendix II). Ideally, adjustments of death certificate misclassification that take into account all the factors that may be correlated with such misclassification, such as nativity and place of residence, would be preferable. Adjustment is done as follows:

$$\text{ASDR}_i * \text{CR}_i,$$

where  $\text{ASDR}_i$  is defined above and  $\text{CR}_i$  is the age-specific classification ratio based on NLMS.

For the Hispanic subgroups, the 1% PUMS was used to replicate the simulation carried out by Cresce and Ramirez (23) by age, and the age-specific death rates were corrected by reestimating population counts for the specific country of origin categories using information on country of birth and ancestry.

## Results

### Evaluation of Race and Hispanic Origin Reporting on Death Certificates

Table 1 presents the record-level percentage agreement and classification ratios for each defined race and Hispanic origin group for deaths occurring during two periods: 1979–1989 and 1990–1998. Record-level agreement is close to 100% for both the white and black populations in both periods, which is consistent with the findings of Hambricht; Sorlie, Rogot, and Johnson; and Rosenberg et al. (1–3). In contrast, record-level agreement for the AIAN population is significantly lower in both periods. Only about 55% of decedents who self-identified as AIAN on the CPS were correctly classified on the death

certificate in both periods (sensitivity), and 80% (1979–1989) and 72% (1990–1998) of decedents identified as AIAN on the death certificate had actually self-identified as such on the CPS in the two periods (predictive value positive). Record-level agreement measures are significantly better for the API population, with sensitivity measures of 84% (1979–1989) and 90% (1990–1998) in the two periods and predictive value positive measures of 95% (1979–1989) and 96% (1990–1998).

Also consistent with previous studies is the close to perfect agreement between CPS and death certificate counts for the white and black populations in both periods studied. Likewise, the classification ratios reflect significantly poorer agreement between CPS and death certificate counts for the AIAN and API groups. The classification ratios were 1.45 for the AIAN population and 1.13 for the API

population in the earlier period. The ratios declined over time from 1.45 to 1.30 for the AIAN population and from 1.13 to 1.07 for the API population, although these changes were not statistically significant.

For a better perspective on how persons self-identifying as AIAN and API on the CPS were classified on the death certificate, Figure 1 presents death certificate race distributions by period of study for these two groups. Approximately 41% (1979–1989) and 42% (1990–1998) of self-identified AIAN decedents were classified as white on the death certificate in the two periods. For the API population, the percentage classified as white on the death certificate declined from approximately 14% to 10% between the two periods.

Correspondence between death certificate and survey identification of all Hispanics was high in both the 1979–1989 and 1990–1998 periods,

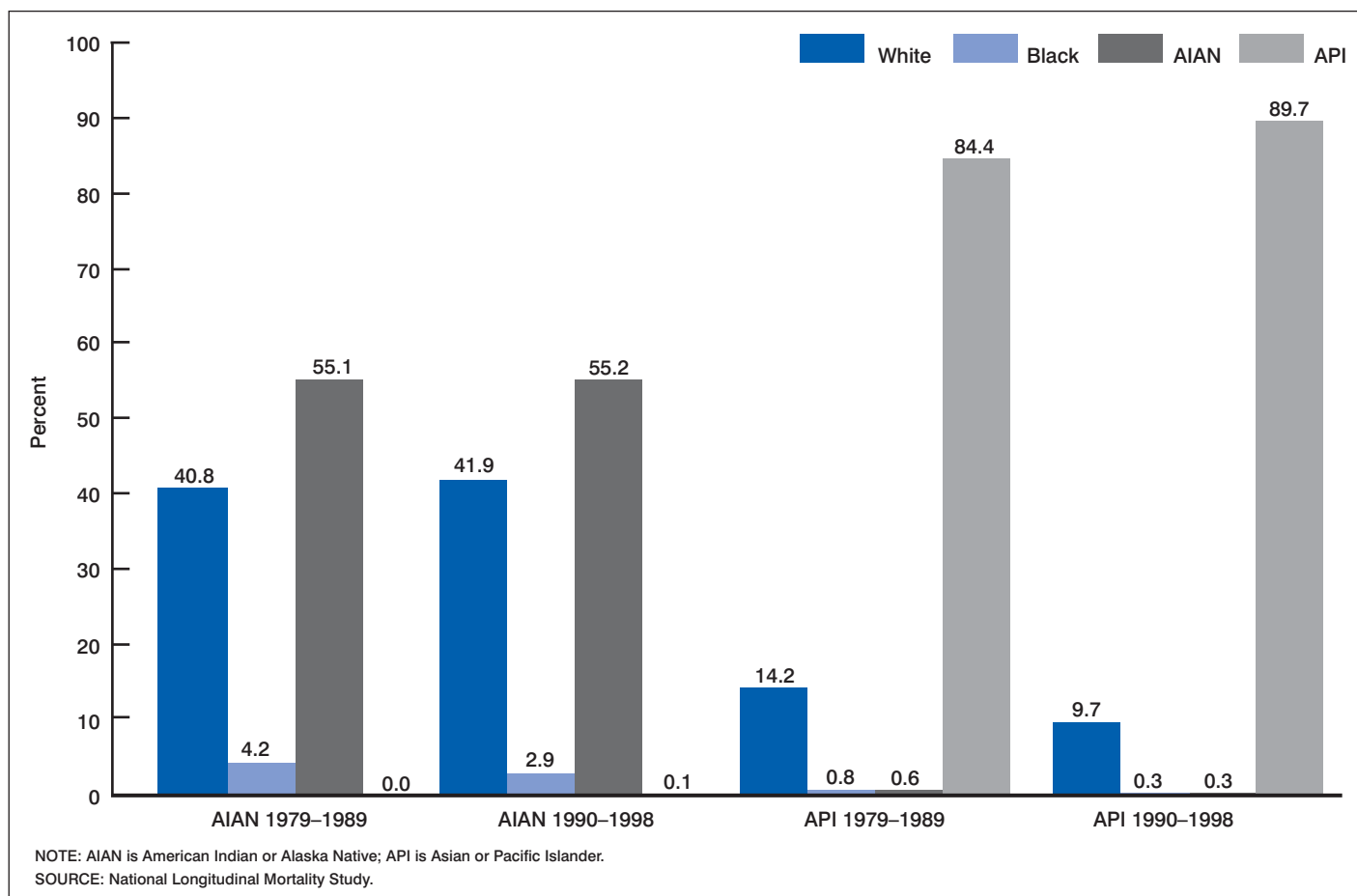


Figure 1. Race distribution on death certificate among self-identified American Indian or Alaska Natives and Asian or Pacific Islanders: United States, 1979–1989 and 1990–1998

declining slightly between the two periods measured at both record and aggregate levels (Table 1). The sensitivity and predictive value positive estimates declined slightly between the two periods but were always near or above 90%. The classification ratio was 1.04 in the 1979 to 1989 period, meaning that the survey responses identified an additional 4% of Hispanics compared with death certificates. The Hispanic classification ratio of 1.04 suggests greater reliability of Hispanic origin reporting on the death certificate than the ratio of 1.07 reported by Rosenberg et al. (3). This interpretation is supported by the fact that these sample sizes are more than twice as large as those used by Rosenberg and coauthors. In the 1990s, the classification ratio increased to 1.05 (Table 1). However, the difference between the two time periods was not statistically significant.

Agreement between death certificate and survey classification improved significantly between the two periods for Mexicans, Central and South

Americans, and other Hispanics as measured by the classification ratios and, for the former two, by the measure of sensitivity. The proportion of Mexicans and Central and South Americans falling in the other Hispanic group on the death certificate due to missing information on country of origin declined from 17% to 7% (Mexicans) and 26% to 8% (Central and South Americans) between 1979–1989 and 1990–1998 (see Figure 2).

### Age and sex

Table 2 presents classification ratios by age and sex for the 1990–1998 period. Among the four main race groups, there is not much difference by sex. With respect to age, the white and black populations exhibit practically no variation in ratios across the age range. The age-specific classification ratios for the API population are also relatively constant across the age range. There is some slight variation over the age-range in the sex- and age-specific classification ratios. In contrast, both the age-specific and sex-age-specific

classification ratios of the AIAN population exhibit considerably more variation over the age range. For instance, the ratios vary from a low of 1.05 in age group 0–24 years to a high of 1.61 in age group 65–74 years. One might argue that the greater variability exhibited by the AIAN population is a function of the relatively small sex-age specific and age-specific sample sizes. However, the API sample sizes are also relatively small and yet the ratios are more consistent across the age range (see Appendix II, Table II).

For the total Hispanic population, the difference between males and females is minimal, with males exhibiting a slightly lower ratio (1.04 compared with 1.06). Variation across the age distribution for the total Hispanic population is relatively stable. In contrast, with the exception of the Mexican population, the classification ratios vary significantly across the age range in both the sex-age specific and age-specific ratios. The large differences in the ratios across the age range may be a function of the small

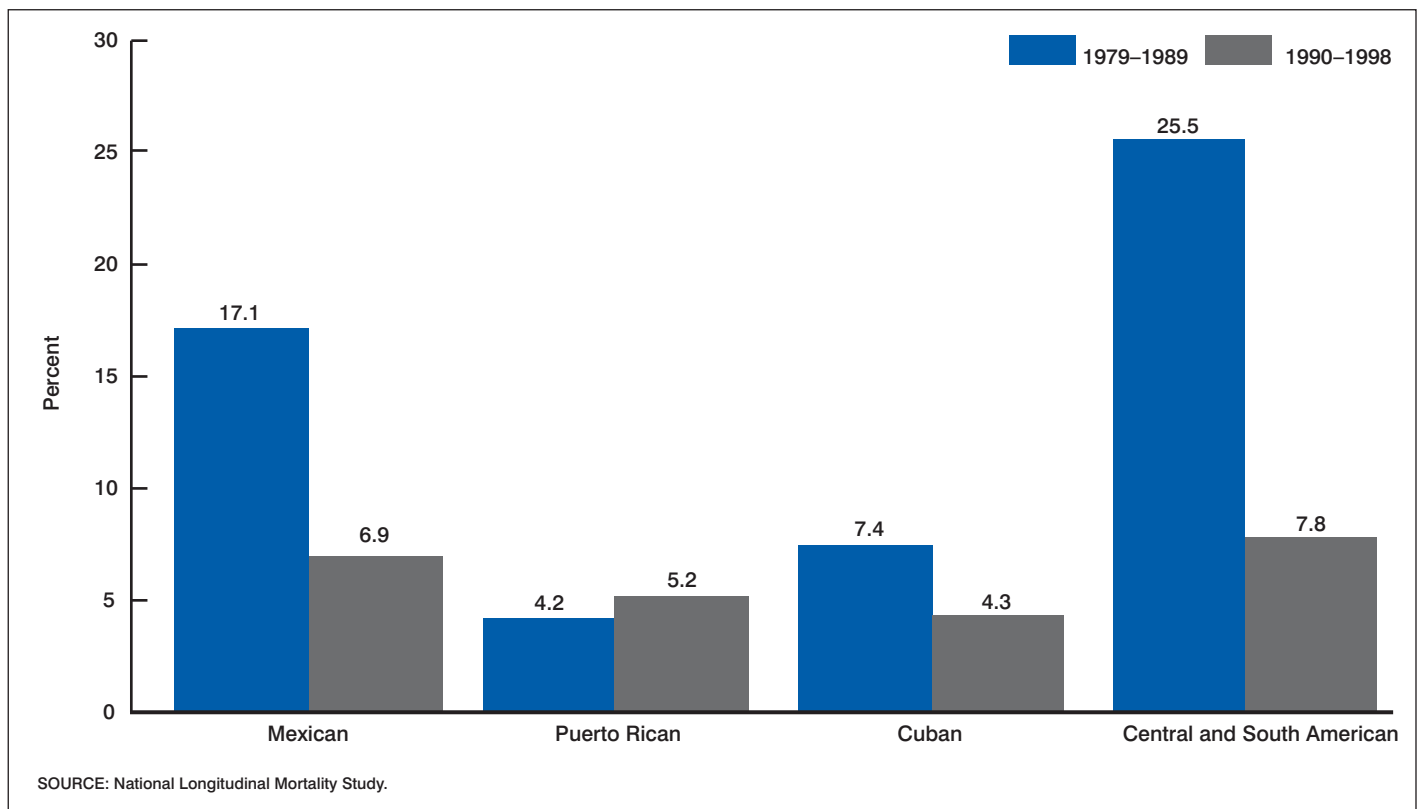


Figure 2. Assignment to nonspecific Hispanic status (other Hispanic) on the death certificate for self-identified specific Hispanic subgroup origin: United States, 1979–1989 and 1990–1998

sample sizes observed for some Hispanic subgroups, sex, and age combinations (see [Appendix III](#)). Sex-age patterns for the non-Hispanic population by race are consistent with those for the main race groups.

### Place of residence

[Table 3](#) presents classification ratios by geographic region and urban-rural status of residence at time of death for all defined race and Hispanic origin populations. For both the white and black populations, there is practically no misclassification or variability by either region or urban-rural status. In contrast (and as hypothesized) there is considerable variability across the categories of these geographic characteristics for the AIAN and API populations. In most cases, the variability in the quality of reporting is a direct result of the geographic distribution of these populations. For example, the ratio is nearly perfect (1.01) for the API population in the West but about 1.30 in the other three regions, consistent with this population's overwhelming concentration in the Western region of the United States. As per the 2000 census, 48% of Asians and 76% of NHOPI resided in the West. Similarly, reporting is much better in regions where the AIAN population is more numerous, such as the West and Midwest, and in rural areas.

### Coethnic concentration

[Table 3](#) presents classification ratios by coethnic geographic concentration for the AIAN and Hispanic populations. As noted previously, this measure is a dichotomous indicator of whether a person died in a county where a substantial number of coethnic deaths took place or not (see [Appendix III](#); a list of counties of concentration for the AIAN population is available from the authors upon request). These results show most dramatically how geographic place of death affects death certificate race and Hispanic origin misclassification for some populations. For the AIAN population, the ratios of CPS to death certificate counts vary significantly from a low of 1.02 in areas

of high coethnic concentration to a high of 1.63 in areas with low coethnic concentration. For the total Hispanic population, coethnic concentration also has a significant effect, with a classification ratio of 1.02 in areas of high concentration compared with 1.08 outside these areas. The ratios are significantly (statistically) closer to 1.00 for Mexicans and Central and South Americans in areas with high coethnic concentration. Although the ratios for Cubans and Puerto Ricans show the same pattern, they are not statistically significant.

### Nativity

Finally, [Table 3](#) also presents classification ratios by nativity. For the white population, there is practically no misclassification or variability in the nativity ratios. There is some difference in classification for the black population, with the U.S. born being more likely to be classified correctly. For both the API and AIAN populations, the ratios suggest better reporting for the U.S. born, but the differences are not statistically significant.

Among the Hispanic population, nativity has a significant effect on death certificate classification. As expected, the foreign born are considerably more likely to be correctly classified on the death certificate than the U.S. born, with a classification ratio of 1.02 compared with 1.07 for the U.S. born. This relationship holds for subgroup reporting for Mexicans (1.01 compared with 1.09), Puerto Ricans (1.04 compared with 1.14), Cubans (1.02 compared with 1.92), and Central and South Americans (1.04 compared with 1.30), although U.S.-born ratios are unreliable for the latter two groups because of the very small number of U.S.-born decedents of these nationalities in the study sample. The better reporting among the foreign born is not surprising because inquiring about the decedent's place of birth increases the probability that the funeral director will correctly assign specific Hispanic origin.

In summary, consistent with previous studies, race and ethnic classification on the death certificate for the white and black population was

found to be excellent. Likewise, reporting was found to be significantly poorer for other groups, especially for the AIAN population. However, some improvement was found in reporting and coverage over time for some groups. This is especially true for the Hispanic population. By 1997, all 50 states and the District of Columbia included a Hispanic origin item on the death certificate, and by 1990, the overwhelming majority of states had missing rates of less than 1% on this item. The results of the bivariate analyses support the hypothesis that there are some decedent characteristics that play an important role in whether the death certificate classification agrees with self-report. Among the Hispanic population, nativity had an important effect on Hispanic origin classification on the death certificate. Likewise, among AIANs, APIs, and Hispanics, place of residence also had an important effect. For all three populations, residence in areas where coethnics were numerous had a positive effect on the quality of race-ethnicity classification on the death certificate.

## Death Certificate Misclassification Effects on Mortality Estimates

In this next section, the effects of death certificate race and ethnicity misclassification on observed death rates are explored. [Tables 4](#) and [5](#) present age-specific and age-adjusted death rates and death rate ratios by race and Hispanic origin uncorrected and corrected for death certificate misclassification using the age-specific classification ratios discussed above.

With respect to race, correction for death certificate misclassification makes a large difference to both age-specific and age-adjusted death rates for the AIAN population. The age-adjusted death rate for the AIAN population climbs from 85% to 111% of that of the white population ([Table 4](#)). However, overall mortality for the AIAN population is probably even greater than the adjustment suggests. The extremely low death rates (even after correction) for the older age groups, where the

corrected ratio to the white death rate drops from 1.51 in age group 65–74 years to 0.99 in age group 75–84 years and further to 0.76 in age group 85 years and over is unrealistic. Table 4 presents uncorrected and corrected ratios of AIAN to white age-specific death rates, which show the rapid and steep decline in the ratios over the age range. The drop in the AIAN age-specific death rates could be a function of age-misreporting, which has been shown to disproportionately affect and bias downwards mortality at the oldest ages (25). It could also be a result of generational differences in self-identification (4).

Adjustment has little effect on both age-specific and age-adjusted death rates for the API population. The age-adjusted death rate for this group changes minimally from 60% to 64% of the rate of the white population. The ratios of API to white age-specific death rates do not decline with age but rather present a U-shaped distribution that remains well

below 1.00 throughout the entire age range.

With respect to the Hispanic population, two interesting findings emerge (see Table 5). First, overall mortality, as measured by the age-adjusted death rate, remained significantly lower than that of the non-Hispanic white population after correction for death certificate misclassification. The age-adjusted death rate for the total Hispanic population increased from 79% to 83% of that of the non-Hispanic white population after correction. The same pattern was evident by Hispanic subgroup after correction for both death certificate and census misclassification. The ratio remained 0.88 for the Mexican population and 0.81 for the Cuban population. It increased from 0.93 to 0.96 for the Puerto Rican population and from 0.45 to 0.76 for the other Hispanic population. The ratio declines from 0.87 to 0.70 for the Central and South American population. As

expected, the two groups most affected by the correction for census misclassification were the Central and South American and other Hispanic populations because the members of these groups were considerably more likely to give a general Hispanic term rather than a specific country of origin (16,22,23).

Second, the Hispanic mortality advantage increases with age as shown in the Hispanic to non-Hispanic white age-specific death rate ratios (see Figure 3). Among the specific subgroups, this pattern is observed mainly in the Mexican or Central and South American populations but not at all in the Cuban or other Hispanic populations. The older age advantage could be a reflection of the “salmon bias” (return migration) effect or age misreporting, but neither of these possibilities were investigated (25,26). These exercises are beyond the focus of this study.

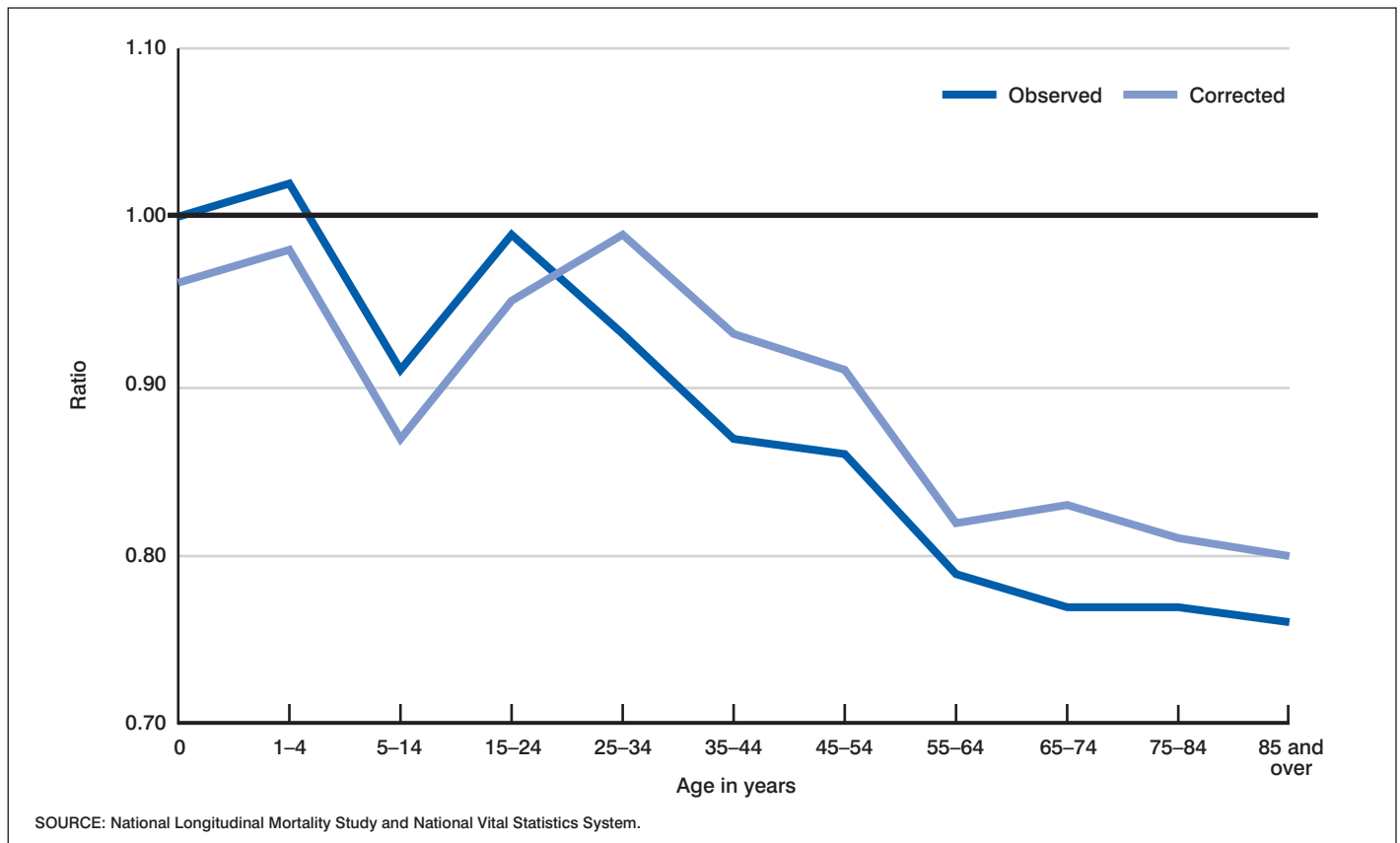


Figure 3. Ratios of Hispanic to non-Hispanic white age-specific death rates, uncorrected and corrected for death certificate misclassification: United States 1999–2001



# Discussion

## Summary and Conclusions

This evaluation of race and Hispanic origin reporting on death certificates revealed three important findings. First, consistent with the results of previous studies, agreement between self-report and death certificate proxy report was found to be excellent for the white and black populations but poor for the AIAN population. Second, agreement between survey and death certificate classification improved for some groups, especially specific Hispanic subgroups, between the 1980s and the 1990s. Third, select decedent characteristics, such as nativity and population composition of place of residence at death, have important effects on the quality of death certificate race-ethnicity classification for populations that contain significant numbers of foreign-born members or do not fit neatly into the OMB race-ethnicity categories.

This study also showed that correction for death certificate misclassification had variable impact on mortality estimates for the different racial and ethnic populations studied. The effect of death certificate race-ethnicity misclassification on mortality estimates for the AIAN population was substantial. Correction changed a relatively large AIAN-to-white mortality advantage to a relatively large disadvantage. On the other hand, the effect of correction was minimal for the API and Hispanic populations. Both maintained a rather large mortality advantage in comparison with the majority population.

In summary, this study presents both optimistic and pessimistic conclusions regarding the state and future of U.S. race- and ethnicity-specific mortality estimates. On the positive side, one of the most important findings is that national coverage of the Hispanic population in NVSS is complete and robust; all registration areas of NVSS include a Hispanic origin item on their death certificates, and the missing rate on this item is miniscule.

Another positive finding is that relatively minor adjustments are needed to correct for death certificate race-ethnicity misclassification in order to produce reliable mortality estimates for the API and Hispanic populations. This bodes well for studies of racial and ethnic mortality disparities.

On the negative side, important problems were observed in U.S. Census Bureau population estimates that negatively affect mortality measures for Hispanic subgroups. This is especially troubling as researchers are becoming ever more aware of the important intragroup differences in the health and mortality profiles of the Hispanic population. Similarly troubling were the results for the AIAN population. The degree of misclassification on the death certificate for this population is substantial and showed no improvement over time. Although this study was able to quantify the extent of such misclassification, the reliability of the corrected mortality estimates for this population at the national level is uncertain. As noted in the “Results,” even after correction, mortality estimates for the older segments of this population appear unrealistic.

This study has some limitations. First, CPS data pertain only to the noninstitutionalized U.S. population. Second, the effects of age-misreporting was not addressed, which may be a factor in the findings regarding the AIAN and Hispanic populations. Third, the possible cohort effects of race-ethnicity self-report were not explored, which may be important especially for the AIAN population. Lastly, this study addressed issues that pertain to the 1977 OMB directive regarding race. The full implementation of OMB’s 1997 revision, which mandates the collection and recording of multiple-race by NVSS, will add a new and complex challenge to the production of high-quality U.S. race-specific mortality estimates.

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**Table 1. Sensitivity, predictive value positive, and classification ratios, by race and Hispanic origin: National Longitudinal Mortality Study, for deaths occurring in 1979–1989 and 1990–1998**

Group	Sensitivity		Predictive value positive		Ratio <sup>1</sup> of CPS <sup>2</sup> to death certificate	
	1979–1989	1990–1998	1979–1989	1990–1998	1979–1989	1990–1998
<b>Race</b>						
White . . . . .	99.8	99.8	99.6	99.5	1.00 (.0004)	1.00 (.0004)
Black . . . . .	98.8	98.1	98.8	98.9	1.00 (.002)	†1.01 (.002)
AIAN <sup>3</sup> . . . . .	55.1	55.2	80.2	71.7	1.45 (.096)	1.30 (.062)
API <sup>4</sup> . . . . .	84.4	89.7	94.9	95.7	1.13 (.029)	1.07 (.016)
<b>Hispanic origin</b>						
Hispanic . . . . .	92.8	88.1	95.9	92.5	1.04 (.010)	1.05 (.008)
Mexican . . . . .	79.2	86.0	93.2	91.4	1.17 (.021)	†1.06 (.011)
Puerto Rican . . . . .	85.8	79.7	88.8	85.0	1.06 (.047)	1.07 (.036)
Cuban . . . . .	82.1	86.6	87.0	90.5	1.05 (.069)	1.04 (.026)
Central and South American . . . . .	32.3	64.3	75.9	67.1	2.35 (.432)	†1.05 (.063)
Other Hispanic . . . . .	46.7	39.2	22.3	38.7	0.50 (.042)	†0.99 (.045)
<b>Non-Hispanic by race</b>						
Non-Hispanic white . . . . .	99.6	99.6	99.1	99.2	1.00 (.001)	1.00 (.001)
Non-Hispanic black . . . . .	98.7	98.4	98.6	98.9	1.00 (.004)	1.01 (.002)
Non-Hispanic AIAN . . . . .	57.1	55.9	86.5	71.3	1.51 (.209)	1.28 (.066)
Non-Hispanic API . . . . .	77.2	89.5	97.5	95.4	1.27 (.077)	†1.07 (.017)

† Difference in ratios across the two time periods is significant at the 1% level.

<sup>1</sup>Ratio based on weighted data.<sup>2</sup>Current Population Survey.<sup>3</sup>American Indian or Alaska Native.<sup>4</sup>Asian or Pacific Islander.

NOTE: Standard errors in parentheses.

**Table 2. Classification ratios by race, Hispanic origin, age, and sex: National Longitudinal Mortality Study, for deaths occurring in 1990–1998**

Race, Hispanic origin, sex, and source of data	Total	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75 years and over
Race		Ratio <sup>1</sup>					
White . . . . .	1.00 (.0004)	0.99 (.005)	0.99 (.003)	1.00 (.002)	1.00 (.001)	1.00 (.001)	1.00 (.0004)
Male . . . . .	1.00 (.001)	0.99 (.006)	0.99 (.004)	1.00 (.003)	0.99 (.002)	1.00 (.001)	1.00 (.001)
Female . . . . .	1.00 (.0004)	0.99 (.009)	1.00 (.004)	1.00 (.003)	1.00 (.002)	1.00 (.001)	1.00 (.0005)
Black . . . . .	1.01 (.002)	1.02 (.010)	1.01 (.006)	1.00 (.006)	1.01 (.006)	1.01 (.004)	1.01 (.003)
Male . . . . .	1.01 (.003)	1.02 (.012)	1.02 (.009)	1.01 (.011)	1.02 (.008)	1.00 (.005)	1.01 (.005)
Female . . . . .	1.01 (.002)	1.01 (.013)	1.01 (.006)	0.99 (.005)	1.01 (.007)	1.01 (.005)	1.00 (.004)
AIAN <sup>2</sup> . . . . .	1.30 (.062)	1.05 (.182)	1.16 (.132)	1.38 (.190)	1.23 (.155)	1.61 (.208)	1.24 (.092)
Male . . . . .	1.29 (.076)	1.06 (.207)	1.31 (.168)	1.24 (.208)	1.47 (.237)	1.40 (.235)	1.19 (.111)
Female . . . . .	1.31 (.101)	*1.00 (–)	0.87 (.196)	1.55 (.338)	0.96 (.198)	1.92 (.392)	1.28 (.144)
API <sup>3</sup> . . . . .	1.07 (.016)	1.03 (.104)	1.07 (.088)	1.04 (.043)	1.09 (.054)	1.10 (.037)	1.05 (.020)
Male . . . . .	1.08 (.025)	*0.96 (.129)	1.09 (.117)	1.01 (.049)	1.08 (.067)	1.13 (.063)	1.06 (.033)
Female . . . . .	1.05 (.019)	1.11 (.168)	1.03 (.127)	1.08 (.077)	1.10 (.091)	1.06 (.030)	1.03 (.019)
Hispanic origin							
Hispanic . . . . .	1.05 (.008)	0.96 (.053)	1.06 (.026)	1.05 (.025)	1.03 (.020)	1.07 (.017)	1.05 (.012)
Male . . . . .	1.04 (.011)	0.98 (.069)	1.07 (.027)	1.02 (.028)	1.03 (.024)	1.06 (.024)	1.03 (.018)
Female . . . . .	1.06 (.012)	0.91 (.060)	1.01 (.061)	1.12 (.050)	1.02 (.034)	1.08 (.023)	1.07 (.017)
Mexican . . . . .	1.06 (.011)	0.98 (.050)	1.09 (.044)	1.15 (.039)	1.05 (.025)	1.08 (.023)	1.04 (.016)
Male . . . . .	1.07 (.014)	1.04 (.056)	1.14 (.047)	1.15 (.051)	1.04 (.033)	1.08 (.032)	1.02 (.021)
Female . . . . .	1.05 (.017)	*0.82 (.098)	0.96 (.093)	1.15 (.062)	1.06 (.038)	1.08 (.032)	1.05 (.023)
Puerto Rican . . . . .	1.07 (.036)	*0.87 (.272)	1.16 (.107)	0.96 (.083)	1.05 (.047)	1.20 (.090)	0.98 (.052)
Male . . . . .	1.08 (.052)	*0.79 (.314)	1.12 (.127)	1.03 (.093)	1.04 (.066)	1.26 (.149)	1.00 (.078)
Female . . . . .	1.05 (.046)	*1.20 (.224)	1.27 (.197)	0.84 (.152)	1.06 (.061)	1.13 (.084)	0.96 (.069)
Cuban . . . . .	1.04 (.026)	*1.00 (–)	1.09 (.163)	*1.21 (.163)	1.07 (.079)	1.12 (.046)	1.00 (.032)
Male . . . . .	1.08 (.037)	*1.00 (–)	*1.22 (.292)	*1.10 (.108)	1.18 (.095)	1.12 (.054)	1.01 (.051)
Female . . . . .	1.00 (.035)	–	*0.91 (.068)	*2.26 (1.55)	0.91 (.130)	1.12 (.086)	0.98 (.041)
Central and South American . . . . .	1.05 (.063)	*1.00 (.411)	0.74 (.146)	0.86 (.151)	1.18 (.169)	1.03 (.127)	1.18 (.109)
Male . . . . .	1.07 (.099)	*1.01 (.582)	0.72 (.182)	*0.65 (.149)	*1.26 (.198)	*1.19 (.239)	1.46 (.277)
Female . . . . .	1.04 (.079)	*1.00 (–)	*0.78 (.180)	*1.29 (.337)	*1.08 (.281)	*0.92 (.138)	1.07 (.109)
Other Hispanic . . . . .	0.99 (.045)	*0.96 (.345)	0.88 (.146)	0.79 (.138)	0.82 (.110)	0.93 (.094)	1.14 (.071)
Male . . . . .	0.88 (.054)	*0.87 (.320)	0.83 (.170)	0.67 (.136)	0.77 (.141)	0.82 (.110)	1.02 (.088)
Female . . . . .	1.16 (.079)	*1.71 (1.78)	*1.04 (.277)	1.14 (.373)	0.89 (.173)	1.12 (.171)	1.26 (.113)
Non-Hispanic white . . . . .	1.00 (.001)	1.00 (.009)	0.99 (.004)	0.99 (.003)	0.99 (.002)	0.99 (.001)	1.00 (.0005)
Male . . . . .	1.00 (.001)	1.00 (.012)	0.99 (.004)	0.99 (.003)	0.99 (.002)	1.00 (.001)	1.00 (.001)
Female . . . . .	1.00 (.001)	1.00 (.014)	1.00 (.007)	0.99 (.004)	1.00 (.003)	0.99 (.001)	1.00 (.001)
Non-Hispanic black . . . . .	1.01 (.002)	1.00 (.008)	1.01 (.005)	1.00 (.007)	1.01 (.006)	1.00 (.003)	1.00 (.003)
Male . . . . .	1.01 (.003)	1.00 (.009)	1.01 (.009)	1.01 (.010)	1.02 (.008)	1.01 (.005)	1.01 (.005)
Female . . . . .	1.00 (.002)	1.01 (.014)	1.00 (.004)	0.99 (.007)	1.01 (.008)	1.01 (.004)	1.00 (.004)
Non-Hispanic AIAN . . . . .	1.28 (.066)	1.17 (.176)	1.14 (.147)	1.25 (.182)	1.24 (.171)	1.47 (.201)	1.26 (.104)
Male . . . . .	1.30 (.083)	*1.17 (.196)	1.30 (.189)	1.04 (.156)	1.42 (.243)	1.31 (.234)	1.35 (.138)
Female . . . . .	1.25 (.106)	*1.20 (.276)	0.85 (.216)	1.51 (.375)	0.99 (.240)	1.71 (.365)	1.20 (.148)
Non-Hispanic API . . . . .	1.07 (.017)	1.06 (.102)	1.05 (.093)	1.03 (.041)	1.15 (.067)	1.09 (.036)	1.04 (.020)
Male . . . . .	1.09 (.026)	*1.02 (.121)	1.06 (.124)	1.03 (.054)	1.16 (.088)	1.13 (.063)	1.07 (.031)
Female . . . . .	1.04 (.020)	*1.11 (.168)	1.02 (.131)	1.04 (.065)	1.14 (.103)	1.05 (.029)	1.01 (.022)

\* Figure does not meet standards of reliability or precision. Ratio is unreliable because either the unweighted number of Current Population Survey deaths or the unweighted number of death certificate deaths or both are based on fewer than 20 deaths.

– Quantity zero.

<sup>1</sup>Ratio based on weighted data.

<sup>2</sup>American Indian or Alaska Native.

<sup>3</sup>Asian or Pacific Islander.

NOTE: Standard errors in parentheses.

**Tables 3. Classification ratios by race and Hispanic origin by region, urban-rural status, coethnic concentration, and nativity: National Longitudinal Mortality Study, for deaths occurring in 1990–1998**

Region, urban-rural status, concentration, and nativity	Race				Classification ratio <sup>1</sup> Hispanic by specific origin						Non-Hispanic by race			
	White	Black	AIAN <sup>2</sup>	API <sup>3</sup>	Total	Mexican	Puerto Rican	Cuban	Central and South American	Other Hispanic	White	Black	AIAN <sup>2</sup>	API <sup>3</sup>
<b>Region</b>														
Northeast . . . . .	1.00 (.001)	1.03 (.008)	*1.92 (.494)	1.27 (.115)	1.08 (.028)	*1.47 (.452)	1.12 (.037)	0.99 (.081)	1.05 (.123)	1.00 (.142)	1.00 (.001)	1.02 (.007)	2.05 (.579)	1.21 (.106)
Midwest . . . . .	1.00 (.001)	1.01 (.004)	1.13 (.102)	1.29 (.135)	1.02 (.040)	1.05 (.052)	0.98 (.197)	*1.56 (.405)	*1.91 (.742)	0.72 (.175)	1.00 (.001)	1.01 (.004)	1.12 (.099)	1.32 (.145)
South . . . . .	1.00 (.001)	1.00 (.002)	1.49 (.143)	1.28 (.103)	1.05 (.012)	1.02 (.014)	0.99 (.103)	1.04 (.026)	1.04 (.108)	1.37 (.153)	1.00 (.001)	1.00 (.002)	1.64 (.226)	1.34 (.113)
West . . . . .	1.00 (.001)	1.02 (.010)	1.22 (.085)	1.01 (.013)	1.04 (.011)	1.10 (.017)	0.95 (.086)	1.05 (.151)	1.00 (.083)	0.89 (.045)	0.99 (.001)	1.01 (.010)	1.17 (.083)	1.01 (.014)
<b>Urban-rural status</b>														
Urban . . . . .	1.00 (.0004)	1.01 (.002)	1.60 (.151)	1.08 (.018)	1.05 (.008)	1.05 (.011)	1.09 (.036)	1.04 (.026)	1.06 (.064)	1.01 (.053)	1.00 (.001)	1.00 (.002)	1.57 (.165)	1.08 (.018)
Rural . . . . .	1.00 (.001)	1.01 (.004)	1.12 (.054)	0.98 (.035)	1.05 (.026)	1.16 (.038)	*0.49 (.149)	*1.13 (.277)	*0.84 (.218)	0.88 (.077)	1.00 (.001)	1.01 (.004)	1.11 (.057)	0.98 (.035)
<b>Coethnic concentration</b>														
Yes . . . . .	...	...	**1.02 (.037)	...	**1.02 (.008)	**1.02 (.011)	1.04 (.042)	1.02 (.025)	**0.99 (.078)	**0.70 (.043)	...	...	...	...
No. . . . .	...	...	1.63 (.143)	...	1.08 (.014)	1.11 (.019)	1.09 (.058)	1.10 (.059)	1.12 (.101)	1.19 (.073)	...	...	...	...
<b>Nativity</b>														
U.S. born. . . . .	**1.00 (.0003)	1.01 (.002)	1.30 (.062)	1.03 (.028)	**1.07 (.013)	**1.09 (.016)	1.14 (.133)	*1.92 (.558)	*1.30 (.381)	0.98 (.049)	**1.00 (.0004)	1.01 (.002)	1.27 (.066)	1.04 (.028)
Foreign born. . . . .	0.99 (.002)	1.09 (.040)	*1.22 (.440)	1.09 (.020)	1.02 (.008)	1.01 (.011)	1.04 (.028)	1.02 (.023)	1.04 (.063)	1.05 (.111)	0.99 (.003)	1.00 (.041)	*1.31 (.578)	1.08 (.021)

\* Figure does not meet standards of reliability or precision. Ratio is unreliable because either the unweighted number of Current Population Survey deaths or the unweighted number of death certificate deaths or both are based on fewer than 20 deaths.  
 ... Category not applicable. Ratios were not estimated for these racial or ethnic groups.  
 \*\* Difference in ratios across the two variable dimensions is significant at the 1% level.

<sup>1</sup>Ratio based on weighted data.      <sup>2</sup>American Indian or Alaska Native.      <sup>3</sup>Asian or Pacific Islander.      NOTE: Standard errors in parentheses.

**Table 4. Age-specific and age-adjusted death rates and rate ratios by race and age, uncorrected and corrected for death certificate misclassification: United States, 1999–2001**

Age in years	As reported on death certificate						With correction for misclassification				Rate ratios to white			
	White		AIAN <sup>1</sup>		API <sup>2</sup>		AIAN		API		AIAN to white		API to white	
	Rate	SE <sup>3</sup>	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Uncorrected	Corrected	Uncorrected	Corrected
0 . . . . .	607.7	2.6	641.9	19.9	453.4	9.6	673.9	20.4	467.0	9.7	1.06	1.11	0.75	0.77
1–4 . . . . .	30.2	0.3	42.8	2.6	23.0	1.1	45.0	2.6	23.7	1.1	1.42	1.49	0.76	0.78
5–14 . . . . .	16.8	0.1	19.5	1.0	12.4	0.5	20.4	1.1	12.8	0.5	1.16	1.22	0.74	0.76
15–24 . . . . .	74.5	0.3	102.5	2.5	40.0	0.8	107.7	2.6	41.2	0.9	1.38	1.44	0.54	0.55
25–34 . . . . .	92.3	0.3	136.6	3.2	43.7	0.8	158.5	3.4	46.8	0.8	1.48	1.72	0.47	0.51
35–44 . . . . .	180.6	0.4	232.3	4.1	84.0	1.2	269.6	4.4	89.9	1.2	1.29	1.49	0.46	0.50
45–54 . . . . .	388.7	0.6	416.9	6.4	201.8	2.1	575.5	7.5	210.0	2.1	1.07	1.48	0.52	0.54
55–64 . . . . .	940.7	1.2	933.8	13.0	514.4	4.5	1,148.9	14.4	560.8	4.7	0.99	1.22	0.55	0.60
65–74 . . . . .	2,342.7	2.2	2,191.8	27.2	1,304.7	9.0	3,529.8	34.5	1,435.5	9.4	0.94	1.51	0.56	0.61
75–84 . . . . .	5,634.1	4.1	4,510.4	57.0	3,522.3	21.1	5,594.5	63.4	3,699.1	21.6	0.80	0.99	0.63	0.66
85 and over . . . . .	15,669.6	11.7	9,588.6	149.3	10,302.5	71.0	11,893.3	166.3	10,819.8	72.8	0.61	0.76	0.66	0.69
Age-adjusted . . . . .	849.6	0.3	718.0	4.2	510.4	1.7	941.3	4.9	542.0	1.7	0.85	1.11	0.60	0.64

<sup>1</sup>American Indian or Alaska Native.      <sup>2</sup>Asian or Pacific Islander.      <sup>3</sup>Standard error.

**Table 5. Age-specific and age-adjusted death rates and rate ratios by Hispanic origin and age, uncorrected and corrected for death certificate misclassification: United States, 1999–2001**

Age in years	Non-Hispanic white		Total Hispanic		Mexican		Puerto Rican		Cuban		Central and South American		Other Hispanic		
	Rate	SE <sup>1</sup>	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Rate	SE	
0 . . . . .	594.1	3.0	592.2	5.1	653.6	6.6	700.8	19.1	475.5	36.0	864.2	26.8	289.2	7.9	
1–4 . . . . .	29.6	0.3	30.2	0.6	34.9	0.8	25.6	1.8	22.7	3.9	50.9	3.3	13.1	0.9	
5–14 . . . . .	16.9	0.1	15.3	0.3	17.6	0.4	15.6	0.9	15.4	2.0	25.2	1.5	6.1	0.4	
15–24 . . . . .	73.7	0.3	72.7	0.6	83.1	0.8	70.2	2.0	56.1	3.8	96.6	2.4	30.9	0.9	
25–34 . . . . .	92.4	0.3	85.5	0.7	91.2	0.9	119.3	2.7	66.8	3.5	107.5	2.3	39.3	1.1	
35–44 . . . . .	181.7	0.4	158.1	1.0	163.1	1.4	262.3	4.1	149.7	4.8	169.0	3.1	86.3	1.7	
45–54 . . . . .	390.5	0.7	335.8	1.9	360.4	2.7	516.4	7.0	343.4	8.6	332.2	5.7	175.8	3.0	
55–64 . . . . .	950.5	1.3	748.1	3.8	848.1	5.8	1,022.4	12.8	740.6	13.2	729.7	11.9	369.0	5.9	
65–74 . . . . .	2,366.5	2.3	1,820.3	7.5	2,120.5	11.8	2,191.0	24.5	1,701.7	20.9	1,964.6	27.5	961.2	11.9	
75–84 . . . . .	5,669.6	4.2	4,378.5	17.0	5,012.3	26.8	4,949.1	55.2	4,539.7	45.4	4,827.3	67.9	2,532.4	27.5	
85 and over . . . . .	15,755.3	11.9	11,962.0	51.4	13,051.1	81.2	12,296.5	160.9	13,843.7	134.0	13,836.7	220.7	7,712.5	87.3	
Age-adjusted . . . . .	855.0	0.4	672.1	1.3	753.7	2.0	798.1	4.2	692.8	3.8	743.1	5.2	381.8	2.1	
Corrected for misclassification															
0 . . . . .	594.1	3.0	568.5	5.0	606.2	6.2	608.0	17.8	346.8	26.3	606.3	18.8	441.2	12.3	
1–4 . . . . .	29.6	0.3	29.0	0.6	32.3	0.7	21.1	1.6	20.1	3.5	36.3	2.4	21.3	1.4	
5–14 . . . . .	16.9	0.1	14.7	0.3	15.7	0.3	13.0	0.8	14.7	1.9	17.8	1.1	9.7	0.6	
15–24 . . . . .	73.7	0.3	69.8	0.6	76.0	0.8	59.2	1.8	52.1	3.5	70.9	1.8	56.4	1.7	
25–34 . . . . .	91.5	0.3	90.7	0.7	92.6	0.9	133.3	2.8	72.3	3.7	61.1	1.5	71.9	2.1	
35–44 . . . . .	179.9	0.4	167.7	1.0	157.0	1.3	292.6	4.3	155.5	4.8	88.2	1.9	146.3	3.0	
45–54 . . . . .	386.6	0.7	352.8	1.9	378.4	2.6	477.9	6.6	398.3	9.0	202.3	3.7	252.2	4.8	
55–64 . . . . .	941.1	1.3	771.0	3.9	845.1	5.7	1,066.6	13.0	758.6	13.1	654.5	9.8	564.9	9.9	
65–74 . . . . .	2,342.9	2.3	1,948.8	7.8	2,180.2	11.6	2,682.9	27.4	1,774.2	20.6	1,442.9	19.9	1,477.7	18.9	
75–84 . . . . .	5,669.9	4.2	4,600.1	17.4	4,844.7	25.4	4,860.2	54.7	4,334.7	43.4	4,242.8	55.0	4,550.6	46.3	
85 and over . . . . .	15,756.1	11.9	12,567.3	52.7	12,953.4	79.0	11,620.7	153.6	13,456.1	130.2	11,692.5	171.7	13,600.7	144.0	
Age-adjusted . . . . .	851.7	0.4	705.5	1.3	747.9	2.0	818.1	4.2	690.5	3.7	596.7	4.0	645.9	3.5	
Rate ratios to non-Hispanic white															
			Total Hispanic corrected		Mexican corrected		Puerto Rican corrected		Cuban corrected		Central and South American corrected		Other Hispanic corrected		
			No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	
0 . . . . .	...	...	1.00	0.96	1.10	1.02	1.18	1.02	0.80	0.58	1.45	1.02	0.49	0.74	
1–4 . . . . .	...	...	1.02	0.98	1.18	1.10	0.86	0.71	0.77	0.68	1.72	1.23	0.44	0.72	
5–14 . . . . .	...	...	0.91	0.87	1.04	0.94	0.93	0.77	0.91	0.87	1.50	1.05	0.36	0.58	
15–24 . . . . .	...	...	0.99	0.95	1.13	1.03	0.95	0.80	0.76	0.71	1.31	0.96	0.42	0.77	
25–34 . . . . .	...	...	0.93	0.99	0.99	1.00	1.29	1.46	0.72	0.79	1.16	0.67	0.42	0.79	
35–44 . . . . .	...	...	0.87	0.93	0.90	0.87	1.44	1.63	0.82	0.86	0.93	0.49	0.48	0.81	
45–54 . . . . .	...	...	0.86	0.91	0.92	0.98	1.32	1.24	0.88	1.03	0.85	0.52	0.45	0.65	
55–64 . . . . .	...	...	0.79	0.82	0.89	0.90	1.08	1.13	0.78	0.81	0.77	0.70	0.39	0.60	
65–74 . . . . .	...	...	0.77	0.83	0.90	0.93	0.93	1.15	0.72	0.76	0.83	0.62	0.41	0.63	
75–84 . . . . .	...	...	0.77	0.81	0.88	0.85	0.87	0.86	0.80	0.76	0.85	0.75	0.45	0.80	
85+ . . . . .	...	...	0.76	0.80	0.83	0.82	0.78	0.74	0.88	0.85	0.88	0.74	0.49	0.86	
Age-adjusted . . . . .	...	...	0.79	0.83	0.88	0.88	0.93	0.96	0.81	0.81	0.87	0.70	0.45	0.76	

... Category not applicable.

<sup>1</sup>Standard error.

NOTE: For the Hispanic subgroups, the death rates are corrected for Census misclassification in addition to death certificate misclassification.

# Appendix I

**Hispanic Origin Reporting on Death Certificate and Percentage Unknown for Reporting States by Year**

States	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Alabama	---	---	---	---	---	---	---	---	---	2.3	1.2	0.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Alaska	---	---	---	---	---	---	---	---	---	---	2.9	0.2	0.6	0.9	0.2	0.2	0.3	0.1	0.0	0.2
Arizona	2.9	1.9	2.0	1.8	1.6	1.1	1.2	1.2	1.6	1.0	0.2	0.2	0.2	0.3	0.3	0.3	1.2	0.3	0.3	0.3
Arkansas	44.1	42.0	37.5	37.7	35.7	26.3	9.2	3.7	3.5	3.2	0.9	0.9	0.3	0.3	0.4	0.3	0.3	0.4	0.1	0.1
California	51.3	54.0	55.2	52.8	16.2	4.9	2.1	2.0	1.8	1.3	0.6	0.5	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1
Colorado	5.3	4.7	4.2	3.4	2.2	1.7	1.3	1.1	1.1	1.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1
Connecticut	---	---	---	---	---	---	---	---	---	---	---	20.2	6.3	6.7	2.2	0.3	0.3	0.3	0.7	0.6
Delaware	---	---	---	---	---	---	---	---	---	---	1.3	0.1	0.1	0.3	0.4	0.3	0.2	0.2	0.2	0.1
Florida	---	---	---	---	---	---	---	---	---	---	0.4	0.3	0.2	0.3	0.3	0.2	0.4	0.4	0.4	0.4
Georgia	4.3	4.1	4.0	3.5	2.9	3.0	2.9	2.7	2.9	2.2	0.5	0.6	0.6	0.5	0.4	0.5	0.4	0.5	0.4	0.3
Hawaii	2.8	1.3	1.1	0.7	0.6	0.6	0.5	0.6	0.5	0.4	0.2	0.1	0.2	0.2	0.3	0.2	0.1	0.1	0.1	0.1
Idaho	---	---	---	---	---	---	---	---	---	---	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Illinois	4.5	4.1	4.0	3.9	3.8	3.8	4.0	3.8	3.9	3.8	1.1	0.8	0.9	0.7	0.8	0.7	1.0	1.2	1.0	1.0
Indiana	3.9	3.5	3.4	3.3	3.0	2.8	2.9	2.8	2.6	1.4	0.5	0.5	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Iowa	---	---	---	---	---	---	---	---	---	---	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Kansas	11.6	10.3	10.3	9.1	9.1	8.6	8.1	7.6	7.1	6.7	2.7	2.9	2.6	2.4	2.4	2.2	2.1	1.9	1.5	1.3
Kentucky	---	---	---	---	---	---	---	---	---	2.2	0.6	0.7	0.8	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Louisiana	---	---	---	---	---	---	---	---	---	---	---	---	0.2	0.3	0.2	0.3	0.2	0.3	0.3	0.2
Maine	37.7	34.0	30.1	24.2	21.1	20.9	21.6	21.1	20.6	11.7	9.0	6.8	5.7	4.9	3.2	3.7	3.3	2.6	2.2	1.4
Maryland	---	---	---	---	---	---	---	---	---	---	17.5	2.3	2.4	2.7	1.8	0.0	0.0	0.0	0.0	0.0
Massachusetts	---	---	---	---	---	---	---	---	---	---	0.7	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.1	0.1
Michigan	---	---	---	---	---	---	---	---	---	---	1.7	1.3	1.1	0.9	0.7	1.0	0.9	0.8	0.8	0.8
Minnesota	---	---	---	---	---	---	---	---	---	---	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.8	0.6	0.5
Mississippi	7.5	6.4	5.8	5.5	5.2	4.2	3.5	3.1	3.0	2.0	1.4	1.5	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2
Missouri	---	---	---	---	---	---	---	---	---	---	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Montana	---	---	---	---	---	---	---	---	---	6.3	2.8	1.6	0.9	0.8	0.8	0.8	0.6	0.5	0.2	0.5
Nebraska	6.1	5.6	5.6	5.0	4.7	4.3	4.0	3.6	3.8	3.5	1.1	1.1	1.0	0.9	1.0	1.1	0.9	0.9	0.6	0.4
Nevada	31.6	29.0	22.6	21.3	21.9	28.1	31.4	33.2	34.9	28.3	0.1	0.1	2.3	2.5	0.4	2.2	2.5	2.2	1.4	0.1
New Hampshire	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6.6	4.5	4.4	2.5	2.3	2.6
New Jersey	28.5	25.6	20.9	18.6	18.3	18.0	16.3	13.1	11.7	11.6	0.5	0.7	0.7	0.7	0.7	0.1	1.8	0.2	0.1	0.1
New Mexico	78.6	1.1	0.9	5.3	0.7	0.6	0.6	0.6	0.5	0.4	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0
New York	7.6	6.9	4.9	4.8	4.9	4.8	7.2	8.3	8.9	6.0	3.6	8.4	8.7	9.5	9.9	1.9	1.5	1.3	1.3	1.4
North Carolina	---	---	---	---	---	---	---	---	---	2.8	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
North Dakota	15.6	14.5	13.9	10.8	10.6	8.4	8.2	7.6	7.9	7.0	2.6	3.0	2.5	2.2	2.6	2.5	2.7	2.2	2.9	3.3
Ohio	9.3	8.5	7.7	6.8	6.3	5.8	5.8	5.5	5.2	4.4	0.6	0.3	0.3	0.5	0.4	0.2	0.4	0.7	1.3	0.9
Oklahoma	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0	0.0
Oregon	---	---	---	---	---	---	---	---	---	0.6	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Pennsylvania	---	---	---	---	---	---	---	---	---	---	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Rhode Island	---	---	---	---	---	---	---	---	---	4.8	0.8	0.7	0.9	1.1	0.7	0.7	1.1	1.3	1.2	1.0
South Carolina	---	---	---	---	---	---	---	---	---	---	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0

See footnotes at end of table.

**Hispanic Origin Reporting on Death Certificate and Percentage Unknown for Reporting States by Year—Con.**

States	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
South Dakota . . . . .	---	---	---	---	---	---	---	---	---	---	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Tennessee . . . . .	---	---	---	---	---	34.8	18.9	13.9	13.1	11.0	1.2	1.1	1.0	0.6	0.4	0.1	0.2	0.1	0.1	0.1
Texas . . . . .	---	3.1	1.6	1.7	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.8	0.5	0.5	0.4	0.4	0.4	0.4	0.2	0.2
Utah . . . . .	2.1	1.7	1.9	1.6	1.5	1.9	1.1	1.0	1.0	0.9	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1
Vermont . . . . .	---	---	---	---	---	---	---	---	---	---	11.6	6.5	6.2	6.7	0.6	0.2	0.1	0.0	0.0	0.1
Virginia . . . . .	---	---	---	---	---	---	---	---	---	---	28.5	3.0	2.2	1.2	0.7	0.4	0.4	0.5	0.5	0.6
Washington . . . . .	---	---	---	---	---	---	---	---	---	1.5	0.2	0.1	0.1	0.3	0.3	0.3	0.2	0.1	0.1	0.1
West Virginia . . . . .	---	---	---	---	---	---	---	---	---	---	1.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Wisconsin . . . . .	---	---	---	---	---	---	---	---	---	---	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wyoming . . . . .	14.6	8.9	7.7	7.0	5.6	5.6	5.2	4.8	4.6	3.0	0.3	0.1	0.0	0.2	0.0	0.1	0.1	0.1	0.1	0.0
District of Columbia . . . . .	---	---	---	---	---	---	9.9	12.0	12.5	13.1	3.0	1.0	0.7	0.3	0.3	0.1	0.0	0.1	0.1	0.6

--- Data not available. State not reporting Hispanic origin.  
 0.0 Quantity more than zero but less than 0.05.



## Appendix II

### Tables 1–3 Study Sample Sizes by Selected Variables

**Table I. Appendix for Table 1, Number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, and period. National Longitudinal Mortality Study for deaths occurring in 1979–1989 and 1990–1998**

Race and Hispanic origin	Number of deaths <sup>1</sup>	
	1979–1989	1990–1998
White		
CPS <sup>2</sup> . . . . .	52,390	90,065
Death certificate . . . . .	52,519	90,272
Black		
CPS . . . . .	5,993	10,010
Death certificate . . . . .	5,994	9,941
AIAN <sup>3</sup>		
CPS . . . . .	419	754
Death certificate . . . . .	332	651
API <sup>4</sup>		
CPS . . . . .	516	1,155
Death certificate . . . . .	473	1,120
Hispanic		
CPS . . . . .	1,516	5,140
Death certificate . . . . .	1,465	4,855
Mexican		
CPS . . . . .	1,018	2,887
Death certificate . . . . .	864	2,622
Puerto Rican		
CPS . . . . .	150	527
Death certificate . . . . .	144	496
Cuban		
CPS . . . . .	84	532
Death certificate . . . . .	80	505
Central and South American		
CPS . . . . .	67	250
Death certificate . . . . .	28	235
Other Hispanic		
CPS . . . . .	197	944
Death certificate . . . . .	349	997
Non-Hispanic white		
CPS . . . . .	12,786	81,797
Death certificate . . . . .	12,860	82,146
Non-hispanic black		
CPS . . . . .	1,960	9,687
Death certificate . . . . .	1,960	9,651
Non-Hispanic AIAN		
CPS . . . . .	94	663
Death certificate . . . . .	77	588
Non-Hispanic API		
CPS . . . . .	100	1,126
Death certificate . . . . .	74	1,092

<sup>1</sup>Number of deaths based on unweighted data.

<sup>2</sup>Current Population Survey.

<sup>3</sup>American Indian or Alaska Native.

<sup>4</sup>Asian or Pacific Islander.

**Table II. Appendix for Table 2, number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, age, and sex: National Longitudinal Mortality Study for deaths occurring in 1990–1998**

Race, sex, and source of data	Total	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75 years and over
Number of deaths							
<b>White</b>							
CPS <sup>1</sup> . . . . .	90,065	892	3,967	4,718	9,254	20,096	51,138
Death certificate . . . . .	90,272	895	3,988	4,738	9,283	20,161	51,207
<b>Male</b>							
CPS . . . . .	45,861	654	2,640	2,926	5,465	11,636	22,540
Death certificate . . . . .	45,982	654	2,658	2,937	5,491	11,665	22,577
<b>Female</b>							
CPS . . . . .	44,204	238	1,327	1,792	3,789	8,460	28,598
Death certificate . . . . .	44,290	241	1,330	1,801	3,792	8,496	28,630
<b>Black</b>							
CPS . . . . .	10,010	256	1,089	922	1,459	2,340	3,944
Death certificate . . . . .	9,941	253	1,079	919	1,443	2,325	3,922
<b>Male</b>							
CPS . . . . .	4,970	211	637	486	768	1,164	1,704
Death certificate . . . . .	4,925	209	629	480	759	1,159	1,689
<b>Female</b>							
CPS . . . . .	5,040	45	452	436	691	1,176	2,240
Death certificate . . . . .	5,016	44	450	439	684	1,166	2,233
<b>AIAN<sup>2</sup></b>							
CPS . . . . .	754	22	117	83	119	137	276
Death certificate . . . . .	651	23	109	70	109	104	236
<b>Male</b>							
CPS . . . . .	420	20	82	43	69	70	136
Death certificate . . . . .	358	21	72	39	54	56	116
<b>Female</b>							
CPS . . . . .	334	2	35	40	50	67	140
Death certificate . . . . .	293	2	37	31	55	48	120
<b>API<sup>3</sup></b>							
CPS . . . . .	1,155	32	84	91	137	289	522
Death certificate . . . . .	1,120	31	81	87	134	272	515
<b>Male</b>							
CPS . . . . .	654	18	54	53	81	162	286
Death certificate . . . . .	640	19	54	52	79	152	284
<b>Female</b>							
CPS . . . . .	501	14	30	38	56	127	236
Death certificate . . . . .	480	12	27	35	55	120	231
<b>Hispanic</b>							
CPS . . . . .	5,140	125	527	474	728	1,151	2,135
Death certificate . . . . .	4,855	125	496	451	700	1,081	2,002
<b>Male</b>							
CPS . . . . .	2,892	97	374	302	434	658	1,027
Death certificate . . . . .	2,750	94	350	290	421	628	967
<b>Female</b>							
CPS . . . . .	2,248	28	153	172	294	493	1,108
Death certificate . . . . .	2,105	31	146	161	279	453	1,035
<b>Mexican</b>							
CPS . . . . .	2,887	84	308	296	415	676	1,108
Death certificate . . . . .	2,622	82	264	249	377	609	1,041
<b>Male</b>							
CPS . . . . .	1,663	65	224	185	254	389	546
Death certificate . . . . .	1,492	60	184	151	231	347	519
<b>Female</b>							
CPS . . . . .	1,224	19	84	111	161	287	562
Death certificate . . . . .	1,130	22	80	98	146	262	522

See footnotes at end of table.

**Table II. Appendix for Table 2, number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, age, and sex: National Longitudinal Mortality Study for deaths occurring in 1990–1998—Con.**

Race, sex, and source of data	Total	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75 years and over
<b>Puerto Rican</b>							
CPS . . . . .	527	20	100	68	85	122	132
Death certificate . . . . .	496	18	90	65	84	108	131
<b>Male</b>							
CPS . . . . .	306	15	67	45	52	69	58
Death certificate . . . . .	291	14	63	42	53	61	58
<b>Female</b>							
CPS . . . . .	221	5	33	23	33	53	74
Death certificate . . . . .	205	4	27	23	31	47	73
<b>Cuban</b>							
CPS . . . . .	532	1	27	19	69	118	298
Death certificate . . . . .	505	1	26	17	63	104	294
<b>Male</b>							
CPS . . . . .	298	1	18	16	45	77	141
Death certificate . . . . .	274	1	15	15	39	68	136
<b>Female</b>							
CPS . . . . .	234	0	9	3	24	41	157
Death certificate . . . . .	231	0	11	2	24	36	158
<b>Central and South American</b>							
CPS . . . . .	250	6	28	31	44	43	98
Death certificate . . . . .	235	6	33	34	37	40	85
<b>Male</b>							
CPS . . . . .	119	4	20	17	23	19	36
Death certificate . . . . .	107	4	23	21	19	16	24
<b>Female</b>							
CPS . . . . .	131	2	8	14	21	24	62
Death certificate . . . . .	128	2	10	13	18	24	61
<b>Other Hispanic</b>							
CPS . . . . .	944	14	64	60	115	192	499
Death certificate . . . . .	997	18	83	86	139	220	451
<b>Male</b>							
CPS . . . . .	506	12	45	39	60	104	246
Death certificate . . . . .	586	15	65	61	79	136	230
<b>Female</b>							
CPS . . . . .	438	2	19	21	55	88	253
Death certificate . . . . .	411	3	18	25	60	84	221
<b>Non-Hispanic white</b>							
CPS . . . . .	81,797	707	3,351	4,100	8,212	18,289	47,138
Death certificate . . . . .	82,146	708	3,376	4,132	8,258	18,377	47,295
<b>Male</b>							
CPS . . . . .	41,394	507	2,202	2,528	4,826	10,594	20,737
Death certificate . . . . .	41,588	507	2,227	2,549	4,857	10,631	20,817
<b>Female</b>							
CPS . . . . .	40,403	200	1,149	1,572	3,386	7,695	26,401
Death certificate . . . . .	40,558	201	1,149	1,583	3,401	7,746	26,478
<b>Non-Hispanic black</b>							
CPS . . . . .	9,687	234	1,039	900	1,413	2,270	3,831
Death certificate . . . . .	9,651	233	1,035	897	1,401	2,265	3,820
<b>Male</b>							
CPS . . . . .	4,786	193	603	467	743	1,128	1,652
Death certificate . . . . .	4,766	193	600	460	737	1,130	1,646
<b>Female</b>							
CPS . . . . .	4,901	41	436	433	670	1,142	2,179
Death certificate . . . . .	4,885	40	435	437	664	1,135	2,174

See footnotes at end of table.

**Table II. Appendix for Table 2, number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, age, and sex: National Longitudinal Mortality Study for deaths occurring in 1990–1998—Con.**

Race, sex, and source of data	Total	0–24 years	25–44 years	45–54 years	55–64 years	65–74 years	75 years and over
<b>Non-Hispanic AIAN</b>							
CPS . . . . .	663	20	104	72	104	120	243
Death certificate . . . . .	588	20	99	65	97	98	209
<b>Male</b>							
CPS . . . . .	371	18	73	37	62	61	120
Death certificate . . . . .	321	19	65	36	50	52	99
<b>Female</b>							
CPS . . . . .	292	2	31	35	42	59	123
Death certificate . . . . .	267	1	34	29	47	46	110
<b>Non-Hispanic API</b>							
CPS . . . . .	1,126	31	81	88	135	280	511
Death certificate . . . . .	1,092	30	78	84	129	266	505
<b>Male</b>							
CPS . . . . .	637	17	53	51	79	157	280
Death certificate . . . . .	617	18	52	49	75	147	276
<b>Female</b>							
CPS . . . . .	489	14	28	37	56	123	231
Death certificate . . . . .	475	12	26	35	54	119	229

<sup>1</sup>Current Population Survey.<sup>2</sup>American Indian or Alaska Native.<sup>3</sup>Asian or Pacific Islander.

**Table III. Appendix for Table 3, number of deaths from the Current Population Survey and death certificate by race, Hispanic origin, region, urban-rural status, geographic concentration, and nativity: National Longitudinal Mortality Study for deaths occurring in 1990–1998**

Region, nativity, and area	Race				Hispanic						Non-Hispanic			
	White	Black	AIAN <sup>1</sup>	API <sup>2</sup>	Total	Mexican	Puerto Rican	Cuban	Central and South American	Other Hispanic	White	Black	AIAN	API
Number of deaths														
<b>Region</b>														
Northeast														
CPS <sup>3</sup> . . . . .	19,423	1,369	21	76	617	19	339	71	94	94	18,243	1,304	20	70
Death certificate. . . . .	19,483	1,331	12	63	563	14	304	70	91	84	18,322	1,289	11	62
Midwest														
CPS . . . . .	24,135	1,937	189	56	293	203	32	10	11	37	23,122	1,907	185	52
Death certificate. . . . .	24,173	1,924	174	46	278	190	35	7	6	40	23,166	1,895	173	
South														
CPS . . . . .	27,629	6,007	167	76	1,911	1,158	93	415	64	181	23,808	5,794	99	72
Death certificate. . . . .	27,713	5,995	110	61	1,793	1,127	88	392	60	126	23,952	5,790	60	56
West														
CPS . . . . .	18,825	695	377	946	2,315	1,504	62	36	81	632	16,618	681	359	931
Death certificate. . . . .	18,852	687	355	949	2,217	1,288	68	36	78	747	16,700	676	344	930
Urban-rural status														
Urban														
CPS . . . . .	62,171	8,032	244	982	4,406	2,430	514	525	243	694	56,395	7,792	201	958
Death certificate. . . . .	62,348	7,978	162	941	4,161	2,246	473	497	229	716	56,699	7,771	141	917
Rural														
CPS . . . . .	27,885	1,978	510	172	731	454	13	7	7	250	25,396	1,895	462	167
Death certificate. . . . .	27,915	1,963	489	178	691	373	23	8	6	281	25,441	1,880	447	174
Coethnic concentration														
Yes														
CPS . . . . .	...	...	474	...	2,507	1,348	256	343	391	361	...	...	...	...
Death certificate. . . . .	...	...	469	...	2,459	1,321	246	334	386	508	...	...	...	...
No														
CPS . . . . .	...	...	280	...	2,633	1,539	271	189	131	583	...	...	...	...
Death certificate. . . . .	...	...	182	...	2,396	1,301	250	171	114	489	...	...	...	...
Nativity														
U.S. born														
CPS . . . . .	83,007	9,756	738	553	2,902	1,948	122	27	22	783	76,724	9,492	651	543
Death certificate. . . . .	83,163	9,701	638	552	2,698	1,704	112	15	17	850	76,988	9,451	578	538
Foreign born														
CPS . . . . .	6,790	205	11	600	2,221	928	402	505	228	158	4,847	152	8	581
Death certificate. . . . .	6,839	190	10	567	2,141	912	383	490	217	139	4,930	155	8	553

... Category not applicable.

<sup>1</sup>American Indian or Alaska Native.<sup>2</sup>Asian or Pacific Islander.<sup>3</sup>Current Population Survey.

## Appendix III

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### Listing of County and State of Death During the 1990–1998 Period for Hispanic Origin Subgroups

County and state	Percent of deaths
Mexican	
Los Angeles, Calif. . . . .	14.17
Bexar, Tex. . . . .	9.63
El Paso, Tex. . . . .	4.50
Cameron, Tex. . . . .	2.69
Webb, Tex. . . . .	2.58
Harris, Tex. . . . .	2.44
San Bernadino, Calif. . . . .	2.40
Frio, Tex. . . . .	2.33
Hidalgo, Tex. . . . .	2.25
San Diego, Calif. . . . .	2.18
Cook, Ill. . . . .	1.88
Nueces, Tex. . . . .	1.81
Dallas, Tex. . . . .	1.73
Total . . . . .	50.59
Remainder of country . . . . .	49.41
Cuban	
Dade, Fla. . . . .	66.60
Remainder of country . . . . .	33.40
Puerto Rican	
New York City, N.Y. . . . .	34.94
Cook, Ill. . . . .	3.41
Honolulu, Hawaii . . . . .	3.21
Dade, Fla. . . . .	3.21
Hudson, N.J. . . . .	3.01
Total . . . . .	47.78
Remainder of country . . . . .	52.22
Central and South American	
New York City, N.Y. . . . .	23.89
Los Angeles, Calif. . . . .	15.79
Dade, Fla. . . . .	13.77
Total . . . . .	53.45
Remainder of country . . . . .	46.55

# Vital and Health Statistics series descriptions

- SERIES 1. **Programs and Collection Procedures**—These reports describe the data collection programs of the National Center for Health Statistics. They include descriptions of the methods used to collect and process the data, definitions, and other material necessary for understanding the data.
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- SERIES 21. **Data on Natality, Marriage, and Divorce**—These reports contain statistics on natality, marriage, and divorce that are not included in regular, annual, or monthly reports. Special analyses by health and demographic variables and geographic and trend analyses are included.
- SERIES 22. **Data From the National Mortality and Natality Surveys**—Discontinued in 1975. Reports from these sample surveys, based on vital records, are now published in Series 20 or 21.
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For answers to questions about this report or for a list of reports published in these series, contact:

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