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

Death certificates are the primary source of mortality data in the United States. They provide the numerator for death rates, while 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 the foundation of our knowledge about overall mortality, cause of death, and life expectancy differentials between the numerous race and ethnic sub-groups in the United States. Inconsistency between death rate numerator and denominator race and ethnic classification has the potential to seriously bias mortality estimates and as a result adversely affect our understanding of the mechanisms associated with racial and ethnic health disparities.

Incongruence 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 ethnic reporting procedures. On the one hand, reporting of race and ethnicity is left to a respondent who answers the question for him/herself and other members in the household through self-administered questionnaires (population censuses) and, on the other, reporting is done by a funeral director who must gather this information from next of kin or, often, rely on personal observation (death certificates). These differences in reporting procedures may not seriously affect mortality estimates for groups, such as the white and black populations because of their long history in the US racial fabric, but may seriously affect estimates for

other race and ethnic populations who through immigration or inter-group marriage are more recent additions to the race and ethnic spectrum of the US population.

Indeed, previous evaluation studies of the agreement between census 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 race or ethnic group (Hambright, 1969; Sorlie, Rogot and Johnson, 1992; Rosenberg, et al., 1999). 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 optimal 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 under-ascertainment on the death certificate. Individuals who self-identified with a particular group while alive are often 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 (Sorlie, Rogot, and Johnson, 1992; Rosenberg, et al. 1999). Changes in the racial and ethnic composition of the US population suggest a critical need for the re-examination of the consistency between death rate numerator and denominator race and ethnic classification.

The purpose of this study, therefore, is to evaluate race and Hispanic origin reporting on death certificates in the United States for the most recent period possible and to assess the impact of misclassification on the death certificate on race and Hispanic origin-specific death rates. The expansion of the National Longitudinal Mortality Study (NLMS), a data set consisting of a linkage between Current Population Surveys (CPS) and death certificates, through the year 1998 has provided us with the best available opportunity to re-assess the congruence between death rate numerator and denominator

race and ethnic classification. We use the NLMS to carry out our evaluation for deaths that took place in years 1979 through 1998. Our study updates and expands on the evaluation study carried out by Rosenberg, et al. (1999) which used an earlier version of the NLMS that included annual CPS files for the years 1973, and 1978-1985 with mortality follow-up for the years 1979 through 1989. Our study adds to extant knowledge on the topic in two significant ways. We use the latest version of the NLMS which includes annual CPS files for the years 1973, and 1978-1998 with mortality follow-up for the years 1979 through 1998. As a result of the increase in both sample size and mortality follow-up time, we are able to explore change over time in the quality of reporting on the death certificate and explore 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. We hypothesize that for some race groups and very likely for the entire Hispanic population these characteristics profoundly influence the quality of classification on the death certificate.

Finally, to better observe the degree to which race and Hispanic origin-specific mortality estimates are biased by misclassification on death certificates, we estimate two sets of race and Hispanic origin-specific death rates. Using pooled 1999-2001 vital statistics mortality data and 2000 Census data, we estimate observed and corrected for death certificate misclassification age-specific death rates and age-adjusted death rates by race and Hispanic origin.

In the following sections, we provide a brief review of extant knowledge on the subject of race and ethnic misclassification on death certificates; describe the data and

methods we use in our evaluation exercise; present the results of our analyses and discuss their use and implications.

BACKGROUND

Previous Studies of Race and Ethnic Misclassification on Death Certificates in the United States

Evaluation studies of race misclassification on the death certificate date back to the 1960s. The first study to assess the congruence between death certificate and census race classification at the national level was based on the 1960 Census-Death Certificate Matched Record Study, which consisted of a sample of 340,000 death certificates linked to the 1960 decennial census (Hambright, 1969). 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 the Census self-identification as the standard for comparison, the study found that 99.8 percent of self-identified whites, 98.2 percent of self-identified blacks, 79.2 percent of self-identified American Indians, and 86.9 percent of self-identified non-white "Others" were correctly identified on the death certificate.

It was not until the 1990s that national level evaluation studies were carried out again mainly because of the lack of appropriate data. The creation of the NLMS generated the opportunity to once again examine this issue. Using the NLMS, which at the time consisted of nine CPS files linked to mortality data for the years 1979 through 1985, Sorlie, Rogot and Johnson (1992) found similar results as the Hambright (1969) study, even though the studies differed in one very important way. The Hambright study compared decennial census self–identification to the death certificate, while the Sorlie, Rogot and Johnson (1992) study compared CPS self–identification to the death

certificate. The latter found that 99.2 percent of self-identified whites, 98.2 percent of

self-identified blacks, 73.6 percent of self-identified American Indians and Alaska

Natives (AIAN), and 82.4 percent of self-identified Asian and Pacific Islanders (API)

were correctly classified on the death certificate.

Using an expanded version of the NLMS with mortality follow-up from 1979

through 1989,[1] Rosenberg, et al. (1999) again report similar results, with 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 (1969) and the Rosenberg, et al. (1999) studies agreement between self and

proxy report for this population declined from 79.2 to 57.4 percent. We note, however,

that the Hambright (1969) study did not include Aleut or Eskimo in the American Indian

category, while the NLMS AIAN category does. Nevertheless, there was a sharp decline

in agreement between self-report and proxy report between the two NLMS-based studies;

from 73.6 to 57.4 percent agreement. We speculate that this large change is likely a

result of the unprecedented growth in the number of individuals identifying themselves as

AIAN since the 1960s, an increase, argued by Passel, (1996), that is not a function of true

demographic mechanisms, but rather a rise over time in the acceptability of claiming

Native American ancestry.

Hispanic origin classification issues did not come to the national fore until the

1980s. The 1980 Census was the first national level data collection system that included

a Hispanic origin question on the questionnaire distributed to all households. Similarly, it

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[1] Included are the same CPS files as those included in the study reported by Sorlie, Rogot, and Johnson, 1992.

was not until 1978 that States began to include a Hispanic origin question on their death certificates. In 1978 only 18 States included this item on their death certificates (Maurer, Rosenberg, and Keemer, 1990). As a result, the first study to assess 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 (1992) evaluate death certificate coverage by Hispanic origin[2]. They found that among self-identified Hispanics 89.7 percent were correctly identified on the death certificate. The percent correctly identified by Hispanic sub-groups was found to be the following: Mexican (84.9); Puerto Rican (85.9); Cuban (80.0); and, Other Hispanic (47.6). Based on the same data set, Rosenberg, et al.(1999) report the following ratios of CPS to death certificates counts:[3] Hispanic (1.07); Mexican (1.11); Puerto Rican (1.04); Cuban (1.07); and Other Hispanic (0.89). While these ratios have been widely cited, they are limited because a number of States with large Hispanic populations were not reporting Hispanic origin on the death certificate at the time, such as Florida, and by the very small size of the sample on which they are based.[4]

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

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[2] For deaths in 1979-1985, an item on Hispanic origin was included on the death certificate of 21 States.
[3] The ratios are based on the sample sizes published in Sorlie, Rogot, and Johnson (1992) and are based on unweighted sample data.
[4] 1979-1985 NLMS Sample Sizes: Hispanic (600); Mexican (417); Puerto Rican (71); Cuban (30); and, Other Hispanic (82).

misclassification for minority populations other than the black population? And, will it

be possible to produce more detailed mortality estimates, such as life tables, for race and

ethnic groups for whom such statistics have to date not been produced?

DATA AND METHODS

Evaluation of Race and Hispanic Origin Reporting on Death Certificates

      Data. The NLMS[5] is a data set consisting of U.S. Census Bureau data from

Current Population Surveys (CPS)[6] and a sample of the 1980 decennial census which

were linked to death certificate information to identify mortality status and cause of

death. To date, the NLMS includes 26 files: March 1973 CPS, February 1978 CPS,

March 1979 CPS, April 1980 CPS, August 1980 CPS, December 1980 CPS, 1980

Decennial Census E Sample, March 1981 CPS through March 1998 CPS, and September

1985 CPS, which adds up to 2.3 million records. Through linkage to the National Center

for Health Statistics (NCHS)' National Death Index (NDI)[7] for the period 1979 through

1998 252,627 deaths have been identified. Our analysis is based on the sample of

decedents identified in the files listed above with the exception of the 1980 Decennial

Census E Sample and the September 1985 CPS files. These two files are excluded

because their records do not contain appropriate weights. For our race-specific analysis

we also exclude CPS files March 1973, February 1978, March 1986, and March 1987

because the CPS race variable in these files included only three categories, white, black,

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[5] See website "http://www.census.gov/nlms/" for full description of the NLMS, including a reference list
of all extant scientific publications based on this dataset.

[6] The CPS is a monthly survey of approximately 50,000 households carried out by the Bureau of the
Census for the Bureau of Labor Statistics. It is a complex survey representative of the non-institutionalized
civilian population.

[7] The NDI is a central computerized index of death record information, containing a set of identifying
information for each death that has taken place in the United States between 1979 and the most recent
NCHS mortality data year (currently, 2004) (detailed information about the NDI can be found in
'http://www.cdc.gov/nchs/ndi.htm').

and other, making it impossible to estimate results for the AIAN and API populations. In all cases only records with non-missing race or Hispanic origin information on either the CPS or death certificates are included[8].

Race categories used in this study include white, black, American Indian and Alaska Native (AIAN), and Asian and Pacific Islander (API) and are based on the 1977 version of OMB Statistical Directive No.15 (Office of Management and Budget, 1977). Hispanic origin categories include total Hispanic, Mexican, Puerto Rican, Cuban, Central and South American, and Other Hispanic. The latter group includes individuals not falling in any of the previous Hispanic categories, such as Dominican Republicans and Spaniards, as well as Hispanic individuals for whom specific country of origin was not ascertained in either the CPS or the death certificate. We combine the race and Hispanic origin variables in both the CPS and the death certificate to identify the non-Hispanic population by race (white, black, AIAN, and API).

The race and ethnic classification system employed in federal population surveys and censuses vs. that employed by the National Vital Statistics System (NVSS) with respect to mortality data differ in a very crucial manner. Both systems are guided by the mandates of OMB's Statistical Directive No. 15 regarding the acceptable race and ethnic categories that should be collected and recorded by federal statistical and administrative systems, however, the two systems differ in the procedures used to collect the information. The CPS, like the decennial Census, relies on the report of individuals

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[8] After accounting for incomplete race information (as noted above), the percentage of records with unknown race on the CPS and death certificate were 0.05 and 0.74 percent for the 1979-89 period, respectively, and 0.07 and 0.00 percent for the 1990-98 period, respectively. Similarly, after removing records from non-reporting States, the percentage of records with unknown Hispanic origin on the CPS and death certificate were 0.86 and 0.27 percent for the 1979-89 period, respectively, and 0.27 and 0.49 percent for the 1990-1998 period, respectively.

responding for themselves and other members of their household, while the NVSS mortality data system relies on proxy report provided by a funeral director.

The CPS has collected information about race since 1946; originally consisting of interviewer observation of whether the respondent was white, Negro, or other. Following OMB's Statistical Directive No. 15 issued in 1977, the CPS expanded the race terms used to include white, black, American Indians, Asians and Pacific Islanders and switched from reliance on interviewer observation to reliance on interviewee report (self-report and report for other members of household). 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 (U.S. Department of Labor, 2001). Similarly, CPS interviewers were instructed to show respondents a flashcard with a list of choices to identify their ethnicity. With the September 1974 survey the term 'ethnicity' was changed to 'origin,' with the primary purpose of identifying the Hispanic population (U.S. Department of Labor, 2001).

Unlike the CPS and decennial Census, the NVSS is not a federally mandated system but rather consists of a voluntary contractual agreement between the National Center for Health Statistics (NCHS) and 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. To attain maximum comparability across the registration areas and produce national level vital statistics data, the NVSS produces and periodically revises US Standard Certificates and Reports that contain the basic elements necessary for the collection and publication of comparable national and local vital statistics (Tolson, et al., 1991).

A race item has been a part of the NVSS US 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' and the inclusion of sample terms for guidance and request for specificity. The greatest change in this item took place with the 2003 revision. This revision incorporated the OMB's 1997 version of Statistical Directive No. 15, which expands the race groups included in the 1977 version from four to five and allows for the selection of more than one race (OMB, 1997; NCHS, 2001). The timing of State implementation of the suggested changes in Standard Certificate revisions varies dramatically. For example, as of the latest mortality year (2004) only twelve States have adopted the proposed changes to their death certificates (Minino, Heron, and Smith, 2006).

A Hispanic origin item did not become a part of the Standard Death Certificate until the 1989 revision, and again the timing of State implementation varied greatly. Prior to the 1989 Standard Certificate revision, a limited number of States included a Hispanic origin item on the death certificate. For instance, in 1979, the first year of mortality follow-up in the NLMS, 20 States recorded Hispanic origin on the death certificate, but a significant number of these had high levels of missing information on this item. By 1989, a majority of States was collecting this information, but it was not until 1997 that all States included a Hispanic origin item on their death certificates and coverage rates of close to 100 percent were achieved (See Appendix A for distribution of Hispanic origin reporting by year and State).

Methods. As in previous studies the evaluation strategy that we employ to assess the degree of racial and ethnic misclassification on death certificates entails making a

somewhat arbitrary assumption at the outset. This is that the standard used to assess the quality of race and Hispanic origin reporting on death certificates should be respondent self-report gathered in a population survey or census. Survey and census responses contain their own set of problems relating to race and ethnic identification, such as question wording effects or non-response (Cresce, Schmidley, and Ramirez, 2005). However, lacking another alternative source for comparison, we make the assumption that the information provided by a respondent to a survey questionnaire is on average of better quality than proxy reporting conducted by a funeral director who has little personal knowledge of the decedent.

To evaluate race and Hispanic origin classification on the death certificate we produced two statistical estimates of death certificate misclassification. First, we estimated ratios of CPS race and Hispanic origin counts to death certificate counts for the sample of identified NLMS decedents described above [hereinafter referred to 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. Our 'classification ratios' are of the same nature as the ratios reported by Rosenberg, et al. (1999) and can be easily interpreted as adjustment factors to correct for the bias found in death certificates. Second, we estimated record-level agreement between the CPS and the death certificates of individual decedents through a measure of sensitivity and predictive value positive. Sensitivity is the percent of respondents in a CPS self-identified race/ethnic group who are correctly identified on the death certificate; predictive value

positive is the percent of decedents identified by the death certificate in a specific race/ethnic group who are self-identified in the same group on the CPS[9] (Swallen and Guend, 2003; Eschbach, 2006; Elo, Cassio, Kestenbaum, and Ferguson, 2004). .

We estimated the 'classification ratios' by decedents' age, sex, nativity, urban/rural status, region of residence, and area of concentration at time of death only for the 1990-1998 period for the following reasons. First, completeness of coverage by State for Hispanics 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 question on their death certificates increased significantly; from 20 States in 1979 to all 50 States and the District of Columbia by 1997 (See Appendix A). Second, estimates based on more current data are preferable for adjustment of observed death rates.

The variables we chose for bivariate analysis are derived from the death certificate. The age at death variable is re-coded into 10-year age groups with the exception of the first and last categories. The youngest age category covers ages 0 to 14 and the oldest 85 and older. The selection of age categories was driven by sample size limitations, particularly for minority populations such as AIANs, APIs and Hispanics. (See Appendix C for sample sizes by selected variables). Categories of the sex, nativity, rural/urban and region of residence variables are straight forward. We estimated "area of concentration," a dichotomous variable indicating whether the decedent died in a county with high concentration of co-ethnics, for Hispanics (and sub-groups) and the AIAN population because we hypothesized that for these two groups more than any other reporting on the death certificate varies significantly by whether the death occurred in an

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[9] All statistics presented are weighted by CPS sample weights.

area with significant numbers of co-ethnics or not[10]. Because racial 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 a co-ethnic or familiar with the population in question because of its high geographic concentration.

For the Hispanic population and component sub-groups, the concentration indicator is defined as 1=decedent died in a county that falls within the first 50th percentile of ranked number of deaths by county during the 1990s, and 0=decedent died outside this list of counties (See Appendix B for 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, we selected 276 counties where in the 2000 Census AIANs reporting a single-race only were at least 70 percent of persons reporting an AIAN race in combination with another race[11]. The concentration measure for AIANs is therefore defined as 1=decedent died in one of these 276 counties during the 1990s and 0=decedent died elsewhere.

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

To assess the effects of race and ethnic misclassification on the death certificate on mortality measures, we estimate two sets of age-specific and age-adjusted death rates by race and Hispanic origin. First, we estimate these rates using observed NVSS

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[10]   As will be shown in the Results section, region of residence is a sufficiently detailed breakdown to assess the quality of reporting on the death certificate for the API population.
[11] List of 276 counties are available from authors upon request.

mortality data and decennial census data. Second, we re-estimate these rates after adjusting counts of death with the age-specific classification ratios defined above.

Data. We use pooled number of deaths for years 1999-2001 from the NCHS vital statistics system for death rate numerators and NCHS bridged April 1, 2000 population census estimates for the four race groups and the total Hispanic population for rate denominators, but we use the Census 2000 Summary File 2 (SF2) based on the April 1, 2000 decennial population enumeration for Hispanic sub-groups because the NCHS bridged population file does not break down the Hispanic population by country of origin (Ingram, et al., 2003). Because the Census Bureau implemented OMB's 1997 revision of Statistical Directive No. 15 with the 2000 decennial census, but most NVSS registration areas had not, NCHS adopted a bridging algorithm that re-assigns 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 (Ingram, 2003). This bridging algorithm uses empirically-derived probabilities of identification with 1977 OMB-standard race categories for persons reporting multiple racial ancestries calculated from data from a question about primary racial identification posed to multiracial subjects of the National Health Interview Survey.

Methods. We estimated age-specific and age-adjusted death rates by race and Hispanic origin as follows:

Age-Specific Death Rate = $\text{ASDR}_i = [D_{i1999} + D_{i2000} + D_{i2001}] / [P_{i2000} * 3]$

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_{iyr} is

population in specific age group i and year 2000, and W_i is the age-specific weight based

on the US Standard Population (Anderson and Rosenberg, 1998).

We correct observed age-specific death rates with the age-specific 'classification

ratios' derived from the NLMS and then re-estimate age-adjusted death rates. We limit

our correction to age because of the sample size restrictions posed by our study sample

(See Appendix C for sample sizes by selected variables). Ideally, we would want to see

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.

Adjustment is done as follows:

$ASDR_i * CR_i$,

where $ASDR_i$ is defined above and CR_i is the age-specific classification ratio based on

the NLMS.

Finally, we note that we do not adjust Census-based denominators for net-

undercount as we follow the strategy used by the US Census Bureau. The Census 2000

post-enumeration survey (Accuracy and Coverage Evaluation Survey (A.C.E.)) revealed

minimal and statistically insignificant net-undercounts by race and Hispanic origin. For

example, net under-counts were found to be statistically different from zero for only the

non-Hispanic white and black populations (-1.13 percent (over count) and 1.84 percent,

respectively). The net under-count estimates for other race and Hispanic origin

populations were found to be not statistically different from zero[12] Second, the A.C.E.

also produced some unexplained results which led the Census Bureau to decide against

adjusting the census population count which is used for inter-censal population estimates

(Mulry, 2006).

RESULTS

Evaluation of Race and Hispanic Origin Reporting on Death Certificates

Table 1 presents the record-level percent agreement (sensitivity and predictive

value positive) comparisons as well as 'classification ratios' for each defined race and

Hispanic origin group for deaths occurring during two periods, 1979-89 and 1990-98.

Both measures of record-level agreement are close to 100 percent for the white and black

populations during both periods. In comparison, record-level agreement for the AIAN

and API groups is considerably lower in both periods. In the AIAN case, only about 55

percent of decedents who self-identified as AIAN on the CPS were correctly classified on

the death certificate in both periods (sensitivity), and 80 and 72 percent of decedents

identified as AIAN on the death certificate had actually self-identified as such on the CPS

in the two periods, respectively (predictive value positive). The record-level agreement

measures are significantly better for the API population, with sensitivity measures of 84.4

and 89.7 percent in the two periods, respectively; and, predictive value positive measures

of 94.9 and 95.7 percent in the two periods, respectively. Both measures of record-level

agreement show an improvement over time for the API population (See Table 1).

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[12]   Net-undercounts: (Hispanics (0.71 percent), non-Hispanic Asian (-0.75 percent), Hawaiian or Pacific Islander (2.12 percent), American Indian and Alaska Native on reservations (-0.88 percent), and American Indian and Alaska Native off reservations (0.62 percent) (Mulry, 2006).

[TABLE 1]

The 'classification ratios' also reflect significantly poorer classification for the AIAN and API groups as compared to the white and black populations. Among the white and black populations there is almost perfect agreement between CPS and death certificate counts during both periods. Among AIANs there is some improvement in recent years, but the 'classification ratio' remains significantly high at 1.30. The 'classification ratio' for the API population improves significantly over time from 1.12 to 1.07.

For a better perspective on how individuals self-identifying as AIAN and API on the CPS are actually coded on the death certificate Figure 1 presents death certificate race distributions by period of study for these two groups. Approximately 41 and 42 percent of self-identified AIANs were classified as white on the death certificate in the two periods, respectively. For the API population the percentage classified as white on the death certificate declined from approximately 14 to 10 percent between the two periods.

[FIGURE 1]

For the total Hispanic population both sensitivity and predictive value positive estimates declined slightly between the two periods (See Table 1). However, sensitivity increased for all sub-groups with the exception of Puerto Ricans and "Other" Hispanics. The classification ratios for the total Hispanic population increased from 1.03 to 1.05 between 1979-89 and 1990-98, but, again, there was significant improvement in classification ratios for most sub-groups. The classification ratios improved significantly for Mexicans (1.18 vs. 1.06), Cubans (1.06 vs. 1.04), and Central and South Americans (2.35 vs. 1.04). Improvement in death certificate classification for individual Hispanic

sub-groups is demonstrated in Figure 2. It displays the prevalence of assignment of non-specific Hispanic status (Other Hispanic) among decedents who identified with specific sub-groups on the CPS for the two periods. In the earlier period specific Hispanic origin decedents were significantly more likely to end up in the 'Other Hispanic' category than in the latter period. For example, 17 and 26 percent of Mexicans and Central and South Americans, respectively, fall in the Other Hispanic category on the death certificate in the1979-89 compared to 7 and 8 percent, respectively, in the 1990-98 period.

[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 show practically no variation in ratios across the age range. On the other hand, the total AIAN population shows pronounced variation over the age range. Similarly, the classification ratios by age and sex for the AIAN population vary noticeably. In comparison, the API population shows considerably smoother age variations for both males and females. A large part of variation across the age range for AIANs and APIs is likely a function of the small sample sizes of the age-sex specific combinations, especially at the youngest ages (See Appendix C for sample sizes).

[TABLE 2]

For the total Hispanic population the difference between males and females is minimal, with males exhibiting a slightly lower ratio (1.04 vs. 1.06). However, the pattern differs among the specific sub-groups. For some, like the Cuban population, the female ratio is lower (1.00 vs. 1.08 for males). Sex-age variation is pronounced for all

Hispanic sub-groups, with the greatest differentials occurring at the younger ages. Again, caution is stressed due to the small sample sizes of age-sex combinations for these groups (See Appendix C). Sex-age patterns for the Non-Hispanic population by race are consistent with those for the main race groups.

Region of Residence. Table 3 presents classification ratios by region of residence at time of death. For the white population there is practically no variance by region. For the black population, there is minor variation but all ratios are very close to 1.00. However, there is considerable regional variation for the AIAN population and the API population. Agreement between CPS and death certificate classification appears to be best in the Midwest (1.13) for the AIAN population, followed by the West (1.22). For the API population the regional effect is very strong. The ratio is nearly perfect (1.01) in the West but almost 1.30 in the other three regions. Regional variation in the classification ratios for these two populations is strongly correlated with their regional distributions. As per the 2000 Census, 48 percent of Asians and 76 percent of Native Hawaiians and Other Pacific Islanders lived in the West. Among the AIAN population 48 percent were found in the West, 16 percent in the Midwest, and 29 percent in the South.

[TABLE 3]

Regional variation in the classification ratios for the total Hispanic population is not as pronounced. It is, however, for specific sub-groups. For example, for the Cuban and Central and South American populations the classification ratios are very high in the Midwest (1.56 and 1.91, respectively) and significantly lower in areas where these groups tend to be concentrated. Similarly, the ratio is significantly higher for Mexicans in the

Northeast (1.47), compared to Mexicans in the Midwest (1.05), South (1.02) and West (1.10). These findings are consistent with the regional distribution of these Hispanic populations. As per the 2000 Census the groups are distributed by region as follows: Mexican (West (55%), South (32%), Midwest (11%), Northeast (2%)); Puerto Rican (Northeast (61%), South (22%), Midwest (10%), West (7%)); Cuban (South (74%), Northeast (14%), West (9%), Midwest (4%)); and, Central and South American (South (36%), Northeast (30%), West (28%), Midwest (6%)).

Urban/Rural Status. Table 3 shows results by urban/rural status. As with region, there is no variation in reporting by rural/urban status for the white and black populations. On the other hand, rural/urban differences are greater for the other race groups and the Hispanic population. Reporting appears to be slightly better in rural areas among the API population and dramatically better in rural areas for the AIAN population (1.12 vs. 1.60). While there appears to be no difference for the total Hispanic population, it does seem that reporting is much better in urban areas for most specific Hispanic sub-groups.

Co-Ethnic Geographic Concentration. Table 3 presents classification ratios by co-ethnic geographic concentration for selected race and Hispanic groups. As noted above, this measure is a dichotomous indicator of whether an individual died in a county where a substantial number of co-ethnic deaths took place or not [See Appendix B; list of counties of concentration for the AIAN population are available from the authors upon request.]. These results show most dramatically how geographic place of death affects death certificate race and Hispanic origin classification for some groups. For the AIAN population the ratios of CPS to death certificate counts vary from a low of 1.02 in areas

of high concentrations of AIANs to a high of 1.63 in other areas. For the total Hispanic

population geographic place of death also has a strong effect, with a classification ratio of

1.02 in areas of high concentration vs. 1.08 outside these areas. Likewise, the

classification ratios in areas of high co-ethnic concentration are closer to 1.00 for all

Hispanic subgroups, with the exception of the amorphous "Other" Hispanic group. The

ratios for Mexicans are 1.02 vs. 1.11, in areas with high concentrations of Mexicans vs.

outside these areas, respectively. Similarly, the ratios are 1.04 vs. 1.09 for Puerto Ricans;

1.02 vs. 1.10 for Cubans; and, 0.97 vs. 1.12 for Central and South Americans. All

differences are statistically significant.

Nativity. Table 3 also presents classification ratios by nativity. For the white

population the ratios are practically the same. There is some difference for the Black

population, with the native born being more likely to be classified correctly. For the

AIAN population the opposite appears to be the case, although because of the small

number of foreign born AIANs this finding may not be very robust (See Appendix C for

sample sizes). Among the API population the classification ratio is 1.03 for the US born

vs. 1.09 for the foreign born, which is somewhat surprising because we would have

expected that the additional information on place of birth would assist funeral directors in

better classifying the foreign born population as is the case for the Hispanic population,

as discussed below. This unexpected result may be a function of the profound diversity

of the API population, which includes people with origins in Asia and in the Pacific

Islands. If we were able to separate these groups we might find different results.

Among the Hispanic population nativity has a significant effect on classification.

As expected, the foreign born are considerably more likely to be correctly classified on

the death certificate than the U.S. born. This is true for all groups with the exception of

Puerto Ricans, for whom the concentration measure was not estimated because of a high

prevalence of missing information on place of birth on the death certificate[13], and the

"Other" Hispanic sub-group, who are overwhelmingly U.S. born. The classification

ratios for foreign born Mexicans and Cubans are very close to perfect (1.01 in each case).

The classification ratio for foreign born Central and South Americans (1.01) is not

statistically different from 1.00. This finding 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 (NCHS, 2004).

In summary, consistent with previous studies we found that race and ethnic

classification on the death certificate for the white and black population is excellent.

Likewise, we found that reporting is significantly poorer for other groups, especially for

the AIAN population. We did find, however, some improvement over time for the API

and Hispanic populations. The results of the bivariate analyses support our 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 co-ethnics were numerous had

a positive effect on the quality of classification on the death certificate.

Death Certificate Misclassification Effects on Mortality Estimates

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[13] Puerto Ricans are U.S. citizens regardless of whether they are born on the Island of Puerto Rico or in the U.S. mainland. This may affect completion of their place of birth information on the death certificate in the U.S.

In this next section we explore the effects of death certificate race and ethnic misclassification on observed death rates. 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.

[TABLE 4]

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. Increases in age-specific death rates resulting from adjustment are statistically significant for all age groups with the exception of age groups 1-4 and 15-24. More noticeable though is that the age-adjusted death rate for the AIAN population climbs from 85 to 110 percent of that of the white population. However, it is probable that overall mortality for the AIAN population is even greater than the adjustment shows. The extremely low death rate, even after correction, for the age group 85 and older, where the ratio to the Non-Hispanic white death rate drops from 1.02 in age group 75-84 to 0.73 in age group 85 and older, is unrealistic and could be a function of age-misreporting, which has been shown to disproportionately affect and bias downwards mortality at the oldest ages (Preston, Elo, and Stewart, 1999). On the other hand, 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 percent of the rate of the white population.[14]

[TABLE 5]

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[14] Estimates for the Black population are not shown as no adjustment was needed for this group. The white population is used as the comparison group.

With respect to the Hispanic population three interesting findings emerge (See Table 5). First, overall mortality, as measured by the age-adjusted death rate, remains 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 percent of that of the Non Hispanic white population after correction. The same pattern is evident by Hispanic sub-group. The effect of correction on the ratio of Hispanic to non-Hispanic white is as follows: 88 to 93 percent for Mexicans; 93 to 97 percent for Puerto Ricans; 81 to 85 percent for Cubans; 87 to 95 percent for Central Americans and South Americans; and, 45 to 47 percent for Other Hispanics (See Table 5).

Second, most of the Hispanic advantage appears to be concentrated in the oldest ages. This is especially the case for Mexicans, Puerto Ricans, and Central and South Americans. In each of these cases mortality appears to be significantly greater than that of non-Hispanic whites in the young and middle-age age groups, but then significantly lower in the oldest age groups. For example, among the Mexican population corrected age-specific death rate ratios fall from 1.07 in age group 45 – 54 to 0.95 in age group 55 – 64, then decline further to 0.85 for age group 85 and older. For the Puerto Rican population ther drop is even greater; from 1.12 in age group 65-74 to 0.70 in age group 85 and older. The very low death rate ratios at the oldest age groups could be a function of age misreporting or return migration (the Salmon bias effect) (Palloni and Arias, 2004; Preston, Elo, and Stewart, 1999). On the other hand, the high death rate ratios at the youngest age groups for Mexicans, Puerto Ricans and Central and South Americans could be a function of problems with Census data, which we discuss below.

Third, the reliability of either the observed or corrected age-specific and age-adjusted death rates for the heterogeneous 'Other' Hispanic group is highly improbable. The most compelling explanation for these improbable death rates is misclassification of Hispanic sub-groups in the 2000 Census (Logan, 2002; Suro, 2002). Indeed, a post-censal evaluation study (Alternative Questionnaire Experiment) revealed that the Census 2000 Hispanic question produced a significantly greater proportion of Hispanics reporting a general Hispanic term (Hispanic, Latino, or Spanish) rather than a specific country of origin than did the 1990 Census Hispanic question (Cresce, Schmidley, and Ramirez, 2005). 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 the word 'origin,' and added the word 'Latino' (Cresce, Schmidley, and Ramirez, 2005).

Cresce and Ramirez (2003) used Census 2000 questions on birthplace and ancestry to estimate the proportion of respondents giving a general Hispanic term that could be re-categorized into a specific country of origin category. Among Hispanics responding with a generic term in 2000 (16 percent of the total Hispanic population) they found that 28.8 % and 25.2 % could be re-categorized using birthplace and ancestry, respectively, leaving 7.5 % in the unspecific Hispanic category (Cresce and Ramirez, 2003). Confirming the effect of removal of country specific examples from the Census 2000 Hispanic question, the groups gaining the most numbers when birthplace and ancestry were considered were those without a country-specific checkbox, and who were expected to write in their country of origin. The percent increase in numbers for these groups were as follows: Spaniards (68.7 %), Central Americans (34.4 %), South Americans (30.1 %), and Dominicans (25.0 %). Mexicans, Puerto Ricans and Cubans

gained significantly smaller numbers when birthplace and ancestry were taken into account (6.9, 4.0, and 5.0 percent, respectively), as expected since the Census 2000 Hispanic origin question included country-specific check boxes for these three populations.

Using the 1 % Public Use Microdata Sample (PUMS) of the 2000 Decennial Census, we replicated this simulation by age and corrected the age-specific death rates by re-estimating population counts for the specific country of origin categories using information on country of birth and ancestry. Table 6 shows the results. The Central and South American group experienced the greatest change in death rates among the specific sub-groups, as expected. Their age-adjusted death rate declined from 95 % to 69 % of that of the non-Hispanic white population. In comparison, the changes much smaller for Mexicans (93 % vs. 88 %), Puerto Ricans (97 % vs. 96 %), and Cubans (85 % vs. 82 %). The adjustment led to an increase in the age-adjusted death rate for the "Other" Hispanic group from 47 % to 76 % of the rate for non-Hispanic whites, making it much more reasonable. Nonetheless, the questionably low death rates at ages 85 and older remained and/or became even more unlikely for Mexicans, Puerto Ricans and Central and South Americans.

[TABLE 6]

Are these death rates reasonable? Further exploration of the Hispanic population who gave a generic response revealed two things that led us to conclude that we were probably as close as we could possibly get to correctly estimating Hispanic sub-group populations using Census data. First, the remaining 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 %). We can assume the CPS question elicits better responses because respondents are given a country-specific list to select from. Second, both analysis of CPS and Census 2000 revealed that the majority of these respondents were born in California, Texas, New Mexico, and Colorado. The CPS shows that these are predominantly 3rd or higher generation Hispanic Americans, who are descendants of early Spanish immigrants and/or that segment of the Mexican population who were technically never immigrants since they live in what used to be Mexico. These Hispanic Americans probably no longer identify with a specific country of origin.

SUMMARY AND CONCLUSIONS

Our evaluation of race and ethnic reporting on death certificates revealed three interesting patterns. First, consistent with the findings of previous studies, we found that agreement between self-report and death certificate proxy report continues to be excellent for the white and black populations, but not for the other populations considered (Sorlie, Rogot, and Johnson, 1992; Rosenberg, et al., 1999). Second, we found that there was some improvement over the two decades considered in reporting on the death certificate for most groups. Third, our study revealed there are important relationships between decedents' characteristics and the quality of race and ethnic reporting on death certificates. We found that whether a death occurred in an area of high co-ethnic concentration or not had a profound impact on the quality of race and ethnic reporting on death certificates. AIAN and Hispanic decedents (including most Hispanic sub-groups) were significantly more likely to be correctly classified on the death certificate in areas of high co-ethnic concentration than elsewhere. Likewise, APIs were similarly more likely to be correctly classified in the Western region of the country, where the population is

most numerous. These findings confirm our hypothesis that local familiarity with the ethnic group in question greatly improves the probability of correct identification among populations that fall outside the black-white dichotomy of the US racial spectrum. Similarly, we found that decedents' nativity had an important effect on whether they were correctly identified on the death certificate. Foreign born Hispanic decedents (including most sub-groups) were significantly more likely to be correctly classified on the death certificate than their US born counter parts. This is understandable since a funeral director must also inquire about birthplace when filling out the death certificate.

Not surprisingly we found that race and ethnic specific mortality estimates are profoundly affected by the quality of reporting on death certificates. The most glaring example of the effects of race misclassification on death certificates is found in the case of AIAN mortality estimates. Correction of race misclassification on the death certificates of AIANs changed a relatively large AIAN to white mortality advantage to a relatively large disadvantage.

Our findings regarding Hispanic mortality estimates brought to light two distinct issues. One, correction for death certificate misclassification does not eliminate the Hispanic mortality advantage relative to non-Hispanic whites. This finding is consistent with that of previous studies which have identified this advantage in distinct data sources (Palloni and Arias, 2004; Eschbach, 2006; Abraido-Lanza, Dohrenwend, Ng-Mak, and Turner, 1999; Hummer, Rogers, Amir, Forbes, and Frisbie, 2000; Markides, 1983). Second, and unexpectedly, our evaluation exercise revealed that Census ethnic classification is not problem-free. Without correction for Census denominator

misclassification, mortality estimates for Hispanic sub-groups were found to be of questionable value, especially for groups other than Mexican, Puerto Ricans, and Cubans.

We end with both optimistic and pessimistic conclusions regarding the state and future of mortality estimates for groups other than the white and black populations of the United States. Improvement in race and ethnic reporting on death certificates over the two decades studied and the growing commonality throughout the country of previously small and highly segregated groups leads us to optimistically conclude that mortality estimates will continue to become more robust over time for some groups, like the API and total Hispanic population. On the other hand, problems with Census question wording, such as what we found with respect to the identification of specific Hispanic origin does not bode well for the future of mortality estimates for these sub-populations. Lastly, the full implementation of OMB's 1997 revision of Statistical Directive Number 15 which mandates the collection and recording of multiple-race by the NVSS will add a new and complex challenge to the production of high quality US race-specific mortality estimates.

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Table1. Sensitivity, Predictive Value Positive and Classification Ratios: National Longitudinal Mortality Study, for Deaths occurring in 1979-1989 and 1990-1998

Group	Sensitivity		Predictive Value Positive		Ratio[15] of CPS to death certificate	
	1979-89	1990-98	1979-89	1990-98	1979-89	1990-98
Race						
White	99.8	99.8	99.6	99.5	1.00* (.00004)	1.00* (.00003)
Black	98.8	98.1	98.8	98.9	1.00 (.0002)	1.01* (.0002)
American Indian	55.1	55.2	80.2	71.7	1.46* (.009)	1.30* (.006)
Asian or Pacific Islander	84.4	89.7	94.9	95.7	1.12* (.003)	1.07* (.001)
Hispanic Origin						
Hispanic	92.8	88.1	95.9	92.5	1.03* (.001)	1.05* (.001)
Mexican	79.2	86.0	93.2	91.4	1.18* (.002)	1.06* (.001)
Puerto Rican	85.8	79.7	88.8	85.0	1.04* (.005)	1.07* (.003)
Cuban	82.1	86.6	87.0	90.5	1.06* (.007)	1.04* (.003)
Central/South American	32.3	64.3	75.9	67.1	2.35* (.041)	1.04* (.006)
Other Hispanic	46.7	39.2	22.3	38.7	0.47* (.004)	0.99 (.005)
NonHispanic by race						
NonHispanic White	99.6	99.6	99.1	99.2	1.00* (.0001)	1.00* (.00004)
NonHispanic Black	98.7	98.4	98.6	98.9	1.00 (.0004)	1.01* (.0002)
NonHispanic AIAN	57.1	55.9	86.5	71.3	1.52* (.023)	1.28* (.006)
NonHispanic API	77.2	89.5	97.5	95.4	1.26* (.007)	1.07* (.001)

*Significantly different from 1 at the 1% level
(Standard errors in parentheses)

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[15] Ratio based on weighted data

Table 2. Classification Ratios by Race, Hispanic Origin, Sex and Age: National Longitudinal Mortality Study, for Deaths Occurring in 1990-1998

Race, Hispanic origin, Sex, and source of data	Classification Ratio[1]									
	Total	0-14 years	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75-84 years	85 years and over
Race										
White	1.00*	0.99*	0.99*	0.99*	0.99*	1.00*	1.00*	1.00*	1.00*	1.00*
	(.00003)	(.001)	(.001)	(.0004)	(.0003)	(.0002)	(.0001)	(.0001)	(.0001)	(.0001)
Male	1.00*	0.99*	1.00*	0.99*	0.99*	1.00*	0.99*	1.00*	1.00*	1.00*
	(.00005)	(.002)	(.001)	(.0004)	(.0004)	(.0002)	(.0001)	(.0001)	(.0001)	(.0001)
Female	1.00*	0.98*	0.99*	1.00*	1.00	1.00*	1.00*	1.00*	1.00*	1.00*
	(.00004)	(.003)	(.001)	(.001)	(.0005)	(.0003)	(.0002)	(.0001)	(.0001)	(.0001)
Black	1.01*	1.02*	1.02*	1.01*	1.02*	1.00*	1.01*	1.01*	1.00*	1.01*
	(.0002)	(.002)	(.001)	(.001)	(.001)	(.001)	(.0004)	(.0003)	(.0004)	(.0005)
Male	1.01*	1.00	1.02*	1.00	1.03*	1.01*	1.02*	1.00*	1.01*	1.02*
	(.0003)	(N.A.)	(.001)	(.001)	(.001)	(.001)	(.001)	(.0005)	(.001)	(.001)
Female	1.01*	1.07*	1.00	1.02*	1.01*	0.99*	1.01*	1.01*	1.00	1.01*
	(.0002)	(.009)	(N.A.)	(.001)	(.001)	(.0005)	(.001)	(.0004)	(.0005)	(.001)
American Indian and Alaska Native	1.30*	1.17*	1.00	1.33*	1.10*	1.38*	1.23*	1.61*	1.27*	1.20*
	(.006)	(.028)	(.031)	(.021)	(.014)	(.018)	(.015)	(.020)	(.011)	(.014)
Male	1.29*	1.17*	1.00	1.52*	1.24*	1.24*	1.47*	1.40*	1.23*	1.11*
	(.008)	(.028)	(.037)	(.031)	(.017)	(.022)	(.024)	(.022)	(.015)	(.017)
Female	1.31*	.	1.00	1.03	0.79*	1.55*	0.96	1.92*	1.31*	1.26*
	(.009)	.	(N.A.)	(.027)	(.025)	(.031)	(.017)	(.036)	(.018)	(.020)
Asian and Pacific Islander	1.07*	1.00	1.03*	1.03*	1.09*	1.04*	1.09*	1.10*	1.06*	1.03*
	(.001)	(N.A.)	(.011)	(.014)	(.009)	(.004)	(.005)	(.003)	(.003)	(.002)
Male	1.08*	1.00	0.96*	1.09*	1.09*	1.01*	1.08*	1.13*	1.08*	1.03*

[1] Ratio based on weighted data

Race, Hispanic origin, Sex, and source of data	Classification Ratio[1]									
	Total	0-14 years	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75-84 years	85 years and over
	(.002)	(N.A.)	(.013)	(.019)	(.011)	(.005)	(.006)	(.004)	(.004)	(.004)
Female	1.05*	1.00	1.12*	0.91*	1.10*	1.08*	1.10*	1.06*	1.03*	1.03*
	(.002)	(N.A.)	(.019)	(.017)	(.017)	(.008)	(.009)	(.003)	(.002)	(.003)
Hispanic Origin										
All Hispanic	1.05*	0.92*	0.97*	1.02*	1.08*	1.05*	1.03*	1.07*	1.05*	1.06*
	(.001)	(.009)	(.005)	(.004)	(.003)	(.002)	(.002)	(.002)	(.002)	(.002)
Male	1.04*	1.00	0.98*	1.05*	1.09*	1.02*	1.03*	1.06*	1.03*	1.04*
	(.001)	(N.A.)	(.006)	(.004)	(.003)	(.003)	(.002)	(.002)	(.002)	(.003)
Female	1.06*	0.80*	0.93*	0.93*	1.07*	1.12*	1.02*	1.08*	1.07*	1.06*
	(.001)	(.022)	(.006)	(.007)	(.007)	(.005)	(.003)	(.002)	(.002)	(.002)
Mexican	1.06*	0.99	0.98*	1.04*	1.13*	1.15*	1.05*	1.08*	1.04*	1.03*
	(.001)	(.025)	(.005)	(.005)	(.005)	(.004)	(.003)	(.002)	(.002)	(.002)
Male	1.07*	1.36*	1.03*	1.09*	1.19*	1.15*	1.04*	1.08*	1.02*	1.03*
	(.001)	(.053)	(.006)	(.005)	(.006)	(.005)	(.003)	(.003)	(.003)	(.004)
Female	1.05*	0.75*	0.83*	0.88*	1.01	1.15*	1.06*	1.08*	1.07*	1.03*
	(.002)	(.026)	(.010)	(.013)	(.009)	(.006)	(004)	(.003)	(.003)	(.003)
Puerto Rican	1.07*	1.00	0.85*	0.95*	1.27*	0.96*	1.05*	1.20*	1.04*	0.90*
	(.003)	(N.A.)	(.025)	(.013)	(.012)	(.008)	(.005)	(.007)	(.007)	(.008)
Male	1.08*	1.00	0.76*	0.90*	1.21*	1.03*	1.04*	1.26*	1.09*	0.87*
	(.004)	(N.A.)	(.028)	(.016)	(.013)	(.009)	(.007)	(.012)	(.011)	(.010)
Female	1.05*	1.00	1.25*	1.03	1.48*	0.84*	1.06*	1.13*	1.00	0.92*
	(.004)	(N.A.)	(.036)	(.021)	(.029)	(.014)	(.007)	(.008)	(.009)	(.011)
Cuban	1.04*	.	1.00	1.17*	1.01	1.21*	1.07*	1.12*	0.93*	1.09*
	(.002)	.	(N.A.)	(.022)	(.020)	(.014)	(.008)	(.005)	(.004)	(.005)
Male	1.08*	.	1.00	1.47*	1.07*	1.10*	1.18*	1.12*	0.96*	1.10*
	(.003)	.	(N.A.)	(.055)	(.028)	(.010)	(.010)	(.006)	(.005)	(.007)
Female	1.00	.	.	0.93*	0.87*	2.26*	0.91*	1.12*	0.89*	1.09*
	(.004)	.	.	(.010)	(.017)	(.147)	(.012)	(.009)	(.005)	(.008)
Central/South	1.04*	.	1.01	0.87*	0.70*	0.86*	1.18*	1.03	1.33*	0.99

Race, Hispanic origin, Sex, and source of data		Classification Ratio[1]									
		Total	0-14 years	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75-84 years	85 years and over
American		(.006)	.	(.045)	(.033)	(.015)	(.013)	(.016)	(.014)	(.017)	(.013)
	Male	1.05*	.	1.01	0.83*	0.70*	0.65*	1.26*	1.19*	1.49*	1.38*
		(.009)	.	(.064)	(.041)	(.018)	(.014)	(.018)	(.026)	(.031)	(.051)
	Female	1.04*	.	1.00	1.00	0.73*	1.29*	1.08*	0.92*	1.23*	0.91*
		(.008)	.	(N.A.)	(N.A.)	(.025)	(.030)	(.026)	(.016)	(.019)	(.012)
Other Hispanic		0.99	0.62*	1.03	0.92*	0.86*	0.79*	0.82*	0.93*	1.10*	1.20*
		(.005)	(.038)	(.044)	(.025)	(.018)	(.013)	(.011)	(.010)	(.009)	(.012)
	Male	0.88*	0.62*	0.93	0.91*	0.79*	0.67*	0.77*	0.82*	0.99	1.08*
		(.005)	(.038)	(.044)	(.033)	(.019)	(.013)	(.014)	(.011)	(.012)	(.014)
	Female	1.16*	.	1.71*	0.94	1.13*	1.14*	0.89*	1.12*	1.23*	1.30*
		(.008)	.	(.189)	(.034)	(.051)	(.038)	(.017)	(.018)	(.015)	(.018)
Non-Hispanic by race											
Non-Hispanic White		1.00*	0.99*	1.00*	1.00*	0.99*	0.99*	0.99*	0.99*	1.00*	1.00*
		(.00004)	(.002)	(.0008)	(.0006)	(.0004)	(.0002)	(.0002)	(.00008)	(.00006)	(.00006)
	Male	1.00*	0.99*	1.00*	0.99*	0.99*	0.99*	0.99*	1.00*	1.00*	1.00*
		(.00006)	(.002)	(.001)	(.0007)	(.0005)	(.0003)	(.0002)	(.0001)	(.0001)	(.0001)
	Female	1.00*	1.00	1.00	1.02*	1.00*	0.99*	1.00*	0.99*	1.00*	1.00*
		(.00006)	(.004)	(.001)	(.001)	(.0007)	(.0004)	(.0003)	(.0001)	(.00009)	(.00008)
Non-Hispanic Black		1.01*	1.02*	1.00	1.00*	1.01*	1.00*	1.01*	1.00*	1.00*	1.01*
		(.0002)	(.002)	(.0008)	(.0007)	(.0006)	(.0005)	(.0004)	(.0003)	(.0004)	(.0004)
	Male	1.01*	1.00	1.00	1.00*	1.01*	1.01*	1.02*	1.00*	1.01*	1.01*
		(.0002)	(N.A.)	(.0009)	(.0009)	(.0009)	(.0008)	(.0006)	(.0005)	(.0005)	(.0007)
	Female	1.00*	1.07*	1.00	1.01*	1.00*	0.99*	1.01*	1.01*	1.00*	1.00*
		(.0002)	(.009)	(N.A.)	(.0007)	(.0005)	(.0006)	(.0007)	(.0004)	(.0005)	(.0005)
Non-Hispanic AIAN[4]		1.28*	1.17*	1.17*	1.36*	1.04*	1.25*	1.24*	1.47*	1.33*	1.17*
		(.006)	(.028)	(.035)	(.025)	(.015)	(.017)	(.016)	(.019)	(.013)	(.015)
	Male	1.30*	1.17*	1.16*	1.60*	1.17*	1.04	1.42*	1.31*	1.38*	1.27*
		(.008)	(.028)	(.041)	(.037)	(.018)	(.018)	(.024)	(.022)	(.018)	(.021)
	Female	1.25*	.	1.20*	0.98	0.78*	1.51*	0.99	1.71*	1.27*	1.13*

Race, Hispanic origin, Sex, and source of data	Classification Ratio[1]									
	Total	0-14 years	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75-84 years	85 years and over
	(.010)	.	(.053)	(.032)	(.027)	(.033)	(.021)	(.033)	(.019)	(.020)
Non-Hispanic API	1.07*	1.00	1.07*	1.04*	1.05*	1.03*	1.15*	1.09*	1.05*	1.02*
	(.001)	(N.A.)	(.011)	(.015)	(.010)	(.004)	(.006)	(.003)	(.003)	(.002)
Male	1.09*	1.00	1.02	1.11*	1.04*	1.03*	1.16*	1.13*	1.10*	1.01*
	(.002)	(N.A.)	(.013)	(.020)	(.012)	(.006)	(.008)	(.004)	(.004)	(.003)
Female	1.04*	1.00	1.12*	0.89*	1.07*	1.04*	1.14*	1.05*	1.00	1.03*
	(.002)	(N.A.)	(.019)	(.020)	(.016)	(.007)	(.010)	(.003)	(.003)	(.003)

*Significantly different from 1.00 at the 1% level
(Standard errors in parentheses)

Table 3. Classification Ratios by Race, Hispanic Origin, Region, Urban Status, Co-Ethnic Concentration and Nativity: National Longitudinal Mortality Study, for Deaths Occurring in 1990-1998

Region, urban status, concentration, nativity	Race				Classification ratio[1] Hispanic by specific origin						Non-Hispanic by Race			
	White	Black	AIAN	API	Total	Mexican	Puerto Rican	Cuban	Cent./So. American	Other Hispanic	White	Black	AIAN	API
Region														
Northeast	1.00*	1.03*	1.92*	1.27*	1.08*	1.47*	1.12*	0.99	1.02	1.01	1.00*	1.02*	2.05*	1.21*
	(.0001)	(.001)	(.049)	(.010)	(.003)	(.047)	(.004)	(.008)	(.011)	(.014)	(.0001)	(.001)	(.057)	(.009)
Midwest	1.00*	1.01*	1.13*	1.29*	1.02*	1.05*	0.98	1.56*	1.91*	0.72*	1.00*	1.01*	1.12*	1.32*
	(.00005)	(.0003)	(.010)	(.012)	(.004)	(.005)	(.016)	(.042)	(.069)	(.018)	(.0001)	(.0003)	(.010)	(.013)
South	1.00*	1.00*	1.49*	1.28*	1.05*	1.02*	1.00	1.04*	1.04*	1.36*	1.00*	1.00*	1.64*	1.34*
	(.0001)	(.0002)	(.014)	(.010)	(.001)	(.001)	(.007)	(.002)	(.010)	(.015)	(.0001)	(.0002)	(.022)	(.010)
West	1.00*	1.02*	1.22*	1.01*	1.04*	1.10*	0.95*	1.05*	1.00	0.89*	0.99*	1.01*	1.17*	1.01*
	(.0001)	(.001)	(.008)	(.001)	(.001)	(.002)	(.009)	(.014)	(.008)	(.005)	(.0001)	(.001)	(.007)	(.001)
Urban/Rural														
Urban	1.00*	1.01*	1.60*	1.08*	1.05*	1.05*	1.09*	1.04*	1.05*	1.01*	1.00*	1.01*	1.57*	1.08*
	(.00004)	(.0002)	(.014)	(.002)	(.001)	(.001)	(.003)	(.002)	(.006)	(.005)	(.00005)	(.0002)	(.015)	(.002)
Rural	1.00*	1.01*	1.12*	0.98*	1.05*	1.16*	0.49*	1.13*	0.84*	0.88*	1.00*	1.01*	1.11*	0.98*
	(.00005)	(.0004)	(.005)	(.004)	(.002)	(.004)	(.013)	(.028)	(.026)	(.009)	(.0001)	(.0003)	(.006)	(.004)
Co-ethnic Concentration														
Yes	NA	NA	1.02*	NA	1.02*	1.02*	1.04*	1.02*	0.97*	0.70*	NA	NA	NA	NA
			(.004)		(.001)	(.001)	(.004)	(.002)	(.007)	(.005)				
No	NA	NA	1.63*	NA	1.08*	1.11*	1.09*	1.10*	1.12*	1.18*	NA	NA	NA	NA
			(.006)		(.001)	(.002)	(.005)	(.006)	(.010)	(.007)				
Nativity														
US born	1.00*	1.01*	1.30*	1.03*	1.07*	1.09*	NA	1.92*	1.30*	0.98*	1.00*	1.01*	1.27*	1.04*
	(.00003)	(.0002)	(.006)	(.002)	(.001)	(.002)	NA	(.061)	(.040)	(.005)	(.00004)	(.0002)	(.006)	(.002)
Foreign born	0.99*	1.06*	1.22*	1.09*	1.02*	1.01*	NA	1.01*	1.01	1.12*	0.99*	1.01*	1.31*	1.08*
	(.0002)	(.003)	(.040)	(.002)	(.001)	(.001)	NA	(.002)	(.006)	(.012)	(.0003)	(.004)	(.050)	(.002)

[1] Ratio based on weighted data
* Significantly different from 1.00 at the 1% level (Standard errors in parentheses)

Table 4. Age-specific and age-adjusted death rates per 100,000, as reported, and adjusted for death certificate misclassification, American Indians/Alaska Natives and Asians/Pacific Islanders compared to White

Age	As reported on death certificate						With correction for misclassification				Rate ratios to White			
	WHITE		AIAN		API		AIAN		API		AIAN/White		API/White	
	Rate	SE	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	751.0	21.5	453.4	9.6	1.06	1.24	0.75	0.75
1-4	30.2	0.3	42.8	2.6	23.0	1.1	50.1	2.8	23.0	1.1	1.42	1.66	0.76	0.76
5-14	16.8	0.1	19.5	1.0	12.4	0.5	22.8	1.1	12.4	0.5	1.16	1.36	0.74	0.74
15-24	74.5	0.3	102.5	2.5	40.0	0.8	102.5	2.6	41.2	0.9	1.38	1.38	0.54	0.55
25-34	92.3	0.3	136.6	3.2	43.7	0.8	181.7	3.7	45.1	0.8	1.48	1.97	0.47	0.49
35-44	180.6	0.4	232.3	4.1	84.0	1.2	255.6	4.3	91.5	1.2	1.29	1.42	0.46	0.51
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	1148.9	14.4	560.8	4.7	0.99	1.22	0.55	0.60
65-74	2342.7	2.2	2191.8	27.2	1304.7	9.0	3529.8	34.5	1435.5	9.4	0.94	1.51	0.56	0.61
75-84	5634.1	4.1	4510.4	57.0	3522.3	21.1	5729.9	64.2	3734.3	21.7	0.80	1.02	0.63	0.66
85+	15669.6	11.7	9588.6	149.3	10302.5	71.0	11509.6	163.6	10613.7	72.1	0.61	0.73	0.66	0.68
Age-Adjusted	849.6	0.3	718.0	4.2	510.4	1.7	943.2	4.9	540.1	1.7	0.85	1.11	0.60	0.64

Table 5. Age-Specific, Age-Adjusted Death Rates and Rate Ratios to non-Hispanic White by Hispanic Origin: as reported and corrected for death certificate misclassification

Age	Non-Hispanic White		Total Hispanic		Mexican		Puerto Rican		Cuban		Cent./So. American		Other Hispanic	
	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Rate	SE
					As reported on death certificate									
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	1022.4	12.8	740.6	13.2	729.7	11.9	369.0	5.9
65-74	2366.5	2.3	1820.3	7.5	2120.5	11.8	2191.0	24.5	1701.7	20.9	1964.6	27.5	961.2	11.9
75-84	5669.6	4.2	4378.5	17.0	5012.3	26.8	4949.1	55.2	4539.7	45.4	4827.3	67.9	2532.4	27.5
85+	15755.3	11.9	11962.0	51.4	13051.1	81.2	12296.5	160.9	13843.7	134.0	13836.7	220.7	7712.5	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	588.2	2.9	544.8	4.9	653.6	6.6	700.8	19.1	475.5	36.0	864.2	26.8	289.2	7.9
1-4	29.3	0.3	27.8	0.6	34.9	0.8	25.6	1.8	22.7	3.9	50.9	3.3	13.1	0.9
5-14	16.7	0.1	14.1	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	70.6	0.6	81.4	0.8	59.7	1.8	56.1	3.8	96.7	2.4	31.9	0.9
25-34	92.4	0.3	87.3	0.7	94.9	0.9	113.3	2.6	78.2	3.8	93.5	2.1	36.2	1.0
35-44	179.9	0.4	170.8	1.1	184.4	1.5	333.1	4.6	151.2	4.8	118.3	2.6	74.4	1.6
45-54	386.6	0.7	352.8	1.9	414.7	2.9	495.8	6.9	415.6	9.4	285.7	5.3	139.2	2.7
55-64	941.1	1.3	771.0	3.9	890.8	6.0	1073.7	13.1	792.7	13.6	861.2	12.9	303.3	5.3
65-74	2342.9	2.3	1948.8	7.8	2291.1	12.2	2629.6	26.9	1906.4	22.1	1965.0	27.5	896.1	11.5
75-84	5669.9	4.2	4600.1	17.4	5215.0	27.3	5147.8	56.3	4223.0	43.8	6421.4	78.4	2792.4	28.9
85+	15756.1	11.9	12687.0	53.0	13448.3	82.4	11068.4	152.7	15093.7	139.9	13700.6	219.6	9277.7	95.8
Age-adjusted	851.7	0.4	707.1	1.3	795.0	2.1	827.8	4.3	727.6	3.9	807.6	5.4	400.5	2.2

	Total Hispanic		Mexican		Rate ratios to non-Hispanic White Puerto Rican		Cuban		Cent./So. American		Other Hispanic	
	Reported	Corr.	Reported	Corr.	Reported	Corr.	Reported	Corr.	Reported	Corr.	Reported	Corr.
0	1.00	1.01	1.10	1.11	1.18	1.19	0.80	0.81	1.45	1.47	0.49	0.49
1-4	1.02	0.95	1.18	1.19	0.86	0.87	0.77	0.77	1.72	1.74	0.44	0.44
5-14	0.91	0.84	1.04	1.05	0.93	0.94	0.91	0.92	1.50	1.51	0.36	0.36
15-24	0.99	0.96	1.13	1.10	0.95	0.81	0.76	0.76	1.31	1.31	0.42	0.43
25-34	0.93	0.94	0.99	1.03	1.29	1.23	0.72	0.85	1.16	1.01	0.42	0.39
35-44	0.87	0.95	0.90	1.02	1.44	1.85	0.82	0.84	0.93	0.66	0.48	0.41
45-54	0.86	0.91	0.92	1.07	1.32	1.28	0.88	1.08	0.85	0.74	0.45	0.36
55-64	0.79	0.82	0.89	0.95	1.08	1.14	0.78	0.84	0.77	0.92	0.39	0.32
65-74	0.77	0.83	0.90	0.98	0.93	1.12	0.72	0.81	0.83	0.84	0.41	0.38
75-84	0.77	0.81	0.88	0.92	0.87	0.91	0.80	0.74	0.85	1.13	0.45	0.49
85+	0.76	0.81	0.83	0.85	0.78	0.70	0.88	0.96	0.88	0.87	0.49	0.59
Age-adjusted	0.79	0.83	0.88	0.93	0.93	0.97	0.81	0.85	0.87	0.95	0.45	0.47

Table 6. Age-Specific, Age-Adjusted Death Rates and Rate Ratios by Hispanic Origin: Adjusted for Death Certificate Misclassfication and Census Misclassification

Age	Non-Hispanic White		Mexican		Puerto Rican		Cuban		Central/South American		Other Hispanic	
	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Rate	SE	Rate	SE
0	588.2	2.9	618.3	6.3	699.0	19.1	346.9	26.3	606.3	18.8	459.6	12.5
1-4	29.3	0.3	32.9	0.7	24.2	1.7	20.1	3.5	36.3	2.4	22.2	1.4
5-14	16.7	0.1	16.0	0.3	14.9	0.8	14.7	1.9	17.8	1.1	10.1	0.6
15-24	73.7	0.3	76.0	0.8	57.8	1.8	52.1	3.5	70.9	1.8	60.6	1.8
25-34	92.4	0.3	88.3	0.8	109.2	2.5	77.7	3.8	71.8	1.6	75.2	2.1
35-44	179.9	0.4	162.7	1.3	320.4	4.5	144.1	4.6	83.4	1.8	143.0	3.0
45-54	386.6	0.7	378.2	2.6	478.1	6.6	398.4	9.0	202.3	3.7	252.2	4.8
55-64	941.1	1.3	844.7	5.7	1067.0	13.0	758.7	13.1	654.5	9.8	564.9	9.9
65-74	2342.9	2.3	2179.3	11.6	2683.8	27.4	1774.6	20.6	1400.8	19.6	1477.7	18.9
75-84	5669.9	4.2	4842.6	25.4	5159.4	56.4	4032.1	41.8	4782.1	58.4	4390.9	45.4
85+	15756.1	11.9	12823.5	78.6	10675.5	147.2	14670.0	135.9	9809.8	157.2	14316.5	147.8
Age-Adjusted	851.7	0.4	746.3	2.0	819.8	4.2	694.6	3.7	589.6	4.0	650.7	3.5

Age			C&DC	DC	C&DC	DC	C&DC	DC	C&DC	DC	C&DC	DC
0			1.05	1.11	1.19	1.19	0.59	0.81	1.03	1.47	0.78	0.49
1-4			1.12	1.19	0.83	0.87	0.69	0.77	1.24	1.74	0.76	0.45
5-14			0.96	1.05	0.89	0.94	0.88	0.92	1.06	1.51	0.61	0.36
15-24			1.03	1.10	0.78	0.81	0.71	0.76	0.96	1.31	0.82	0.43
25-34			0.95	1.03	1.18	1.23	0.84	0.85	0.78	1.01	0.81	0.39
35-44			0.90	1.02	1.78	1.85	0.80	0.84	0.46	0.66	0.79	0.41
45-54			0.98	1.07	1.24	1.28	1.03	1.08	0.52	0.74	0.65	0.36
55-64			0.90	0.95	1.13	1.14	0.81	0.84	0.70	0.92	0.60	0.32
65-74			0.93	0.98	1.15	1.12	0.76	0.81	0.60	0.84	0.63	0.38
75-84			0.85	0.92	0.91	0.91	0.71	0.74	0.84	1.13	0.77	0.49
85+			0.81	0.85	0.68	0.70	0.93	0.96	0.62	0.87	0.91	0.59
Age-Adjusted			0.88	0.93	0.96	0.97	0.82	0.85	0.69	0.95	0.76	0.47

Appendix A. Hispanic Origin Reporting on Death Certificate and Percent Unknown for Reporting States by Year

State	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
Conn.	-	-	-	-	-	-	-	-	-	-	-	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
Mass.	-	-	-	-	-	-	-	-	-	-	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 Hamp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	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 Carol.	-	-	-	-	-	-	-	-	-	2.8	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0

State	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
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
Pennsyl.	-	-	-	-	-	-	-	-	-	-	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
So. Carol.	-	-	-	-	-	-	-	-	-	-	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
So. 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 VA.	-	-	-	-	-	-	-	-	-	-	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
Wash. D.C.	-	-	-	-	-	-	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

- State not reporting Hispanic origin

Appendix B. Counties in ethnic concentration areas by percent of all deaths for group during the 1990-1998 period for Hispanic Origin Sub-Groups

Hispanic sub-group, county, state	Percent of deaths of Hispanic Sub-group
Mexican	
Total Concentration Area	50.59
Los Angeles, CA	14.17
Bexar, TX	9.63
El Paso, TX	4.50
Cameron, TX	2.69
Webb, TX	2.58
Harris, TX	2.44
San Bernadino, CA	2.40
Frio, TX	2.33
Hidalgo, TX	2.25
San Diego, CA	2.18
Cook, Ill	1.88
Nueces, TX	1.81
Dallas, TX	1.73
Remainder of Country	49.41
Cuban	
Total Concentration Area	66.60
Dade, FL	66.60
Remainder of Country	33.40
Puerto Rican	
Total Concentration Area	47.78
New York City, NY	34.94
Cook, Ill	3.41
Honolulu, HI	3.21
Dade, Fl	3.21
Hudson, NJ	3.01
Remainder of Country	52.22
Central and South American	
Total Concentration Area	53.45
New York City, NY	23.89
Los Angeles, CA	15.79
Dade, Fl	13.77
Remainder of Country	46.55

Appendix C. Sample Sizes
Appendix for Table 1: Cell counts by decade from Current Population Survey and Death Certificate

Race or Hispanic Origin	Decade	
	1979-89	1990-98
White		
CPS	52,390	90,065
Death certificate	52,519	90,272
Black		
CPS	5,993	10,010
Death certificate	5,994	9,941
American Indian[1]		
CPS	419	754
Death certificate	332	651
Asian and Pacific Islander		
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/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

Appendix for Table 2 - Number of deaths from CPS and death certificate by group, sex and years of age for deaths occurring in 1990-1998

Group, sex, source of data	Number of deaths									
	Total	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85 years
White										
CPS	90,065	76	816	1356	2611	4718	9254	20096	28251	22887
Death certificate	90,272	78	817	1359	2629	4738	9283	20161	28289	22918
Male										
CPS	45,861	44	610	944	1696	2926	5465	11636	14358	8182
Death certificate	45,982	45	609	945	1713	2937	5491	11665	14378	8199
Female										
CPS	44,204	32	206	412	915	1792	3789	8460	13893	14705
Death certificate	44,290	33	208	414	916	1801	3792	8496	13911	14719
Black										
CPS	10,010	33	223	416	673	922	1459	2340	2439	1505
Death certificate	9,941	32	221	413	666	919	1443	2325	2435	1487
Male										
CPS	4,970	23	188	267	370	486	768	1164	1151	553
Death certificate	4,925	23	186	265	364	480	759	1159	1147	542
Female										
CPS	5,040	10	35	149	303	436	691	1176	1288	952
Death certificate	5,016	9	35	148	302	439	684	1166	1288	945
American Indian										
CPS	754	3	19	49	68	83	119	137	174	102
Death certificate	651	2	21	47	62	70	109	104	147	89
Male										
CPS	420	3	17	30	52	43	69	70	93	43
Death certificate	358	2	19	28	44	39	54	56	80	36

Group, sex, source of data	Number of deaths									
	Total	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85 years
Female										
CPS	334	0	2	19	16	40	50	67	81	59
Death certificate	293	0	2	19	18	31	55	48	67	53
Asian and Pacific Islander										
CPS	1,155	2	30	32	52	91	137	289	320	202
Death certificate	1,120	2	29	34	47	87	134	272	313	202
Male										
CPS	654	1	17	20	34	53	81	162	187	99
Death certificate	640	1	18	23	31	52	79	152	184	100
Female										
CPS	501	1	13	12	18	38	56	127	133	103
Death certificate	480	1	11	11	16	35	55	120	129	102
Hispanic										
CPS	5,140	12	113	205	322	474	728	1151	1280	855
Death certificate	4,855	13	112	196	300	451	700	1081	1200	802
Male										
CPS	2,892	9	88	149	225	302	434	658	664	363
Death certificate	2,750	9	85	139	211	290	421	628	629	338
Female										
CPS	2,248	3	25	56	97	172	294	493	616	492
Death certificate	2,105	4	27	57	89	161	279	453	571	464
Mexican										
CPS	2,887	6	78	124	184	296	415	676	674	434
Death certificate	2,622	6	76	113	151	249	377	609	634	407
Male										
CPS	1,663	4	61	98	126	185	254	389	362	184
Death certificate	1,492	3	57	86	98	151	231	347	346	173
Female										

Group, sex, source of data					Number of deaths					
	Total	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85 years
CPS	1,224	2	17	26	58	111	161	287	312	250
Death certificate	1,130	3	19	27	53	98	146	262	288	234
Puerto Rican										
CPS	527	5	15	34	66	68	85	122	86	46
Death certificate	496	5	13	32	58	65	84	108	82	49
Male										
CPS	306	4	11	20	47	45	52	69	39	19
Death certificate	291	4	10	19	44	42	53	61	37	21
Female										
CPS	221	1	4	14	19	23	33	53	47	27
Death certificate	205	1	3	13	14	23	31	47	45	28
Cuban										
CPS	532	0	1	13	14	19	69	118	161	137
Death certificate	505	0	1	11	15	17	63	104	167	127
Male										
CPS	298	0	1	8	10	16	45	77	85	56
Death certificate	274	0	1	5	10	15	39	68	84	52
Female										
CPS	234	0	0	5	4	3	24	41	76	81
Death certificate	231	0	0	6	5	2	24	36	83	75
Central/South American										
CPS	250	0	6	8	20	31	44	43	62	36
Death certificate	235	0	6	8	25	34	37	40	48	37
Male										
CPS	119	0	4	6	14	17	23	19	28	8
Death certificate	107	0	4	6	17	21	19	16	19	5
Female										
CPS	131	0	2	2	6	14	21	24	34	28

Group, sex, source of data	Number of deaths									
	Total	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85 years
Death certificate	128	0	2	2	8	13	18	24	29	32
Other Hispanic										
CPS	944	1	13	26	38	60	115	192	297	202
Death certificate	997	2	16	32	51	86	139	220	269	182
Male										
CPS	506	1	11	17	28	39	60	104	150	96
Death certificate	586	2	13	23	42	61	79	136	143	87
Female										
CPS	438	0	2	9	10	21	55	88	147	106
Death certificate	411	0	3	9	9	25	60	84	126	95
Non-Hispanic White										
CPS	81,797	62	645	1131	2220	4100	8212	18289	25940	21198
Death certificate	82,146	63	645	1134	2242	4132	8258	18377	26041	21254
Male										
CPS	41,394	34	473	779	1423	2528	4826	10594	13198	7539
Death certificate	41,588	35	472	787	1440	2549	4857	10631	13245	7572
Female										
CPS	40,403	28	172	352	797	1572	3386	7695	12742	13659
Death certificate	40,558	28	173	347	802	1583	3401	7746	12796	13682
Non-Hispanic Black										
CPS	9,687	33	201	397	642	900	1413	2270	2381	1450
Death certificate	9,651	32	201	395	640	897	1401	2265	2378	1442
Male										
CPS	4,786	23	170	254	349	467	743	1128	1123	529
Death certificate	4,766	23	170	252	348	460	737	1130	1123	523
Female										
CPS	4,901	10	31	143	293	433	670	1142	1258	921
Death certificate	4,885	9	31	143	292	437	664	1135	1255	919

Group, sex, source of data	Number of deaths									
	Total	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85 years
Non-Hispanic AIAN										
CPS	663	3	17	46	58	72	104	120	157	86
Death certificate	588	2	18	45	54	65	97	98	133	76
Male										
CPS	371	3	15	29	44	37	62	61	84	36
Death certificate	321	2	17	27	38	36	50	52	71	28
Female										
CPS	292	0	2	17	14	35	42	59	73	50
Death certificate	267	0	1	18	16	29	47	46	62	48
Non-Hispanic API										
CPS	1,126	2	29	31	50	88	135	280	313	198
Death certificate	1,092	2	28	32	46	84	129	266	306	199
Male										
CPS	637	1	16	20	33	51	79	157	184	96
Death certificate	617	1	17	22	30	49	75	147	178	98
Female										
CPS	489	1	13	11	17	37	56	123	129	102
Death certificate	475	1	11	10	16	35	54	119	128	101

Appendix of Table 3: Number of deaths in the Current Population Survey and on the Death Certificate by Hispanic origin, region, urban status, geographic concentration and nativity for deaths occurring in 1990-1998

Region, urban status, concentration, nativity	Race				Number of deaths Hispanic by specific origin						Non-Hispanic by Race			
	White	Black	AIAN	API	Total	Mexican	Puerto Rican	Cuban	Cent./So. American	Other Hispanic	White	Black	AIAN	API
Region														
Northeast														
CPS	19,423	1,369	21	76	617	19	339	71	94	94	18,243	1304	20	70
Death certificate	19,483	1,331	12	63	563	14	304	70	91	84	18,322	1289	11	62
Midwest														
CPS	24,135	1,937	189	56	293	203	32	10	11	37	23,122	1907	185	52
Death certificate	24,173	1,924	174	46	278	190	35	7	6	40	23,166	1895	173	
South														
CPS	27,629	6,007	167	76	1,911	1158	93	415	64	181	23,808	5794	99	72
Death certificate	27,713	5,995	110	61	1,793	1127	88	392	60	126	23,952	5790	60	56
West														
CPS	18,825	695	377	946	2,315	1504	62	36	81	632	16,618	681	359	931
Death certificate	18,852	687	355	949	2,217	1288	68	36	78	747	16,700	676	344	930
Urban/Rural status														
Urban														
CPS	62,171	8,032	244	982	4,406	2430	514	525	243	694	56,395	7792	201	958
Death certificate	62,348	7,978	162	941	4,161	2246	473	497	229	716	56,699	7771	141	917
Rural														
CPS	27,885	1,978	510	172	731	454	13	7	7	250	25,396	1895	462	167
Death certificate	27,915	1,963	489	178	691	373	23	8	6	281	25,441	1880	447	174

Region, urban status, concentration, nativity	Race				Number of deaths Hispanic by specific origin						Non-Hispanic by Race			
	White	Black	AIAN	API	Total	Mexican	Puerto Rican	Cuban	Cent./So. American	Other Hispanic	White	Black	AIAN	API
Co-ethnic Concentration														
Yes														
CPS	NA	NA	474	NA	2,507	1348	256	343	391	361	NA	NA	NA	NA
Death certificate	NA	NA	469	NA	2,459	1321	246	334	386	508	NA	NA	NA	NA
No														
CPS	NA	NA	280	NA	2,633	1539	271	189	131	583	NA	NA	NA	NA
Death certificate	NA	NA	182	NA	2,396	1301	250	171	114	489	NA	NA	NA	NA
Nativity														
US born														
CPS	83,007	9,757	738	553	2,902	1948	122	27	22	783	76,724	9,492	651	543
Death certificate	83,163	9,702	638	552	2,698	1704	112	15	17	850	76,988	9,451	578	538
Foreign born														
CPS	6,404	185	11	595	1,812	920	NA	502	225	148	4,831	147	8	576
Death certificate	6,447	176	10	562	1,746	909	NA	490	217	123	4,904	150	8	548

Figure 1. Race Distribution on Death Certificate Among Self-Identified AIANs and APIs, 1979-89 and 1990-98
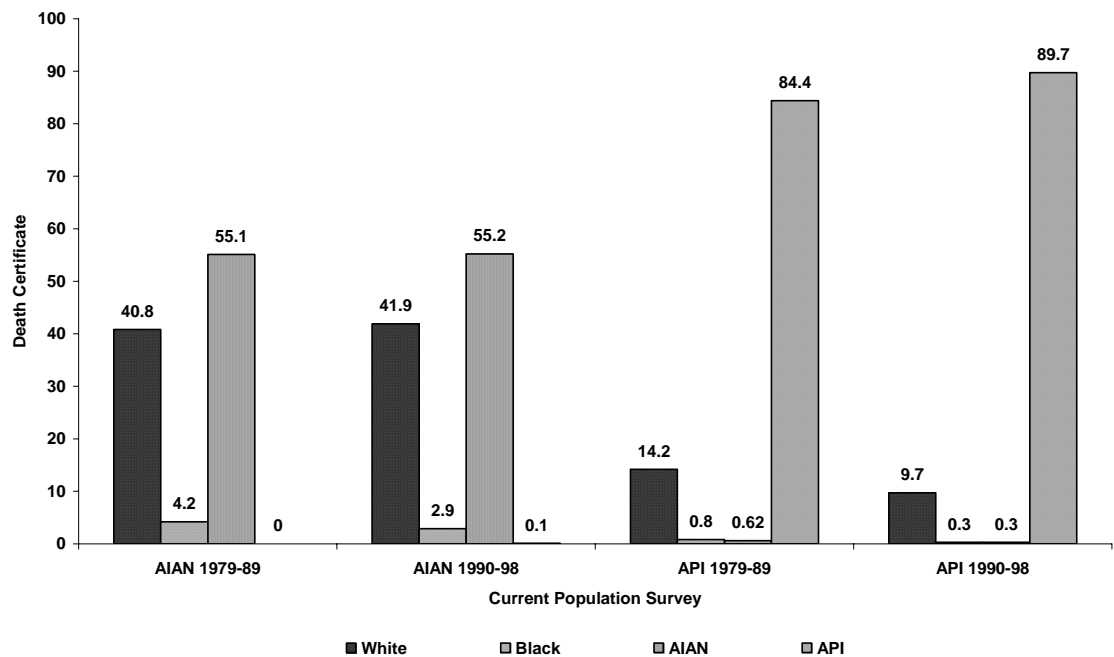
Figure 2. Assignment to Non-Specific Hispanic Status (Other Hispanic) on the Death Certificate for Self Identified Specific Hispanic Sub-group Origin