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Running head: Age Reporting among Elderly African-Americans

ABSTRACT

This paper investigates the quality of age reporting in vital statistics and Social Security/Medicare data among elderly African-Americans. The authors examine whether the death certificate or Social Security age is more likely to reflect accurately the decedents' true age at death by matching their sample to the US Censuses of 1900, 1910 and 1920, and identify factors associated with consistency of age reporting on death certificates and social security records. The results reveal significant discrepancies in age at death data. Birth record availability and literacy were identified as key predictors of age agreement. The match to an early-life census record showed greater agreement with Social Security age than with death certificate age at death. The results have implications for the collection of age information in surveys of elderly African-Americans.

Key words: African-Americans; death certificate; age reporting; vital statistics, Social Security Administration

In recent years, demographers and other social scientists have devoted increasing attention to the study of the causes and consequences of population aging in the United States and other developed countries. The rapid growth of the elderly population, particularly of the oldest old, has important implications for the allocation of resources devoted to the care of the elderly. The development of appropriate public and private initiatives to address the needs of this group requires accurate data for empirical investigations and for projecting the likely future demands on health, social and other institutional resources.

This paper is addressed to the quality of data on age itself. The focus of the study is on the elderly African-American population. We examine the consistency of age reporting in two sets of government documents extensively used to study health and mortality among the elderly in the United States, namely vital statistics and Social Security/Medicare data. Although the focus of the paper is limited to the quality of age reporting in these two sources, our investigations point to factors that are likely to influence the quality of age reporting in any survey of elderly African-Americans. Our findings suggest that in studies involving elderly African-Americans in which age is a central variable, procedures to obtain an independent source of age verification at the baseline interview would be likely to increase the reliability of conclusions.

Previous studies have pointed to inconsistencies in age reporting in different records for elderly African-Americans. The 1960 Matched Records Study that linked death certificates registered in May-August, 1960 to the 1960 Census of Population, for example, revealed major inconsistencies in the reporting of age on death certificates and matching census records for African-Americans (National Center for Health Statistics, 1968; Kitagawa and Hauser, 1973). Such inconsistencies increased sharply with age and were more marked for nonwhite than white Americans. In only 44.7% of nonwhite male and 36.9% of nonwhite female matched cases was the same age reported in the two sources, in contrast with 74.5% for white males and 67.9% for white females. Rosenwaike and Logue (1983) have further

demonstrated that death certificate ages are more often inaccurately reported for older African-Americans than for whites. The authors linked a sample of Pennsylvania and New Jersey death certificates from 1968-1972 for decedents with reported ages at death of 85 and above to records for the same individuals in the US Census of 1900. Of the linked cases, only 40% of African-Americans had an age at death that was consistent with or differed by less than one year from the age based on the 1900 Census data; the respective percentage for whites was 72%.

Similarly, a recent study by Kestenbaum (1992) revealed that age at death in the Social Security record, the source of most age information for Medicare data files, is often inconsistent, particularly for African-Americans. This study, based on 1987 deaths that occurred in Massachusetts and Texas, found that only 72.6% of African-Americans whose age at death on the death certificate was 65 and over had the same age reported in the two sources; for the 85+ age group the respective percentage was even lower (63.2%). Consistent with findings from previous studies, age reporting among whites was much more comparable; ages agreed for 94.6% and 91.7% of non-Hispanic white decedents aged 65+ and aged 85+ respectively. Other studies that have compared information on the death certificate with data from a matching SSA record did not examine age reporting in the two sources (Alvey and Aziz, 1979; Curb et al., 1985; Wentworth, Neaton and Rasmussen, 1983). Curb et al. (1985) did, however, examine the consistency of age information reported on the death certificate with age reported at the study's initial screening interview, and found a difference in the year of birth for 25% of 1,322 known decedents; no data by race were reported, although two-fifths of the study population was black.

The purpose of this study is three-fold. First, we extend the work of Kestenbaum (1992) by examining the consistency of age reporting in the SSA records and in vital statistics for a national sample of elderly African-American decedents and for a sample of African-American decedents born in Maryland, a state with relatively good birth registration and a high African-American literacy level

in the early decades of this century. Second, by comparing ages at death reported among the matched cases to those in early-life census records for the same individuals, we determine whether the death certificate or the Social Security age at death is more likely to reflect accurately the decedent's true age at death. Finally, to elucidate what factors or characteristics of the decedent are associated with consistency of age reporting in the two sources, we examine age reporting by age, sex, marital status, migration status, and the level of literacy among the African-American population in 1920 in the decedent's state of birth, and an estimate of birth record availability based on state of birth.

Data and Methods

As a part of a larger study of the African-American population, we have obtained a nationally representative sample of 4,216 death certificates for persons reported as dying at ages 60-69 in January 1-7, 1980 and 65+ in January 1-14, 1985. Deaths at ages 85 and above were oversampled. Including decedents aged 60-69 in 1980 allows us to examine age misreporting around age 65, the age at which many individuals apply for Social Security benefits.

We drew an additional sample of 1,046 death certificates for persons born in Maryland reported as dying at ages 65 and above in January-May 1985. A separate examination of the consistency of age reporting among the Maryland-born decedents is of interest because Maryland was the first southern state admitted to the Birth Registration Area (BRA) in 1916, only one year after its establishment (Shapiro, 1950). A larger proportion of African-American decedents born in Maryland are likely to have birth certificates than decedents in our national sample, the overwhelming majority of whom were born in other Southern states (93%) where birth registration was less complete in the early decades of this century. Thus, we expect age-at-death reporting for Maryland-born decedents to be more consistent than it is among decedents in our national sample.

Linkage to the Social Security Administration's Death Master File

The SSA records used in this study come from SSA's publicly available variant of the Death

Master File (DMF). The SSA generates two versions of the DMF from its NUMIDENT database, the principal repository of the SSA death notices collected from various sources, including the Master Beneficiary Record (MBR), the Supplemental Security Record (SSR), the Black Lung File, Health Care Financing Administration files, and the Beneficiary and Earnings Data (BENDEX) files. The publicly available version of the DMF excludes certain death data received from state bureaus of vital statistics under agreements with the SSA (Aziz and Buckler, 1992:264-265). [1] Information on the DMF analogous to that on the death certificate includes the decedent's social security number (SSN), first and last name, month and day of birth, month and year of death (the day of death is missing for most cases on the DMF), and state of last residence. Linkage of death certificates to the DMF was carried out in two steps, once we had selected a subset of records from the DMF that included all individuals whose month and year of death was recorded as either December 1979, January 1980, December 1984 or January through June 1985. [2]

We then selected DMF records that had an exact match on the individual's SSN reported on the death certificate. Because of the possibility that the SSN on the death certificate is not the decedent's own number (Kestenbaum, 1992), we further required name agreement, allowing for minor spelling differences, in the two sources. [3] We do not use age at death in any way to establish a match, thereby

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[1] The copy of the DMF used in this study was produced in 1992 and contains close to 40 million deaths dating back to 1937.

[2] We chose a subset of the DMF records for the linkage to minimize the possibility of spurious matches.

[3] On about 9% of the death certificates no SSN was reported. Because the SSN is a key variable in matching to the DMF, we made an attempt to obtain SSNs for these cases from an alternate source. As a part of this search, we also made an attempt to verify the SSNs for records which we were initially unable to match to the DMF. Here we were assisted by Bert Kestenbaum of the Social Security Administration (SSA) who searched through various internal SSA files (other than the DMF), accessible only to SSA personnel, for potential matches to the death certificates. When agreement between the death certificate and an internal SSA record was found for first and/or middle and last name of the decedent, sex, month of birth and death, year of death, and state of last residence at the time of death, we accepted these SSNs and then included them in the match to the DMF. By these

avoiding one potential match bias. This procedure netted 4,479 matches, the vast majority of all acceptable matches. A second step in the match to the DMF involved unmatched records with a SSN. Here we selected records for which the first or middle name and the last name, state of residence at the time of death, and month and year of death agreed exactly, and there was only a one or two digit variation in the reported SSN. [4] We obtained 156 matches by this procedure. We made no attempt to match 130 records without SSNs.

Altogether, we matched 4,635 (88.1%) of our death certificate samples. We were unable to link 497 death certificates with SSNs to the DMF because no match based on the decedent's SSN meeting the above criteria was located in the subset of the DMF records selected for the linkage. We believe that this may be in part due to the exclusion of deaths from the Public-Use DMF (Aziz and Buckler, 1992).

Table 1 presents the proportion of the sample records matched to the DMF by five-year age group of the decedent reported on the death certificate. We were able to match the smallest proportion of records in the age interval 60-64 (82.4%); at ages 65 and above the proportions vary from a low of 86.3% at ages 85-89 to a high of 90.4% at ages 100+. These results suggest that the inclusion of deaths in the public-use DMF is somewhat more complete for individuals who have reached retirement age prior to death.

Linkage to the US Censuses of 1900, 1910 and 1920

To determine whether the death-certificate or the SSA age at death is more likely to be accurate, we further attempted to link each of the death certificates to a third source, namely the census of 1900, 1910 or 1920, taken when the decedents were children or young adults. The key pieces of

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procedures we were able to obtain SSNs for 97.5% of our sample records.

[4] When multiple matches were found for the same name, all cases were dropped from further consideration in order to minimize the possibility of spurious matches.

information on the death certificate for establishing a match were the decedent's name, sex, father's name, mother's name and state of birth. Other useful information included the city or county of birth available on death certificates from selected states, and the month of birth in matching to the 1900 census only. Age and year of birth were excluded as matching criteria. Each record was manually linked utilizing the Soundex records of the three censuses available on microfilm in the Philadelphia branch of the National Archives (for further details on the matching procedures, see Preston et al., 1995). We were able to match 2,991 or 56.8% of the death certificates to an early census record. [5] A larger proportion of the older than younger decedents were matched due to the possibility of finding them in more than one of the censuses (Table 1). Linkage among all three sources, death certificate, the DMF and early census record, was obtained for 2,657 cases or 50.5% of all death certificates (Table 1).

Calculation of Age at Death from Different Sources

In comparisons of age reporting, the death certificate age refers to the reported age at death (a separate field on the death certificate), because this age is the basis of NCHS mortality tabulations. The Social Security age at death is calculated from the date-of-birth and date-of-death information available on the DMF. Because the specific day of death is missing for most cases on the DMF, we substituted the death-certificate day of death in calculations of SSA age at death.

The decedent's age at death based on the 1910 and 1920 census record was obtained from the age in years reported on the census record and the decedent's birthday (i.e., month and day) reported on the death certificate. Both pieces of information were required in order to determine whether a birthday would have occurred between the date in the calendar year when the decedent was enumerated

[5] For one case age was not reported on the census record and thus this case is dropped from all subsequent analyses involving the census matches.

in the early census and the date when the death occurred, available from the death certificate. [6] When the decedent was matched to the census of 1900, his or her age at death was calculated from the year and month of birth available from the 1900 census record and the day of birth and date of death from the death certificate.

Match Bias

As noted above, we were able to link 88.1% of our death certificate sample to the SSA's Death Master File, 56.8% of the records to an early census record, and 50.5% of the records to both the DMF and an early census. The principal source of match bias that concerns us is whether the quality of age reporting on the death certificates differed between records that we were able to match and those we did not. To examine this issue we take advantage of the two and three-way linkages of death certificates to the DMF and an early census record. There were 1978 records that were matched to the DMF but not to an early census, 333 records that were matched to an early census record but not to the DMF, and 2,657 records that were matched to all three. For 294 records (5.6% of the entire sample) no linkage was made to either the DMF or an early census record.

To examine whether the quality of age reporting differed between the records that we were able to match to both an early census record and to the DMF and cases which were matched to the DMF only, we compared the distribution of differences between death certificate ages and social security ages for the two groups of decedents. The results are shown in Table 2, Part A. There is no significant difference between the two distributions. [7] In other words, the reporting of age at death on death certificates that were matched to an early census record is not significantly different for age reporting

[6] One decedent was linked to the 1880 census; age at death was calculated in the same manner as for matches to the 1910 and 1920 censuses.

[7] Separate tests for males and females confirmed the results of the chi-square tests shown in Table 2, as did an alternative test of linear association between the two distributions by sex with one degree of freedom.

on records that were not matched to an early census but were matched to the DMF.

Similarly, to examine whether the quality of age reporting differed between the records that we were able to link to both an early census record and the DMF and those we were unable to link to the DMF, we compared the distribution of differences between the death certificate age and the census-based age at death for these two groups of decedents. The results are also shown in Table 2, Part B. Based on the chi-square tests shown there are no significant differences between the two distributions at the 5%-level of significance. [8]

Age Inconsistencies between Death Certificates and Social Security Records

As shown in Table 3, notable discrepancies in age reporting on death certificates and social security records are evident at all ages with the discrepancies being somewhat more pronounced in the national than the Maryland sample. Overall at ages 65 and above, for example, only 63% of the 1985 national sample decedents have the same age reported on both the death certificate and the matching Social Security record; 79.7% of the records differ by one year or less. Differences exceed four years in 8.0% of the cases. Age agreement is significantly higher among Maryland-born decedents; in 72.6% of the cases ages agree, 87.9% differ by one year or less, and only 3.5% differ by five years or more. When ages are grouped into five-year age intervals age discrepancies are reduced, but they remain substantial. Approximately 18% of the matched records in the 1985 national sample, and 11% of the records in the Maryland sample fall into a different five year age group (Tables 4 and 5). As suggested previously, Maryland had better than average birth registration in the early decades of this century, which may have contributed to the higher level of age agreement among Maryland-born decedents.

According to age on the death certificate, age agreement is most common among the youngest

[8] Similar results were obtained when the test was run separately for males and females. An alternative test of a linear association between the two distributions with one degree of freedom confirmed the results of the chi-square tests for males, but not for females, suggesting that the age reporting patterns for females among those not matched to the DMF is somewhat different from that of decedents whom we were able to link successfully.

age group and least common among the oldest old (Table 3). Variation in exact age agreement from ages 70-74 through 90-94 is not substantial, except for the low level of agreement in the 80-84 year old age group - only 56.2% - in the national sample. This peculiarity may be due in part to a tendency to favor 1900 as the decedent's year of birth. In the early 1960s, SSA analysts recognized a similar heaping of 1900 year-of-birth reporting and instituted special date-of-birth verification procedures, which required additional proof of age when 1900 was reported as the year of birth by individuals seeking old age benefits (Deutch, 1973).

When ages disagree, the death certificate age is more often younger than the SSA age, except among the very oldest decedents. Overall, at death certificate ages 65 and above, 26.2% of the 1985 national sample decedents have a death certificate age that is younger than the SSA age compared to 10.9% of the cases in which the opposite is true. The same pattern of discrepancy holds for 1980 deaths and Maryland-born decedents (Table 3). At the oldest death certificate ages, however, this pattern of age disagreement is reversed; on average, the death certificate age is more likely to be older than the corresponding SSA age.

This same pattern of inconsistency is also evident when the data are cross-classified by 5-year age groups (Tables 4 and 5). These tables can also be used to examine the pattern of age reporting on the death certificate, given the SSA age. When SSA age is used as the reference age, the death certificate age is more often understated than overstated relative to the SSA age for both males and females at SSA ages below age 100 (Table 4). These results further confirm that death certificate ages are systematically understated relative to ages in Social Security records. At older ages and the highest age groups in the Maryland sample (Table 5), the sample sizes are too small to draw any conclusions.

The degree of age agreement for decedents reported as dying at ages 65-69 can be assessed in both 1980 and 1985 (Table 3). For this group of decedents, age agreement is significantly higher in 1985 (71.3%) than in 1980 (63.9%). This difference may be associated with a cohort-specific pattern

of age reporting. Age agreement for the birth cohort aged 60-64 in 1980 is 71.5%; when this cohort is aged 65-69 in 1985, the agreement is similar at 71.3%. The percentage agreement for the cohort aged 65-69 in 1980 is 63.9%, compared with 61.9% when the cohort is aged 70-74 in 1985. This pattern, although based on limited experience, suggests that successively younger cohorts have higher quality of age reporting and tend to maintain that standard as they age.

Evaluation of Age Reporting on the Death Certificate and the Social Security Record

It is commonly believed that the individual's age at death based on SSA records is more accurate than the age recorded on the death certificate. This belief stems from the fact that age data in SSA records are reported by the decedent several years or decades prior to death, whereas the death certificate age is reported by relatives or others. [9] But, perhaps even more important is the fact that SSA, unlike the death registration system, now requires verification of alleged age as a condition for entitlement to program benefits and enrollment in Medicare.

To determine whether the death certificate or the Social Security record age at death more accurately reflects the decedent's true age at death, we matched our death certificate samples to records of the US Censuses of 1900, 1910 and 1920 that can provide an independent source of age data. The findings of these analyses are shown in Table 6 where we present the degree of agreement between the ages at death based on the census record and the death certificate, and the census and social security record by single years of age. [10] In these analyses all death certificates have been pooled and no weighting system is applied to the matched cases.

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[9] According to the 1986 National Mortality Followback Survey, on death certificates of decedents aged 65 and above, about 55% of the informants were spouses; close to 28% were adult children, 5% were siblings and 8% other relatives (Poe et al., 1993).

[10] Our definition of consistency includes cases in which the census-based age at death was one year older than the age in another source if the birthday occurs in the month when the census was taken or in either of the next two months. This procedure was employed in order to account for the tendency for respondents to round up to the next age when a birthday was imminent (Preston et al., 1995).

These results show the social security age to be more consistent with the census-based age at death than the age reported on the death certificate; 69.0% of social security ages at death agree with those based on the early census records compared with 53.8% of the death certificate ages. In both comparisons, age agreement tends to decline as age at death advances. The comparison of death certificate and census-based ages at death suggests that overall 29.9% of the decedents had an age on the death certificate that was too young; 16.4% of decedents had an age at death that was overstated. There is a systematic tendency for the death certificate age to be younger than the census-based age at younger ages at death, while at the oldest ages the opposite is true. In contrast, the overall pattern of age inconsistency between the census-based age and the SSA age appears more symmetric; 16.5% of the cases had an age at death in the SSA record that was younger than the census-based age, while in 14.5% of the cases the opposite is true. The tendency for the SSA age to be somewhat younger, on average, than the census-based age is true at most age intervals examined, except at ages 80-84, 90-94, and 95-99. [11]

The above results are consistent with the hypothesis that age reporting in SSA records is superior to that on death certificates. Corroborating evidence is provided by an examination of all two-way age agreements among the three-way linkages. Among the two-way age agreements, when two of the three ages agree, the SSA age is one of the two in approximately 91% of the cases and the death certificate age in only about 55%. Overall, the SSA age agreed with either the death certificate or the census-based age or with both in 87% of the cases and the death certificate age in about 71% (not shown).

None of the ages agree for 266 records. These decedents had a mean age at death in all three records that was older than among decedents for whom three or two-way age agreements were found.

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[11] In the comparison of census-based ages at death and ages reporting on the death certificate, the age groups are based on the average of census and death certificate ages. In the comparison of census and SSA ages at death, age groups refer to the average of census and SSA age.

The youngest mean age at death was recorded for decedents whose age at death agreed in all three sources (not shown). These results further suggest that as younger cohorts enter the oldest ages accuracy of age reporting among elderly African-Americans will steadily improve.

These results are not surprising. As noted earlier, birth registration was improving during the early decades of this century and thus a larger proportion of the younger cohorts are more likely to have had their births registered. Age reporting accuracy in the SSA files is also likely to be more accurate for the younger than the older cohorts, because of the relatively lax procedures used prior to 1965 to verify an individual's age at the time a benefit application was made. Prior to 1965, an individual filing for Social Security benefits was not usually required to provide proof of age as long as the alleged age was the same as on a request for a Social Security card filed at least five years earlier (Deutch, 1973) -- even though SSA made no systematic attempt to verify the date of birth reported on these initial application forms (Aziz and Buckler, 1992). Thus, SSA date-of-birth information has not been strictly verified for many persons born near or before the turn of the century. In addition, even after stricter age verification procedures were instituted in 1965 many elderly persons who cannot obtain a birth certificate are allowed to submit various documents of lesser quality (Social Security Administration, 1988).

Associations between Age Agreement and Other Characteristics of the Decedent

We now turn to an examination of the associations between the characteristics of the decedents and consistency of age reporting. Previous studies have shown consistency of age reporting to vary by sex (National Center for Health Statistics, 1968; Kestenbaum 1992) and marital status (Kestenbaum, 1992). We examine consistency of age reporting by both characteristics of the decedent based on the information reported on the death certificate. We expect age reporting to be more consistent for males than for females and for married than for unmarried decedents.

Literacy has also long been considered to be an important factor in determining the accuracy of

age reporting (Wolfenden, 1954). Unfortunately, only death certificates from New York state and Utah include information on the decedent's educational attainment in 1980 and 1985. Thus, to measure the potential impact of literacy on age reporting we have included an indicator of the percent literate in the African-American population aged 10 years old and above in the decedent's state of birth (U.S. Bureau of the Census, 1923). This state-level measure is highly correlated with the proportion of African-Americans aged 60+ reporting at least 8 years of schooling by state of birth in the 1980 Census of Population (U.S. Bureau of the Census, 1983). [12] We distinguish three levels of literacy: < 75%, 75-79%, and ≥ 80%. We hypothesize that age reporting for individuals born in states with higher levels of African-American literacy will be more consistent.

In addition to the above characteristics, we also examine age reporting by migration status. Migration status, like state of birth, also correlates with educational attainment. Analyses of census data have indicated that African-American migrants from the South had more schooling than nonmigrants (U.S. Bureau of the Census, 1969). We determine migration status by comparing the decedent's state of birth with the state of residence at the time of death. When the same state is reported in both instances a subject is classified as a non-migrant; otherwise, he or she is considered a migrant. We anticipate age agreement to be higher for migrants than for non-migrants.

Ignorance of an individual's exact birthdate is likely to be a major source of bias in age reporting. Because the BRA was not established until 1915 and was not complete until 1933, many elderly individuals never had their births registered (Shapiro, 1950). That age reporting among elderly African-Americans appears to be worse than among elderly whites (National Center for Health Statistics, 1968; Rosenwaike and Logue, 1983; Kestenbaum, 1992) may in part be related to less complete registration coverage of nonwhite than white births in the early decades of this century (Whelpton, 1934; Grove, 1943). In our sample, we would also expect age reporting consistency to be

[12] A correlation coefficient of 0.895; tabulated from the 1980 Census PUMS file.

higher for individuals whose births were registered. We do not, however, have any data to measure this effect directly. Instead, we employ a proxy measure for the availability of birth records among our sample decedents.

This measure utilizes information from a special study conducted by SSA's Evaluation and Measurement Staff (EMS) in the mid-1970s (Social Security Administration, 1977). These data provide, by state, the percentage of civil birth records available among adult retirement and survivor-benefit claimants, whose claims were adjudicated, in 1973 and 1974. These percentages range from a low of 3.5% in Arkansas to a high of 100% in Nevada. The major shortcomings of these data are small sample sizes in some states, which make them subject to "considerable sampling variability" (Social Security Administration, 1977: 32), and that they are not reported by race of the claimant. Nevertheless, they provide a relatively recent indicator of birth record availability among applicants for Social Security benefits. We examine the consistency of age reporting by a categorical variable of birth record availability coded by the decedent's state of birth. We expect age reporting to be more comparable for decedents who were born in states with a higher level of birth record availability. [13]

The degree of age agreement by characteristics of the decedent is shown in Table 7. Results from multivariate logit regression analyses that examine the joint significance of decedent characteristics on age agreement are shown in Table 8. In these analyses, the dependent variable is the log odds of age agreement, and the samples are pooled with a dummy variable indicating whether the

[13] We also examined an alternative measure of birth record availability drawn from information regarding when the decedent's state of birth entered the BRA. Based on an analysis of birth registration completeness in 1929-30, Whelpton (1934: 131) concluded that the percentage of births registered was influenced by the length of time that had lapsed since a state had instituted birth registration requirements. We distinguished between five groups of states: those that made up the BRA in 1915 when it was first established, and states that subsequently joined the BRA in 1916-20; 1921-25; 1926-30; and 1931-33. Although consistency of age reporting was greater among decedents born in states that made up the BRA in 1915, among the rest of the states the relationship between the year when the state joined the BRA and age reporting was not highly consistent. We dropped this variable from subsequent analyses.

decedent died in 1980 or was born in Maryland. As noted above, we oversampled decedents aged 85+ in 1985; age at death as reported on the death certificate is also included as a covariate in the multivariate analysis. [14]

As expected, concordance in age reporting is slightly higher for males than for females, and for individuals who were married at the time of death than for those who were not (Table 7). Because a larger proportion of male than female decedents were married, some of the variation in age agreement by sex is attributable to these marital status differentials. When both sex and marital status are controlled, the male coefficient is reduced by 33%, although it remains positive and statistically significant at the 10% level (comparison of Models 1 and 2, Table 8). Marital status continues to be a significant predictor of age agreement. It has been suggested that the greater consistency in age reporting for married than for unmarried decedents is related to the fact that an individual's spouse is more likely to know the decedent's true age than other death certificate informants (Kestenbaum, 1992). We investigated this possibility among a subsample of decedents from states where death certificates include information on the informant's relationship to the decedent. [15] Among the 744 records for which this information was coded, a spouse was the informant for 183 decedents. We found age agreement to be somewhat higher at 72.7% when the death certificate informant was the decedent's spouse than in all other instances, 63.6%. These results differed, however, by sex. Among married decedents (N=249), when the wife was the surviving spouse and the death certificate informant, age agreement was 76%

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[14] To estimate the models, we use the maximum likelihood estimation method under the logit procedure in STATA. Standard errors for the coefficients were adjusted to account for the fact that more than one decedent from the same state of birth could be included in the sample. The adjustments are based on the Huber formula that is incorporated into the hlogit procedure in STATA (Computing Resource Center, 1992; Huber, 1967).

[15] The relationship of the informant to the deceased was available only for the following eight death registration areas: California, Colorado, District of Columbia, Georgia, Illinois, Massachusetts, New York City, and North Carolina. Age agreement among the records for which this information was coded is not significantly different from all other records.

versus 62% for all others. In contrast, when the husband was the surviving spouse and the death certificate informant, age agreement was only 61% versus 76% for all others. These findings, although based on a relatively small sample, suggest that wives, but not husbands, are more likely to provide accurate age information for death certificates.

Age agreement is also somewhat higher for migrants than for nonmigrants, except among Maryland-born decedents (Table 7). This difference was not unexpected, and was hypothesized to reflect the higher educational attainment of migrants from the South compared to non-migrants. It is not, however, accounted for by either the level of literacy or birth record availability in the decedent's state of birth (Table 8). This variation thus in part reflects differences in unobserved characteristics between the two migration groups.

A pronounced difference in age agreement is observed by the level of African-American literacy in the decedent's state of birth. In the 1985 national sample, for example, only 58.0% of the ages agreed for decedents who were born in states with African-American literacy levels of less than 75% in 1920 compared with a 72.0% age agreement among decedents born in the most literate states (Table 7). Similarly, age agreement was much higher among decedents born in states where a larger proportion of applicants for Social Security benefits had a civil birth record in the early 1970s (Table 7). Both variables remain significant predictors of age agreement in the multivariate analysis shown in Table 8. Although the two measures are crude proxies for the level of literacy and birth record availability among our sample decedents, the results are consistent with the hypothesis that birth registration and the literacy level of the population are important determinants of accurate age reporting. The findings are also consistent with the hypothesis that the higher level of age agreement in the Maryland than in the national sample is the result of better than average birth registration completeness and higher than average African-American level of literacy in Maryland during the early decades of this century (Table 8).

Summary

Our analyses reveal significant inconsistencies in age reporting on death certificates and Social Security Administration records for elderly African-Americans. In 1985, based on the national sample, only 63% of ages at death reported on the death certificate agreed with ages at death based on SSA records for African-Americans at death certificate ages 65+. When ages disagreed, the most likely pattern was for the decedent's age on the death certificate to be younger than on the Social Security record. Several other studies have shown death certificate ages to be systematically younger than census ages among older African-Americans, suggesting that the most common source of age inaccuracy when different sources are compared is age understatement on death certificates (National Center for Health Statistics, 1968; Kestenbaum, 1992; Elo and Preston, 1994). A comparison of ages at death reported on the death certificate and the Social Security record to an age at death based on an early census-record for the same individuals, reveal that Social Security data provide a superior source of age information among elderly African-Americans.

The literacy level of a population and birth record availability appear to be important determinants of consistency of age reporting. Our data do not permit direct measurement of these factors, but our proxy measures strongly predict consistency of age reporting. A comparison of age agreement in the national and Maryland samples is also consistent with this interpretation. The degree of age agreement is significantly higher for African-Americans born in Maryland (72.6%), a state with a better than average birth registration during the early decades of this century and a high level of literacy among the state's African-American population, than in the national sample. These results could explain the higher rates of agreement among more recent birth cohorts, and suggest that as younger cohorts age reliability of age reporting among elderly African-Americans will steadily increase. This latter conclusion is also consistent with the results from the comparison of ages at death on death certificates and SSA records with a third source of age data, the US Censuses of 1900, 1910

and 1920. Ages at death in all three sources were more likely to agree among the younger decedents and least likely to agree among the oldest old.

Although this study is limited to age-at death information reported on death certificates and matching Social Security records, the amount of discrepancy in age information between the two sources suggests that studies involving elderly African-Americans should institute independent age verification procedures at the baseline interview in order to draw accurate conclusions about age-related processes among this population sub-group. In this paper, we have demonstrated the usefulness of one such independent source of age data, namely the public-released manuscripts from the US Censuses of 1900, 1910 and 1920.

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TABLE 1: Percent of Sample Records Matched to the Death Master File and to an Early Census Record by Age of the Decedent on the Death Certificate

Age on the Death Certificate	% Matched to DMF	% Matched to Census	% 3-Way Match	Total Number of Cases
60-64	82.4	46.0	36.9	409
65-69	88.8	52.6	47.2	1,345
70-74	90.3	54.8	49.4	812
75-79	88.8	56.8	50.8	716
80-84	89.0	57.7	51.9	724
85-89	86.3	64.7	57.0	665
90-94	86.5	68.8	60.1	378
95-99	88.8	65.2	59.6	161
100+	90.4	57.7	53.9	52
Total	88.1	56.8	50.5	5,262

TABLE 2: Tests of Non-Match Bias in Age Reporting

A. Test of Non-Match Bias for Death Certificate-Census Link*

Age at Death on Death Certificate Minus Age at Death on DMF (in years)	Death Matched to Early Census Record	Death not Matched to Early Census Record
≤-5	138	123
-2 to -4	195	167
-1	294	177
0	1,750	1,293
+1	155	119
+2 to +4	81	70
≥+5	44	29
Total	2,657	1,978
Pearson Chi-Square with 6 degrees of freedom	10.0845	
p-value	.121	

B. Test of Non-Match Bias for the Death Certificate-Social Security Link**

Age at Death on Death Certificate Minus Census-Based Age at Death (in years)	Death Matched to the DMF	Death not Matched to the DMF
≤-5	174	27
-2 to -4	297	51
-1	473	66
0	1,278	146
+1	256	23
+2 to +4	115	16
≥+5	64	4
Total	2,657	333
Pearson Chi-Square with 6 degrees of freedom	11.627	
p-value	.071	

* All death certificates in Part A have been linked to social security records.
** All death certificates in Part B have been linked to early census records.

TABLE 3: Percent Agreement in Age between the Death Certificate and the Matching Social Security Record, 1980 and 1985 National and Maryland Samples

Age on the Death Cert.	Death Certificate Age Minus Social Security Age							Number of Records
	≤-5	-2 to -4	-1	0	1	2 to 4	5+	
	1980 National Sample							
60-64	8.3	6.2	9.2	71.5	3.0	1.2	0.6	337
65-69	8.1	8.9	11.1	63.9	5.6	1.8	0.6	496
All	8.2	7.8	10.3	67.0	4.6	1.6	0.6	833
	1985 National Sample							
65-69	5.1	8.6	10.0	71.3	3.9	1.0	0.0	488
70-74	7.9	9.4	10.3	61.9	6.4	3.8	0.4	533
75-79	8.8	9.1	11.3	62.8	5.7	1.4	0.9	441
80-84	7.7	12.0	12.7	56.2	7.0	3.1	1.3	457
85-89	4.9	8.1	10.5	64.4	7.5	3.2	1.5	469
90-94	0.8	5.3	5.7	67.1	9.1	8.3	3.8	264
95-99	1.8	1.8	7.2	48.7	9.0	16.2	15.3	111
100+	0.0	2.6	7.9	34.2	5.3	18.4	31.6	38
All	6.6	9.1	10.6	62.9	6.2	3.2	1.5	2,801
	Maryland Sample							
65-69	1.9	5.2	7.1	80.0	4.8	0.5	0.5	210
70-74	2.5	4.5	10.5	74.0	6.0	2.0	0.5	200
75-79	4.6	6.2	9.7	71.8	4.6	2.6	0.5	195
80-84	1.6	5.9	12.3	68.5	4.8	5.9	1.1	187
85-89	3.8	8.6	9.5	67.6	5.7	3.8	0.9	105
90-94	0.0	1.6	12.7	74.6	7.9	3.2	0.0	63
95-99	0.0	3.1	6.3	68.8	9.4	6.3	6.3	32
100+	0.0	11.1	0.0	33.3	11.1	22.2	22.2	9
All	2.5	5.5	9.8	72.6	5.5	3.1	1.0	1,001

[1] All 1985 decedents born in Maryland are included under the Maryland Sample.
Note: Weights are applied to the 1985 national sample to take account of double-sampling at ages 85+. Number of cases reflect the number of unweighted cases.

TABLE 4. Cross Classification of 5-Year Age Intervals as Stated on the Death Certificate and on the Matching Social Security Record (DMF), by Sex: 1985 National Sample

Sex and Age on the Death Certificate	Age on the DMF											
	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105+	Total
Males												
65-69 years		7	**268**	27	7							309
70-74 years	1	1	9	**244**	29	3	3					290
75-79 years			3	5	**200**	19	4	1				232
80-84 years				3	8	**192**	19	3	1			226
85-89 years					1	10	**163**	12	2			188
90-94 years							6	**78**	2	1		87
95-99 years							5	8	**27**	1		41
100-104 years								2	1	**4**		7
105+ years										2		2
Total	1	8	280	279	245	224	200	104	33	8	0	1382
Females												
65-69 years		3	**158**	19	5	2	1					188
70-74 years			2	**205**	30	10	4					251
75-79 years				2	**168**	36	8	2	1	2		219
80-84 years					8	**176**	43	9	4	1		241
85-89 years				1	2	7	**245**	28	5			288
90-94 years						2	17	**154**	9			182
95-99 years							6	11	**55**	1		73
100-104 years							1	3	5	**13**		22
105+ years									1	4	**2**	7
Total	0	3	160	227	213	233	325	207	80	21	2	1471

Note: No weighting system is applied to matched cases.

TABLE 5. Cross Classification of 5-Year Age Intervals as Stated on the Death Certificate and on the Matching Social Security Record, by Sex: Maryland Sample

Sex and Age on the Death Certificate	Age on the DMF										
	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	Total
Males											
65-69 years	1	3	**114**	2	1	1					122
70-74 years		1		**111**	8	1					121
75-79 years				5	**86**	3	2				96
80-84 years					4	**68**	3				75
85-89 years							**38**	4			42
90-94 years							1	**24**	1		26
95-99 years									**11**		11
100-104 years										**3**	3
105+ years										1	1
Total	1	4	114	118	99	73	44	28	12	4	497
Females											
65-69 years			**81**	7							88
70-74 years			1	**70**	7	1					79
75-79 years		1		3	**83**	8	4				99
80-84 years				1	6	**94**	10	1			112
85-89 years					1	2	**55**	5			63
90-94 years								**36**	1		37
95-99 years								3	**18**		21
100-104 years									2	**3**	5
105+ years											0
Total	0	1	82	81	97	105	69	45	21	3	504

TABLE 6: Percent Agreement in Age between the Death Certificate and the Matching Census Record, 1980 and 1985 National and Maryland Samples Combined

Average Age[1]	Census-Based Age Minus Death Certificate Age			Number of Records
	< 0	0	>0	
60-64	12.6	61.5	25.9	143
65-69	9.4	65.2	25.4	598
70-74	13.0	53.5	33.5	430
75-79	13.4	51.6	35.0	374
80-84	17.0	49.3	33.7	359
85-89	17.5	48.3	34.2	406
90-94	32.8	44.9	22.3	247
95-99	38.3	46.9	14.8	81
100+	57.9	31.6	10.5	19
All	16.4	53.8	29.9	2,657
Average Age[2]	Census-Based Age Minus Social Security Age			
60-64	8.0	74.5	17.5	137
65-69	8.9	79.8	11.3	559
70-74	10.8	74.5	14.7	435
75-79	12.8	66.0	21.2	391
80-84	17.1	68.1	14.8	345
85-89	18.3	60.1	21.6	431
90-94	25.3	56.8	17.9	257
95-99	25.0	61.9	13.1	84
100+	11.1	66.7	22.2	18
All	14.5	69.0	16.5	2,657

[1] Age refers to the average age based on death certificate age and census-based age at death.
[2] Age refers to the average age based on social security age and census-based age at death.
Note: No weighting system is applied to matched cases.

TABLE 7: Percent Age Agreement between the Death Certificate and the Matching Social Security Record by Selected Characteristics of the Decedent

	1980 Sample		1985 National Sample[1]		Maryland Sample[2]	
Characteristic	%	N	%	N	%	N
Sex						
Female	65.6	323	58.6	1,443	71.4	504
Male	67.8	510	67.1	1,358	73.8	497
Marital Status						
Married	69.3	439	69.2	902	75.8	335
Widowed	64.0	247	57.6	1,516	71.4	476
Other	65.3	147	65.9	383	70.0	190
Migration Status[3,4]						
Migrant	69.9	412	64.7	1,452	71.1	363
Non-Migrant	63.8	417	60.7	1,327	73.5	638
Percent Literate[3]						
80+%	76.4	157	72.0	518	72.6	1,001
75-79%	69.1	265	64.8	879	na	na
<75%	61.7	407	58.0	1,382	na	na
Birth Record Availability[3,5]						
< 10%	61.0	326	57.1	959	na	na
10-29%	65.2	221	62.4	884	na	na
30+%	74.8	282	68.9	936	72.6	1,001

[1] Percentages calculated using weights that take account of double sampling at ages 85 and above.
[2] All 1985 decedents born in Maryland are included under the Maryland sample.
[3] Twenty-six decedents for whom state of birth was not reported on the death certificate are excluded from these calculations.
[4] A non-migrant is defined as a person whose state of birth and state of death agreed; otherwise, she or he is classified as a migrant.
[5] The percentage of civil birth records available among adult retirement and survivor-benefit claimants in 1973 and 1974 in the decedent's state of birth.

TABLE 8: Coefficients of Equations Predicting the Log Odds of Age Agreement

Characteristic	Model 1	Model 2	Model 3
Age[1]	-.0192 ***	-.0166 ***	-.0167 ***
Sex			
Female	---	---	---
Male	.1982 ***	.1328 *	.1422 *
1980 Sample			
No	---	---	---
Yes	-.1204	-.1231	-.0985
Maryland Births			
No	---	---	---
Yes	.4340 ***	.4356 ***	.0500
Marital Status			
Married		---	---
Widowed		-.2271 ***	-.2153 ***
Other		-.2029 ***	-.2276 ***
Migration Status[3]			
Migrant			---
Non-Migrant			-.1893 **
Percent Literate			
80+%			---
76-80%			-.0939
<76%			-.3817 ***
Birth Record Availability[4]			
< 10%			-0.3925 ***
10-29%			-0.1704 ***
30+%			---
Constant	1.9441 ***	1.9250 ***	2.4320 **
Log-Likelihood	-2930.2	-2925.6	-2893.9
Chi-Square	45.68 df=3	54.97 df=5	118.34 df=8
Sample Size[2]	4,609	4,609	4,609

[1] Age refers to age as reported on the death certificate.
[2] We have dropped 26 decedents for whom state of birth was not reported on the death certificate from these analyses.
[3] A non-migrant is defined as a person whose state of birth and state of death agreed; otherwise, she or he is classified as a migrant.
[4] The percentage of civil birth records available among adult retirement and survivor-benefit claimants in 1973 and 1974 in the decedent's state of birth.
--- reference category; *** p-value ≤ .01; ** p-value ≤ .05; * p-value ≤ .10.
Chi-Square obtained by subtracting the deviance of the current model from a model that controls only for age.