

MORTALITY BY CAREER-AVERAGE EARNINGS LEVEL

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Tiffany Bosley, FSA

Michael Morris, ASA

Karen Glenn, FSA, EA, MAAA

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I. Introduction

Research has shown that higher income levels are associated with lower mortality rates.² Higher lifetime earnings are also likely to be associated with lower mortality rates. This relationship is important for analyzing and projecting costs for the Social Security program because a worker's career-average earnings level is a critical factor in determining the level of monthly benefits that will be payable to the worker and his or her dependents. Average indexed monthly earnings (AIME) is a particularly useful measure of a person's lifetime, or career-average, earnings.³ In this study, we analyze the relationship between AIME levels and mortality rates for Social Security retired-worker beneficiaries.

In general, we observe lower death rates for retired-worker beneficiaries with higher-than-average AIME levels, and higher death rates for retired-worker beneficiaries with lower-than-average AIME levels. At older ages, the differences in death rates across AIME levels diminish. This convergence at older ages is consistent with the fact that the healthiest individuals tend to survive to older ages in each earnings-level group, and that the advantages associated with higher earnings tend to dissipate with increased years after retirement. The trends from 1995 to 2015 show the spread in death rates among the AIME levels remaining fairly steady. The spread does not significantly increase in general, and even slightly decreases for some age groups in recent years.

Our basic approach for this study is to compare the death rates among retired-worker beneficiaries by sex, age group, and lifetime career-average earnings level (i.e., the beneficiary's AIME) to the annual death rate among retired-worker beneficiaries for that sex and age group, for every fifth year from 1995 to 2015. The actual number of deaths and the exposure used to calculate the annual death rate come from the Social Security Administration's Master Beneficiary Record

1. The authors would like to thank Steve Goss, Bert Kestenbaum, and Alice Wade for their valuable input on data, methods, and presentation. We also thank Mark Bye, Chris Chaplain, Johanna Maleh, Polina Vlasenko, Hilary Waldron, and Bob Weathers for their helpful review and comments.

2. *Trends in Mortality Differentials and Life Expectancy for Male Social Security-Covered Workers, by Socioeconomic Status* by Hilary Waldron includes a survey of literature on this topic. See

<https://www.ssa.gov/policy/docs/ssb/v67n3/v67n3p1.html>.

3. Another very closely related value that reflects the level of a worker's lifetime earnings is the primary insurance amount (PIA). Because of the way the PIA is calculated directly from the AIME, lower AIME levels lead directly to lower PIA levels and higher AIME levels lead directly to higher AIME levels. As will be seen later in the study, ordering individuals by either AIME or PIA is equivalent for those born in the same year. See

<https://www.ssa.gov/oact/cola/Benefits.html> for information on the AIME and PIA calculations.

(MBR). For each sex and age group, we calculated relative mortality ratios¹ at various AIME levels. A relative mortality ratio of 1.00 for an AIME level indicates that the death rate was the same as the death rate for that sex and age group as a whole. A relative mortality ratio of less than 1.00 means that the death rate for that AIME level was lower than the death rate for that sex and age group as a whole, and a ratio of greater than 1.00 means that the death rate for that AIME level was higher than the death rate for that sex and age group as a whole.

The remainder of this study discusses our data, methods, results, and also identifies possible areas of future study. We present results both by “AIME quintiles” (i.e., quintile of AIME level intervals) and by “hypothetical worker” intervals. (See Section II, Data and Methods, for more information about these hypothetical workers.)

II. Data and Methods

A. Data

In this study, we included retired-worker beneficiaries for the selected years from the 100 percent sample of the Social Security Administration’s June 2017 MBR file where a Primary Insurance Amount (PIA) was available, allowing direct computation of the worker’s AIME. We excluded beneficiaries affected by the Windfall Elimination Provision² and Totalization agreements,³ because such individuals generally have relatively low AIMEs that do not accurately represent their true career-average earnings levels. We excluded those with benefits based on the old-start formula,⁴ because these records have a different benefit calculation which is not comparable with the PIA and AIME. We also excluded retired-worker beneficiaries previously entitled for a disability benefit, because such individuals generally have a shorter work history and AIMEs that are not comparable to individuals in the same birth cohort included in the study. A detailed description of the codes used to select the records from the MBR can be found in Appendix E.

B. AIME Quintiles

We analyzed the data in two different ways. First, we considered quintiles of beneficiaries based on AIME level. For this analysis, we determined the records that had exposure and were in pay status during the report year, and sorted the records by AIME level for each sex and single year of age. We then determined the record number for each quintile breakpoint and the corresponding AIME value for that record number. We determined the quintile using the AIME values as the breakpoints (which define the AIME ranges) for each sex and single year of age.

1. We define the relative mortality ratio to be the ratio of the death rate of a subgroup to the death rate of the group as a whole.

2. As described in the Windfall Elimination Provision publication, <https://www.ssa.gov/pubs/EN-05-10045.pdf>, “If you work for an employer who doesn’t withhold Social Security taxes from your salary, such as a government agency or an employer in another country, any retirement or disability pension you get from that work can reduce your Social Security benefits.”

3. See https://www.ssa.gov/international/agreements_overview.html.

4. See https://www.ssa.gov/OP_Home/handbook/handbook.07/handbook-toc07.html.

Tables 1 and 2 show how the AIME quintiles are defined for males and for females at age 65 in 2015. Note that the AIME ranges vary across ages and report years.

Table 1.—Male AIME Quintiles

Male Quintiles	AIME Range ^a	Percentage of Beneficiaries
Lowest AIME Quintile	AIME ≤ \$1,866	20%
2nd AIME Quintile	\$1,866 < AIME ≤ \$3,230	20%
3rd AIME Quintile	\$3,230 < AIME ≤ \$4,448	20%
4th AIME Quintile	\$4,448 < AIME ≤ \$5,863	20%
Highest AIME Quintile	\$5,863 < AIME	20%

a. The AIME ranges in this example are for male retired-worker beneficiaries who were age 65 in 2015.

Table 2.—Female AIME Quintiles

Female Quintiles	AIME Range ^a	Percentage of Beneficiaries
Lowest AIME Quintile	AIME ≤ \$817	20%
2nd AIME Quintile	\$817 < AIME ≤ \$1,640	20%
3rd AIME Quintile	\$1,640 < AIME ≤ \$2,520	20%
4th AIME Quintile	\$2,520 < AIME ≤ \$3,761	20%
Highest AIME Quintile	\$3,761 < AIME	20%

a. The AIME ranges in this example are for female retired-worker beneficiaries who were age 65 in 2015.

C. Hypothetical Worker Intervals

As a second approach, we grouped the records by AIME level, consistent with the AIME levels of the Office of the Chief Actuary’s five hypothetical worker examples.¹ The first four are hypothetical scaled workers and are classified as “Very Low”, “Low”, “Medium”, and “High” earners. The fifth is a hypothetical “Maximum” worker who has earnings equal to the OASDI maximum taxable earnings level for each year. Using the midpoints between the AIMEs of adjacent hypothetical worker examples, we calculated the AIME level breakpoints for the five intervals. These breakpoints are the same for each sex because the hypothetical worker examples do not vary by

1. For more information about these hypothetical workers, see Actuarial Note 2017.3, *Scaled Factors for Hypothetical Earnings Examples Under the 2017 Trustees Report Assumptions*, at <https://www.ssa.gov/OACT/NOTES/ran3/an2017-3.pdf>.

sex. We call the five intervals: “Very Low Interval”, “Low Interval”, “Medium Interval”, “High Interval”, and “Very High Interval”. For example, a record with an AIME that is closest to that of the Very Low hypothetical worker would fall into the Very Low Interval. A record with an AIME closest to a Maximum worker would be in the Very High Interval. Table 3 shows how the intervals are defined for a retired worker born in 1950 who was age 65 in 2015, and also shows the percentage distribution of retired-worker beneficiaries in each interval.

Table 3.—Hypothetical Worker Intervals

Interval	AIME Range ^a	Percentage of Beneficiaries
Very Low Interval	$\text{AIME} \leq \$1,218$	17%
Low Interval	$\$1,218 < \text{AIME} \leq \$2,524$	22%
Medium Interval	$\$2,524 < \text{AIME} \leq \$4,527$	29%
High Interval	$\$4,527 < \text{AIME} \leq \$7,023$	22%
Very High Interval	$\$7,023 < \text{AIME}$	10%

a. The AIME ranges in this example are for retired-worker beneficiaries who were age 65 in 2015.

The AIME quintile approach will likely be more useful and intuitive for the reader. We included the hypothetical worker interval approach because of its potential use for incorporating mortality differences into the Office of the Chief Actuary’s annual internal real rate of return¹ and money’s worth ratio² analyses.

D. Calculations

For each record, we determined the sex, age, AIME level, exposure, and death status.

- Sex and age – This study includes male and female retired-worker beneficiaries at ages 62 and older.
- AIME level – As described in the previous sections, we grouped the records based on either the AIME quintiles or the hypothetical worker intervals.

Each AIME quintile, ideally, should have 20 percent of record exposure. We assigned the AIME quintile based on age, calculated as the report year minus the birth year. However, when calculating exposure by age, exposure is assigned based on age at last birthday for each month in the report year. Thus, each quintile may not contain exactly 20 percent of the exposure.

1. See Actuarial Note 2017.5, *Internal Real Rates of Return under the OASDI Program for Hypothetical Workers*, at <https://www.ssa.gov/OACT/NOTES/ran5/an2017-5.pdf>.

2. See Actuarial Note 2017.7, *Money’s Worth Ratios Under the OASDI Program for Hypothetical Workers*, at <https://www.ssa.gov/OACT/NOTES/ran7/an2017-7.pdf>.

- Exposure – To determine the exposure, we grouped the records into three categories: Active, Death, and Termination Other Than Death. Active records are those that are in benefit entitled status during the report year and end the year in benefit entitled status. Death records are those with a reported death during the report year. Terminations Other Than Deaths are records in a terminated category, other than a death termination category, during the report year. (For example, a record could be categorized as terminated if the beneficiary were entitled to other benefits.) Terminations Other Than Deaths are an insignificant fraction, less than 0.01 percent, of the number of records.

Exposure is measured in terms of years; a month is equal to $\frac{1}{12}$ of an exposure year. Deaths receive a full year of exposure at the age when the death occurs, unless the record becomes active at the same age as the death occurs. In that case, exposure starts when the record becomes active and ends at the end of the age period. Exposure is calculated for the record's age based on the birth month, but not the day of the month, so that exposure is only calculated in $\frac{1}{12}$ year increments. Thus, for example, if a record is active all year and the claimant turns age 65 on July 25th, the record will receive $\frac{1}{2}$ year exposure for age 64 and $\frac{1}{2}$ year exposure for age 65. The exposure is calculated only during the selected report year (January 1 through December 31). For each record, we determined the first month of the report year that the record was active, which month the record terminated for death, and which month the record terminated for reasons other than death.

Exposure calculation details and examples are presented in Appendix F.

- Deaths – The actual number of deaths by single year of age is from the MBR data. A death is recorded if the date of death is during the report year. If the date of death is after the report year and the record was in entitled status during the entire report year, the record will receive a full year of “Active” exposure and the death is not recorded for that year.

We grouped the data by sex, age group, and AIME level, and calculated annual death rates by dividing the number of deaths by the years of exposure. Then we calculated the relative mortality ratio by dividing the death rates for each AIME level by the death rate for everyone in the sex and age group at all AIME levels.

III. Results by AIME Quintiles

For the AIME quintile analysis, records are assigned to the following quintiles using the breakpoints described in Section II, Data and Methods: “Lowest AIME Quintile”, “2nd AIME Quintile”, “3rd AIME Quintile”, “4th AIME Quintile”, and “Highest AIME Quintile”.

We only present relative mortality ratios for birth cohorts 1930 and later. Earlier birth cohorts have different benefit calculations, which makes consistent assignment into career-average earnings levels difficult.

A. Mortality Differences by AIME Quintile

The tables in Appendix A¹ show the relative mortality ratios by sex, age group, and AIME quintile for every fifth year from 1995 through 2015. For example, in 2015 (Table 8), the male 65-69 age group ratios are 1.63, 1.15, 0.91, 0.74, and 0.54 for the Lowest AIME Quintile through the Highest AIME Quintile, respectively. Generally, as seen in the tables, higher AIME levels are associated with lower mortality for both males and females.

The figures in Appendix B illustrate the relative mortality ratios over time for each age group, by sex and AIME quintile. The figures also display the variation among the quintiles. For example, for males at ages 65-69 (Figure 2), the difference between the Lowest and 2nd AIME Quintiles and the 2nd and 3rd AIME Quintiles generally increases over time, but the difference between the 3rd and 4th AIME Quintiles remains fairly constant, and the difference between the 4th and Highest AIME Quintiles slightly decreases over time. At older ages, there is less of a difference in relative mortality ratios among the AIME quintiles. This may be because the healthiest individuals in each quintile are more likely to survive to older ages, and that the advantages associated with higher career-average earnings tend to dissipate with increased years after retirement.

In the Appendix B figures, the difference between the relative mortality ratios for the Lowest and Highest AIME Quintiles for male age groups 62-64 and 65-69 decreased somewhat from 2010 to 2015. During the same time period, there was a slight increase in the spread of relative mortality ratios for male age groups 70-74 and 75-79. For females, there was a significant increase in the spread of relative mortality ratios from 2010 to 2015 for the 62-64 age group. The remaining female age groups saw a slight increase in the spread of relative mortality ratios over the report years.

B. Male / Female Comparison

Historically, the majority of women worked in paid employment less consistently than men, and thus became dually entitled² in retirement, so their personal earnings (as summarized by the AIME) may not have accurately represented their “family” income level, or their potential career earnings level. For example, a woman with personal earnings in the Lowest AIME Quintile may have experienced a lifestyle on par with a woman with personal earnings in the Highest AIME Quintile when considering her spouse’s income. Despite this, we find that females generally follow the same relative mortality pattern as males, in that higher earners have lower mortality.

1. This study only includes birth cohorts 1930 and later due to benefit formula differences in older cohorts. The reader should use caution when comparing the total relative mortality ratios between report years, as they will include different age groups. For example, the totals for the 1995 report year only include retired-worker beneficiaries at ages 62-64, while the totals for the 2015 report year include ages 62-84.

2. A person may be entitled to more than one benefit at the same time. For example, a person may be entitled as a retired worker on his/her own record and as a spouse on another record. In dual entitlement cases where the spouse benefit is higher than the worker benefit, the dually entitled beneficiary receives his or her full worker benefit in addition to a partial spouse benefit. The total benefit is the same amount or approximately the same amount as the full spouse benefit. See <https://secure.ssa.gov/apps10/poms.nsf/lnx/0300615020> for details.

With the exception of females ages 62-64 in 1995, females have the same relative mortality pattern as males, with higher AIME beneficiaries having lower mortality. However, it is interesting to note that the spreads in female relative mortality ratios among AIME quintiles are smaller than those for males. The female relative mortality ratios for the Lowest and 2nd AIME Quintiles are lower (closer to the overall average) than those for males, and the female ratios in the 4th and Highest AIME Quintiles are higher (also closer to the overall average) than those for males. This leads to the following questions: Is the socioeconomic status gradient smaller for women? Or are earnings a less accurate measure of socioeconomic status for women? As previously noted, this may be because the level of personal earnings for married women may not correspond to their socioeconomic status. Another possible reason for this is that, historically, most men worked consistently. Therefore, the sample of retired-worker beneficiaries tends to capture a male population that is very representative of the general population. However, many women did not work consistently, or did not work enough to be eligible for a retired-worker benefit.

C. Age Groups

As briefly noted in the previous section, the spread in the relative mortality ratios among the quintiles decreases at older ages. For example, in 2015 (Table 8), the male age 62-64 relative mortality ratios are 1.77 and 0.52 for the Lowest and Highest AIME Quintiles, respectively. The Lowest AIME Quintile relative mortality ratio steadily decreases for older age groups, while the Highest AIME Quintile relative mortality ratio increases. In 2015, the male 80-84 relative mortality ratios are 1.18 and 0.75 for the Lowest and Highest AIME Quintiles, respectively. For females, in 2015, the relative mortality ratio for the Lowest AIME Quintile decreases from 1.54 for age group 62-64 to 1.06 for age group 80-84, while the relative mortality ratio for the Highest AIME Quintile increases from 0.73 for age group 62-64 to 0.91 for age group 80-84. Note that the spread in the 2015 female 80-84 age group relative mortality ratio is very small, with mortality ratios ranging from 0.91 to 1.06. Again, this is most likely due to the healthier individuals being more likely to survive, and that the AIME quintiles are not as strong of an indication of higher or lower than average mortality rates at older ages.

Also note that the 62-64 age group consists solely of retired workers who retired prior to normal retirement age (NRA), the age at which a person may first become entitled to retirement benefits without a reduction based on age. The NRA is 65 for those born in 1937 and earlier, 66 for those born in 1943-1954, and 67 for those born in 1960 and later. For the intervening birth years, the NRA is increasing by 2 months per year. Some of the individuals who retired prior to the NRA may have retired because they have physically demanding jobs they are no longer able to perform or because they have knowledge about being in poor health.

IV. Results by Hypothetical Worker Intervals

We also analyzed results by proximity to the AIME level of hypothetical worker beneficiary examples. More information on these hypothetical workers may be found in Section II, Data and Methods. The intervals for this analysis are labeled as Very Low, Low, Medium, High, and Very High. The tables in Appendix C show results for these five intervals.

Similar to the results by AIME quintiles, the results by hypothetical worker intervals show higher mortality for the Very Low Interval and lower mortality for the Very High Interval. One interesting thing to note is that mortality for the Very Low Interval is lower than the mortality for the Low Interval, for males at ages 75-79 in 2010 (Table 12) and ages 75-84 in 2015 (Table 13). This differs from the results by AIME quintiles, where the mortality for the Lowest AIME Quintile is always higher than the mortality for the 2nd AIME Quintile. One possible explanation is that the Very Low Interval may consist of a higher percentage of beneficiaries with many years of zero earnings, such as foreign born workers, rather than consistent low earnings over many years. Other than these types of anomalies, the results by hypothetical worker intervals are very similar to the results by AIME quintiles. Females continue to show the same pattern as males, with higher earners generally having lower mortality. There are a few exceptions where females do not follow this pattern. For example, in 1995 (Table 9), for ages 62-64, the relative mortality ratio of the Medium Interval is lower than that of the Very High Interval. And in 2015 (Table 13), for ages 62-64, the relative mortality ratio of the High Interval is lower than that of the Very High Interval. For the 1995 ages 62-64 intervals, we saw similar results in the 4th and Highest AIME Quintile analysis. For the 2015 ages 62-64 intervals, note that the Very High Interval is extremely small, so a small number of additional deaths can skew the results.

The figures in Appendix D illustrate the relative mortality ratios for each age group, by sex and hypothetical worker interval, over the years available in the data used for this study. These figures are similar to the AIME quintile figures shown in Appendix B and described above.

V. Possible Areas of Future Study

This study leaves us with several questions and topics that could be further explored.

- As seen in the study, the spread in death rates among AIME levels is smaller for females than for males. For males ages 62-64 (Figure 1), the spread is relatively stable for most years but somewhat smaller in 1995. The female 2015 group of 62-64 year olds has a larger spread than prior birth cohorts. This coincides with increased female labor force participation over the last several decades. Is it possible that the trend will continue for females? Will females converge to males? Is there a possible cohort effect for women? Could there be a change in the characteristics of women taking early retirement?
- As briefly noted in the study, the hypothetical worker Very Low Interval consists of a mix of individuals with many years of zero earnings and individuals with a full career of low earnings. Many of these workers with years of zero earnings are likely foreign-born individuals who immigrated during their working years. One possible area that could be further explored is to determine the percentage of foreign-born individuals in the Very Low Interval and to examine their relative mortality ratios.¹ We speculate that foreign-born immigrants may be healthier than average in order to travel and work.

1. We have done some analysis on the percentage of retired-worker beneficiaries who are foreign born, as shown in table B3 of our proposal memoranda. These memoranda provide actuarial analysis of the estimated financial effects of legislative proposals to change the Social Security program. For an example, see https://www.ssa.gov/OACT/solvency/CCrist_20170802.pdf.

VI. Conclusion

As seen in this analysis, higher AIME levels correlate with lower mortality rates, while lower AIME levels correlate with higher mortality rates. The trends from 1995 to 2015, presented in the figures in Appendices B and D, show that the spread in relative mortality ratios among the AIME quintiles and hypothetical worker intervals remains fairly steady. The spread widens, but not significantly, and even slightly compresses for some age groups in recent years.

Currently, the Office of the Chief Actuary's projections of the actuarial status of the Social Security OASI and DI Trust Funds for annual Trustees Reports and other purposes include the effects of lower mortality for beneficiaries with higher AIME and the effects of higher mortality for beneficiaries with lower AIME. These effects are incorporated into our projections by the use of "post-entitlement factors" which reflect the change in benefit levels beyond cost-of-living adjustments for retirement cohorts as they age. (For more information on post-entitlement factors, see the *Long-Range OASDI Projection Methodology* documentation at the following website: https://www.ssa.gov/oact/TR/2017/2017_LR_Model_Documentation.pdf.) Our projections also include the effects of higher mortality for disabled-worker beneficiaries both before and after their conversion to retired worker status at NRA. This study provides another measure of, and perspective on, the extent of variation in mortality rates by AIME and how they have changed over time. We are evaluating ways to potentially incorporate the results of this study into our projections of actuarial status. We also expect the hypothetical worker interval analysis included in this study to be a useful first step toward incorporating mortality differences into our annual internal real rate of return and money's worth ratio analyses.

Finally, the results presented in this study illustrate the spread in mortality rates by lifetime career-average earnings levels (i.e., the AIME). Previous studies have generally been done based on partial career earnings levels that are not reflective of earnings that determine Social Security benefit levels. The spread in mortality rates by AIME appears to be relatively stable in recent years and even diminishing in some cases. We plan to extend the analysis presented here as additional data become available, to continue assessing the trends in mortality by AIME and to better inform our projections of Social Security cost.

VII. Appendices

A. Relative Mortality Ratio Tables by AIME Quintiles

Table 4.—1995 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
Percentages show exposure in the sample

	Age Group					Total (62-64)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.65 10.8%	-	-	-	-	1.65 10.8%
2nd AIME Quintile	1.09 10.9%	-	-	-	-	1.09 10.9%
3rd AIME Quintile	0.90 10.9%	-	-	-	-	0.90 10.9%
4th AIME Quintile	0.75 11.0%	-	-	-	-	0.75 11.0%
Highest AIME Quintile	0.59 10.1%	-	-	-	-	0.59 10.1%
Total	1.00 53.7%	-	-	-	-	1.00 53.7%
Female Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.41 9.5%	-	-	-	-	1.41 9.5%
2nd AIME Quintile	1.07 9.5%	-	-	-	-	1.07 9.5%
3rd AIME Quintile	0.90 9.4%	-	-	-	-	0.90 9.4%
4th AIME Quintile	0.78 9.2%	-	-	-	-	0.78 9.2%
Highest AIME Quintile	0.81 8.9%	-	-	-	-	0.81 8.9%
Total	1.00 46.3%	-	-	-	-	1.00 46.3%

Note: Includes only birth cohorts 1930 and later.

Table 5.—2000 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
 Percentages show exposure in the sample

	Age Group					Total (62-69)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.77 3.0%	1.54 7.8%	-	-	-	1.59 10.8%
2nd AIME Quintile	1.11 3.1%	1.13 7.9%	-	-	-	1.13 10.9%
3rd AIME Quintile	0.86 3.0%	0.96 7.9%	-	-	-	0.93 10.9%
4th AIME Quintile	0.69 3.1%	0.81 7.9%	-	-	-	0.78 10.9%
Highest AIME Quintile	0.52 2.8%	0.56 7.8%	-	-	-	0.56 10.6%
Total	1.00 15.0%	1.00 39.2%	-	-	-	1.00 54.2%
Female Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.44 2.8%	1.29 6.4%	-	-	-	1.32 9.2%
2nd AIME Quintile	1.04 2.8%	1.07 6.4%	-	-	-	1.06 9.2%
3rd AIME Quintile	0.86 2.8%	0.97 6.4%	-	-	-	0.94 9.2%
4th AIME Quintile	0.82 2.7%	0.87 6.4%	-	-	-	0.86 9.1%
Highest AIME Quintile	0.82 2.6%	0.80 6.4%	-	-	-	0.81 9.0%
Total	1.00 13.9%	1.00 31.9%	-	-	-	1.00 45.8%

Note: Includes only birth cohorts 1930 and later.

Table 6.—2005 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
Percentages show exposure in the sample

	Age Group					Total (62-74)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.84 <i>1.8%</i>	1.65 <i>4.7%</i>	1.41 <i>4.1%</i>	-	-	1.54 <i>10.6%</i>
2nd AIME Quintile	1.13 <i>1.8%</i>	1.15 <i>4.7%</i>	1.17 <i>4.1%</i>	-	-	1.16 <i>10.6%</i>
3rd AIME Quintile	0.87 <i>1.8%</i>	0.92 <i>4.7%</i>	1.00 <i>4.1%</i>	-	-	0.95 <i>10.6%</i>
4th AIME Quintile	0.66 <i>1.8%</i>	0.77 <i>4.7%</i>	0.81 <i>4.1%</i>	-	-	0.78 <i>10.6%</i>
Highest AIME Quintile	0.49 <i>1.7%</i>	0.51 <i>4.7%</i>	0.61 <i>4.1%</i>	-	-	0.56 <i>10.5%</i>
Total	1.00 <i>9.0%</i>	1.00 <i>23.6%</i>	1.00 <i>20.4%</i>	-	-	1.00 <i>53.0%</i>
Female Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.44 <i>1.8%</i>	1.33 <i>4.1%</i>	1.19 <i>3.6%</i>	-	-	1.26 <i>9.5%</i>
2nd AIME Quintile	1.03 <i>1.8%</i>	1.05 <i>4.1%</i>	1.05 <i>3.6%</i>	-	-	1.05 <i>9.5%</i>
3rd AIME Quintile	0.88 <i>1.8%</i>	0.94 <i>4.1%</i>	1.00 <i>3.6%</i>	-	-	0.97 <i>9.4%</i>
4th AIME Quintile	0.85 <i>1.8%</i>	0.90 <i>4.1%</i>	0.92 <i>3.6%</i>	-	-	0.91 <i>9.4%</i>
Highest AIME Quintile	0.78 <i>1.7%</i>	0.78 <i>4.0%</i>	0.84 <i>3.6%</i>	-	-	0.82 <i>9.3%</i>
Total	1.00 <i>8.9%</i>	1.00 <i>20.3%</i>	1.00 <i>17.8%</i>	-	-	1.00 <i>47.0%</i>

Note: Includes only birth cohorts 1930 and later.

Table 7.—2010 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
Percentages show exposure in the sample

	Age Group					Total (62-79)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.83 <i>1.4%</i>	1.67 <i>3.6%</i>	1.47 <i>3.0%</i>	1.29 <i>2.3%</i>	-	1.47 <i>10.3%</i>
2nd AIME Quintile	1.12 <i>1.4%</i>	1.13 <i>3.6%</i>	1.17 <i>3.0%</i>	1.16 <i>2.3%</i>	-	1.15 <i>10.4%</i>
3rd AIME Quintile	0.84 <i>1.4%</i>	0.91 <i>3.6%</i>	0.96 <i>3.0%</i>	1.02 <i>2.3%</i>	-	0.96 <i>10.3%</i>
4th AIME Quintile	0.66 <i>1.4%</i>	0.74 <i>3.6%</i>	0.80 <i>3.0%</i>	0.86 <i>2.3%</i>	-	0.80 <i>10.3%</i>
Highest AIME Quintile	0.54 <i>1.4%</i>	0.53 <i>3.5%</i>	0.59 <i>3.0%</i>	0.67 <i>2.3%</i>	-	0.61 <i>10.2%</i>
Total	1.00 <i>7.0%</i>	1.00 <i>18.1%</i>	1.00 <i>15.0%</i>	1.00 <i>11.6%</i>	-	1.00 <i>51.6%</i>
Female Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.46 <i>1.5%</i>	1.33 <i>3.4%</i>	1.20 <i>2.7%</i>	1.10 <i>2.2%</i>	-	1.20 <i>9.7%</i>
2nd AIME Quintile	0.98 <i>1.5%</i>	1.07 <i>3.3%</i>	1.04 <i>2.7%</i>	1.03 <i>2.2%</i>	-	1.04 <i>9.7%</i>
3rd AIME Quintile	0.90 <i>1.5%</i>	0.95 <i>3.3%</i>	1.00 <i>2.7%</i>	1.02 <i>2.2%</i>	-	0.99 <i>9.7%</i>
4th AIME Quintile	0.88 <i>1.4%</i>	0.87 <i>3.3%</i>	0.96 <i>2.7%</i>	0.97 <i>2.2%</i>	-	0.94 <i>9.6%</i>
Highest AIME Quintile	0.77 <i>1.4%</i>	0.77 <i>3.3%</i>	0.81 <i>2.7%</i>	0.88 <i>2.2%</i>	-	0.83 <i>9.6%</i>
Total	1.00 <i>7.3%</i>	1.00 <i>16.6%</i>	1.00 <i>13.7%</i>	1.00 <i>10.8%</i>	-	1.00 <i>48.4%</i>

Note: Includes only birth cohorts 1930 and later.

Table 8.—2015 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
Percentages show exposure in the sample

	Age Group					Total (62-84)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.77 <i>0.9%</i>	1.63 <i>3.2%</i>	1.48 <i>2.7%</i>	1.33 <i>1.9%</i>	1.18 <i>1.3%</i>	1.38 <i>10.1%</i>
2nd AIME Quintile	1.18 <i>0.9%</i>	1.15 <i>3.2%</i>	1.18 <i>2.7%</i>	1.16 <i>1.9%</i>	1.13 <i>1.3%</i>	1.15 <i>10.1%</i>
3rd AIME Quintile	0.86 <i>0.9%</i>	0.91 <i>3.2%</i>	0.97 <i>2.7%</i>	1.00 <i>1.9%</i>	1.02 <i>1.3%</i>	0.98 <i>10.1%</i>
4th AIME Quintile	0.66 <i>0.9%</i>	0.74 <i>3.2%</i>	0.79 <i>2.7%</i>	0.85 <i>1.9%</i>	0.91 <i>1.3%</i>	0.83 <i>10.1%</i>
Highest AIME Quintile	0.52 <i>0.9%</i>	0.54 <i>3.1%</i>	0.58 <i>2.7%</i>	0.65 <i>1.9%</i>	0.75 <i>1.3%</i>	0.65 <i>10.0%</i>
Total	1.00 4.6%	1.00 15.8%	1.00 13.7%	1.00 9.6%	1.00 6.6%	1.00 50.4%
Female Retired-Worker Beneficiaries by AIME Quintile:						
Lowest AIME Quintile	1.54 <i>1.0%</i>	1.34 <i>3.1%</i>	1.22 <i>2.6%</i>	1.13 <i>1.9%</i>	1.06 <i>1.3%</i>	1.16 <i>10.0%</i>
2nd AIME Quintile	1.02 <i>1.0%</i>	1.06 <i>3.1%</i>	1.08 <i>2.6%</i>	1.06 <i>1.9%</i>	1.02 <i>1.3%</i>	1.05 <i>10.0%</i>
3rd AIME Quintile	0.88 <i>1.0%</i>	0.96 <i>3.1%</i>	0.99 <i>2.6%</i>	1.01 <i>1.9%</i>	1.01 <i>1.3%</i>	0.99 <i>9.9%</i>
4th AIME Quintile	0.83 <i>1.0%</i>	0.88 <i>3.1%</i>	0.92 <i>2.6%</i>	0.97 <i>1.9%</i>	1.00 <i>1.3%</i>	0.96 <i>9.9%</i>
Highest AIME Quintile	0.73 <i>1.0%</i>	0.75 <i>3.0%</i>	0.78 <i>2.6%</i>	0.84 <i>1.9%</i>	0.91 <i>1.3%</i>	0.84 <i>9.8%</i>
Total	1.00 5.2%	1.00 15.4%	1.00 13.1%	1.00 9.3%	1.00 6.7%	1.00 49.6%

Note: Includes only birth cohorts 1930 and later.

B. Age Group Relative Mortality Ratios by AIME Quintiles

Figure 1.—Age Group 62-64 Relative Mortality Ratios for Retired-Worker Beneficiaries

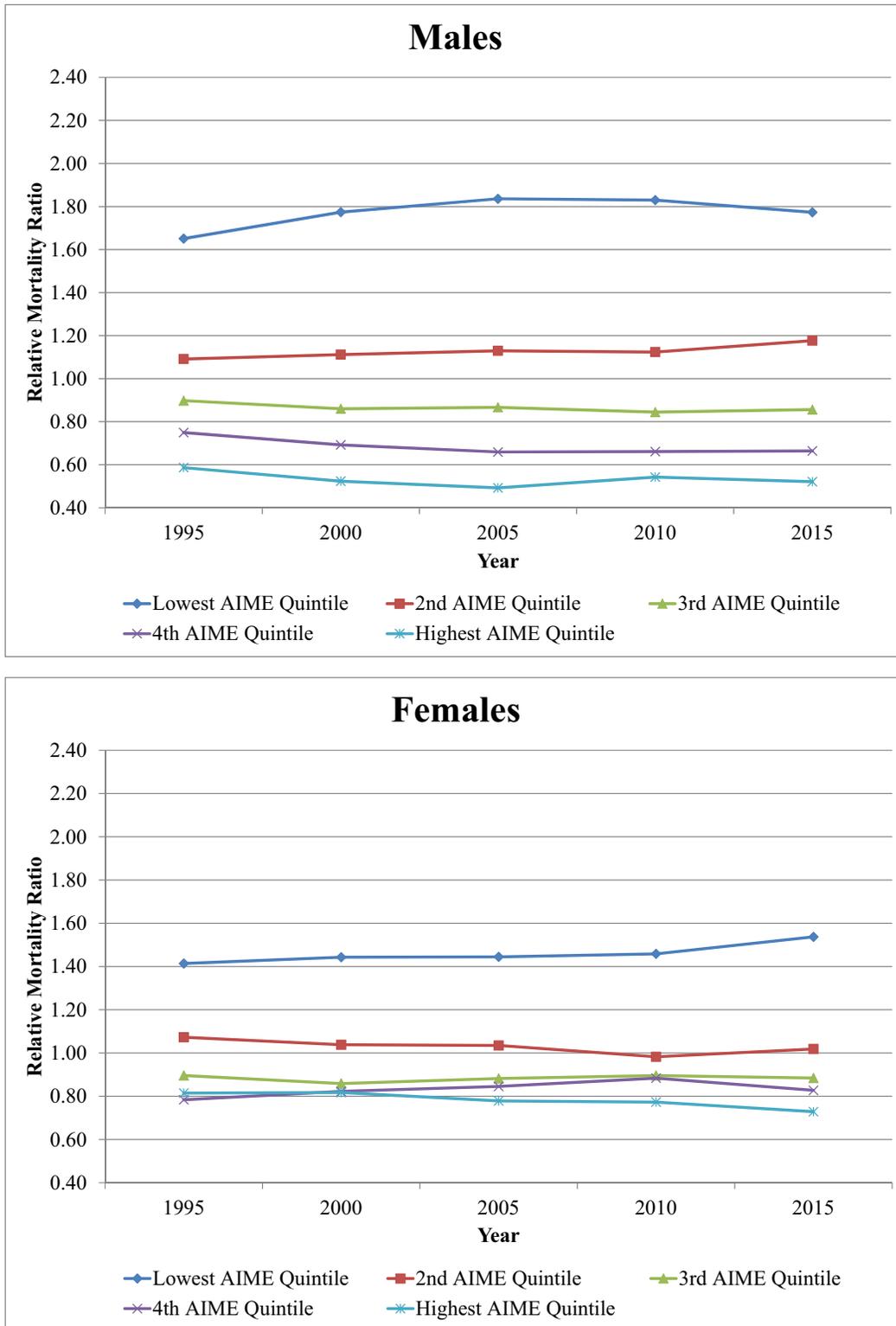


Figure 2.—Age Group 65-69 Relative Mortality Ratios for Retired-Worker Beneficiaries

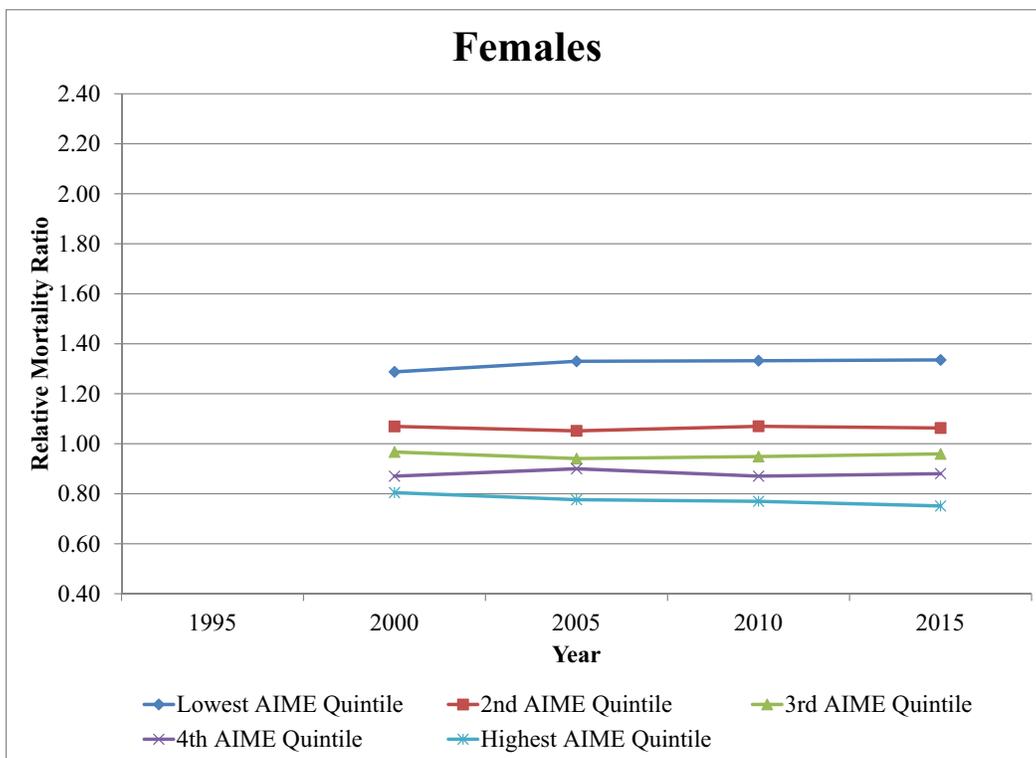
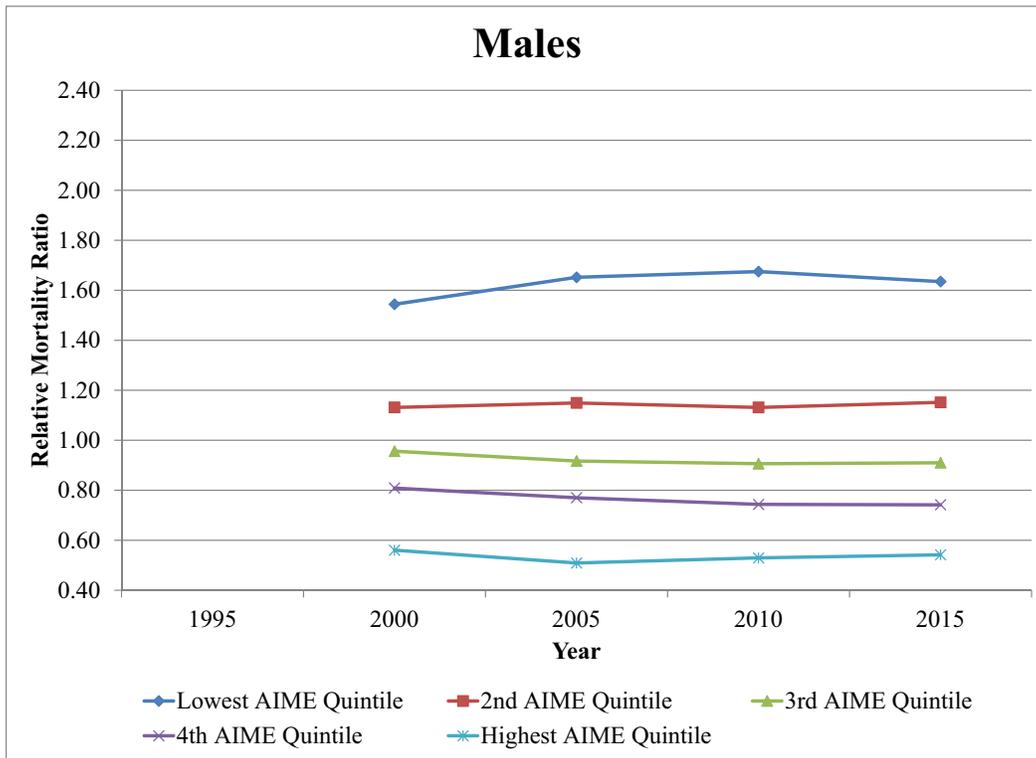


Figure 3.—Age Group 70-74 Relative Mortality Ratios for Retired-Worker Beneficiaries

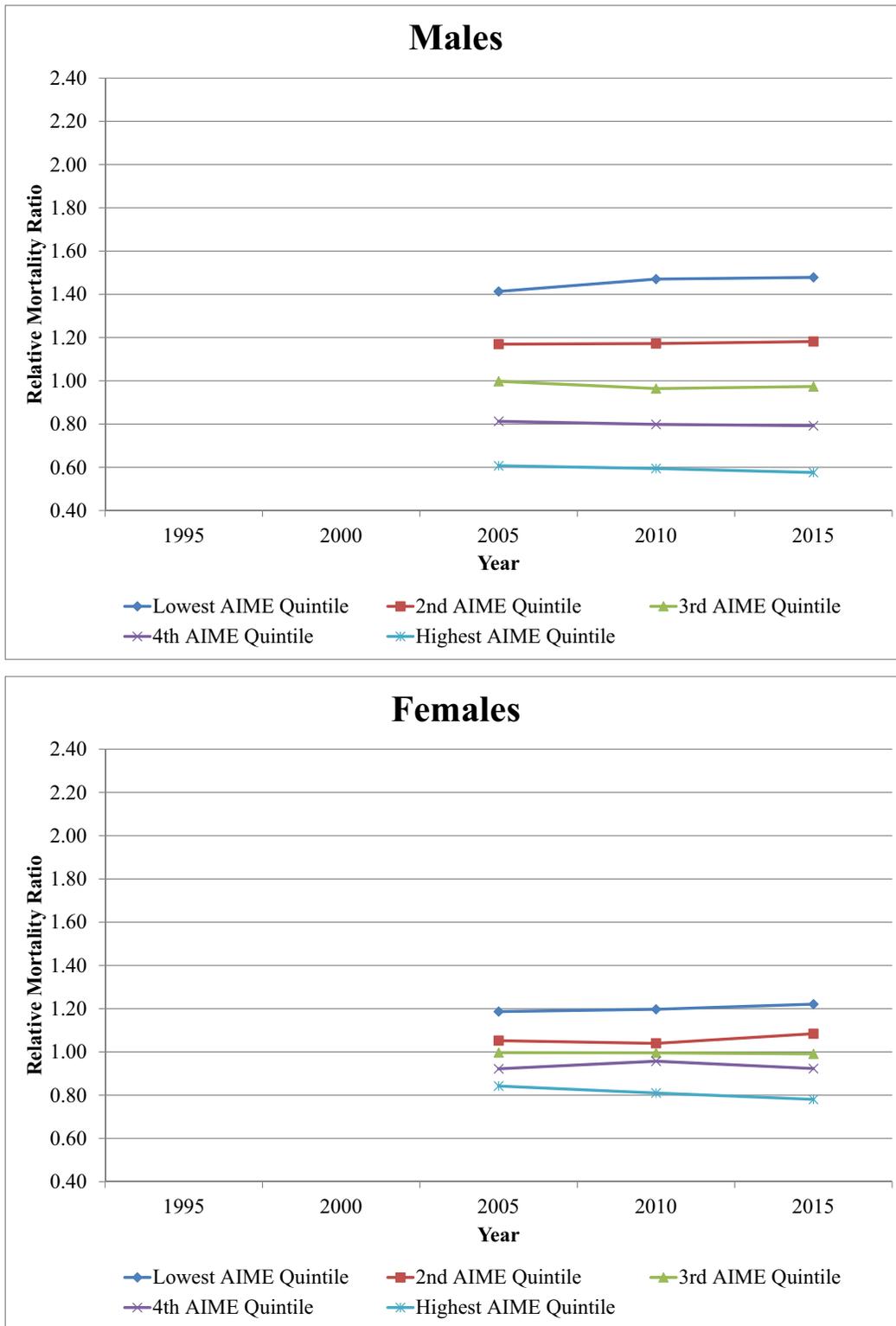


Figure 4.—Age Group 75-79 Relative Mortality Ratios for Retired-Worker Beneficiaries

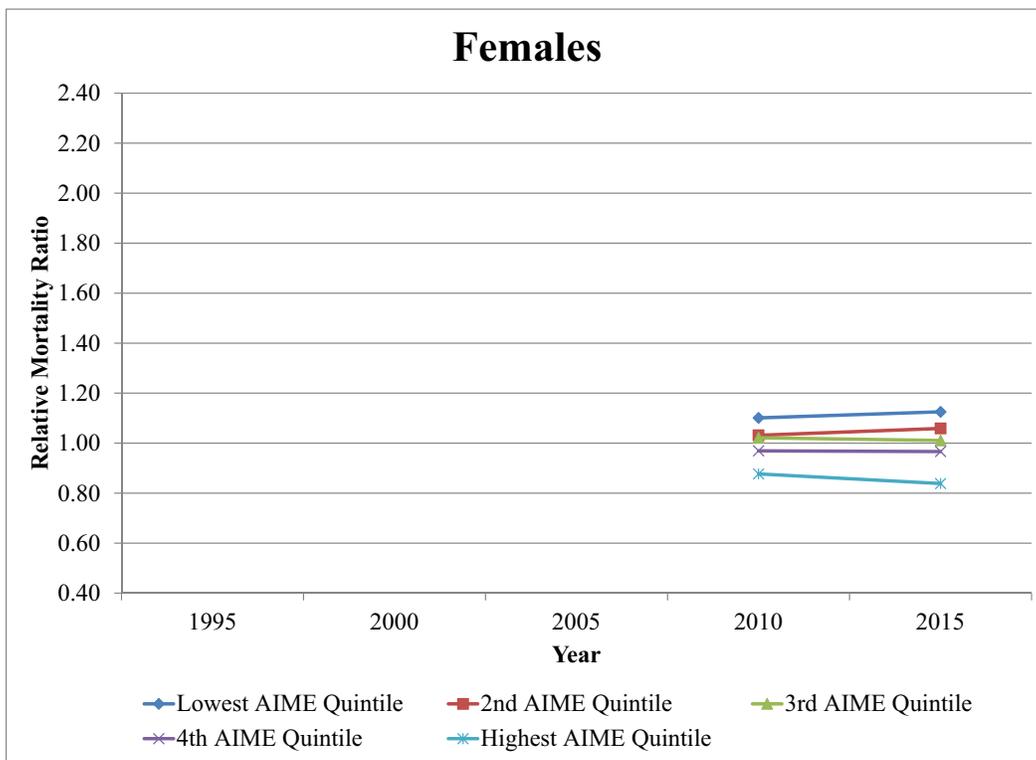
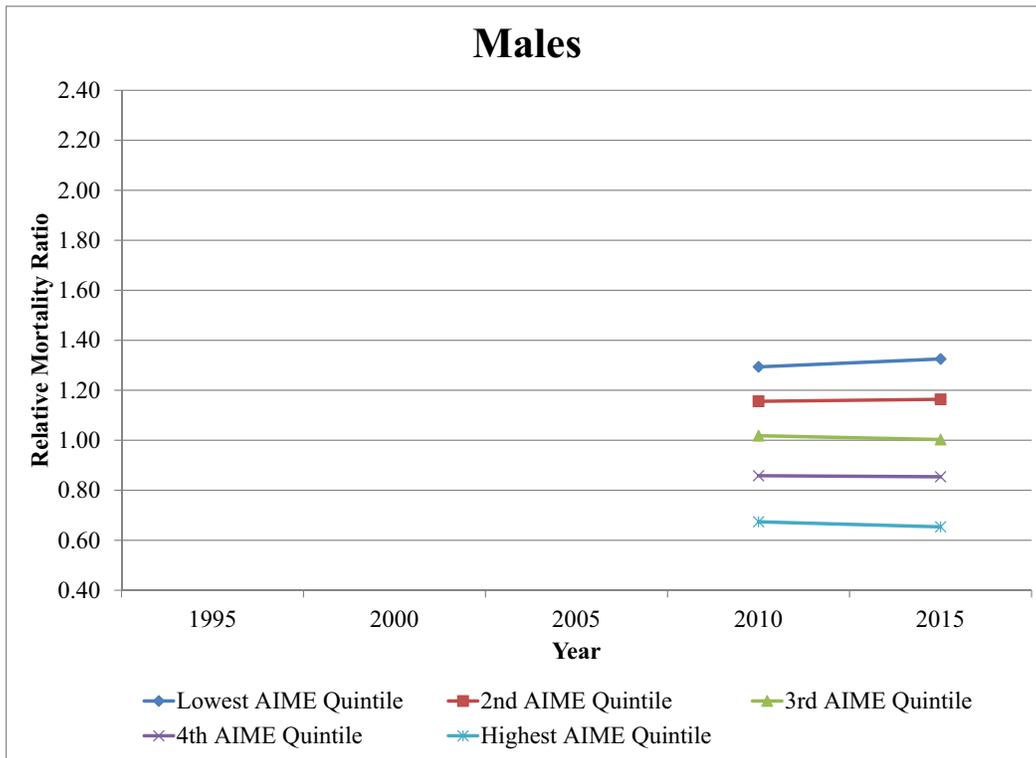
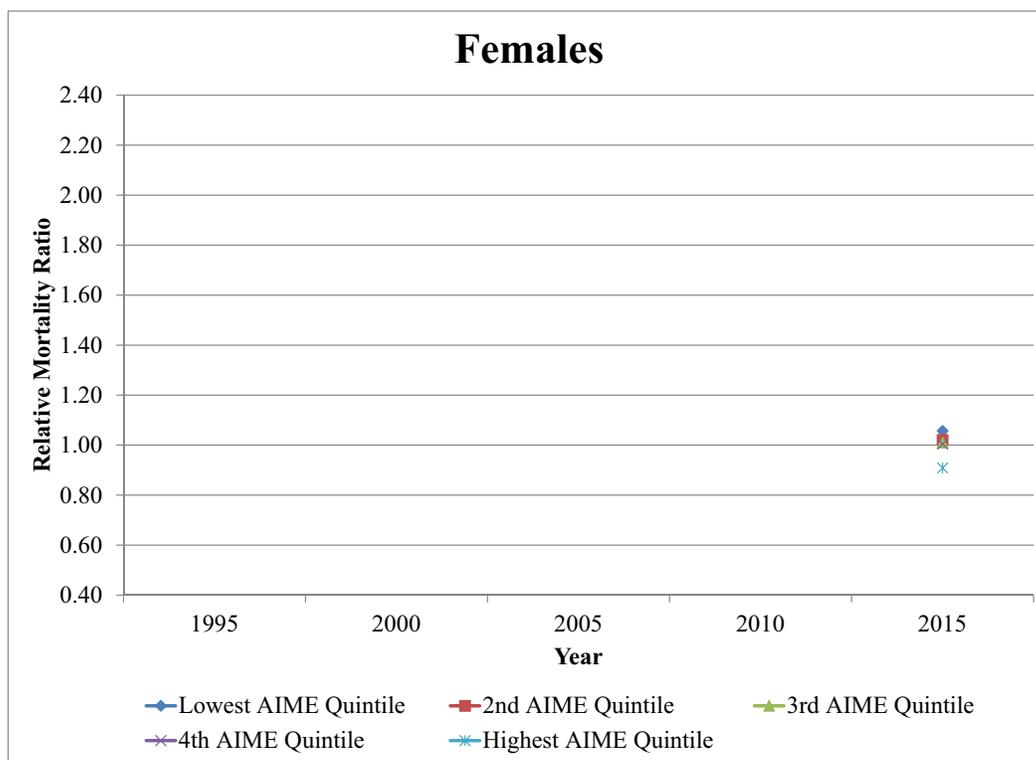
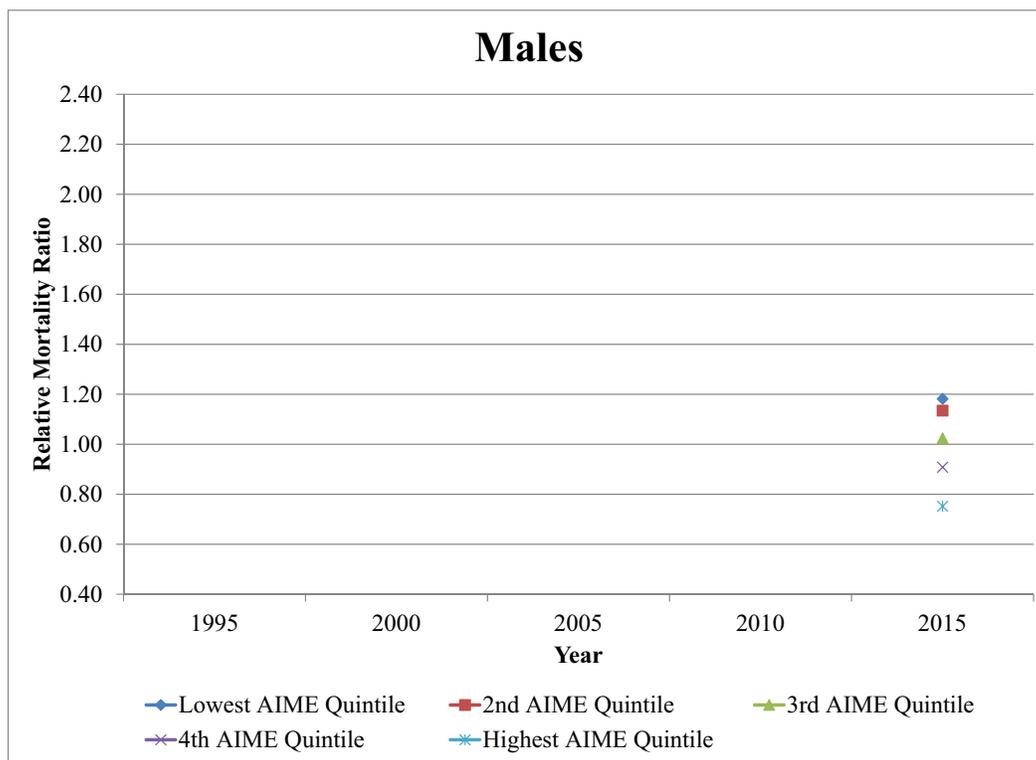


Figure 5.—Age Group 80-84 Relative Mortality Ratios for Retired-Worker Beneficiaries



C. Relative Mortality Ratio Tables by Hypothetical Worker Intervals

Table 9.—1995 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
 Percentages show exposure in the sample

	Age Group					Total (62-64)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	1.86 3.4%	-	-	-	-	1.86 3.4%
Low Interval	1.56 7.1%	-	-	-	-	1.56 7.1%
Medium Interval	1.03 17.6%	-	-	-	-	1.03 17.6%
High Interval	0.74 21.2%	-	-	-	-	0.74 21.2%
Very High Interval	0.54 4.3%	-	-	-	-	0.54 4.3%
Total	1.00 53.7%	-	-	-	-	1.00 53.7%
Female Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	1.23 19.6%	-	-	-	-	1.23 19.6%
Low Interval	0.85 15.9%	-	-	-	-	0.85 15.9%
Medium Interval	0.79 8.8%	-	-	-	-	0.79 8.8%
High Interval	0.91 1.9%	-	-	-	-	0.91 1.9%
Very High Interval	0.80 0.1%	-	-	-	-	0.80 0.1%
Total	1.00 46.3%	-	-	-	-	1.00 46.3%

Note: Includes only birth cohorts 1930 and later.

Table 10.—2000 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
 Percentages show exposure in the sample

	Age Group					Total (62-69)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	2.12 0.9%	1.69 2.3%	-	-	-	1.78 3.2%
Low Interval	1.64 1.9%	1.54 4.4%	-	-	-	1.55 6.3%
Medium Interval	1.05 4.9%	1.12 11.7%	-	-	-	1.10 16.7%
High Interval	0.69 5.8%	0.84 14.2%	-	-	-	0.81 20.0%
Very High Interval	0.49 1.3%	0.53 6.7%	-	-	-	0.54 8.0%
Total	1.00 15.0%	1.00 39.2%	-	-	-	1.00 54.2%
Female Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	1.25 5.3%	1.21 10.9%	-	-	-	1.21 16.2%
Low Interval	0.87 4.8%	0.96 10.8%	-	-	-	0.94 15.7%
Medium Interval	0.81 3.0%	0.85 7.8%	-	-	-	0.85 10.8%
High Interval	0.82 0.7%	0.77 2.0%	-	-	-	0.79 2.7%
Very High Interval	0.71 0.0%	0.43 0.4%	-	-	-	0.49 0.5%
Total	1.00 13.9%	1.00 31.9%	-	-	-	1.00 45.8%

Note: Includes only birth cohorts 1930 and later.

Table 11.—2005 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
 Percentages show exposure in the sample

	Age Group					Total (62-74)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	2.28 <i>0.6%</i>	1.83 <i>1.4%</i>	1.45 <i>1.2%</i>	-	-	1.66 <i>3.2%</i>
Low Interval	1.59 <i>1.2%</i>	1.64 <i>2.6%</i>	1.43 <i>2.2%</i>	-	-	1.50 <i>5.9%</i>
Medium Interval	1.04 <i>2.8%</i>	1.14 <i>7.1%</i>	1.17 <i>5.9%</i>	-	-	1.14 <i>15.8%</i>
High Interval	0.68 <i>3.5%</i>	0.80 <i>8.5%</i>	0.87 <i>7.4%</i>	-	-	0.82 <i>19.3%</i>
Very High Interval	0.44 <i>1.0%</i>	0.49 <i>4.1%</i>	0.60 <i>3.7%</i>	-	-	0.57 <i>8.7%</i>
Total	1.00 <i>9.0%</i>	1.00 <i>23.6%</i>	1.00 <i>20.4%</i>	-	-	1.00 <i>53.0%</i>
Female Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	1.28 <i>3.1%</i>	1.25 <i>6.2%</i>	1.15 <i>5.9%</i>	-	-	1.20 <i>15.3%</i>
Low Interval	0.89 <i>3.0%</i>	0.96 <i>6.8%</i>	0.99 <i>6.1%</i>	-	-	0.98 <i>15.9%</i>
Medium Interval	0.80 <i>2.1%</i>	0.87 <i>5.5%</i>	0.89 <i>4.4%</i>	-	-	0.87 <i>12.0%</i>
High Interval	0.81 <i>0.6%</i>	0.75 <i>1.5%</i>	0.80 <i>1.1%</i>	-	-	0.76 <i>3.3%</i>
Very High Interval	0.61 <i>0.0%</i>	0.44 <i>0.3%</i>	0.56 <i>0.3%</i>	-	-	0.55 <i>0.6%</i>
Total	1.00 <i>8.9%</i>	1.00 <i>20.3%</i>	1.00 <i>17.8%</i>	-	-	1.00 <i>47.0%</i>

Note: Includes only birth cohorts 1930 and later.

Table 12.—2010 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
 Percentages show exposure in the sample

	Age Group					Total (62-79)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	2.18 <i>0.6%</i>	1.91 <i>1.2%</i>	1.51 <i>0.9%</i>	1.27 <i>0.7%</i>	-	1.50 <i>3.4%</i>
Low Interval	1.47 <i>1.0%</i>	1.60 <i>2.0%</i>	1.48 <i>1.5%</i>	1.32 <i>1.2%</i>	-	1.38 <i>5.8%</i>
Medium Interval	0.98 <i>2.2%</i>	1.11 <i>5.2%</i>	1.17 <i>4.3%</i>	1.16 <i>3.3%</i>	-	1.13 <i>15.0%</i>
High Interval	0.66 <i>2.4%</i>	0.80 <i>6.4%</i>	0.86 <i>5.4%</i>	0.92 <i>4.3%</i>	-	0.87 <i>18.5%</i>
Very High Interval	0.49 <i>0.7%</i>	0.53 <i>3.3%</i>	0.58 <i>2.8%</i>	0.67 <i>2.2%</i>	-	0.63 <i>9.0%</i>
Total	1.00 <i>7.0%</i>	1.00 <i>18.1%</i>	1.00 <i>15.0%</i>	1.00 <i>11.6%</i>	-	1.00 <i>51.6%</i>
Female Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	1.30 <i>2.3%</i>	1.27 <i>4.6%</i>	1.16 <i>4.0%</i>	1.09 <i>3.5%</i>	-	1.18 <i>14.5%</i>
Low Interval	0.91 <i>2.3%</i>	0.99 <i>5.3%</i>	1.00 <i>4.6%</i>	1.01 <i>3.7%</i>	-	1.02 <i>15.9%</i>
Medium Interval	0.83 <i>1.9%</i>	0.86 <i>4.8%</i>	0.91 <i>3.8%</i>	0.93 <i>2.7%</i>	-	0.89 <i>13.1%</i>
High Interval	0.79 <i>0.7%</i>	0.76 <i>1.6%</i>	0.78 <i>1.1%</i>	0.85 <i>0.7%</i>	-	0.73 <i>4.1%</i>
Very High Interval	0.68 <i>0.1%</i>	0.54 <i>0.3%</i>	0.60 <i>0.2%</i>	0.64 <i>0.2%</i>	-	0.63 <i>0.8%</i>
Total	1.00 <i>7.3%</i>	1.00 <i>16.6%</i>	1.00 <i>13.7%</i>	1.00 <i>10.8%</i>	-	1.00 <i>48.4%</i>

Note: Includes only birth cohorts 1930 and later.

Table 13.—2015 Relative Mortality Ratios by Age Group for Retired-Worker Beneficiaries
 Percentages show exposure in the sample

	Age Group					Total (62-84)
	62-64	65-69	70-74	75-79	80-84	
Male Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	1.93 <i>0.6%</i>	1.87 <i>1.3%</i>	1.54 <i>0.9%</i>	1.26 <i>0.6%</i>	1.11 <i>0.4%</i>	1.30 <i>3.7%</i>
Low Interval	1.32 <i>0.9%</i>	1.45 <i>2.1%</i>	1.47 <i>1.4%</i>	1.35 <i>0.9%</i>	1.22 <i>0.6%</i>	1.23 <i>5.9%</i>
Medium Interval	0.90 <i>1.5%</i>	1.08 <i>4.7%</i>	1.18 <i>3.7%</i>	1.18 <i>2.7%</i>	1.14 <i>1.8%</i>	1.11 <i>14.4%</i>
High Interval	0.59 <i>1.3%</i>	0.77 <i>5.3%</i>	0.87 <i>4.8%</i>	0.92 <i>3.5%</i>	0.96 <i>2.5%</i>	0.92 <i>17.4%</i>
Very High Interval	0.49 <i>0.3%</i>	0.53 <i>2.6%</i>	0.58 <i>2.9%</i>	0.65 <i>1.9%</i>	0.76 <i>1.4%</i>	0.70 <i>9.0%</i>
Total	1.00 4.6%	1.00 15.8%	1.00 13.7%	1.00 9.6%	1.00 6.6%	1.00 50.4%
Female Retired-Worker Beneficiaries by Hypothetical Worker Interval:						
Very Low Interval	1.38 <i>1.6%</i>	1.29 <i>3.8%</i>	1.20 <i>3.4%</i>	1.11 <i>2.7%</i>	1.05 <i>2.2%</i>	1.20 <i>13.7%</i>
Low Interval	0.91 <i>1.6%</i>	1.01 <i>4.6%</i>	1.04 <i>4.1%</i>	1.02 <i>3.1%</i>	1.01 <i>2.3%</i>	1.05 <i>15.7%</i>
Medium Interval	0.79 <i>1.4%</i>	0.88 <i>4.7%</i>	0.91 <i>3.9%</i>	0.93 <i>2.6%</i>	0.97 <i>1.7%</i>	0.89 <i>14.3%</i>
High Interval	0.71 <i>0.5%</i>	0.75 <i>1.9%</i>	0.75 <i>1.4%</i>	0.80 <i>0.7%</i>	0.86 <i>0.4%</i>	0.68 <i>5.0%</i>
Very High Interval	0.79 <i>0.0%</i>	0.64 <i>0.3%</i>	0.59 <i>0.3%</i>	0.62 <i>0.2%</i>	0.73 <i>0.1%</i>	0.65 <i>0.9%</i>
Total	1.00 5.2%	1.00 15.4%	1.00 13.1%	1.00 9.3%	1.00 6.7%	1.00 49.6%

Note: Includes only birth cohorts 1930 and later.

D. Age Group Relative Mortality Ratios by Hypothetical Worker Intervals

Figure 6.—Age Group 62-64 Relative Mortality Ratios for Retired-Worker Beneficiaries

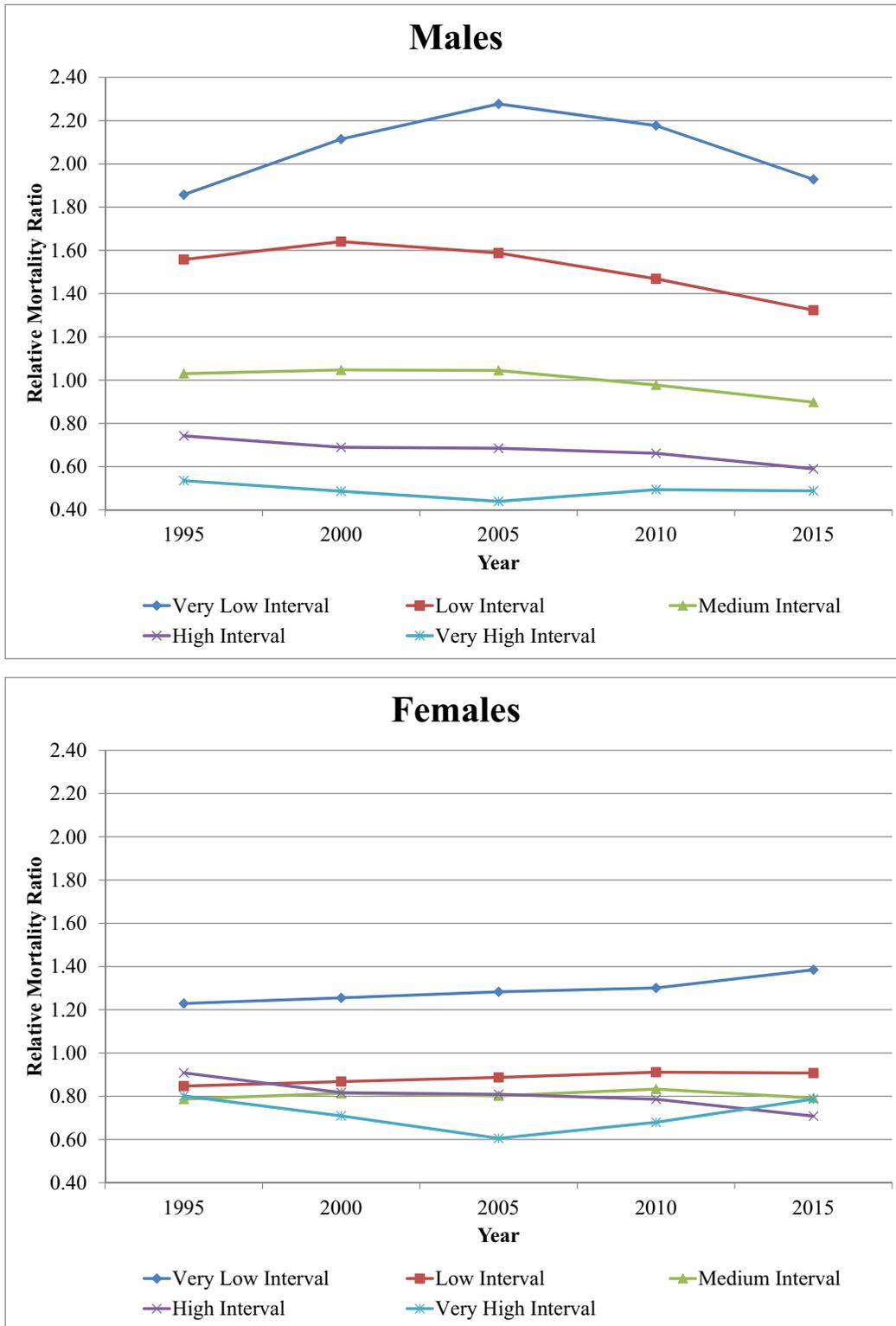


Figure 7.—Age Group 65-69 Relative Mortality Ratios for Retired-Worker Beneficiaries

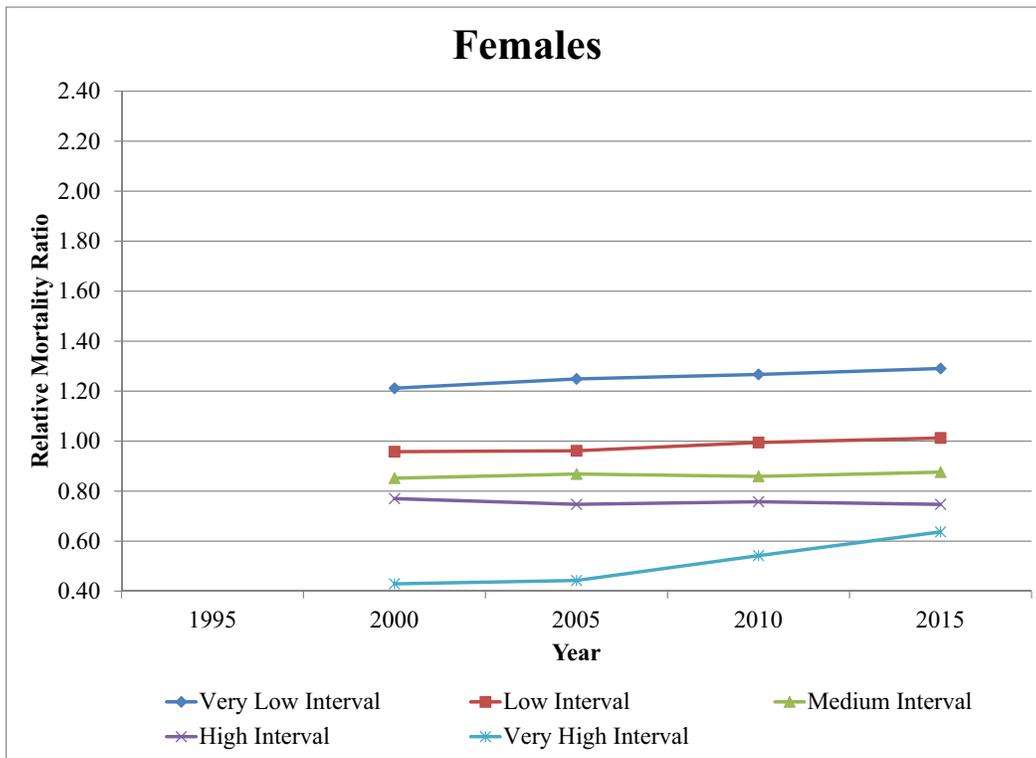
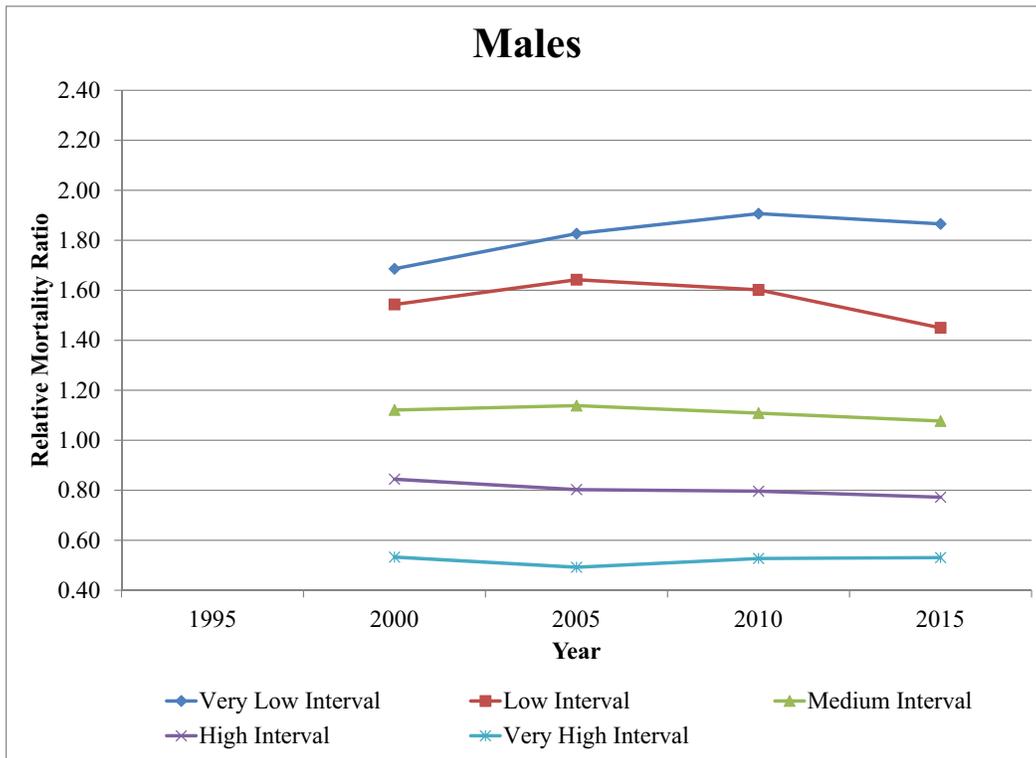


Figure 8.—Age Group 70-74 Relative Mortality Ratios for Retired-Worker Beneficiaries

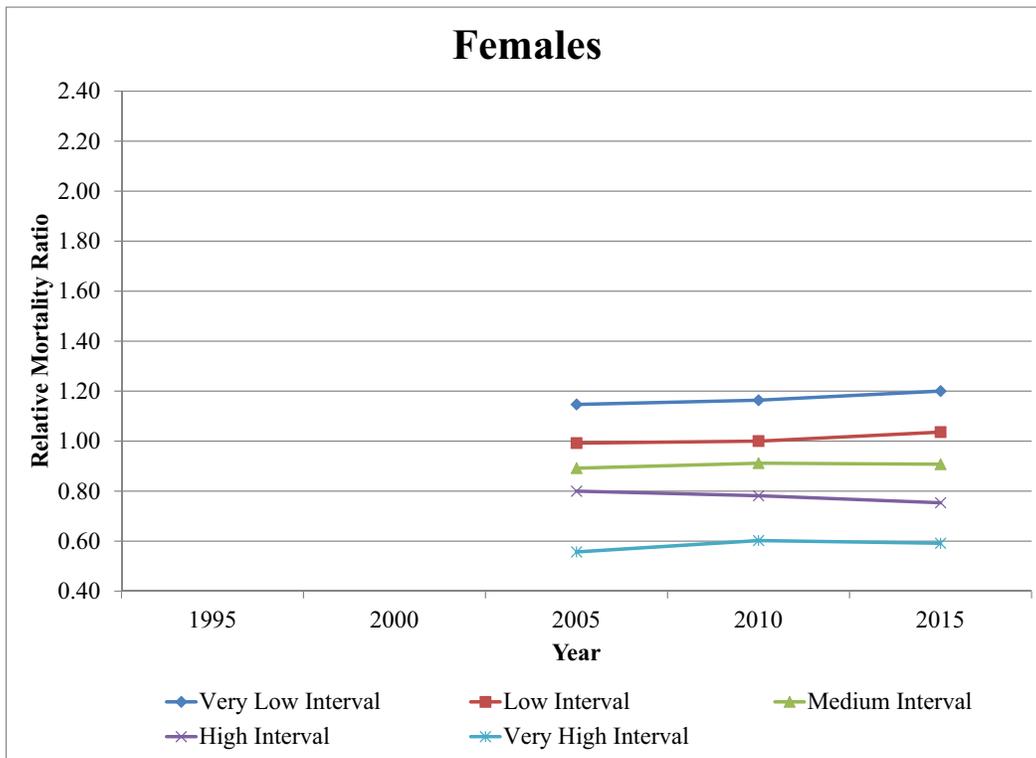
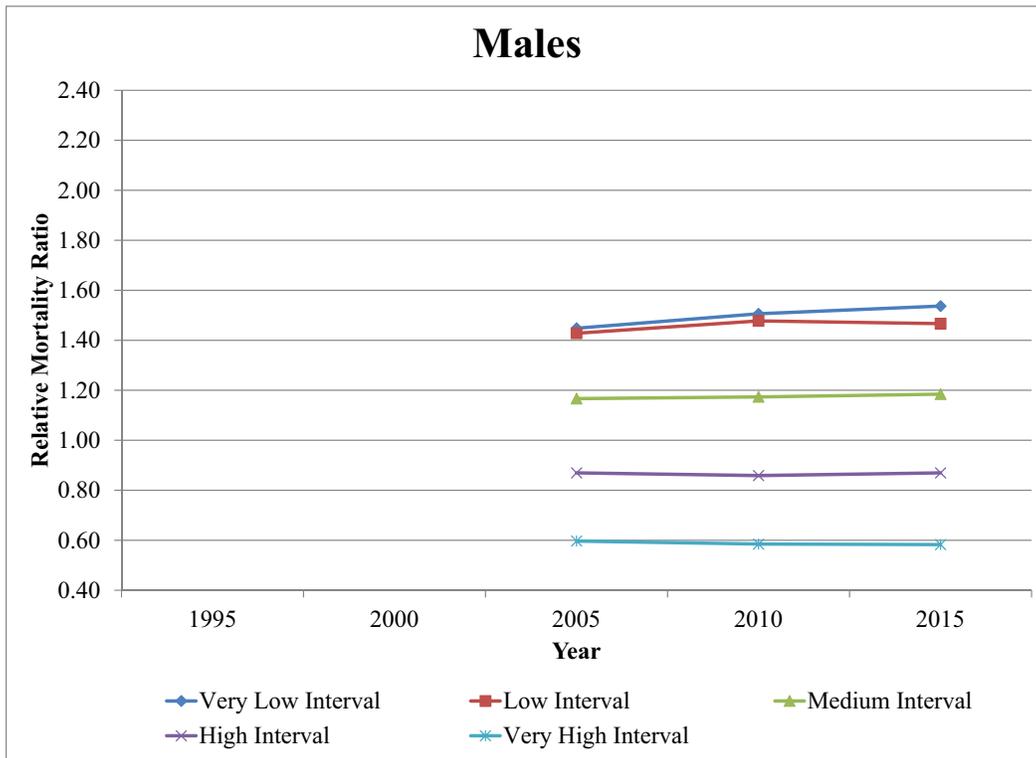


Figure 9.—Age Group 75-79 Relative Mortality Ratios for Retired-Worker Beneficiaries

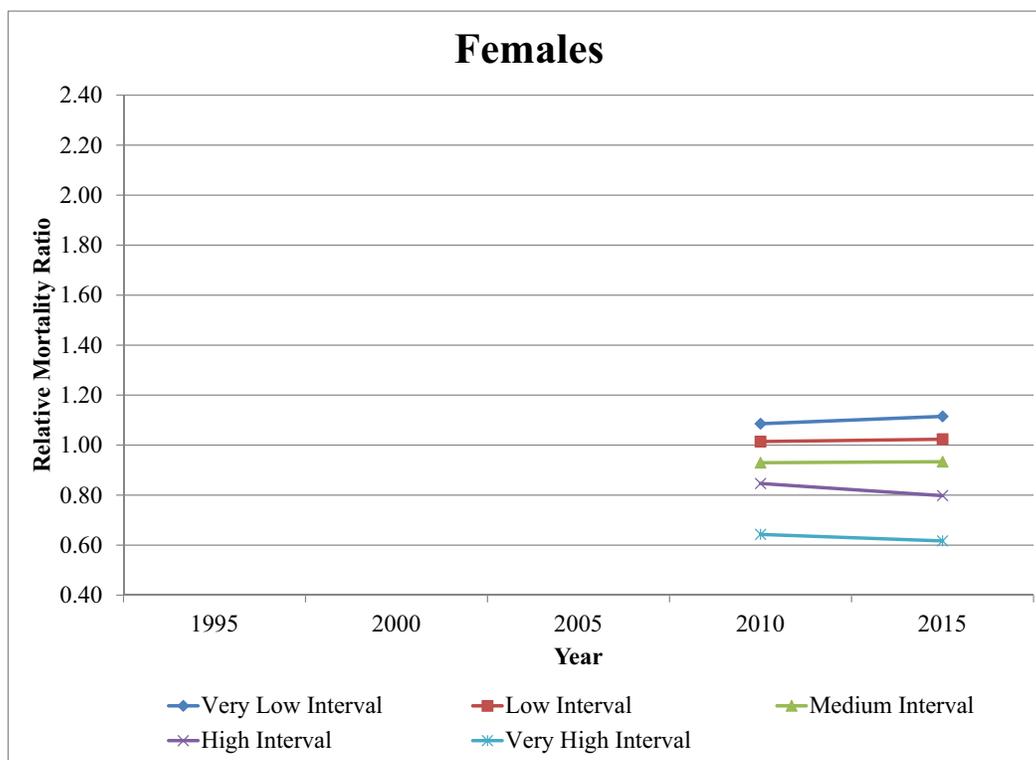
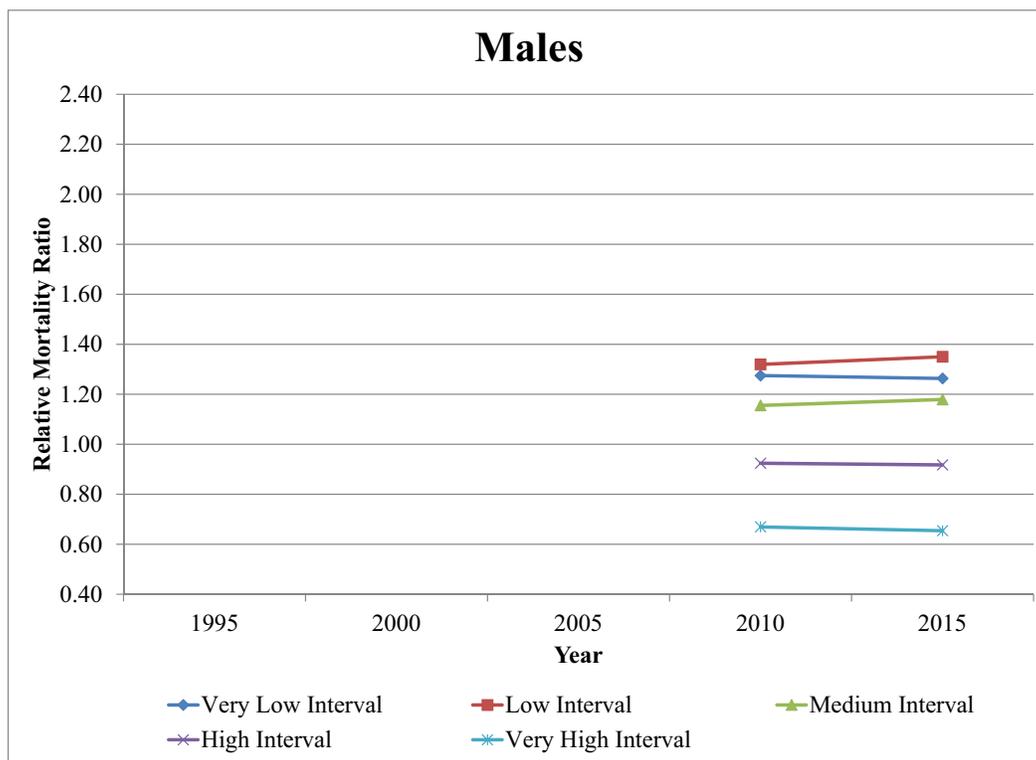
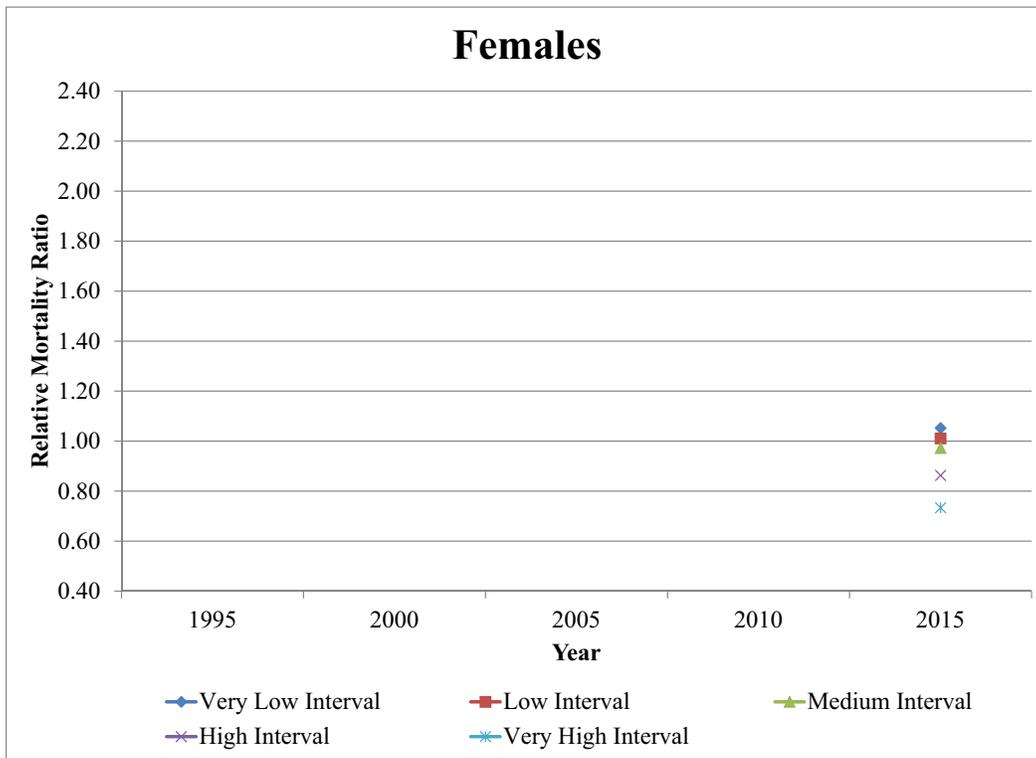
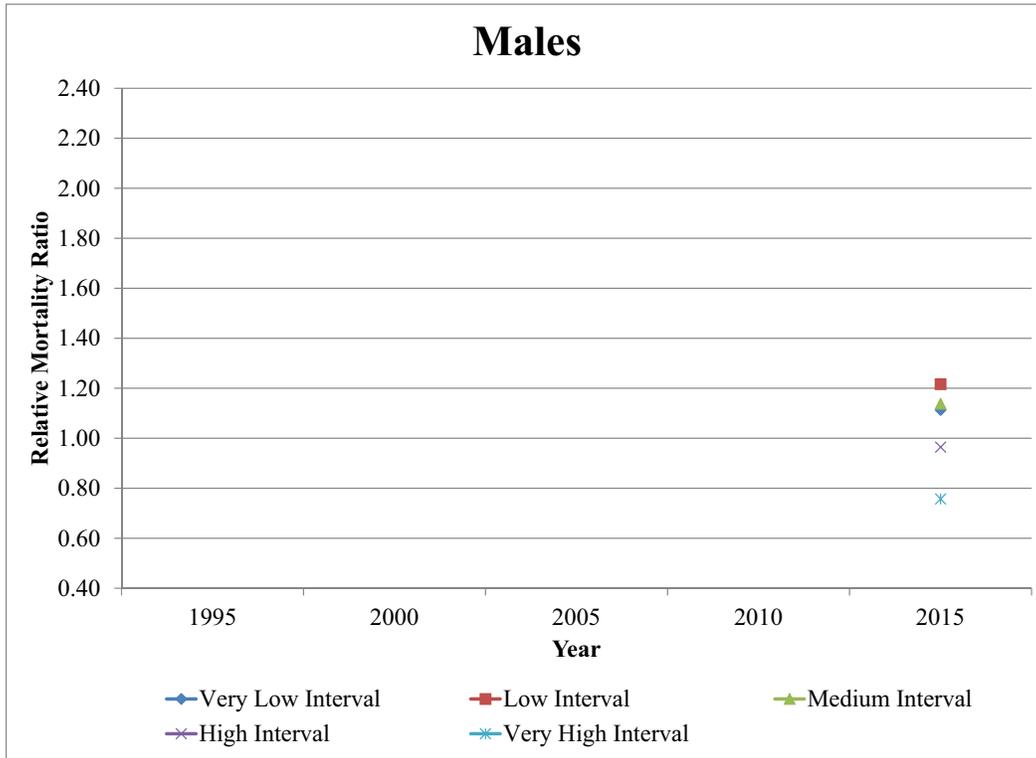


Figure 10.—Age Group 80-84 Relative Mortality Ratios for Retired-Worker Beneficiaries



E. Code Details

1. Data:

- 100 percent sample of MBR records for June 2017.
- The 4 PIA breakpoints, as of January 2017, based on the AIME midpoint values of the hypothetical workers for each birth year 1930 through 2015.

2. We created a file containing records that may contribute exposure during the report year:

- The first position of the BIC (Beneficiary Identification Code) is A (Primary Claimant), and the TOC (Type of Claim) is 1, 2, 3, or 4. This filter allows only retired-worker beneficiaries.
- First position of LAF (Ledger Account File) is C, E, S, D, or T (Current Pay, Current Pay Railroad, Suspended, Deferred, or Terminated).
- Only include records with a current entitlement date less than or equal to Report Year.
- If the first position of LAF is T, then the year of termination must be greater than or equal to Report Year.
- Windfall Elimination Provision, Totalization agreements, and old-start PIA records, i.e., those with PIFC (PIA Factor Code) of 5, V, K, or B, are eliminated since they may have a relatively low AIME that does not accurately represent their earnings level or have a different benefit calculation that makes it difficult to compare.
- The record is classified as “Not Previously Entitled” if the date of initial entitlement equals the date of current entitlement. Otherwise, the record is classified as “Previously Entitled”. Previously Entitled records have had an entitlement due to disability and are excluded from the study.
- If the PIED (PIA Effective Date) is out of date, add COLA increases so the PIA value is consistent with the other records in the file.

3. For each record, we determined:

- Sex
- Age – 62-100+
- Exposure – Active, Death, and Termination Other than Death
 - Exposure: 1 = full year, $\frac{1}{12}$ = month
 - Deaths receive 1 full year of exposure at the age when the death occurred, unless a record becomes active at the same age as the death occurs. In that case, exposure starts when the record becomes active and ends at the end of the age period.
 - For records with suspension codes S6, S8, S9, SF, SJ, SK, SD, and SL, if the record was suspended less than a year ago (that is, after June 2016), the record is treated as Active; otherwise, as Termination Other than Death.
 - PIA Level and AIME Level
 - The sum of exposure and the sum of deaths for each sex, age, and AIME level.

4. Data Review and Final Calculations:

- We determined the death rate by dividing the deaths by the exposure. We then grouped the data as needed (by sex, age group, and AIME level) and determined the relative mortality ratios.

F. Exposure Calculation Examples

Exposure is measured in terms of years; a month is equal to $\frac{1}{12}$ of an exposure. Deaths receive a full year of exposure at the age when the death occurs, unless the record becomes active at the same age as the death occurs. In that case, then exposure starts when the record becomes active and ends at the end of the age period. Exposure is calculated for the record's age based on the birth month, but not the day of the month, so that exposure is only calculated in $\frac{1}{12}$ year increments. Thus, for example, if a record is active all year and the claimant turns age 65 on July 25th, then the record will receive $\frac{1}{2}$ year exposure for age 64 and $\frac{1}{2}$ year exposure for age 65. The exposure is calculated only during the selected report year (January 1 through December 31). For each record, we determined the first month of the report year that the record was active, which month the record terminated for death, and which month the record terminated for reasons other than death.

The exposure is tabulated as follows:

Active

- If a record is active at the beginning of the year through the whole year, then the exposure is 1.
- If a record becomes active sometime during the year and is active through the rest of the year, then the exposure is the fraction of the year the record was active. (Exposure: Start Date through End of Year)

Death

- If a record is active at the beginning of the year and a death occurs during the year, then the death record receives exposure for the fraction of the year the record was active before the death and continued exposure to the end of the age interval. (Exposure: Beginning of Year through End of Age Interval)
- If a record becomes active sometime during the year and then a death occurs, then the exposure starts when the record becomes active and continues until the end of the age interval. (Exposure: Start Date through End of Age Interval)

Termination Other Than Death

- If a record is active at the beginning of the year and terminates for a reason other than death, then the exposure is the fraction of the year the record was active. (Exposure: Beginning of Year through Month Prior to Termination Date)
- If a record becomes active sometime during the year and terminates for a reason other than death, then the exposure is the fraction of the year the record was active. (Exposure: Start Date through Month Prior to Termination Date)

Below are exposure calculation examples by age for records with Active, Death, and Termination Other than Death statuses. In each example, the report year is 2010 and the date of birth is May 15, 1945.

Active

Report Year – 2010
 Date of Birth – 5/15/1945
 Date of Current Entitlement – 2/2010

<u>Age</u>	<u>Exposure</u>	
64	0.250	February - April
65	0.667	May - December
Total	0.917	February - December

Death

Report Year – 2010
 Date of Birth – 5/15/1945
 Date of Current Entitlement – 2/2009
 Date of Death – 8/2010

<u>Age</u>	<u>Exposure</u>	
64	0.333	January - April
65	1.000	Full year of exposure
Total	1.333	

Termination Other than Death

Report Year – 2010
 Date of Birth – 5/15/1945
 Date of Current Entitlement – 2/2009
 Date of Suspension/Termination – 8/2010

<u>Age</u>	<u>Exposure</u>	
64	0.333	January - April
65	0.250	May - July
Total	0.583	January - July