Estimating the Health Effects of Retirement

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Abstract: We estimate the magnitude of any direct effect of retirement on health. Since retirement is endogenous to heath, it is not possible to estimate this effect by comparing the health of individuals before and after they retire. As an alternative we will use institutional features of pension systems in the United States and the United Kingdom that are exogenous to the individual to isolate exogenous variation in retirement behavior. Data used will include both vital statistics and longitudinal survey data from both countries. We find no evidence of negative health effects of retirement and some evidence that there may be a positive effect, at least for men.

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1. Introduction

As the large birth cohorts of the baby boom approach eligibility age for social security old-age benefits, concerns for the fiscal stability of the program have prompted proposed policies to encourage aging workers to postpone retirement. If successful, they would both increase revenues into the system and decrease benefit payments. Beyond fiscal implications, however, delayed retirement may lead to other outcomes that make the social welfare impact ambiguous. One outcome that has not been well-studied is the potential health impact of delayed retirement, and one can imagine retirement being either a positive or negative influence on health. For example, for an individual in a physically demanding job that constitutes an ongoing stressor to health, retiring could be good for health, and postponing retirement could impose an added burden on individuals as well as potentially increased costs for private and public financing of health care. Alternatively, one could imagine scenarios in which retirement leads to the worsening of a person's health. For example, mental activity has been associated with reduced risk of dementia, and the physical activity of work may serve to reduce risks of obesity and diabetes.

Measuring the effect of retirement on health would also inform research on the determinants of retirement. Most models of retirement (e.g., Bound Stinebrickner and Waidmann 2004) treat health as an exogenous to the retirement decision. It is understood that over the life course health is endogenous to both private and public investments in health. That said, it seems plausible that much of the variation in health and changes in health that occur when men and women are approaching retirement age can be considered exogenous to retirement behavior. If retirement were to have a **direct** effect on health, then estimates of typical retirement models would be systematically biased.

Other researchers who have examined the effect of health on retirement have typically compared the health of individuals before and after they retire (e.g. Dave, Rashad and Spasojevic, 2006). Researchers following this kind of strategy have often found that retirement has large negative effects on both physical and mental health. However, if deteriorating health leads individuals to retire, this approach will tend to seriously exaggerate the negative effects of retirement on health.

We estimate the magnitude of any direct effect of retirement on health using a procedure similar to that used by Charles, (2002) to determine if exogenous variation in retirement is associated with variation in several indicators of health. The idea is to compare health indicators immediately before normal retirement age. In the United Kingdom, a significant portion of retirement income for large numbers of individuals is available at age 65 for men and 60 for women. This feature provides a strong incentive for retirement at those ages, and data on labor force attachment show drops at those ages. On the other hand, there is nothing unique about those ages that influences health. By contrast, in the U.S. there are two rather than one spike in retirements and retirement effects health insurance status.

The approach we are using here bears a resemblance to a regression discontinuity (RD) design. However, we want to note that there are important distinctions between our approach and the regression discontinuity approach. In the context a RD design one is looking for a distinct jump at the point of discontinuity. In our case, we do not expect to see such a jump, but do expect that if, for example, retirement tends to have a distinct positive effect on health, we should see health above trend in the years following the age of normal retirement.

2. The Possible Health Effects of Retirement

There are a number of reasons we might imagine that retirement, per se, might affect health. Individuals retire for a number of different reasons. In what follows we will focus on the case in which the net value (both pecuniary and non pecuniary) of continuing to work declines to the point that a person retires. We are imagining the case where this decline is fully anticipated. Canonical examples of this would include the case in which an individual is induced to retire at a certain age by the incentives built into either public or private pension systems.

Grossman (1972) models health as a form of human capital. Changes in health depend, in part, on investments in health, with these investments being functions of both time and medical care. After retirement, non-market time increases. As a result, we would expect the time individuals spend investing in their health would rise, with this being especially true if such investments are time intensive. Here, what we have in mind includes both time spent pursing medical care and time spent in health promoting behaviors. At the same time, the extra time could also be spent in engaged in unhealthy behaviors.

The notion that working, per se, might have negative effects on health that work through patterns of time use is consistent with recent work that has consistently found that recessions tend to be associated with decreases in mortality and improvements in physical health. Available evidence suggests that these changes are, in part, due to life style and health behavior changes that occur during recessions (see Ruhm 2004 for a summary and discussion of the research relating macro economic conditions and health).

In Grossman's model, health increases the value of time spent in both market and non market activities. If the marginal value of health is greater in one of these activities than the other, this gap could affect investment behavior as someone neared retirement age. Whatever their strength early in working life, we suspect that the private incentives to take care of one's health in order to augment market productivity to be weak as one approaches retirement. While worker productivity does tend to drop as workers age, older workers have typically found themselves in jobs that do not pay piece rates. Our sense is that much of the burden of declining productivity among older workers is born by employers, not workers. To the extent that this is the case, retirement means moving from a situation where the individual captures a small share of the benefits of taking care of him/herself to a situation where he/she gets to enjoy all of the benefits. As a result, one would expect investments in health to increase as an individual nears retirement. This said, these behavioral changes should occur prior to retirement.

There are other reasons we might expect that retirement could possibly effect health. On the one hand jobs that are stressful or physically demanding could have a negative effect on health. On the other hand, work and related activities may be one of the primary forms of physical activity for some individuals. In addition, social networks formed at work may be important for many, and the strength of these networks may weaken with retirement. Lastly, work, itself, may be rewarding. In all such cases, continued employment would tend to have a positive effect on a persons mental or physical health.

Clearly, it would seem theoretically possible that retirement could have either positive or negative effects on health. Indeed, it seems natural to imagine that both the direction and magnitude of these effects would vary across individuals. At best we will be able to estimate and average effect. The magnitude of the effect of retirement on health will also depend on the relative importance of contemporaneous investments versus other factors in determining current health. To illustrate this point, imagine that health in period t depends on health in period t-1, health investments in period t-1 and idiosyncratic shocks: $H_{t+1} = \gamma H_t + \delta I_t + \nu_t$. The impact of investments (I_t) on future health depends on the productivity of these investments (the magnitude of δ), the persistence of health over time (the magnitude of γ) and on the typical magnitude of health shocks (the variance of ν_t).

3. Retirement in the United Kingdom

Normal retirement age in the United Kingdom is 65 for men and 60 for women. This is the age at which men and women can begin to receive state retirement benefits. As a result, a large fraction, at least of men, have traditionally left the labor force at this age. Thus, for example, Blundell and Johnson (1999) using the U.K. family expenditure survey calculate a roughly 50 percentage point drop in labor force participation rates at age 65 for men born in 1913 and reaching retirement age in 1978. However, as is true in many other developed countries, the participation rates of men near retirement have dropped dramatically over the last 30 years.[1] In recent cohorts the drop in labor force participation rates for men at 65 is closer to 20 percentage points.

The pension system in the U.K includes important public and private components. The basic state pension provides benefits at flat rate for men and women who have reached normal retirement age so long as they have contributed sufficiently to the national insurance system. In addition, the State Earnings Related Pension Scheme (SERPS) provides a pension equal to 20% of an individual's qualifying annual earnings. In addition means tested Income Support is a flat rate system available for the elderly. Unlike younger individuals, those over the age of 60 do not need to be looking for work to receive benefits. Lastly, Invalidity Benefits are available for those who can pass a medical screen.

In addition to the publicly provided pension benefits, many individuals in the U.K. are eligible for private pension benefits. Close to half of workers are covered by an

[1] Employment rates for 60-64 year old men dropped from 80% in the 1968 to 40% in the late 1990s (Blundell, Meghir and Smith, 2002).

occupational pension. In addition, many workers in the U.K, have individual retirement accounts. Since 1988 individuals have been allowed to contract out of SERPS to take out an individual retirement account. Blundell, Meghir and Smith argue that the drop in the labor force participation of men in their 60s can be largely attributed to the growth of private pensions.

4. Data and Methods

In this study we examine several types of health measures for shifts after normal retirement ages. Data for these analyses come from two sources. For the analyses of morbidity, we use the second wave of the English Longitudinal Study of Aging (ELSA). The ELSA, begun in 2002, interviewed approximately 12,000 individuals and is drawn to represent the resident population of England ages 50 and older. It was modeled after the Health and Retirement Study and contains detailed information on demographics, economic resources, labor force activity and health. The second wave was fielded in 2004, and as part of the "nurse visit" component of the survey it included several physical performance measurements and a series of tests performed on a blood sample taken at the interview.

We focus on two types of variables, self-reported measures of health and functional status, and "objective" physical measurements. The self-reported measures include measures of limitation in physical function (Nagi items), difficulty with activities of daily living (ADLs) and instrumental activities of daily living (IADLs), general health status (fair or poor health), the presence of a longstanding illness that limits activities, and being frequently bothered by pain.

The objective measures we use include a subset of the items found in the Short Physical Performance Battery (Guralnik et al. 1994). Specifically, for all members of the sample, the nurse asks respondents to stand from a sitting position without using their arms and then asks them to repeat this 5 times, while being timed. To measure balance, the nurse directs respondents to stand in three separate positions (feet together side by side, slightly offset, and in the full tandem position, i.e., heel to toe) for about 10 seconds. Older sample members (60 and above) are also timed as they walk a distance of 4 meters. Guralnik and colleagues constructed a scale based on all of these items, but because the sample receiving the entire battery of tests excludes much of the pre-retirement age sample, we base a scale only on the balance and standing portions of the test. The scoring for these items allows a maximum score of 9 points. Approximately one quarter of the sample has a score lower than 7, which we take as a threshold value for some of our analyses.

The second set of objective measures are based on blood chemistry and anthropometric tests. Among the measures collected by ELSA are those sufficient to diagnose "metabolic syndrome," a set of symptoms linked to overweight and obesity that are risk factors for coronary heart disease. The presence of three out of the five symptoms (excessive waist circumference, elevated triglyceride level, low levels of HDL cholesterol, high blood pressure, and elevated fasting blood glucose) is classified as metabolic syndrome (National Heart Lung and Blood Institute, 2007). We use both the dichotomous indicator for having 3 of the 5 symptoms as well as the total number of symptoms as dependent variables in our analyses.

For the analysis of causes of mortality we use data from the UK vital statistics system. Specifically, from the UK Office for National Statistics, we obtained data on numbers of deaths by cause (ICD10), sex, and single year of age in England and Wales during the calendar year 2005. These were compiled from death registration records. Population estimates for England and Wales at mid-year of 2005, by age and sex were downloaded from the website of the Office for National Statistics (www.statistics.gov.uk). Using standard demographic methods, we calculate cause-specific life-table death rates by age and sex for several broad groups of conditions that capture more than 90% of deaths in the older population: diseases of the circulatory system (38%), neoplasms (29%), diseases of the respiratory system (15%), diseases of the digestive system (4%), diseases of the nervous system (3%), as well as "external" causes, that in this population are predominantly accidents (2%). For this analysis we limit our attention to mortality between the ages of 30 and 90.

As our principal mode of analysis to estimate the effect of retirement on health, we estimate the effect of public pension eligibility (being age 60 and above for women, or age 65 and above for men) on the morbidity and mortality measures to see if there are discernible deviations in the age pattern of health measures at pension eligibility ages.

For the dichotomous variables, we use a logit specification, and for the scale variables (physical performance and the number of metabolic syndrome symptoms present) we use an ordered logit specification. We use several specifications for age variables to examine the potential effect of retirement eligibility on health. We looked for shifts that occur after retirement both in the levels of health and in the age-trends in health.

For mortality rates, we estimate linear regression models on the logged mortality rates for the various disease groups using the same strategy of observing deviations from trends established before retirement age.

5. Results

Morbidity: Results for measures obtained from the ELSA are shown in Figures 1 through 18. In these figures, we first plot logit coefficients from age dummy variables for each measure from age 53 through 90, and then plot the age trend in these coefficients as estimated from pre-retirement ages. We then display results from the statistical test that the coefficients from the post-retirement ages deviate from the pre-retirement trend. To examine whether deviations are "temporary," i.e., concentrated around retirement, we also test the hypothesis that the first 10 years after retirement age deviate from the pre-retirement trend.

Considering first the objective measures, men appear to have a slight improvement in health relative to trend after 65 as measured by the probability of scoring below 7 on the abbreviated performance battery and by the probability of exhibiting three of the five indicators of metabolic syndrome. For the performance battery, however, this improvement appears to be temporary. While the first ten years past retirement are significantly different from trend, when we consider all ages up to 90, there is no longer a statistically significant deviation. Looking at coefficients from the ordered logit model of the battery score (Figure 3) we see a different pattern. As a whole, the post-retirement coefficients are significantly worse than trend. However, the first ten years after retirement appear to conform to trend, and performance decline appears to accelerate only in later years. The coefficients from the model of the count of heart disease risk factors shown in Figure 4 is consistent with the findings from the threshold model in Figure 2.

The age patterns in many of the self-reported measures for men shown in Figures

5 through 9 show a consistent improvement relative to pre-retirement trend. The measure most closely related to the performance battery is reported difficulty with a lower-body functioning item (these include standing, sitting for long periods, stooping or kneeling, or climbing stairs). This measure (Figure 5) shows a statistically significant pattern of better functioning than would be predicted by pre-retirement trends. Although the effects appear smaller than for other self-reported measures, they do persist unlike the trends in Figure 1. Most closely related to the metabolic syndrome indicators is having a doctor's diagnosis of a condition related to heart disease (heart attack, angina, or high blood pressure) or diabetes. In the coefficients for this measure (Figure 6), there is no significant deviation from the pre-retirement trend.

While not shown[2], for men, reporting a chronic illness that limits activities, rating one's health as fair or poor, and reporting frequent trouble with pain all show statistically significant improvements relative to trend after the normal retirement age. We find the same results for measures of difficulty with upper body function, ADLs, and IADLs.

Among women, age trends in the objective measures of health and function show some similarities to those of men, though they are generally not as strong, statistically.[3] In the probability of scoring below 7 on the performance battery (Figure 7), there is a statistically insignificant improvement relative to trend, and in the probability of having at least three risk factors for heart disease (Figure 8), a statistically insignificant improvement, but not until after age 70. From the ordered logit models (Figures 9 and 10), there is a statistically significant improvement relative to trend in the performance battery score, but it does not appear until after age 70, and no significant deviation in the number of metabolic syndrome symptoms. Overall, the patterns in objective measures for women do not suggest a retirement effect on health.

Comparing these findings to those for the self-reported analogs for lower body functioning and heart disease in Figures 11 and 12, we find a marginally significant ($p<.10$) improvement relative to trend in lower body function, but the first 10 years after age 60 do not show a significant deviation. In self-reported heart disease/diabetes, there is

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[2] These figures are available from authors upon request.
[3] Because the pre-retirement period observable in the wave 2 data is only 7 years, the pre-retirement trends are estimated with less precision, reducing the statistical power of the tests on deviation from trend.

a significantly higher rate of these reports relative to trend after age 60. The only patterns consistent with a retirement age effect are in the subjective reports of a chronic disease causing activity limitations, fair or poor health, and frequent problems with pain.[4]

*Mortality :*Age patterns of mortality rates do not consistently conform to a model of retirement-induced changes in health. Rather, it seems more likely that basic biological factors are at work. Certain causes of death tend to accelerate with age while others tend to decelerate. It is likely that other factors are driving these trends. Plots (not shown, but available from authors) for all internal causes of death (those related to organ systems) in aggregate show no deviation from trend through age 90 for men or women. For both men and women, cancer deaths tend to decline relative to trend (Figures 13 & 14) while nervous system mortality tends to increase relative to trend (Figures 15 & 16). It is difficult to believe that retirement is driving these causes in opposite directions. Death rates due to circulatory system diseases, the most common cause of death after 50, show strikingly different patterns for men and women (Figures 17 & 18). Women's circulatory mortality rates accelerate somewhat in old age while men's rates decelerate. The shift in women's rates may be due to the protective effect of endogenous estrogen against coronary artery disease before menopause (Lawlor et al. 2002). External cause mortality (not shown) appears to increase after retirement, yet it is difficult to plausibly describe this change as a health effect of retirement.

6. Conclusion

Our tabulations have suggested that, if anything, at least for men, retirement would seem to have a small positive effect on physical health. This evidence mirrors the Charles finding for psychological well-being, but contrasts markedly with Dhaval, Rashad, and Spasojevic findings. This contrast mirrors the difference in the methodology between the various researchers. Dhaval, Rashad, and Spasojevic use longitudinal data to follow individuals over time. They find that retirement between period t-1 and t is associated with declines in various health measures over the same interval. It seems at least as plausible that the correlation they have uncovered represents the effect of changing health on behavior as much as it does the effect of retirement on health. In contrast, Charles and the two of us follow a strategy of trying to find exogenous factors

[4] Available upon request.

effecting retirement.

Just as there are various possible reasons why retirement might effect health, there are various possible explanations for our results. We leave the investigation of the various possible mechanisms by which retirement might effect health to future research.

The nature of our research strategy affects the interpretation of our results. We use exogenous and well known features of the retirement system in the U.K. to identify the contemporaneous effect of retirement on health. As discussed above, it seems quite likely that the effect of retirement on health varies across the population and across circumstances leading to retirement. Our estimates should be interpreted as averages across individuals induced to retire at the normal retirement age in the U.K (Imbens and Angrist, 1994). As we have also argued, our method has some chance identifying the contemporaneous effect of retirement on health. However, to the extent that retirement expectations effect health investments, we will not pick up such shifts. We suspect such effects are small, and, as we have argued, would, if anything, tend to reinforce the positive effect of retirement on health.

It is natural to speculate about whether our estimates have implications for the advisability of changing early or normal retirement age in the U.S. Our estimates would seem to suggest that delaying retirement would tend to postpone the positive health effects of retirement. However, this does not mean that recent shifts that have been introduced to encourage the delay in retirement are a mistake. Instinctually as economists we tend to favor policies that do not distort behavior. In the context of retirement policy, this means policies that neither encourage nor discourage early retirement. Recent changes in social security rules such as the increase in the delayed retirement credit reduced the disincentives build into the program for delayed retirement. As long as individuals are aware of the health consequences of retirement, as we suspect they are, there is no reason to shy away from such policies. By the same token, our results suggest that policies based on the paternalistic notion that work is good for individuals is mistaken.

We interpret our results as encouraging for researchers studying retirement who have made the assumption that health, or, at least, changes in health are largely exogenous to retirement behavior. Given the paucity of plausible instruments for health, this is good news, indeed. At the same time, we have found some differences between results based on self-reported measures of health and functional status, and "objective" physical measurements. Given that the self reports and physical measurements do not tap exactly the same construct, these results are, at best, suggestive. However, they are consistent with recent research that has emphasized the extent to which survey responses to health and physical capacity questions depend on social context.

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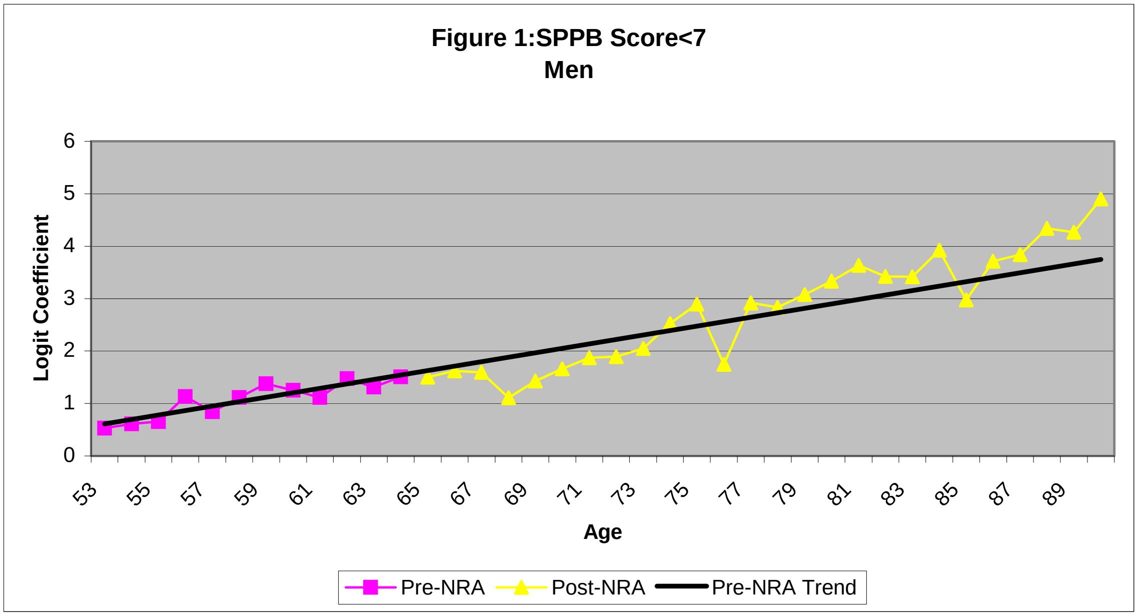
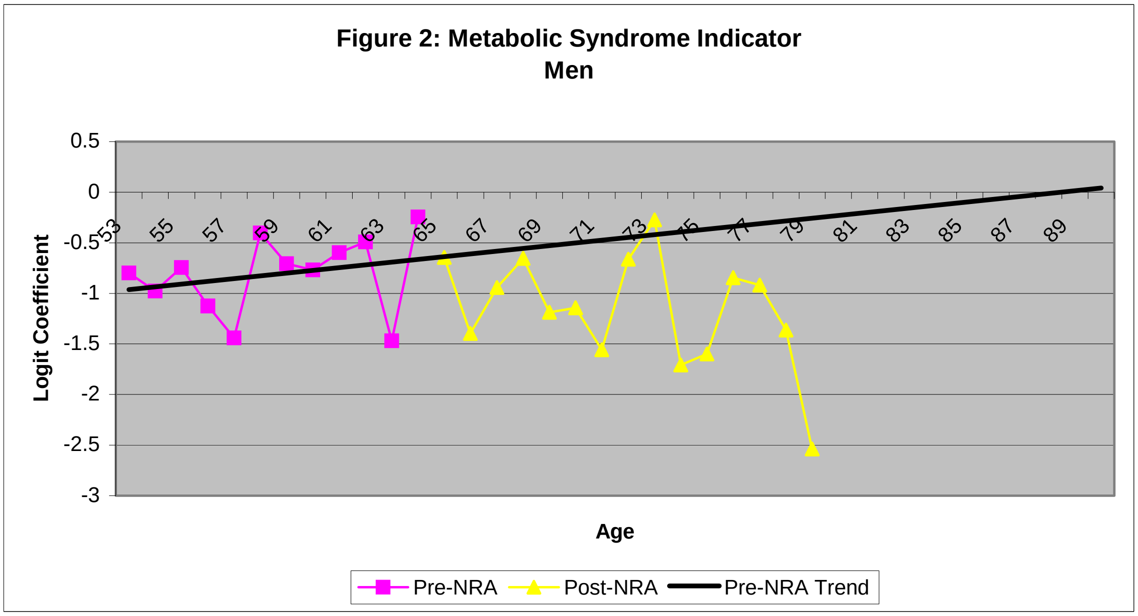
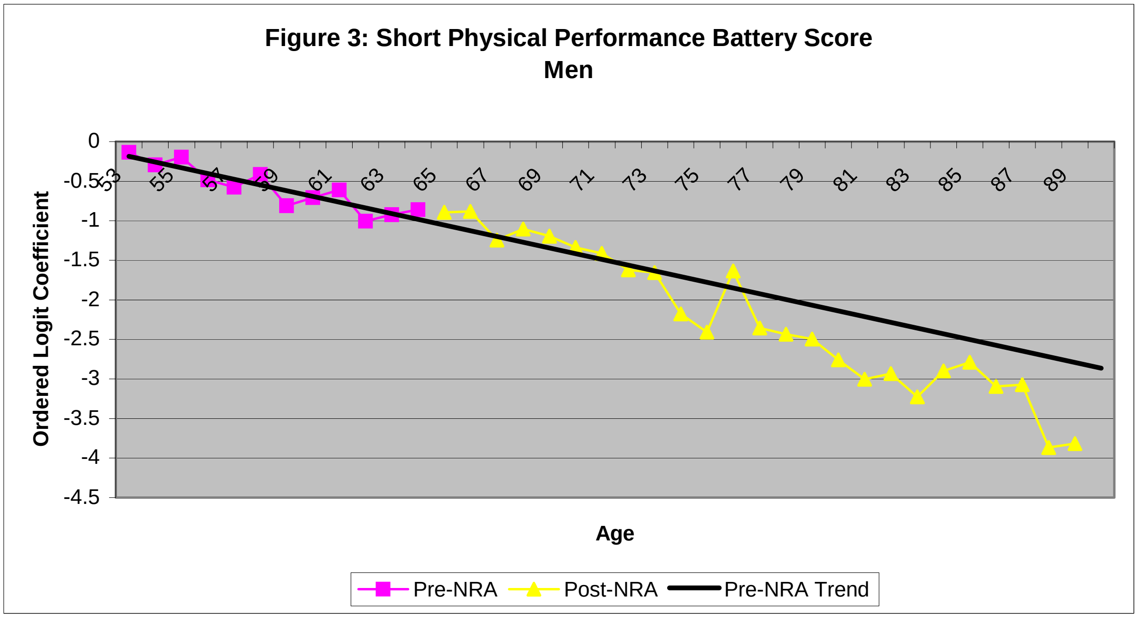


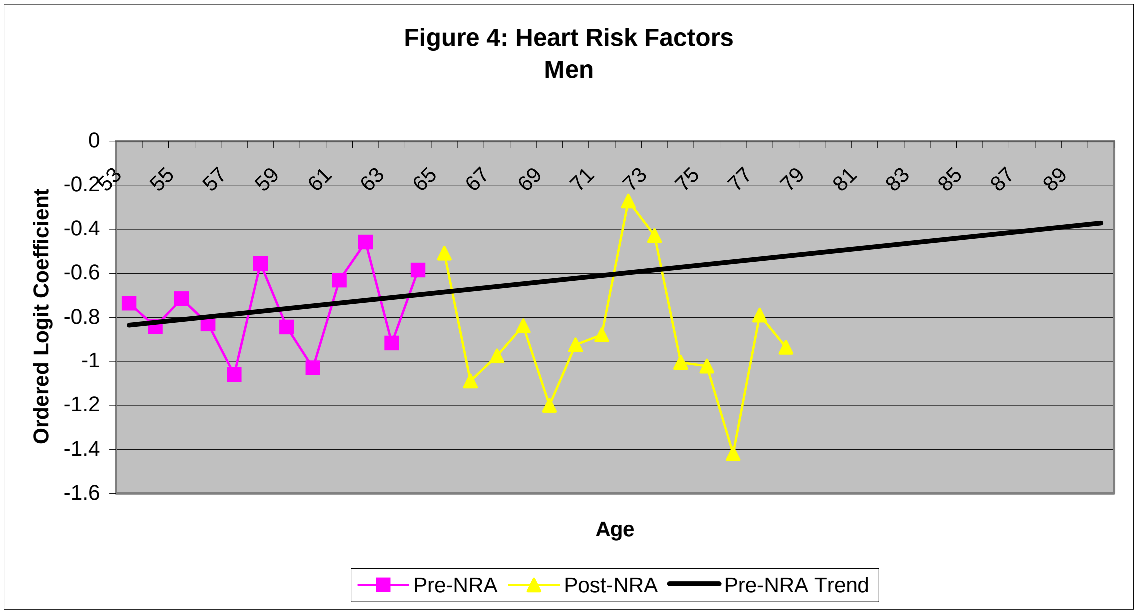
	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-2.159	-14.119
Test of Post-NRA coeffs=0 (z)	-0.205	-1.662
P-value	0.838	0.097



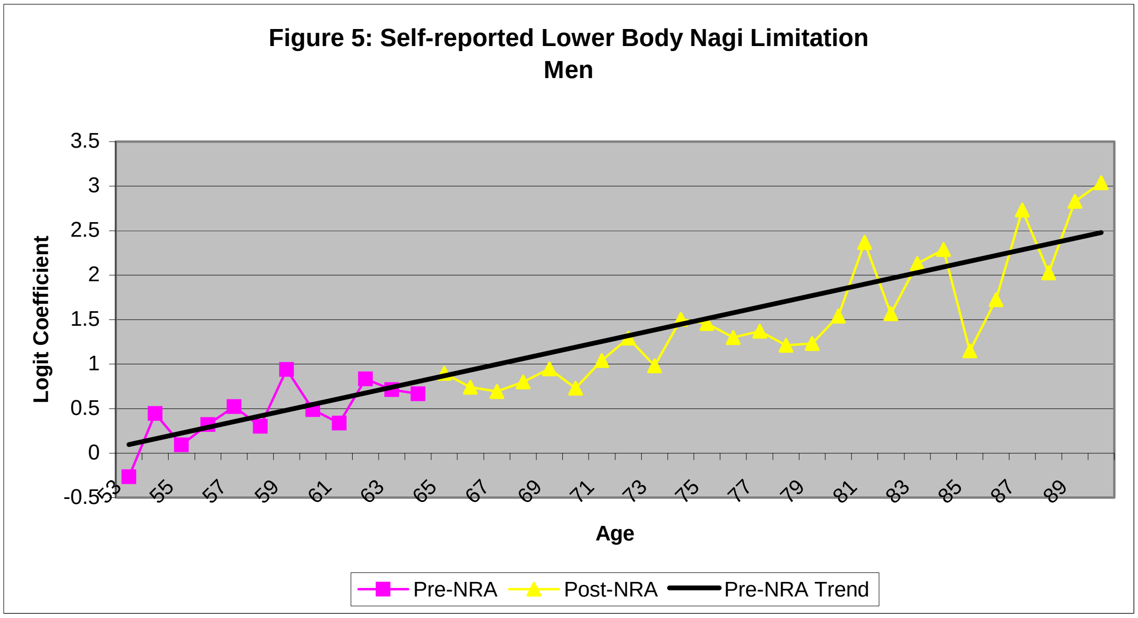
	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-24.113	-18.557
Test of Post-NRA coeffs=0	-3.576	-2.995
P-value	0.000	0.003



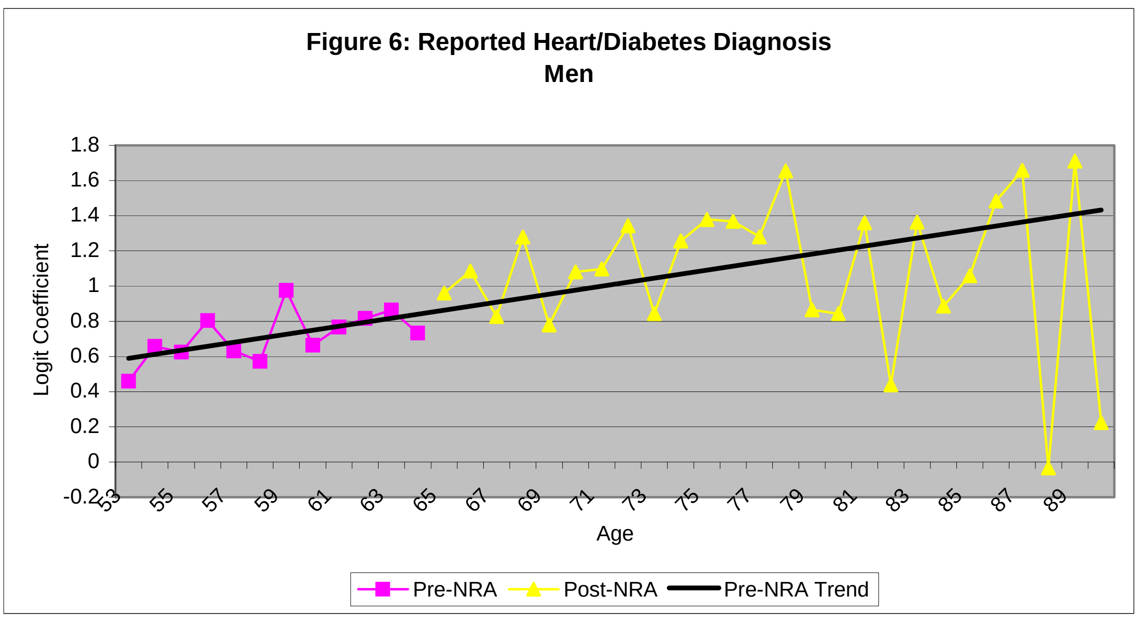
	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-57.457	-10.958
Test of Post-NRA coeffs=0	-3.682	-0.858
P-value	0.000	0.391



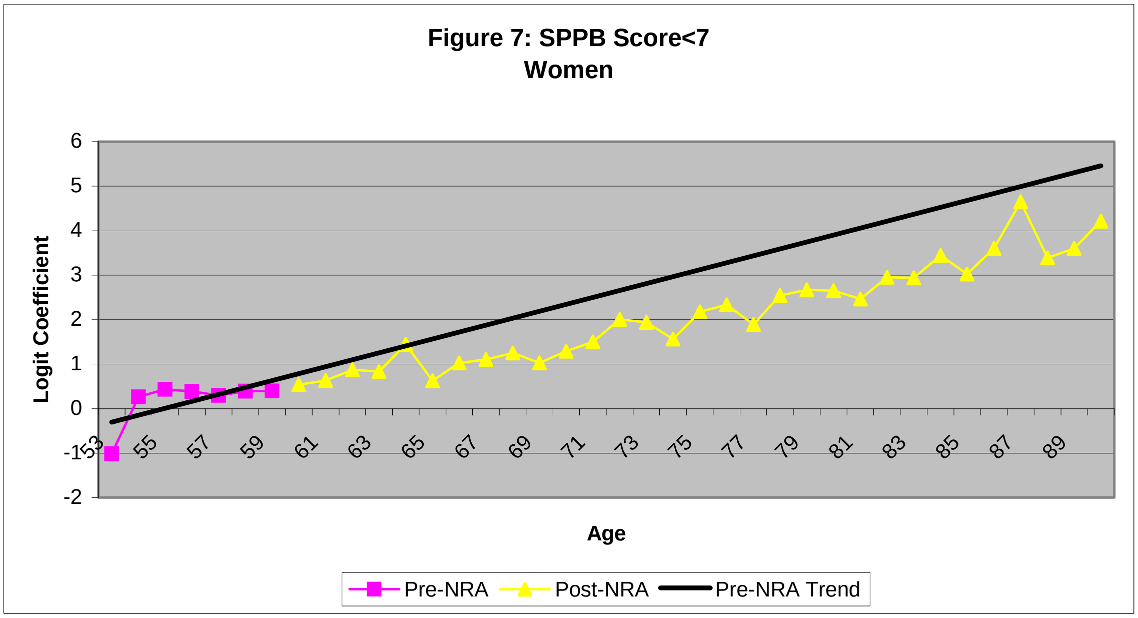
	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-30.741	-21.786
Test of Post-NRA coeffs=0	-2.921	-2.266
P-value	0.003	0.023



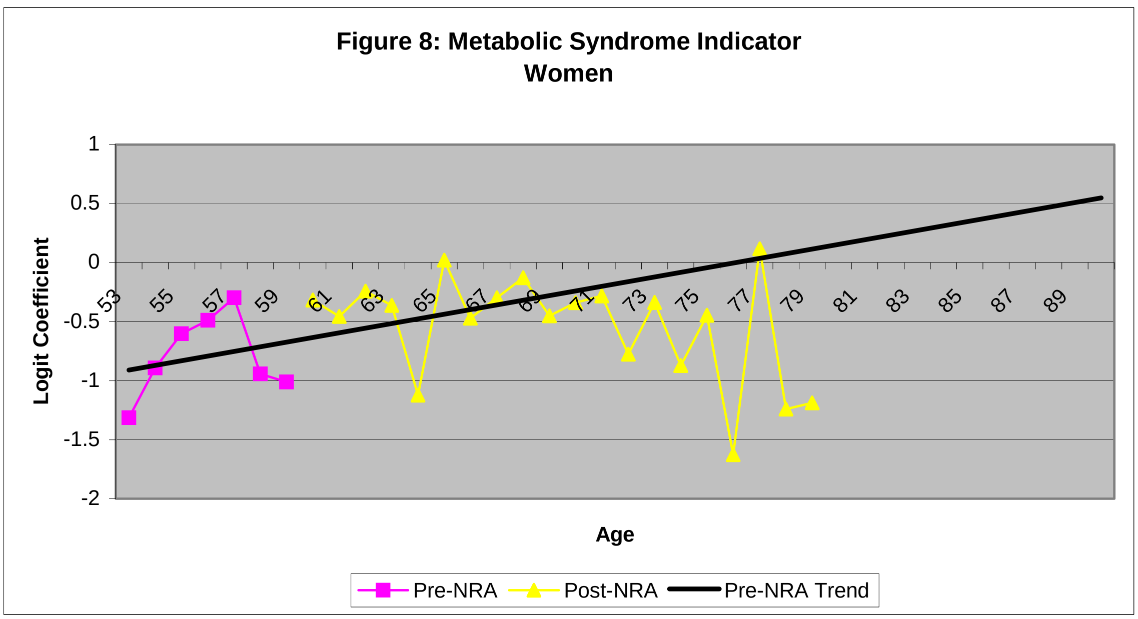
	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-59.224	-39.129
Test of Post-NRA coeffs=0	-3.750	-2.982
P-value	0.000	0.003



	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-9.046	4.598
Test of Post-NRA coeffs=0	-0.652	0.406
P-value	0.514	0.685

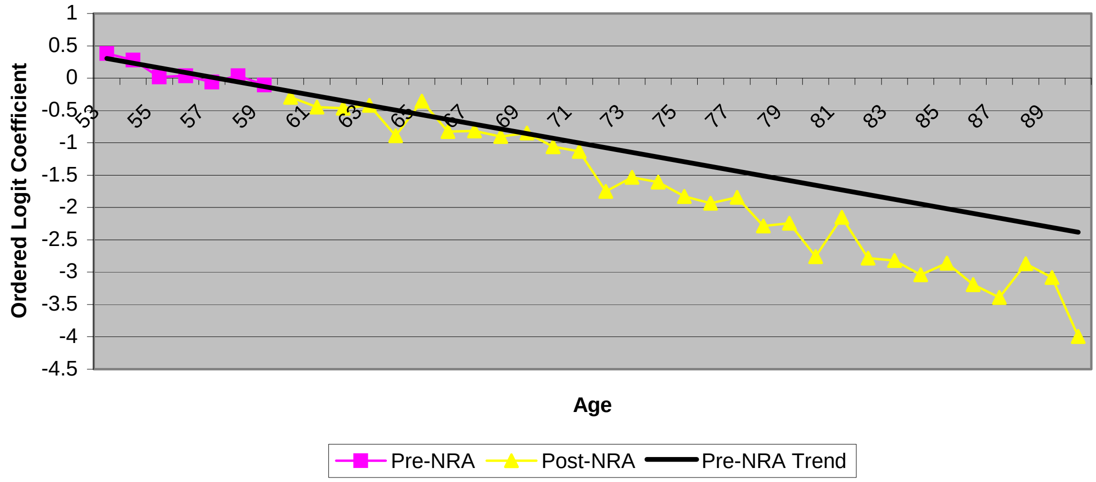


	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-5.125	-5.847
Test of Post-NRA coeffs=0	-0.540	-0.734
P-value	0.589	0.463



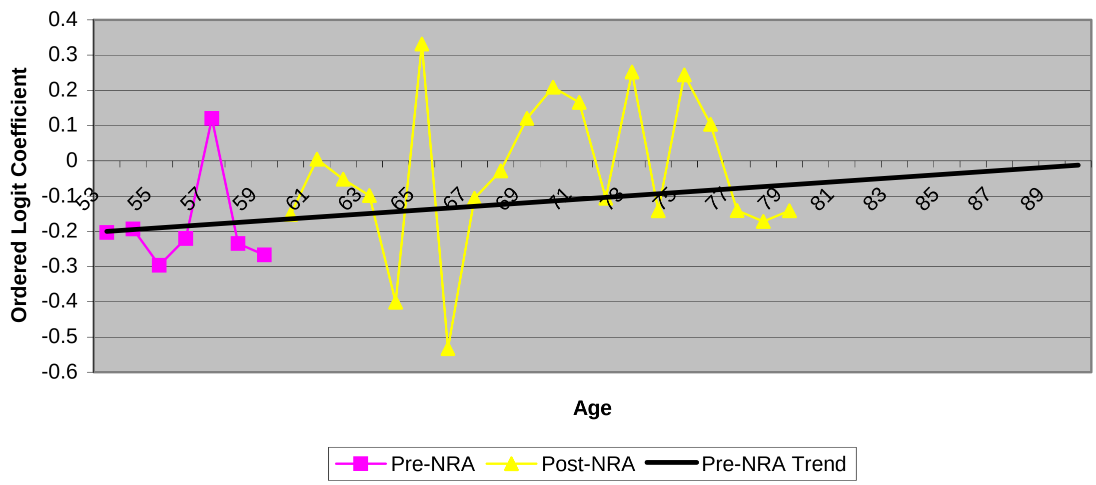
	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-6.910	-1.223
Test of Post-NRA coeffs=0	-1.078	-0.214
P-value	0.281	0.831

Figure 9: Short Physical Performance Battery Score Women

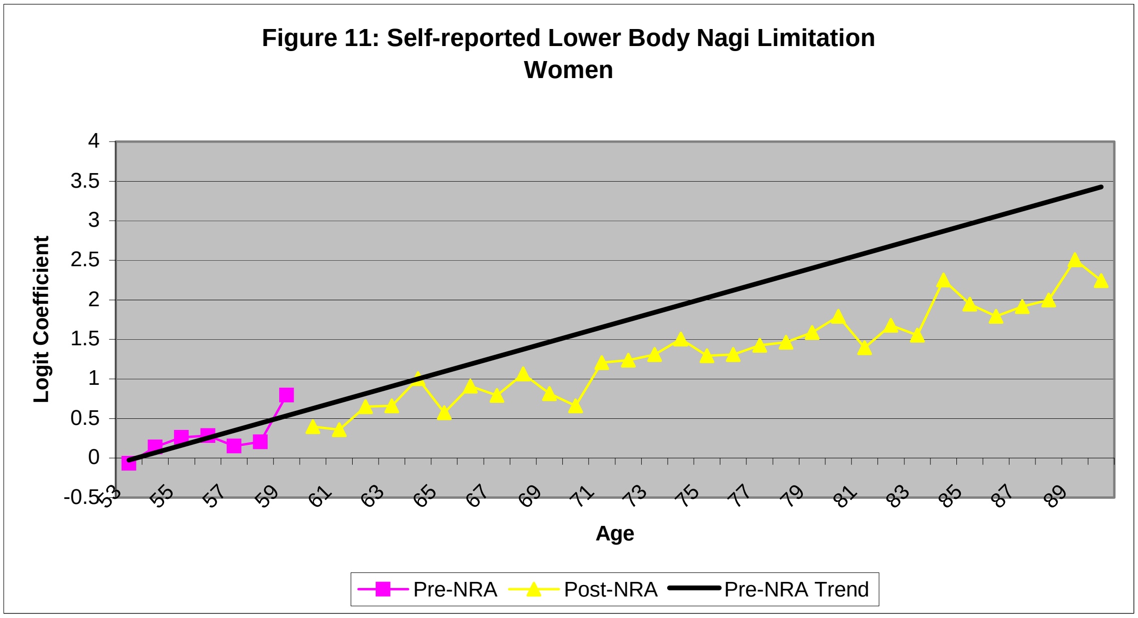


	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-50.006	-11.245
Test of Post-NRA coeffs=0	-3.459	-0.937
P-value	0.001	0.349

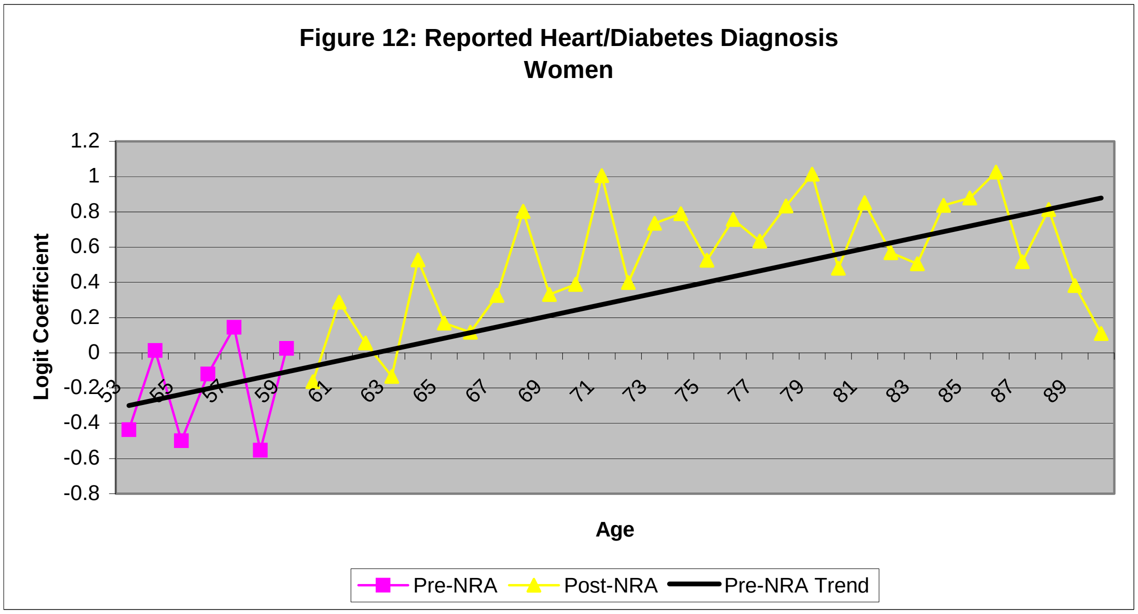
Figure 10: Heart Risk Factors Women



	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	9.389	6.052
Test of Post-NRA coeffs=0	0.900	0.662
P-value	0.368	0.508



	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	-24.559	-13.613
Test of Post-NRA coeffs=0	-1.684	-1.115
P-value	0.092	0.265



	All Post-NRA	First 10 years
Weighted Sum of Post-NRA coeffs	46.694	26.153
Test of Post-NRA coeffs=0	4.084	2.744
P-value	0.000	0.006

Figure 13

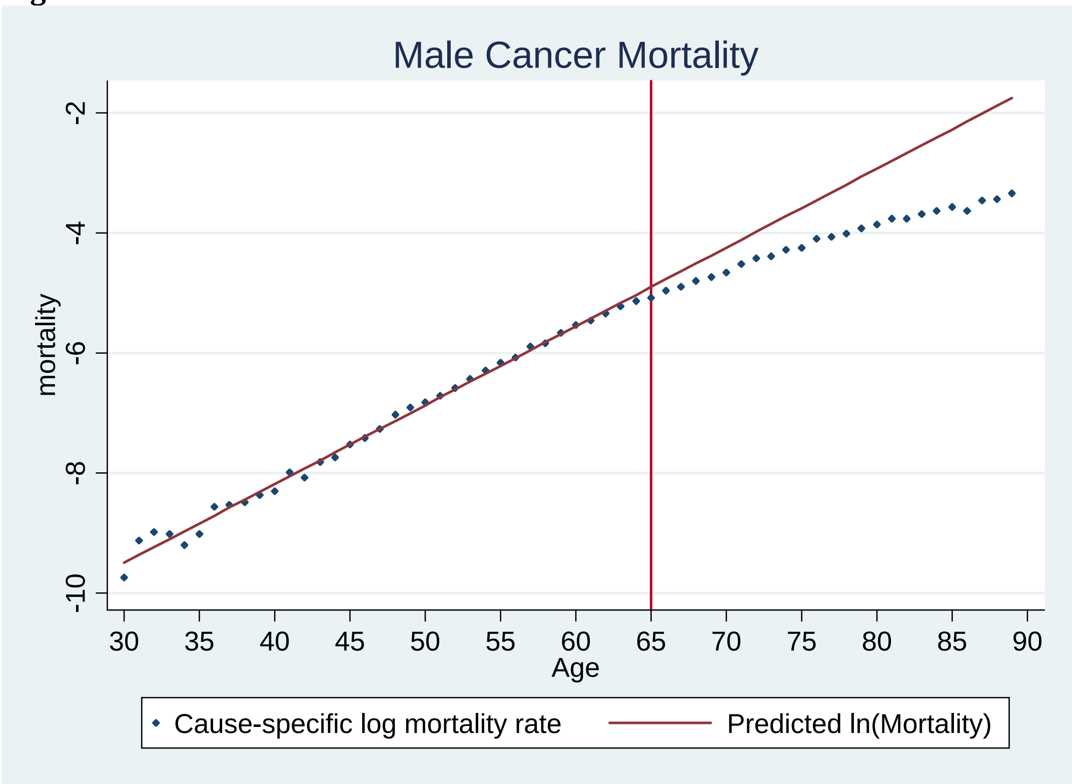


Figure 14

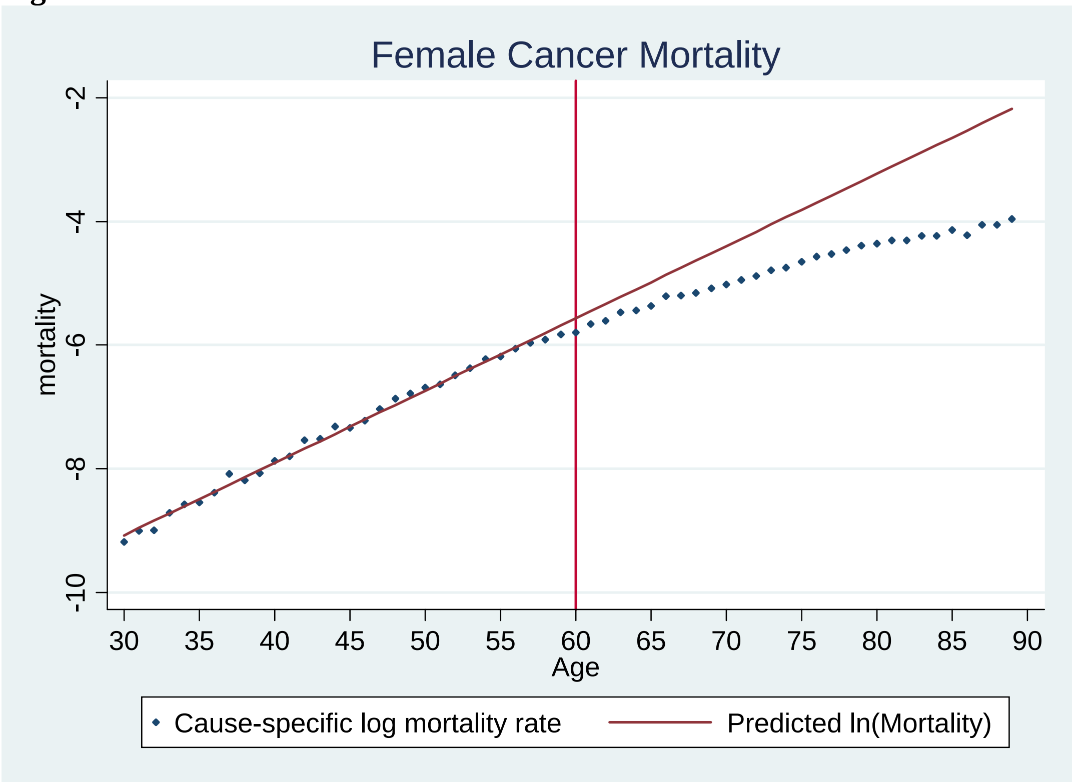


Figure 15

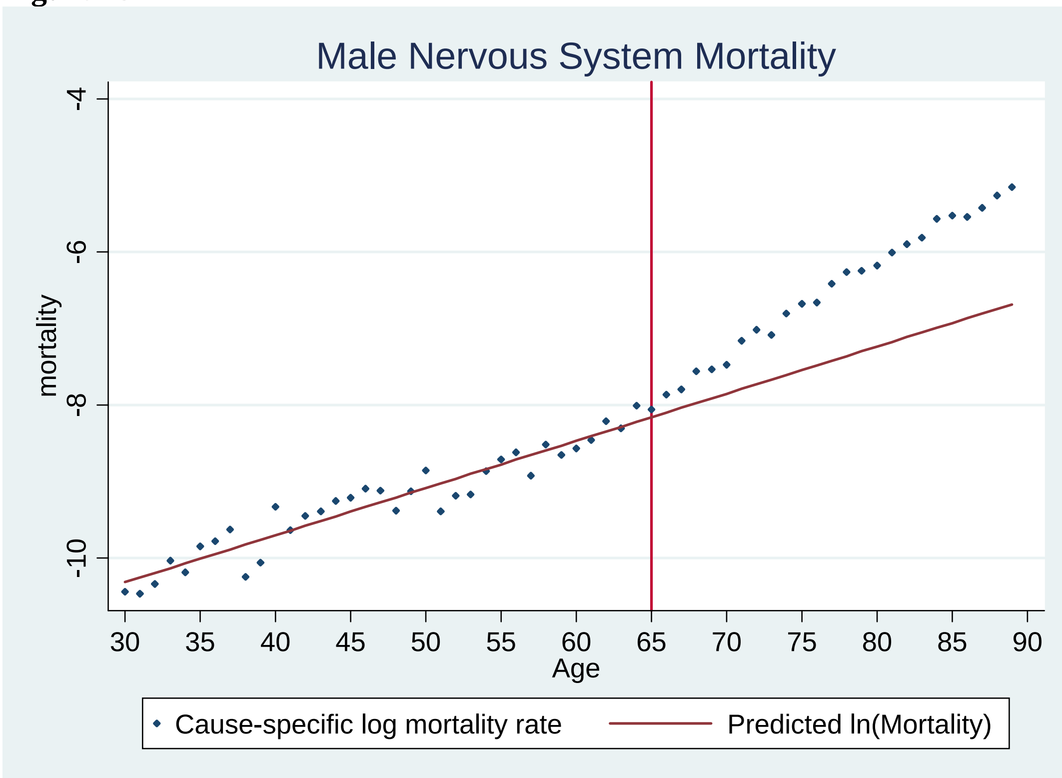


Figure 16

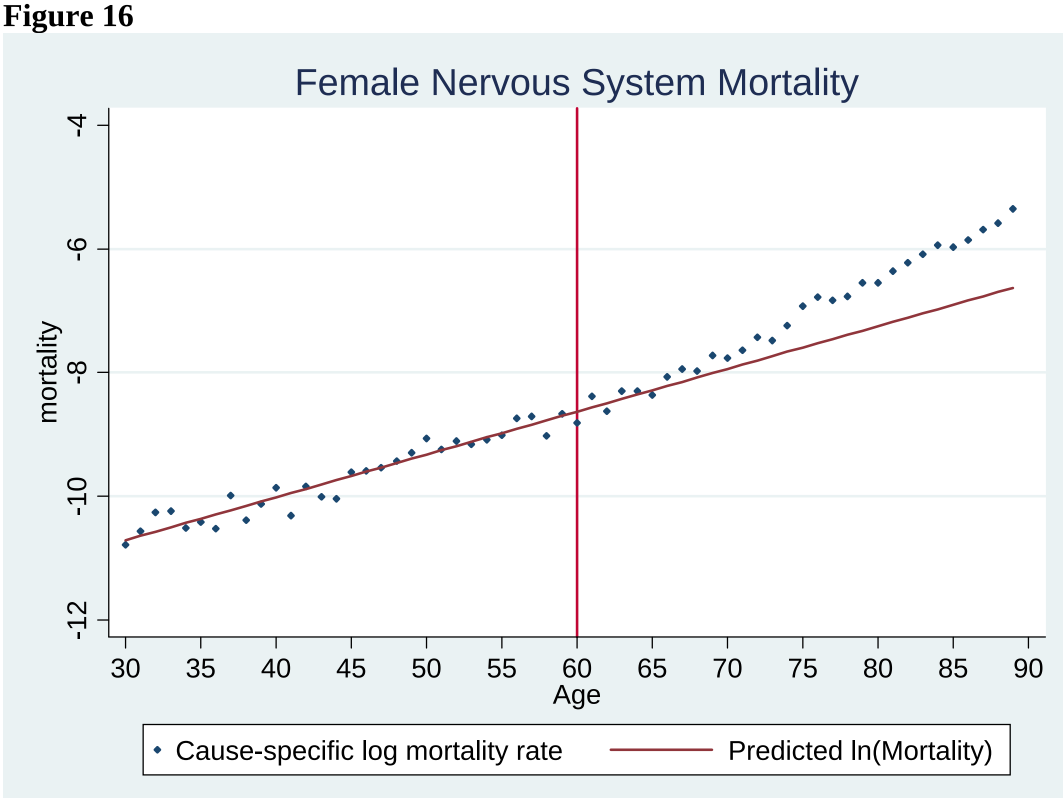


Figure 17

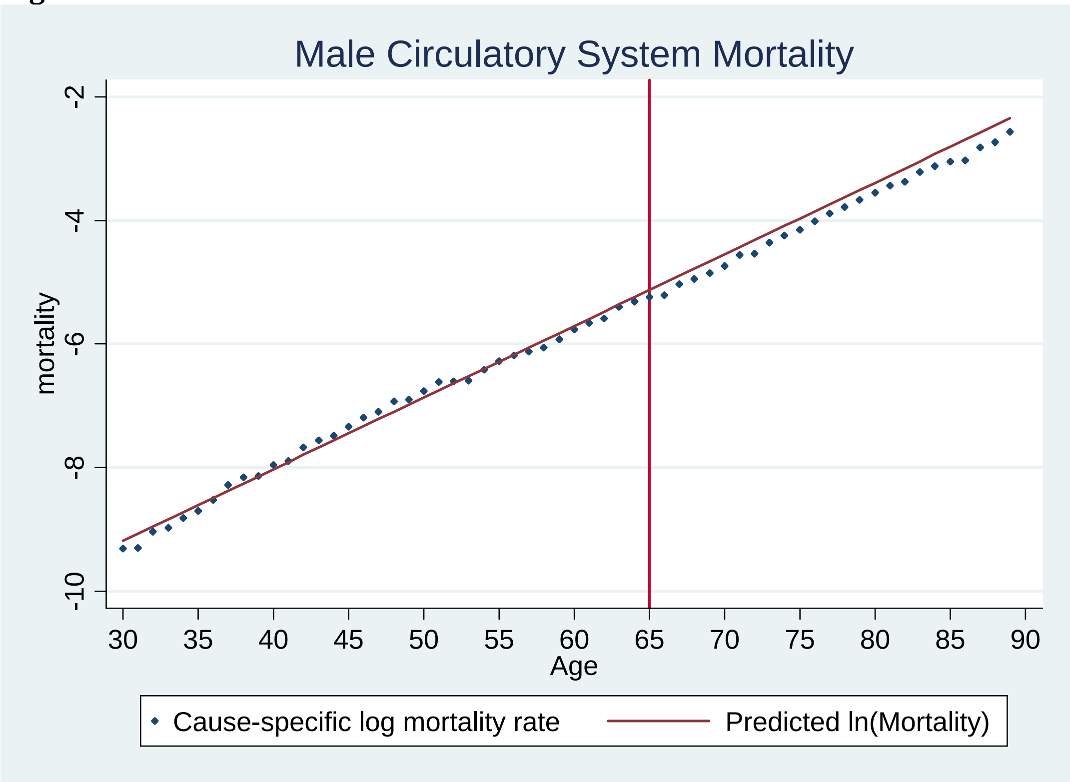


Figure 18