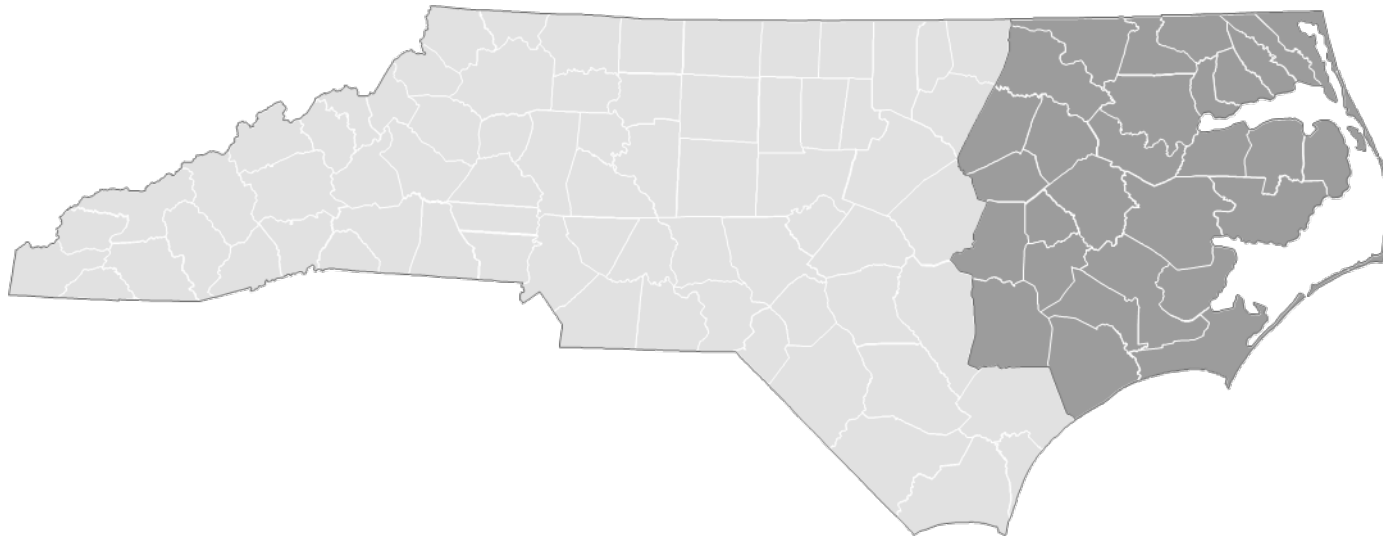


# Trends and Disparities in Mortality in Eastern North Carolina

Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1979-2009



**A Resource for Healthy Communities**

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## 1. Introduction

### Health Indicators Series: A Resource for Healthy Communities May 2012

#### Report Series #2: Mortality Trends for Eastern North Carolina - (1979 to 2009)

*Health Indicators* is a series of reports describing community health at the state, regional, and county level. *Health Indicators* supplements the *Eastern North Carolina Health Care Atlas* published by the Center for Health Systems Research and Development at East Carolina University. These reports are intended to provide state policy makers, local health departments, hospitals, and community-based health planning groups with a wide range of information useful for diagnosing the health of Eastern North Carolina's population and its local communities, evaluating the effectiveness of existing services, and envisioning and planning new interventions. The reports in this periodically published series can be used in conjunction with the *County Health Data Book*, produced by the North Carolina Office of Healthy Carolinians, as part of the Community Health Assessment Process. Individual reports in ECU's Health Indicator Series are custom made for the counties of North Carolina. Reports in this series will describe trends in mortality, including premature mortality for all causes of death, mortality (crude) and age-adjusted mortality for leading causes of death, and measures of race disparities or inequalities in mortality rate.

*Report Series #2* of the series focuses attention on two of the overarching goals of *Healthy People 2020*, the national blueprint for health improvement. The first goal is to increase the span and quality of life and the second is to eliminate health disparities. North Carolina's companion plan, *Healthy North Carolina 2020*, has also embraced these two goals. Using rate comparisons, this report describes the inequalities in mortality among Eastern North Carolina and other regions, and among four demographic groups. Premature mortality, the focus of *Report Series #1*, is included in the death from all causes section located at the beginning of this report. The measure used to quantify premature mortality is described in more detail in the Methods and Interpretations section.

This report describes the leading contributors to mortality, provides a geographic context, and examines trends and inequalities over a 30-year period (1979 to 2009), as well as the most recent ten year period (1999-2009). The report begins with data highlights, provided as an introduction to the data, rather than a summary of it. Readers are encouraged to draw their own conclusions from the data and pose new questions suggested by what they see. The following section presents both the overall and five leading contributors to mortality for the state by race and gender. In this section, pie charts describe the relative contribution of each of five leading contributors to the overall, general rate. These charts also make regional and demographic comparisons. Making the area of each pie chart equivalent to the rate for the population group helps convey the dimension of disparity across population groups. The next section charts recent trends and disparities in mortality and provides projections to the year 2020. These charts place Eastern North Carolina's health status in a historical context and provide a glimpse into the future.

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\* The region *Eastern North Carolina* is comprised of 29 counties located in the extreme east of North Carolina and approximates the coastal plain physiographic province of the state. It includes the northern counties east of I-95. This region is characterized by its rurality, poverty, and some of the highest mortality rates in the nation. The name of the region is abbreviated as ENC29 or ENC. The rest of North Carolina is the remaining 71 counties; abbreviated as RNC71 or RNC.



## 2. Data Highlights

### Trends and Disparities in Mortality in Eastern North Carolina

The following highlights of mortality in Eastern North Carolina (ENC29) describe current status and trends in the causes of death from major diseases and how they vary across different population groups. The graphs, charts, and tables paint a picture of the region’s health with a broad brush. The study of mortality in populations should include consideration of time and geographic space as well as underlying demographic, political-economic, and socio-cultural conditions. Readers are encouraged to think of these factors as they consider the data presented in this report, formulate their own questions about the causes of mortality, and think about strategies to reduce mortality in the population described.

### Current Disparities in Mortality by Geography, Race, and Gender

In 2009, age-adjusted mortality rate for Eastern North Carolina is 877 deaths per 100,000. This rate is 10% higher than the state rate. Within Eastern North Carolina, the non-White rate is 17% higher than the White rate. The non-White male rate is 24% higher than the rate for White males. The non-White female rate is 19% higher than the rate for White females.

The five general leading causes of cancer mortality in Eastern North Carolina (2009) are:

1. Cancer - All Sites
2. Diseases of Heart
3. Cerebrovascular Disease
4. Chronic Lower Respiratory Diseases
5. Diabetes Mellitus

The five general leading causes of mortality in Eastern North Carolina by race and gender (2009) are:

	Race and Gender			
	non-White Males	White Males	non-White Females	White Females
1st	Cancer - All Sites	Cancer - All Sites	Cancer - All Sites	Cancer - All Sites
2nd	Diseases of Heart	Diseases of Heart	Diseases of Heart	Diseases of Heart
3rd	Cerebrovascular Disease	Chronic Lower Respiratory Diseases	Cerebrovascular Disease	Cerebrovascular Disease
4th	Chronic Lower Respiratory Diseases	Cerebrovascular Disease	Chronic Lower Respiratory Diseases	Chronic Lower Respiratory Diseases
5th	Diabetes Mellitus	All Other Unintentional Injuries and Adverse Effects	Alzheimers Disease	Alzheimers Disease

### Trends in Mortality from All Causes

- While the 30-year ENC trend line shows all-cause mortality rates are increasing and diverging from RNC and NC trends, the 10-year trend line shows that all three trends have been decreasing. The ENC all-cause mortality rates are still diverging slightly from RNC and NC 10-year trends.
- The age-adjusted, all-cause mortality rates are decreasing for all four 30-year trends, with ENC remaining above the rest. The 10-year trends suggest convergence of ENC and RNC and NC in the future.
- The non-White male mortality rate remains higher than other demographic groups, although convergence in the future is suggested.
- The non-White mortality rate remains 19% higher than the White rate in 2009 but the 10-year trends suggest convergence in the future, as both are decreasing.

- The 10-year trend for racial disparity shows a 31% decrease in a moderately reliable trend.

#### Trends in Premature Mortality from All Causes (years of life lost before age 75)

- ENC's premature mortality rate has decreased by 4% since 1999. However, this trend is diverging from both RNC and NC, which have both decreased by 9% since 1999.
- The age-adjusted premature mortality trend for ENC continues to decrease. The rate of decrease is slower than RNC and NC but surpasses the US. ENC remains 20% greater than RNC in 2009.
- The non-White male rates of premature mortality are significantly higher than other demographic groups but also have the greatest rate of decrease (slope of trend). White females have the lowest rate of premature mortality.
- The non-White rate remains 53% greater than the White rate but is decreasing at a rate of 20% in the 10-year trend compared to 3% for the White 10-year trend.
- The 10-year trend for racial disparity shows a 38% decrease in a reliable trend.

#### Diseases of Heart

- Based on the 10 year trend line, ENC's heart disease mortality rate is decreasing, but not as quickly as RNC and NC, resulting in an increased geographical disparity. In 1999, ENC's rate was 11% greater than RNC; by 2009, the disparity between the two was 20%.
- ENC's age-adjusted mortality rate is decreasing a bit more quickly than RNC, NC and the US. The ENC rate was 12% greater than RNC in 2009 and convergence in the future appears likely.
- The trend for males, both non-White and White, are converging with those of non-White and White females. Non-White males continue to have the highest rate for all demographic groups.
- The 10-year trend lines by race show an estimated 36% decrease in heart disease mortality rates for both Whites and non-Whites.
- The 10-year increasing trend line for racial disparity is unreliable.

#### Cancer - Trachea, Bronchus, Lung

- The 10-year trend line for ENC crude mortality due to Cancer – TBL is unreliable though continually higher than the rates for RNC and NC. In 2009, the ENC rate was 16% greater than RNC.
- During the period 1999-2009, the age-adjusted rate for ENC is decreasing at a greater rate than RNC, US, and NC and convergence in the near future is suggested. All four rates remain significantly higher than the goal set by *Healthy People 2010* of less than 44.9 deaths per 100,000.
- The mortality rate trends for males (White and non-White) are decreasing; convergence with the increasing female trends is suggested in the future. For the first time in 20 years, White males have the highest mortality rate due to Cancer-TBL in 2009.
- The non-White mortality rate for this cancer continues to decrease over the 10-year period and is diverging from the White rate. In 2009, the non-White rate was 16% less than the White rate.
- The moderately reliable trend for racial disparity has continued to decrease significantly over the 10 year period.

#### Cerebrovascular Disease

- ENC's cerebrovascular disease mortality trend line is decreasing but is diverging slightly from both RNC and NC. In 2009, the ENC rate was 22% greater than RNC.

- The ENC age-adjusted cerebrovascular disease mortality rate is decreasing and converging on the RNC and NC rates. Projected to 2020, the *Healthy People 2010* goal of less than 48 deaths per 100,000 could be achieved in the region.
- Although both non-White males and non-White females continue to have the highest cerebrovascular disease mortality rates, the rates are decreasing and converging on White male and White female rates. The non-White male rate in 2009 was 70% greater than the rate for White males; the non-White female rate was 36% greater than the rate for White females.
- The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of Whites but remains 52% greater than Whites in 2009.
- The trend for racial disparity from 1999-2009 shows a 26% increase in a moderately reliable trend.

#### Chronic Lower Respiratory Diseases

- The 30-year CLRD mortality rate for ENC is increasing. However, the 10-year trend for ENC appears to be decreasing in a moderately reliable trend. In 2009, the ENC rate was 3% less than RNC.
- The 10-year CLRD age-adjusted rate for ENC is decreasing and converging with the US rate, remaining lower than RNC and NC. The ENC rate in 2009 was 11% less than RNC, whereas in 1999 the ENC rate was 10% greater than RNC.
- Fitted rates for White males have the greatest rates of decrease. The 10-year trend for non-White females is unreliable.
- The 10-year White mortality rate trend is higher than the non-White trend, although both are decreasing evenly. The non-White rate remains 41% less than the White rate in 2009.
- The trend for racial disparity is not reliable.

#### Diabetes Mellitus

- According to the 10-year trend, diabetes mellitus rates for ENC, RNC and NC are decreasing, but the rate of decline for ENC is not reliable. ENC's mortality rate has continually been divergent from RNC and NC over the past 30 years. In 2009, the rate for ENC is 49% greater than RNC71. In 1999 ENC was 22% greater than RNC71.
- The 10-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 12% for ENC. The rates for RNC71 and NC have fallen below the US rate. In 2009, the ENC age-adjusted diabetes mellitus death rate remains 40% greater than the RNC71 and 34% greater than the US rate..
- The non-White male and non-White female 10-year mortality rates trends are decreasing but remain higher than those of White males and White females.
- Non-White mortality rates decreased 14% between 1999 and 2009 but remain 138% greater than Whites in 2009.
- The trend for racial disparities is unreliable.

#### All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects has increased substantially in ENC (38% over 10 years). The ENC rate trend is almost identical to the RNC and NC trends.
- The age-adjusted mortality 10-year trend lines suggest a regional disparity that favors ENC. The ENC rate is 3% less than the RNC rate in 2009. The ENC rate has increased 28% over 10 years. All trends are higher than the *Healthy People 2010* projected goal of less than 17.5 deaths per 100,000.

- The non-White male rates continue to decrease at a greater rate (30%) than other demographic groups and convergence with White female and non-White female rates is suggested in the future. The White male rate is now the highest rate of all demographic groups and has increased 47% over 10 years. White females had the greatest rate of increase (97%) over 10 years.
- Non-White rates have decreased by 27% over 10 years, whereas white rates have increased 63%, causing these two rates to diverge significantly. In 2009, the non-White rate is 37% less than the White rate.
- The racial disparity associated with deaths from unintentional injuries favors non-Whites.

#### Alzheimer's Disease

- The Alzheimer's mortality rate is increasing at a rate of 5.2% per year, showing a 57% increase over the 10-year period, more than 10% above the rate of increase in RNC71 and NC.
- The age-adjusted mortality 10 year trend line suggests a regional disparity that favors ENC29. The ENC29 rate is 26% less than the RNC71 rate in 2009.
- The mortality rate for females, both White and non-White, is greater than that of non-White and White males.
- The non-White mortality rate for Alzheimer's has been increasing continually but remains less than the White mortality rate by 21% in 2009.
- The trend for racial disparity is not reliable, but currently favors non-Whites in a moderately reliable trend.

#### Nephritis, Nephrotic Syndrome, and Nephrosis

- Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 39% over 10 years, a rate divergent from those of RNC and NC. While these other regions have also experienced large increases, the ENC rate of increase remains the greatest.
- With age-adjustment, ENC and RNC have increased by 20% over the past 10 years. Since both regions are increasing at the same rate, convergence in the future seems unlikely.
- The 10-year trend for non-White males is unreliable but continues to remain the demographic group with the highest mortality rates.
- In 2009, the non-White rate was 123% greater than the White rate. Both the non-White and White rate are increasing, although the non-White rate trend is unreliable.
- A moderately reliable trend shows a 33% decrease in racial disparity over the 10-year period.

#### Pneumonia and Influenza

- The mortality rates for pneumonia and influenza have all been decreasing over the 1999-2009 period. ENC is decreasing less (20% over the 10-year period) and therefore diverging from RNC and NC.
- The age-adjusted mortality rates for all NC regions are decreasing at very similar rates (decreasing approximately 3.2% annually), and all declining at a rate slightly greater than the US (2.9% decrease annually).
- The age-adjusted mortality rates for both genders of both races appear to be decreasing with Non-White males and White males remaining the highest. White females have seen the greatest decrease, 36% from 1999-2009.
- Non-White rates were 3% less than White rates in 2009. The trend lines suggest a convergence in the future.
- The 10-year trend in racial disparity is not reliable.

### Unintentional Motor Vehicle Injuries

- ENC's unintentional motor vehicle injury rate is moderately reliable and is higher than the RNC rate (32% greater than RNC in 2009).
- The ENC age-adjusted rate is 29% greater than RNC and 45% greater than the US rate in 2009. The ENC rate is declining, although not as quickly as RNC or NC.
- The 10 year trend for non-White males is declining. The trend for White males is not reliable. The non-White female mortality rate has decreased 47% over the 10-year period and has achieved the *HP2010* goal of less than 9.2 deaths per 100,000.
- The non-White rates have decreased by 25% and converged with the White rates suggesting a reversal in disparity within ENC. In 2009, the non-White rate was 12% less than the White rate compared to 1999 when the non-White rate was 9% greater than the White rate.
- Recent observed rates and fitted rates suggest that the racial disparity in ENC is eliminated, and may actually be favoring non-Whites. With a moderately reliable trend, the racial disparity has decreased by 283% over the 10-year period.

### Cancer - All Sites

- The cancer – all sites mortality rate trend for ENC is unreliable but continuously higher than both RNC and NC rate trends. The 30-year trend shows ENC as increasingly divergent from RNC and NC rate trends. In 2009, the ENC rate was 18% greater than RNC.
- The age-adjusted cancer – all sites mortality trends for all regions are decreasing. ENC continues to have a higher rate than RNC, NC and US.
- The cancer – all sites mortality rates for White males and non-White males are decreasing. Non-White males have seen the greatest decrease from 1999-2009 (24% decrease). White females have reached the *HP2010* goal of fewer than 159.9 deaths per 100,000.
- Both Whites and non-White cancer mortality trends have been decreasing over the 10-year period (11% and 18% decreases, respectively) but the non-White rate remains 16% greater than the White rate in 2009.
- The 10-year trend for racial disparity is moderately reliable and has decreased by 38%.

### HIV Disease

- According to the 10-year trend lines for HIV mortality, rates are decreasing for all regions but ENC has the smallest rate of decrease. Although the ENC rate has been decreasing, it is still 35% greater than RNC in 2009.
- The age-adjusted rates for all NC regions are similar and are decreasing, suggesting convergence in the future. However, based on current projections, the goal set by *Healthy People 2010* of 0.7 deaths per 100,000 will not be met by any region in NC.
- Non-White males continue to have the highest rates of age-adjusted mortality for all demographic groups. White males had the greatest rate of decline (52% over 10 years) of all groups. Convergence of all trends is projected in the future.
- From 1999-2009, the non-White age-adjusted HIV mortality rate has decreased by 39% but remains 1212% greater than the White rate. Age-adjusted mortality rates for Whites decreased by 51% in a reliable trend.
- In a moderately reliable trend, the 10 year period shows a 108% increase in racial disparity.



### 3. Methods, Interpretation, and References

#### Data Sources

The data for mortality and premature mortality in Eastern North Carolina were obtained from death certificate data from the North Carolina State Center for Health Statistics and population data from the North Carolina Office of State Planning. For the US, data were obtained from the Compressed Mortality File compiled by the National Center for Health Statistics.

#### Measures

Two types of mortality measures are covered in this report. The first, called mortality rate, is a rate based on the number of deaths per population (or, deaths *normalized* by the population that produced them) for a given unit area, such as the county, region, or state over a specified time interval. The mortality rate is expressed in two ways, the basic true (actual or observed) rate, and an age-adjusted rate (see below). Mortality rates are used to evaluate the impact and burden of mortality on a population and to make comparisons, where appropriate, among populations. Like the mortality rate, the second type, called premature mortality rate, is also a density measure, but instead of deaths, it is the number of person-years lost in a population before a specified age. In this report mortality rates are emphasized with premature mortality (YLL-75) shown only for the total number of deaths from all causes (general mortality). Premature mortality in detail is the focus of Report Series #1.

A simple count of deaths occurring in an area for a given time interval is useful for identifying potential problems or issues of public concern--particularly if the deaths result from a rare cause or they are believed to be an emerging problem for at-risk socio-demographic groups. In this sense, count data are used for sentinel surveillance. Because counts reveal nothing about the underlying population base from which deaths arise, the analytical or practical utility of count data is limited. The size of the underlying population will have an expected effect on the numbers of deaths that occur. Deaths measured in relation to a population, are an expression of density. When measured over a given interval of time (usually 1 to 5 years), the density is called a rate. (The rate is typically multiplied by 100,000 for ease in interpreting the usually small resultant value.) The mortality rate is an improvement over simple count data because it accounts for the relative size and effect of the underlying population. The chief advantage of the mortality rate is that it is useful for focusing attention on the burden of public health problems more rigorously than simple counts. However, the mortality rate is also affected by the age structure of the population, which can confound interpretation when making comparisons of rates among different areas.

Because aging is the greatest risk factor for death, the age structure of a population will have a substantial effect on the mortality rate. For example, two counties may have similar population sizes but one has a larger number of people over the age of 45 than the other. It is more likely that the older population will generate more deaths over an interval of time and this will be reflected in a higher mortality rate. Differing age structures among populations will confound any comparisons of mortality rates among those populations. Therefore, a method for controlling the effects of age structure on the mortality rate is required if any meaningful comparisons are to be made.

Age-adjustment to control for a population's age structure requires an external reference or standard to weight the comparison populations by age groups. Currently, the US 2000 Standard Million Population (SMP) is used as the external reference. The US 2000 SMP is divided into a number of age groups whose sizes or proportions serve as weights to be applied to the corresponding age groups of the study population. This proportional redistribution generates new numbers of expected deaths in each of the corresponding age groups of the study population. These expected deaths are the number of deaths we would expect if the study population had the same age structure as the US 2000 SMP. The

expected number of deaths are summed and normalized by the total population yielding an age-adjusted death rate. Once the effects of age structure are controlled, the way is paved for making comparisons among populations (Buescher, 1998).

The second measure, premature mortality, focuses on the burden of disease and death expressed in terms of accumulated person years lost before a benchmark age. We use 75 years of age as a benchmark because it approximates current life expectancy at birth in the United States and gives weight to deaths from chronic disease occurring in later life. It considers only deaths of people who die before age 75. To calculate the number of years lost, the mid-point age of the age group to which each decedent belongs is subtracted from 75 and the differences (the lost years) are summed. After all lost years are summed; the result is normalized by the population under age 75 and multiplied by 10,000. Premature mortality is expressed as a rate measured over a time interval, and it can also be age-adjusted.

Age-adjusted rates for both mortality and premature mortality have little intrinsic meaning, however, and can mask the burden and trends of mortality (or health event) that may be of local importance. A casual inspection of adjusted rates may divert attention from the actual health problems of a population and inappropriately guide interventions or resource allocation. Thus, it is important to consider the actual number of deaths (count data) in conjunction with the basic non-adjusted mortality rate first, and then use the adjusted rate only if one wishes to factor out age in understanding the pattern of mortality among populations and regions. For regions with larger populations the statistics presented here are for the year 2009. Smaller areas like counties will usually be aggregated into 5-year intervals (e.g., 2003 to 2007). A five-year interval is used because it provides a useful summary of the mortality experience while minimizing wide year-to-year fluctuations in the rate due to the effect of small numbers.

### **Interpreting the Pie Charts**

Pie charts are provided as a visual representation of the burden of mortality. They depict the proportion of mortality accounted for by each of the leading contributors. (The leading causes of death are found in the table preceding the pie chart section.) The pie charts compare the relative levels of burden and proportions by region and demographic groups. Each regional and demographic set of pie charts is based on the observed mortality rate and the age-adjusted (expected) mortality rate. The area of each pie is based on the age-adjusted mortality rate for the year 2009—larger pie charts will represent larger mortality rates. For purposes of presentation, we set the smallest area of a circle on the lowest meaningful rate as a benchmark, the age-adjusted rate for White females in North Carolina. We then scaled up the circles for all other groups proportionately based on their rates.

The first two pie chart figures compare the proportions of leading causes of death across regions at the national, state, and regional/county level. The first figure in this set compares absolute mortality (the burden) using mortality rates, which sheds light on any differences in the burden of mortality by disease intrinsic to each region. The second figure, which is age-adjusted, allows for direct comparisons among regions. The same pattern is repeated in the following figures that show differences among demographic groups.

While comparing the pie charts, the reader should remember that the slices of the pie show differences in how much of the mortality rate (including age-adjusted) is accounted for by a specific cause. Finally, the reader will see that some pies are composed of different leading causes of mortality, so they have different colored slices. The variable sizes of pie slices demonstrate differences in the mortality patterns across populations and are of significant importance in studying inequalities and disparities in population health.



### Interpreting the Trend Figures

Four types of figures are used to show trends in mortality, for all causes combined, and for each of the ten leading causes in the region/county over a 30-year period. Premature mortality is described for deaths by all causes only. The first of the four types of figures depicts the observed mortality rates for the region/county and state. The second figure type shows age-adjusted mortality rates for the region/county, state, and nation allowing comparisons among geographical areas. The third figure type compares trends in age-adjusted mortality rates by race and gender. Adjustment is made for age structure differences among demographic groups, which permits observation on the effects of race and gender on these groups. The last figure type depicts racial differences (or disparities) expressed as a ratio (in percent) of age-adjusted mortality for non-Whites to the age-adjusted rates for Whites over the 30 year time series. Trend lines provide historical depth to mortality processes and a basis for prediction, future comparisons, and action.

The trend line concept is borrowed from statistical modeling. However, unlike true modeling, we are not assuming the statistical independence of each sequential observation (the rate at time interval  $x$ ). Instead, our assumption is that each observation is dependent to some degree on previous observations, forming a trend. If the degree of dependence is high, then the observations (rates) should lie close to the trend line. If observations appear to bounce around the fitted line in a random fashion (indicating high variability), then there is less dependence and less of a trend in the observations. We use trend lines to uncover any general patterns found in the data for the purpose of assisting the investigator in understanding the underlying processes which generate them.

The equation of the line is derived from a set of observation points. This line is an estimate of where each observed rate would be if the previous observation could predict with 100% accuracy the value of the next observation. In nature, this situation seldom arises and the degree to which individual observations deviate from this linear trend line is an indication of how well they “fit” or conform to the trend. The linear trend lines in the time series figures project expected rates to the year 2020 from known historical values (1979 to 2009) to provide a *general* idea about where mortality trends are heading.

The equation of the line allows the user to calculate an expected or fitted rate for any given year,  $x$ . For example, in figure 6.4 ii the year 2005 is the 6th year in the series, so 6 would be substituted for  $x$  in the equation of the line derived from ENC29’s age-adjusted mortality rate series for a selected cause of death. For chronic lower respiratory diseases (1979 to 2009), the 2005 *expected* or *fitted* age-adjusted rate is calculated to be a little more than 45.5 deaths per 100,000 people. The *observed* age-adjusted rate for 2005 is 48 deaths per 100,000 people. (The observed rates are the values found in the table that runs along the  $x$ -axis of the time series chart.) The numeric difference between the expected and observed rates for 1990 is 2.5—the model (the equation of the line) *underestimates* the observed value by 2.5 deaths. Each previous and subsequent year’s difference between the expected and observed rates will vary to a greater or lesser degree depending on the size of the population under study (see below). This variation can be measured to determine how well the line fits or models the observed data.

In the time series figures, the investigator will find several statistical tools to assist in the analyses of trend lines and fitted rates. These tools include the coefficient of determination, percent change values, and slope coefficients. These tools enable the investigator to form not only a mental picture of the comparative impact of mortality by cause on a region and population but to also gain insight into what the near demographic future holds for them.

Coefficients of determination ( $R^2$ ) are provided to indicate how well the fitted line predicts or explains the observed rates. When variation in the observed rates is relatively high (the fitted trend line does not correspond well to the observed trend line)  $R^2$  approaches 0.0, when the variation

is low,  $R^2$  approaches 1.0. A low  $R^2$  implies low reliability and a larger  $R^2$  indicates that a greater degree of confidence can be placed in the trend line. The trend lines are generally unreliable when  $R^2$  is less than 0.10, moderately reliable when  $R^2$  is between 0.10 and 0.35, and most reliable when  $R^2$  is equal to or greater than 0.35. Graphically, data points, data lines and trend lines are weighted according to their reliability and significance. The thinnest, dashed trend lines are for those where  $R^2$  is less than 0.10 and should be considered not reliable. The thickest dotted lines are used for trends where the  $R^2$  is equal to or greater than 0.35. In some cases, the trend lines do not fit the data well (i.e. small  $R^2$ ). In other words, the presentation of a trend line does not necessarily indicate a linear trend in the data line. In several instances a non-linear trend may be present. It should be noted that the linear trend modeling undertaken here is a major simplification of real world processes. These processes are dynamical in nature and can be modeled and fitted with certain limitations and assumptions. Time series of epidemic infectious disease mortality rates typically exhibit a curvilinear pattern. A marked curvilinear pattern is seen in the mortality series for HIV/AIDS mortality, general cancer mortality, and several others which can be approximated into at least two sequential linear segments. Each segment is joined to another in the sequence at a point in time or year. In this series (#2), we begin to explore alternative methods for examining trends that show discontinuities and reversals within the set of time series observations, particularly within the mortality time series for HIV/AIDS.

Percent change provides a measure of the estimated change in mortality over the most recent ten year period (1999-2009). The percent value is followed by the term increase or decrease to help denote the direction of the overall trend. This information is in boldface and included with the  $R^2$  value and the equation of the line. Percent change and the direction of that change is provided on the graphs for trends where  $R^2$  is greater than 0.10.

Another tool is the equation of the line that fits a trend among the observed data point (the rates). The slope coefficient of this equation,  $b$ , is the estimated/expected number of deaths per unit of time ( $x$ ) or the *rate of change* in deaths per annum. The direction of change is indicated with a negative sign preceding the  $b$  and if positive,  $b$  is unsigned. Visually, a negative slope shows a trend decreasing in annual rates from left to right and a positive slope will be rising (increasing) from left to right. An examination of the different slopes for regional or demographic group trends will quickly reveal that they are not equal. Visual inspection combined with slope coefficients also provides a means for making comparisons between any two trend line series in the time series figure. Trends will *diverge*, *converge*, or run *parallel* with one another indicating, respectively, increasing separation, decreasing separation, or very little change in rates between two trend lines. Setting two equations of the line equal to one another can yield an estimated year of convergence in the future (or the year the two trends diverged in the past). However, the investigator is cautioned to not put too much stock in the results if the forward or backward projections are very distant in time, especially when  $R^2$  is low. Recent (or temporally adjacent) short term trends with good correspondence between the fitted trend line and observed trend line will be better indicators of rates in the near future or past (if historical rates are unknown).

The final tool is the pair of comparison tables located in the lower portion of the page. The tables, found in every time series figure (except the ones showing comparisons by race and disparity) are structured so that the reader can make comparisons of rates derived from the equation of the line (i.e., the fitted rates) among all regions or demographic groups portrayed in the figure. The 1999 and 2009 tables compare the fitted rates calculated for the beginning and end of the observed time series in terms of percent difference. Returning to figure 6.4 ii, ENC29's age-adjusted fitted rate for chronic lower respiratory diseases in 1999 is 10% greater than (GT) RNC's fitted rate. In 2009, ENC29's fitted rate is 11% less than (LT) RNC's fitted rate. The tables permit a quick assessment of trends calculated from observed time series data.

The reader should notice that some data lines in the trend figures fluctuate widely. This fluctuation is due to two main factors. In a small population, the number of deaths may vary widely from year-to-year and lead to large changes in annual mortality and premature mortality rates, a phenomenon known as the *effect of small numbers*. In addition, because mortality is based on the age of death, any fluctuation in the

distribution of deaths across age groups from year-to-year can cause rates to change dramatically. Both the number of deaths and the age of decedents influence trends in mortality. The reader should evaluate all available data carefully before drawing conclusions about current, past and future mortality patterns.

### **Caveats about the Concepts of Race, Gender, and Geography**

Several caveats are offered about the concepts of race, gender, and geography as they apply to the analysis of mortality patterns. While we do intend to bring attention to the stark racial inequalities in mortality across North Carolina, we do not mean to imply that this is a biological phenomenon. Other factors such as differences in socioeconomic status, educational attainment, occupation, and lifestyle probably account for the large racial gaps in mortality rates. Likewise, gender inequalities may have less to do with biological differences between men and women than with socially structured gender roles, health behaviors, occupational exposures, and use of health services. Finally, it is important to consider that county borders may not always be the most appropriate way to look at specific health problems. Few of our health care problems begin or end at political boundary lines and many of our health problems in North Carolina are common to large groups of counties. Counties and larger regions composed of counties are convenient units of data collection and readers should not jump to conclusions about health problems or possible solutions based solely on the way data appear when aggregated to this level. In some cases, data at multi-county, zip code, or minor civil division levels are a better way to understand problems and solutions. Similarly, consideration needs to be given to whether or not a county is characterized as rural or urban, as this can be an indication to the level of development and amount of resources available in a county.

### **General References**

Fastrup, J., Vinkenness, M., & O'Dell, M. (1996). *Public Health: A Health Status Indicator for Targeting Federal Aid to States*. Washington, DC: US General Accounting Office.

North Carolina Institute of Medicine. *Healthy North Carolina 2020: a Better State of Health*.

United States Department of Health and Human Services. *Healthy People 2020*. [www.healthypeople.gov](http://www.healthypeople.gov).

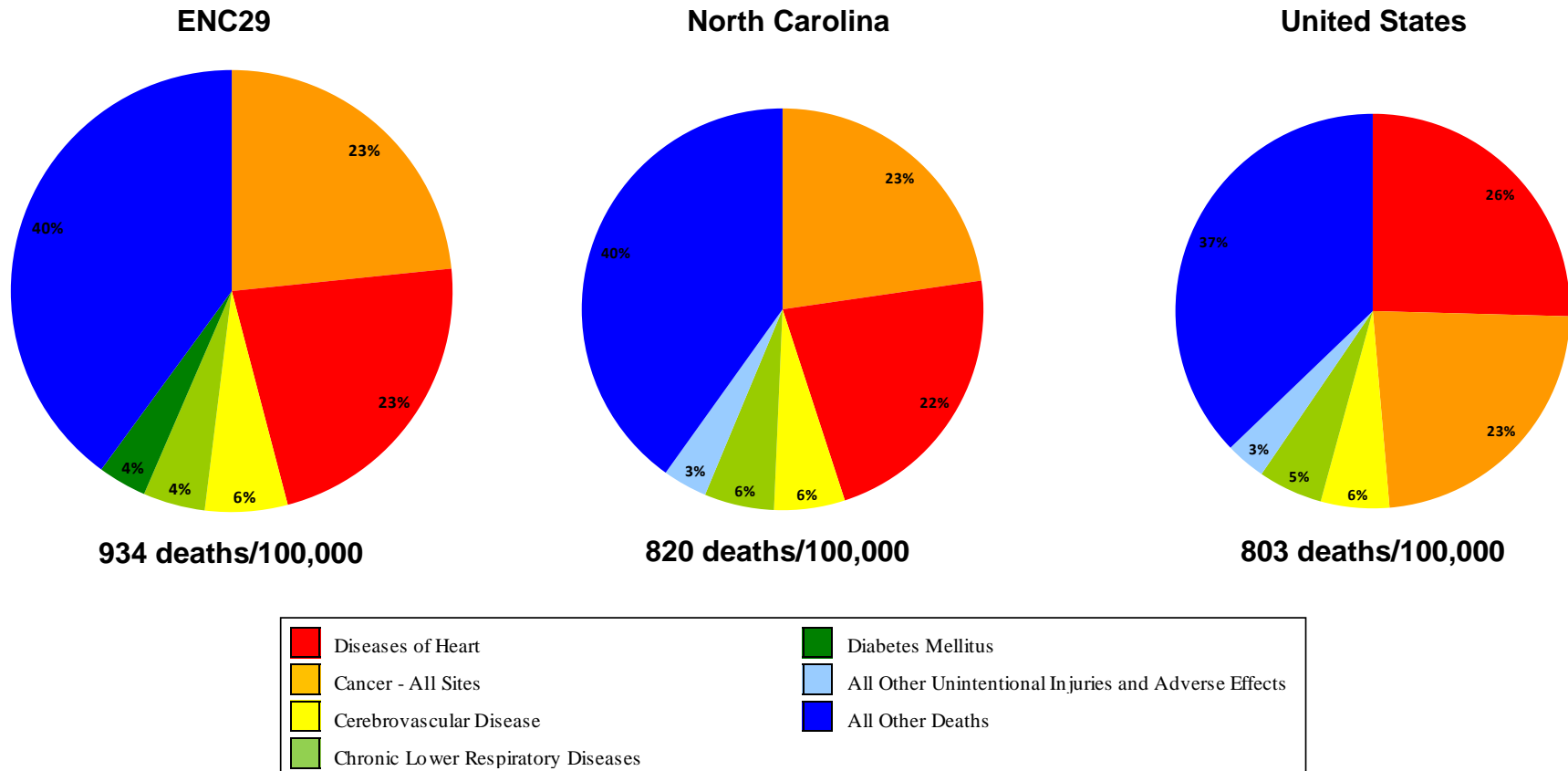
### **Cited References**

Buescher, P. A. (1998). *Age-adjusted death rates (13th ed.)*. Raleigh, North Carolina: North Carolina Center for Health Statistics.



## 4. Current Disparities in Mortality by Geography, Race and Gender, and Race: Total and Five Leading Causes of Death

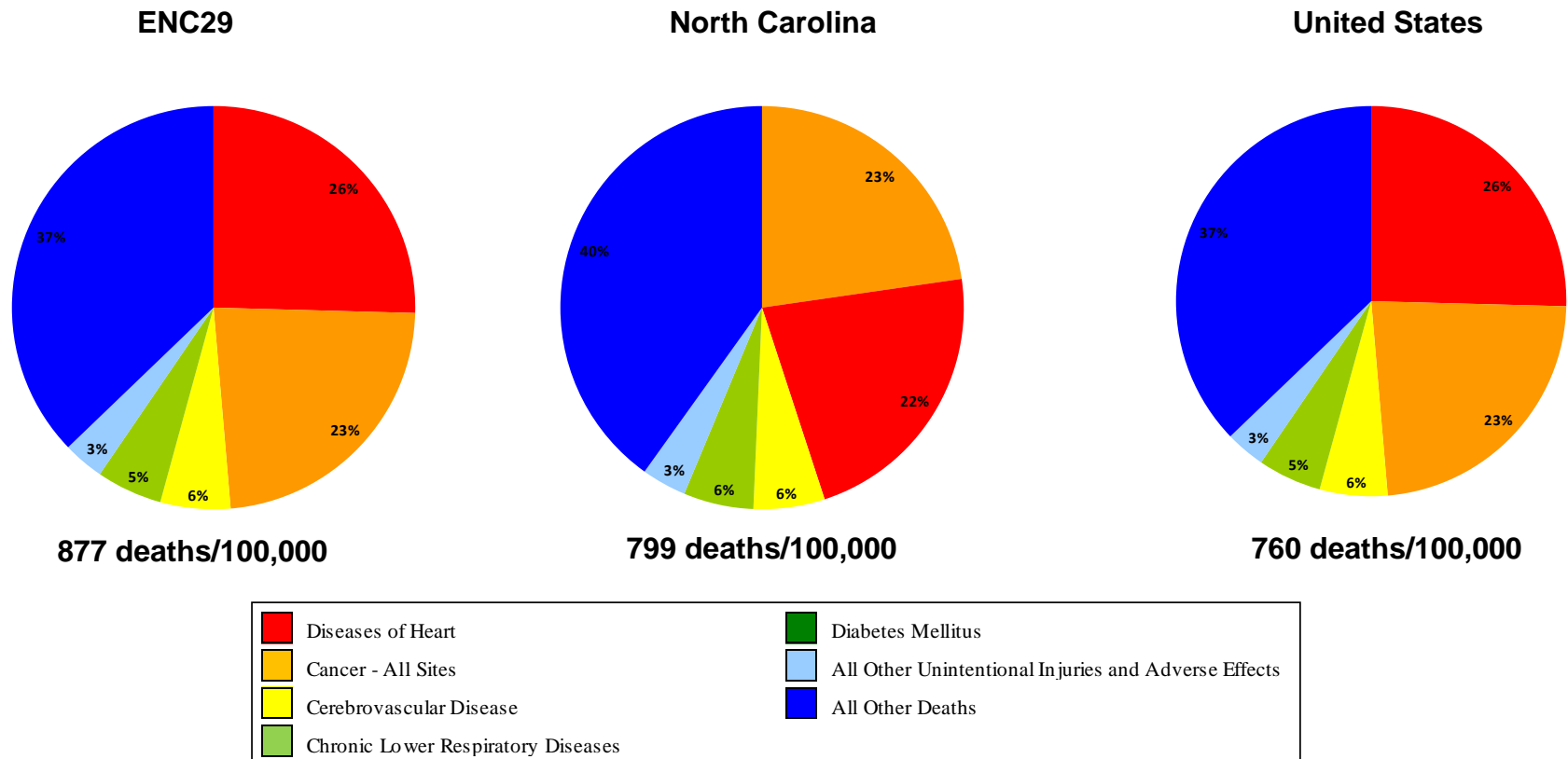
Figure 4.1 i. General leading causes of death for ENC29 (2009), NC (2009), and US (2007). Mortality rate per 100,000 population.



2009 NC rate is 2% higher than 2007 US rate

Pie Charts are Proportionately scaled using the state age-adjusted mortality rate of white females (690 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.1 ii. General leading causes of death for ENC29 (2009), NC (2009), and US (2007). Age-adjusted mortality rate per 100,000 population.

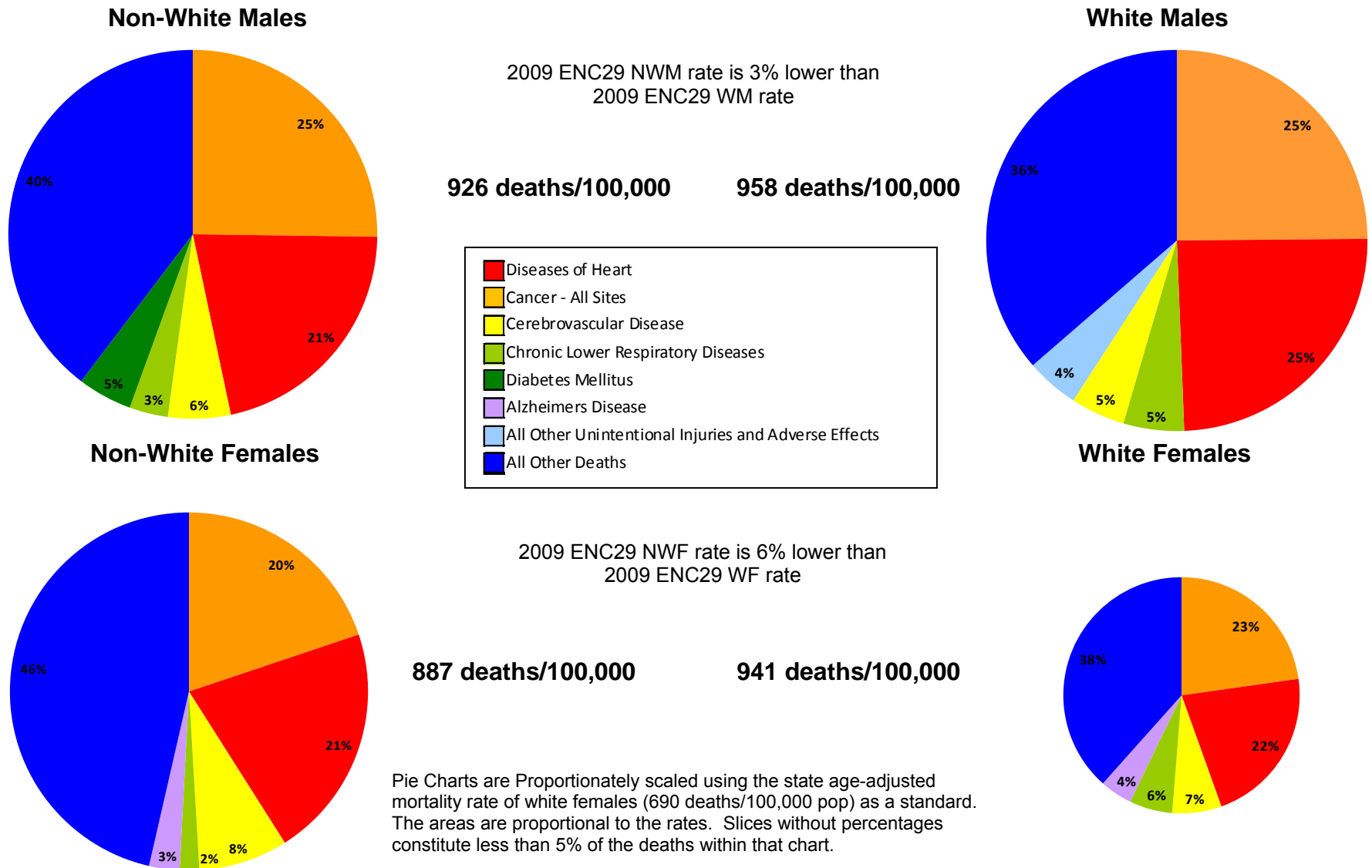


2009 NC age-adjusted rate is 5% higher than 2007 US age-adjusted rate

Pie Charts are Proportionately scaled using the state age-adjusted mortality rate of white females (690 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.



Figure 4.2 i. General leading causes of death for ENC29 (2009) by race and gender. Mortality rate per 100,000 population.



Pie Charts are Proportionately scaled using the state age-adjusted mortality rate of white females (690 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.2 ii. General leading causes of death for ENC29 (2009) by race and gender. Age-adjusted mortality rate per 100,000 population.

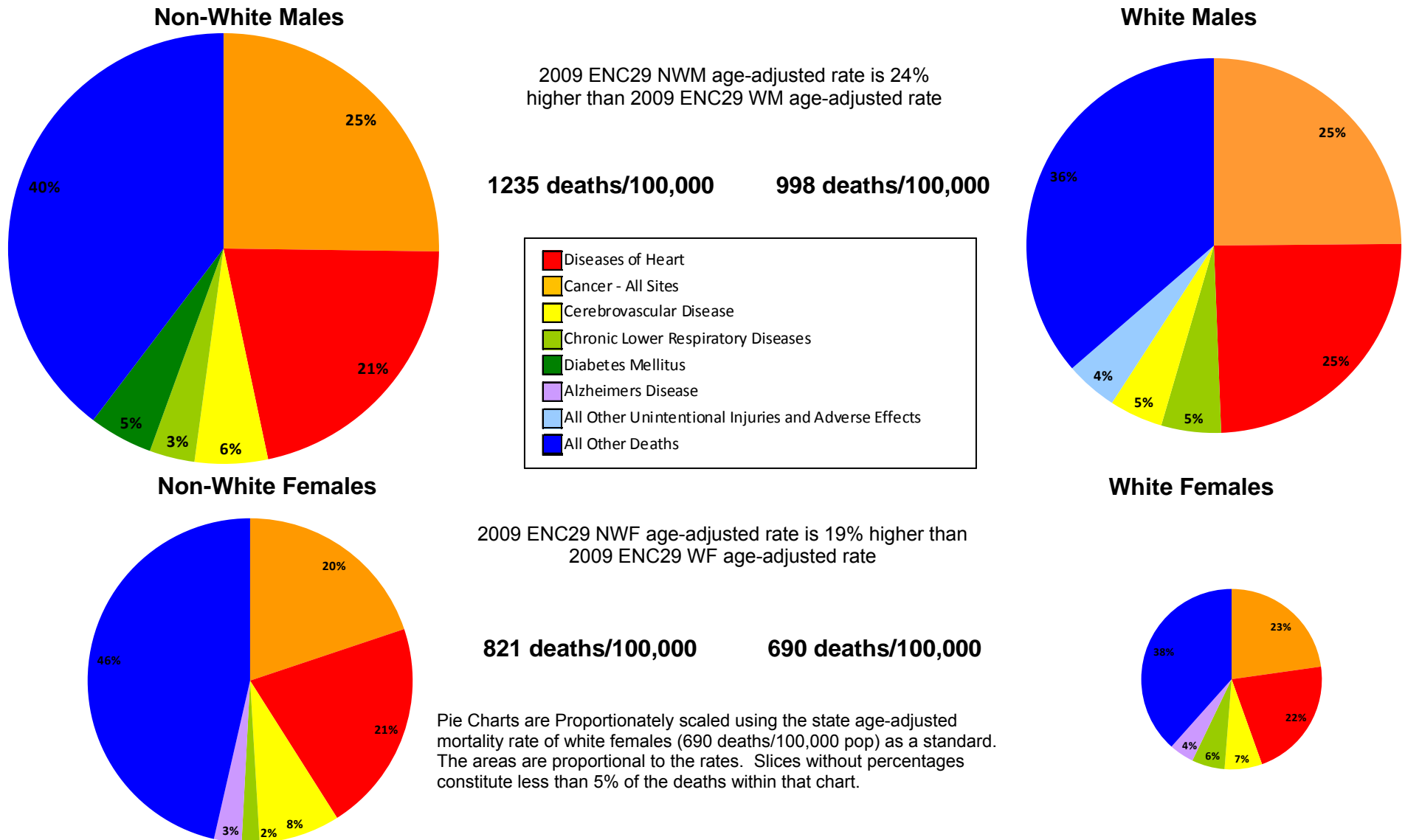
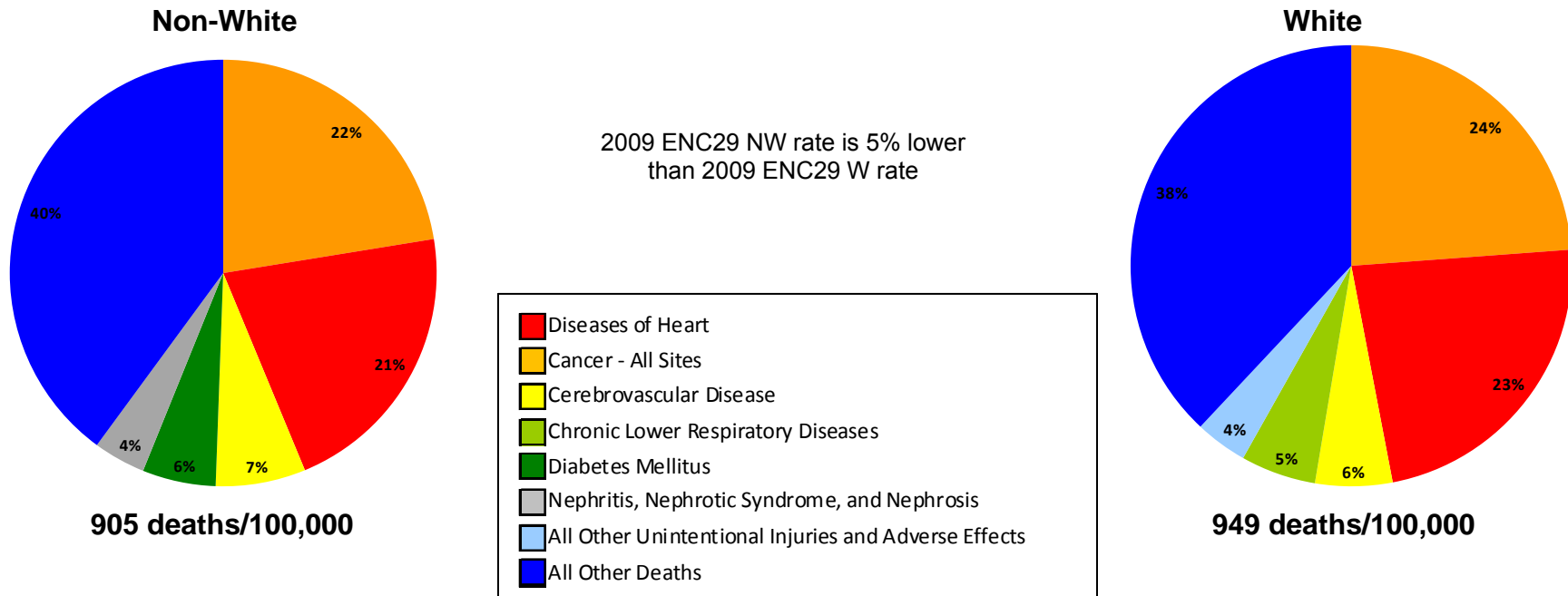
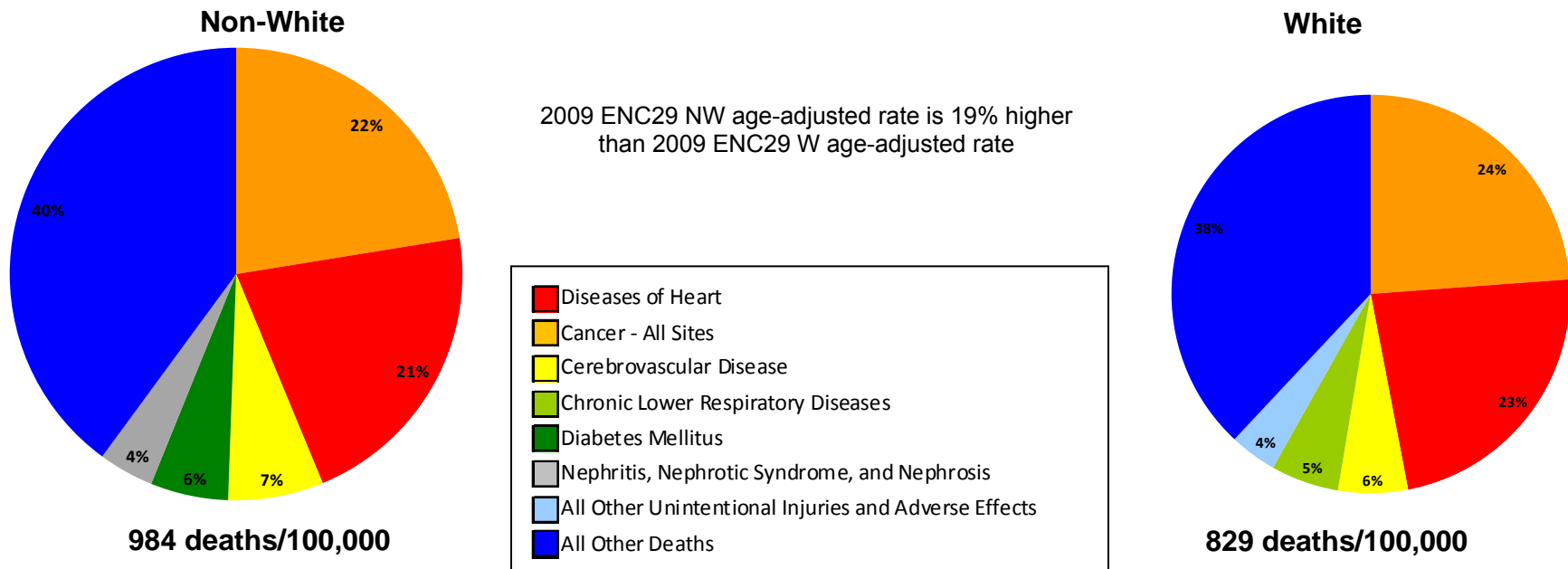


Figure 4.3 i. General leading causes of death for ENC29 (2009) by race. Mortality rate per 100,000 population.



Pie Charts are Proportionately scaled using the state age-adjusted mortality rate of white females (690 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.3 ii. General leading causes of death for ENC29 (2009) by race. Age-adjusted mortality rate per 100,000 population.



Pie Charts are Proportionately scaled using the state age-adjusted mortality rate of white females (690 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.



5. Trends and Disparities in Mortality  
in ENC29:  
All Causes of Death and  
All Causes of Premature Mortality;  
1979-2009

# All Causes of Death

- While the 30-year ENC trend line shows all-cause mortality rates are increasing and diverging from RNC and NC trends, the 10-year trend line shows that all three trends have been decreasing. The ENC all-cause mortality rates are still diverging slightly from RNC and NC 10-year trends.
- The age-adjusted, all-cause mortality rates are decreasing for all four 30-year trends, with ENC remaining above the rest. The 10-year trends suggest convergence of ENC and RNC and NC in the future.
- The non-White male mortality rate remains higher than other demographic groups, although convergence in the future is suggested.
- The non-White mortality rate remains 19% higher than the White rate in 2009 but the 10-year trends suggest convergence in the future, as both are decreasing.
- The 10-year trend for racial disparity shows a 31% decrease in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 5.1 i. All Causes of Death:  
Trends in mortality rates for ENC29, RNC71, and NC  
1979-2009 with projections to 2020

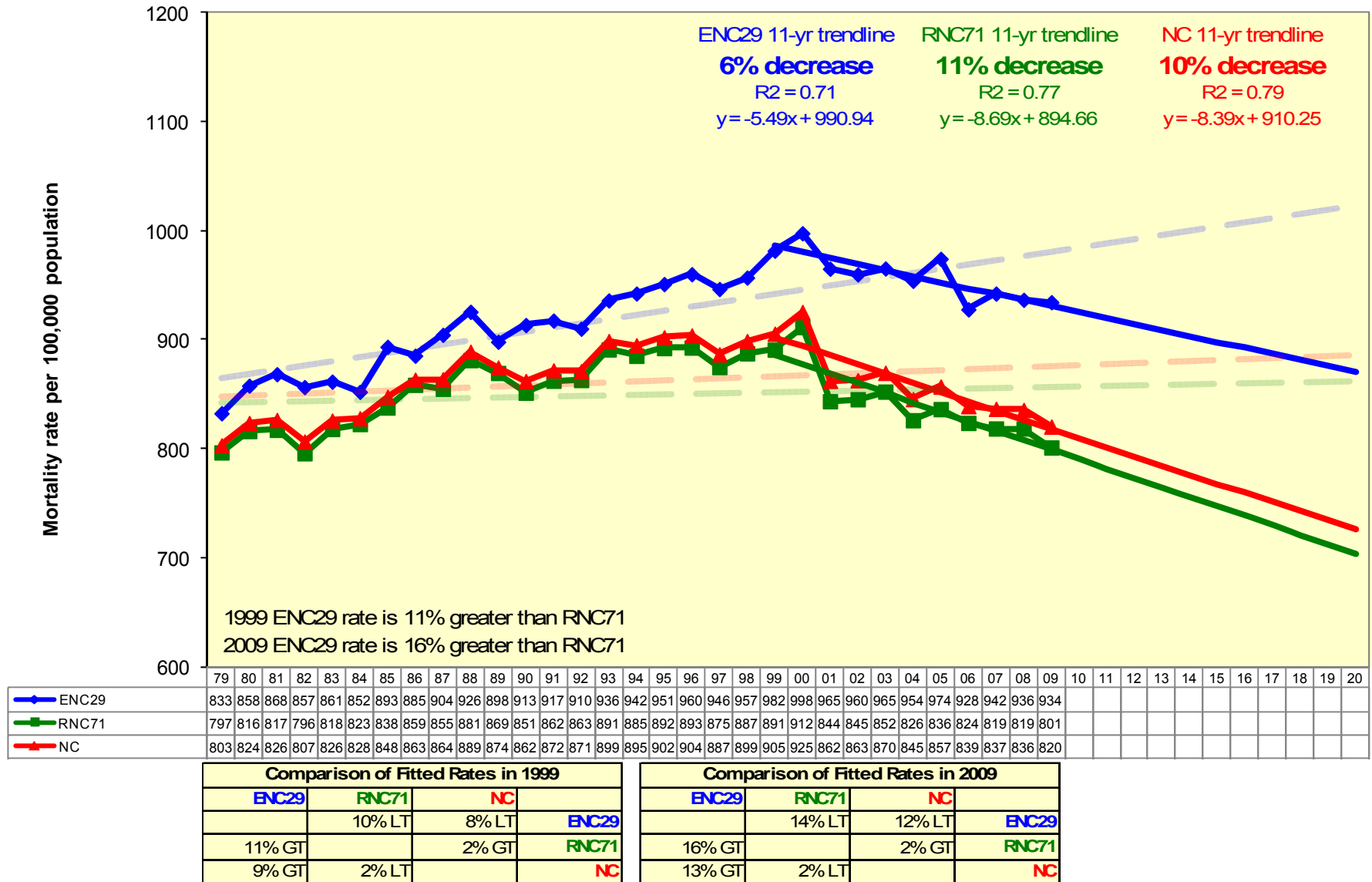




Figure 5.1 ii. All Causes of Death:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

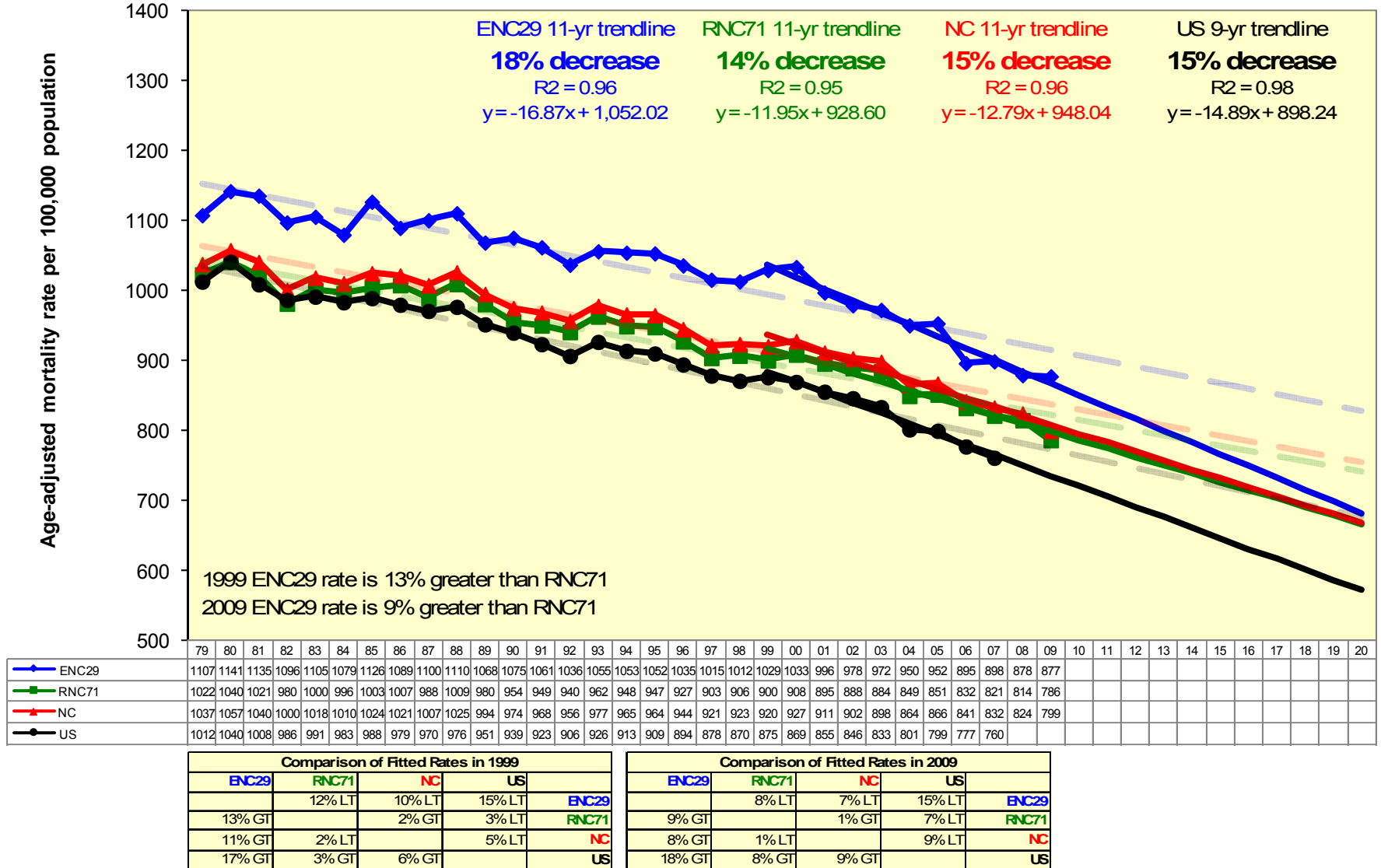


Figure 5.1 iii. All Causes of Death:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

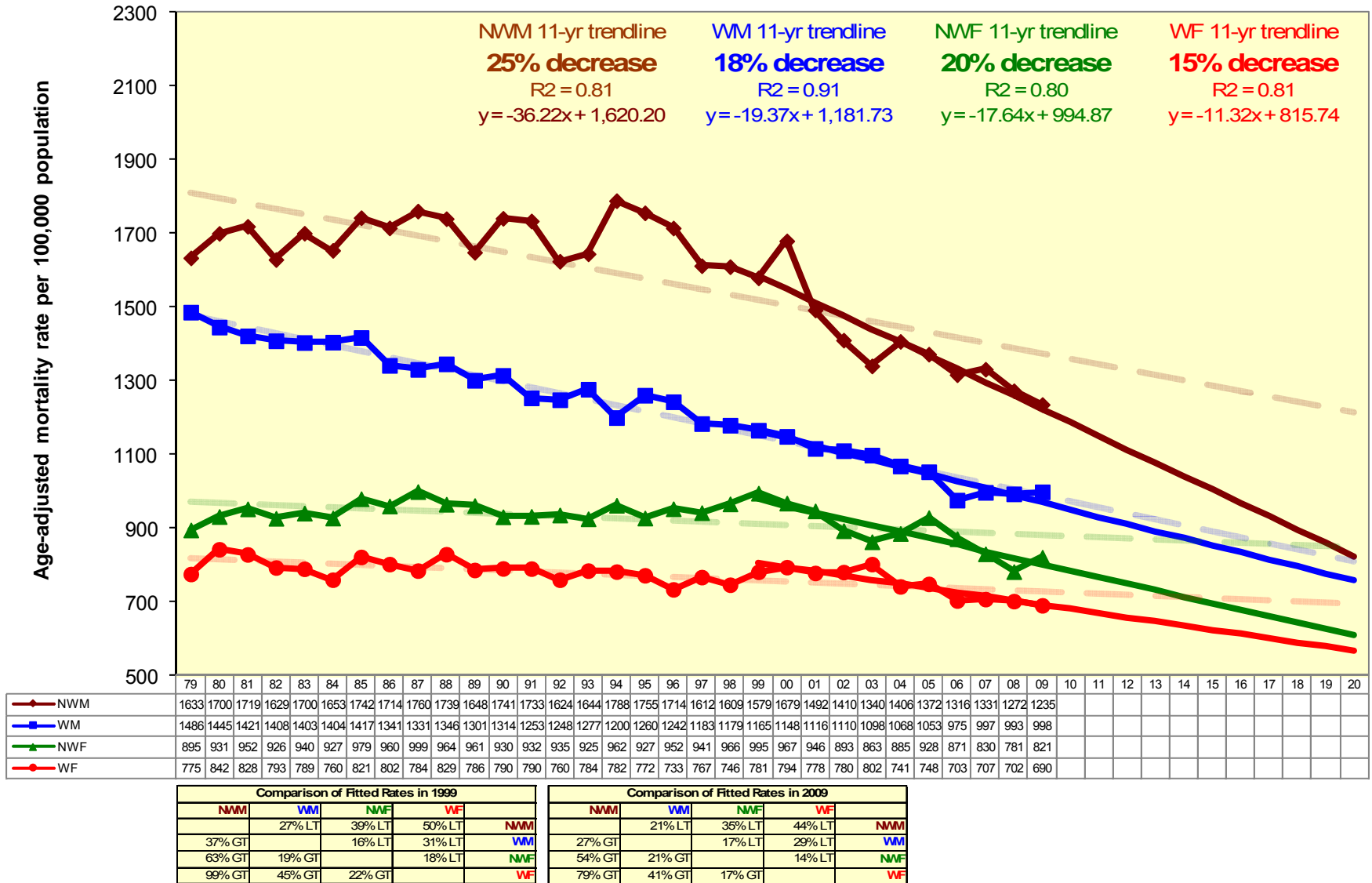


Figure 5.1 iv. All Causes of Death:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

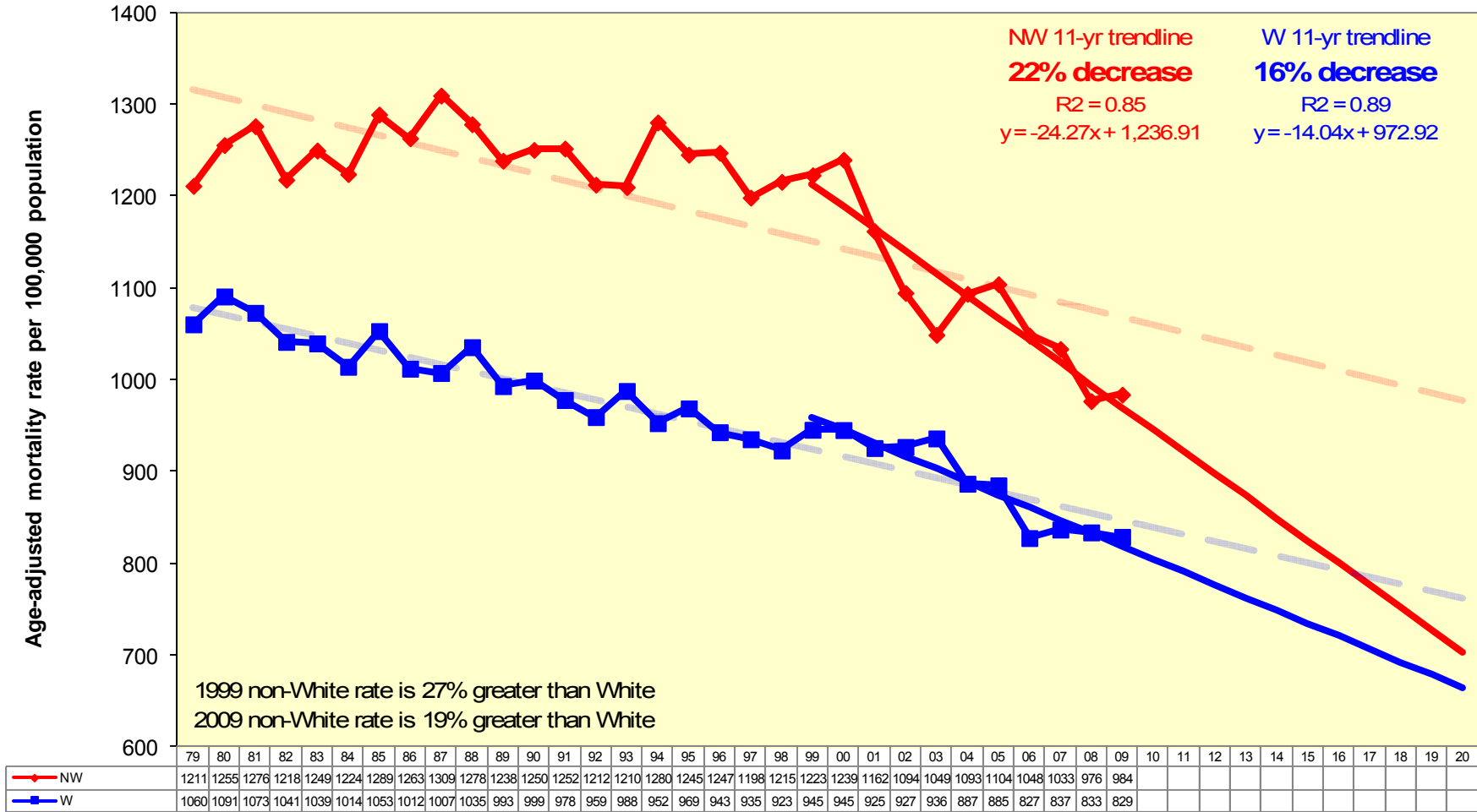
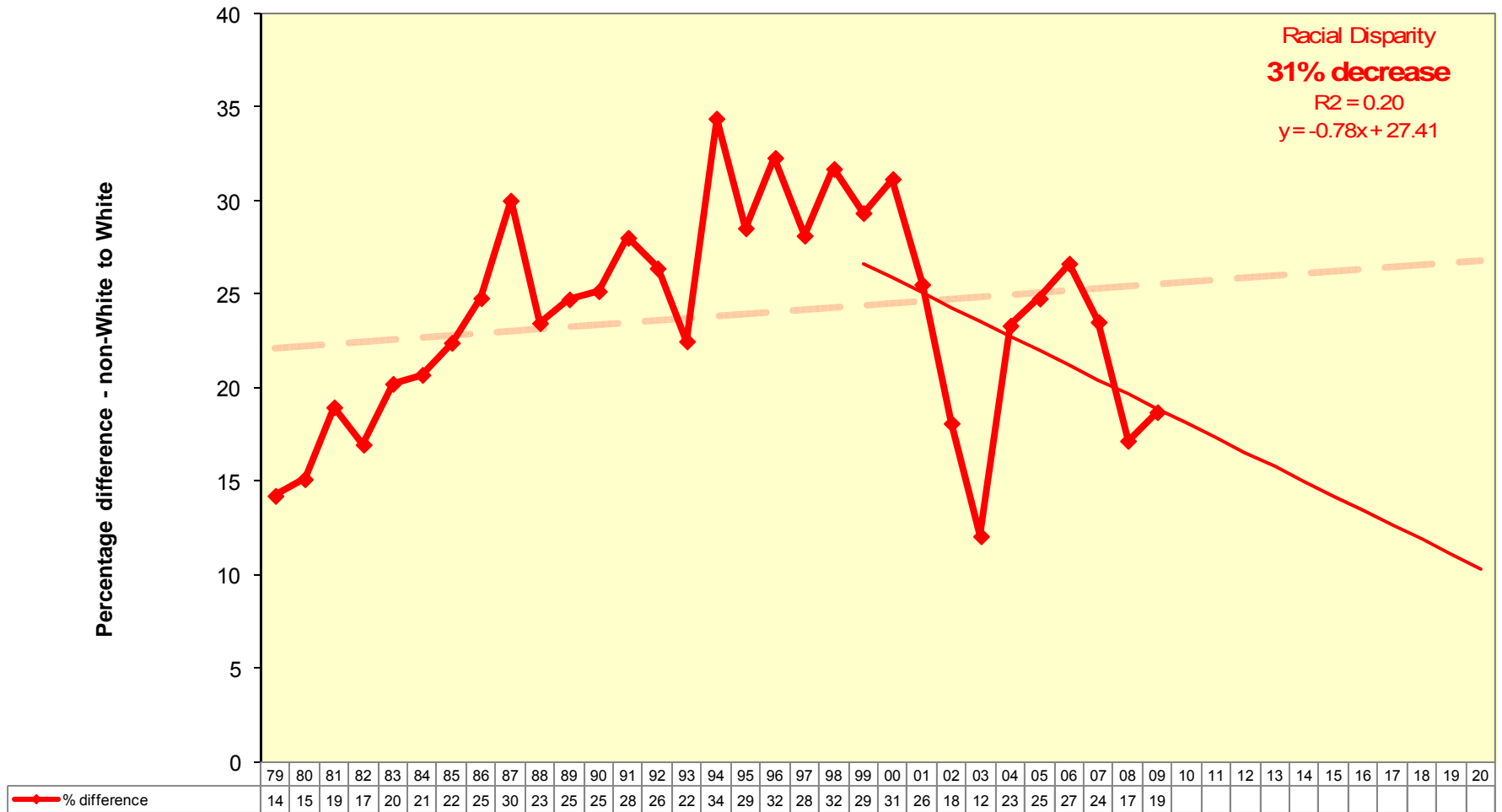


Figure 5.1 v. All Causes of Death:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1979-2009 with projections to 2020

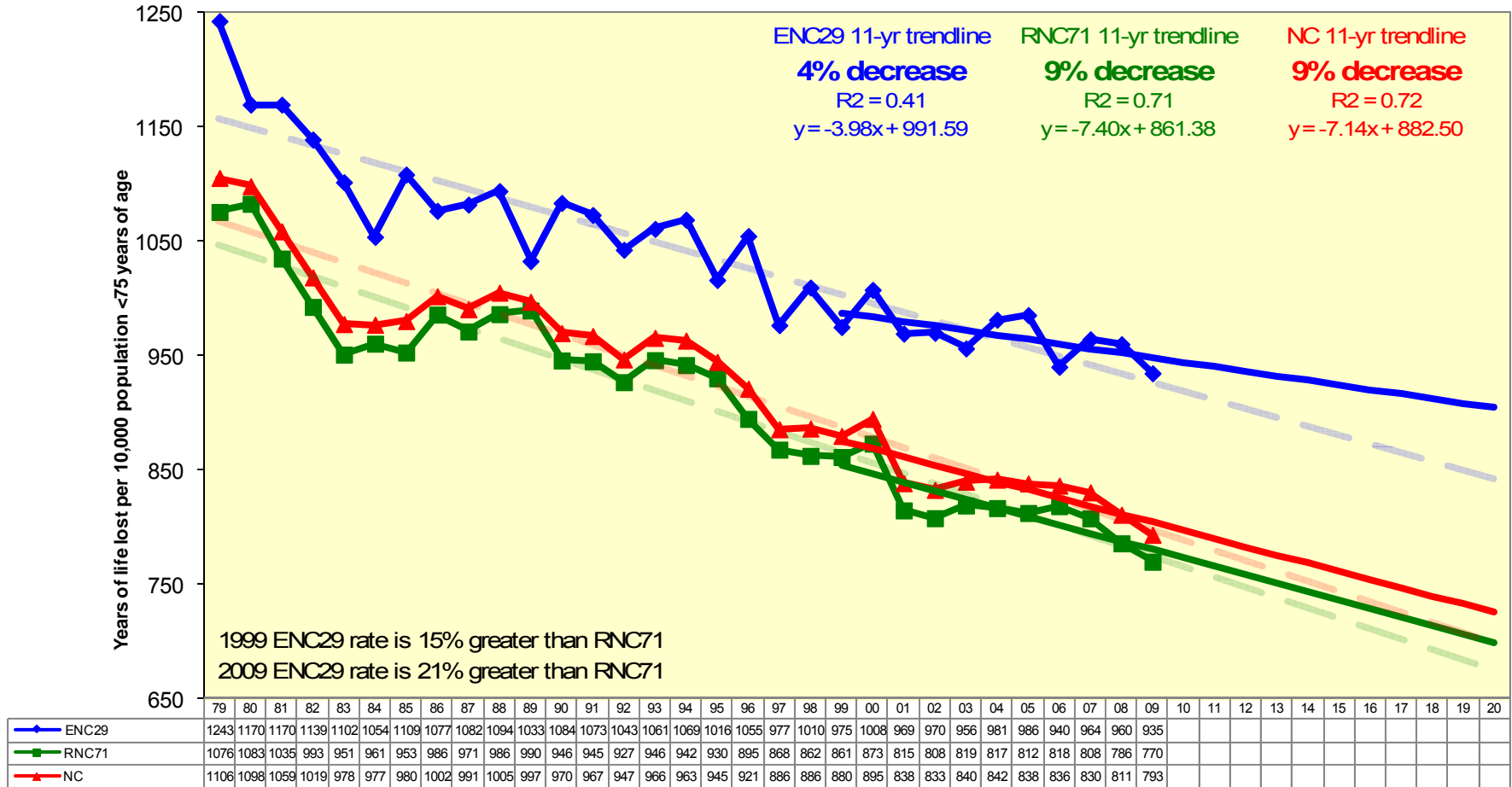


# All Causes of Premature Mortality

- ENC's premature mortality rate has decreased by 4% since 1999. However, this trend is diverging from both RNC and NC, which have both decreased by 9% since 1999.
- The age-adjusted premature mortality trend for ENC continues to decrease. The rate of decrease is slower than RNC and NC but surpasses the US. ENC remains 20% greater than RNC in 2009.
- The non-White male rates of premature mortality are significantly higher than other demographic groups but also have the greatest rate of decrease (slope of trend). White females have the lowest rate of premature mortality.
- The non-White rate remains 53% greater than the White rate but is decreasing at a rate of 20% in the 10-year trend compared to 3% for the White 10-year trend.
- The 10-year trend for racial disparity shows a 38% decrease in a reliable trend.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

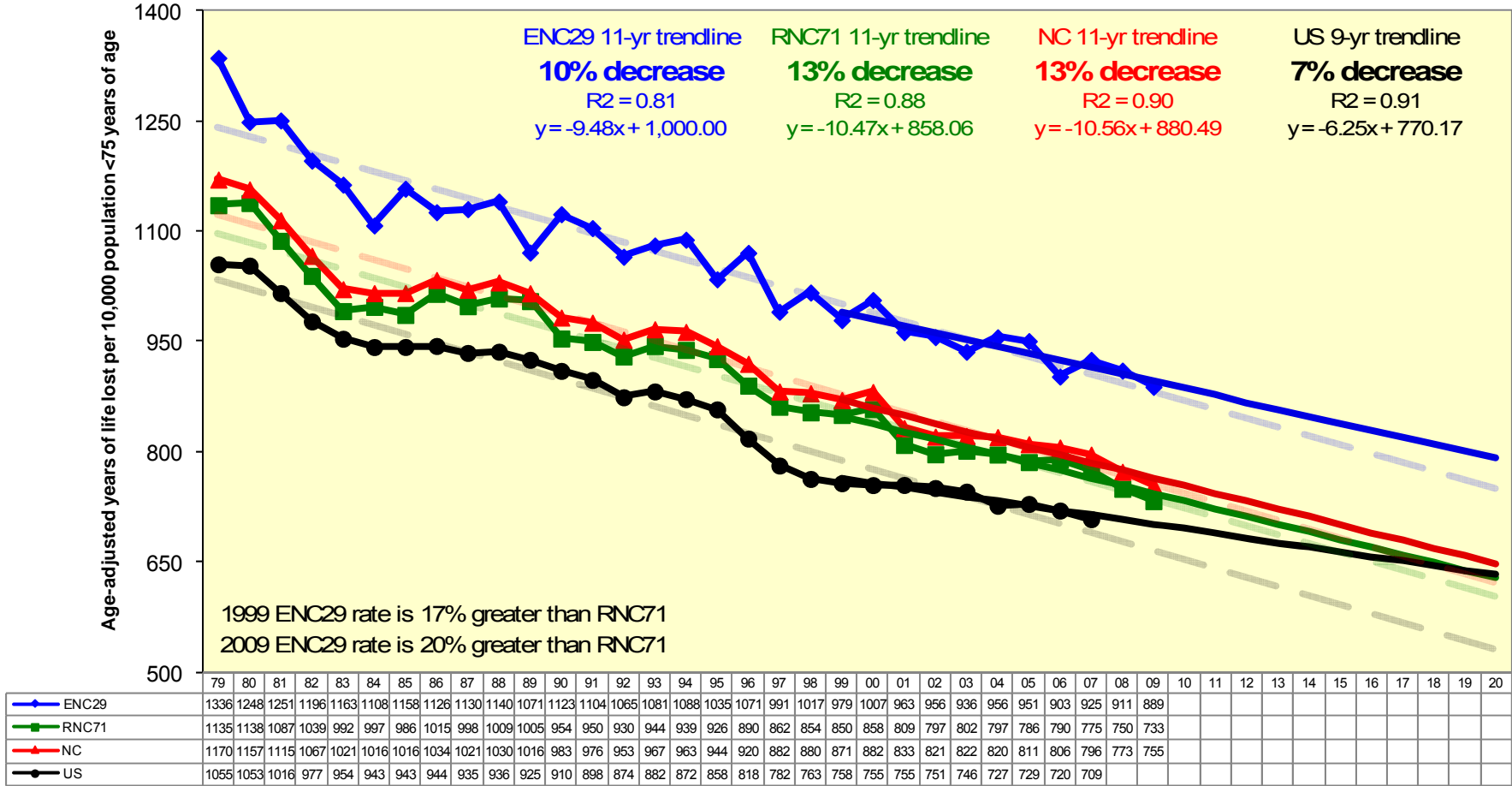
Figure 5.2 i. All Causes of Premature Mortality:  
Trends in premature mortality rates for ENC29, RNC71, and NC, 1979-2009 with projections to 2020



Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	
	13% LT	11% LT	ENC29
15% GT		2% GT	RNC71
12% GT	2% LT		NC

Comparison of Fitted Rates in 2009			
ENC29	RNC71	NC	
	17% LT	15% LT	ENC29
21% GT		3% GT	RNC71
17% GT	3% LT		NC

Figure 5.2 ii. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates for ENC29, RNC71, NC, and US, 1979-2009 with projections to 2020



Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	US
	14% LT	12% LT	23% LT
17% GT		3% GT	10% LT
14% GT	3% LT		13% LT
30% GT	11% GT	14% GT	

Comparison of Fitted Rates in 2009			
ENC29	RNC71	NC	US
	17% LT	14% LT	22% LT
20% GT		3% GT	6% LT
17% GT	3% LT		9% LT
28% GT	6% GT	9% GT	

Figure 5.2 iii. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

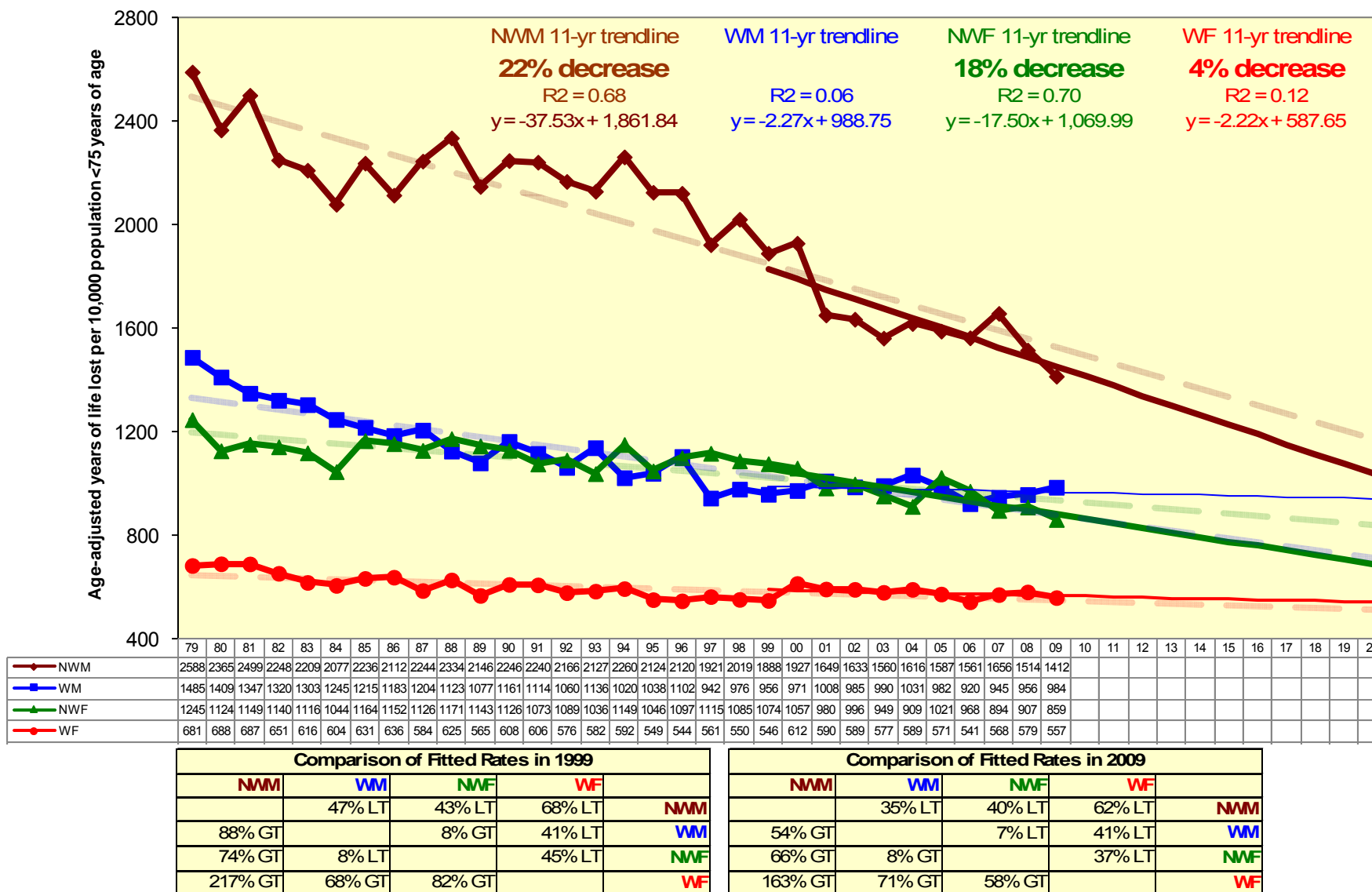




Figure 5.2 iv. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates by race for ENC29,  
1979-2009 with projections to 2020

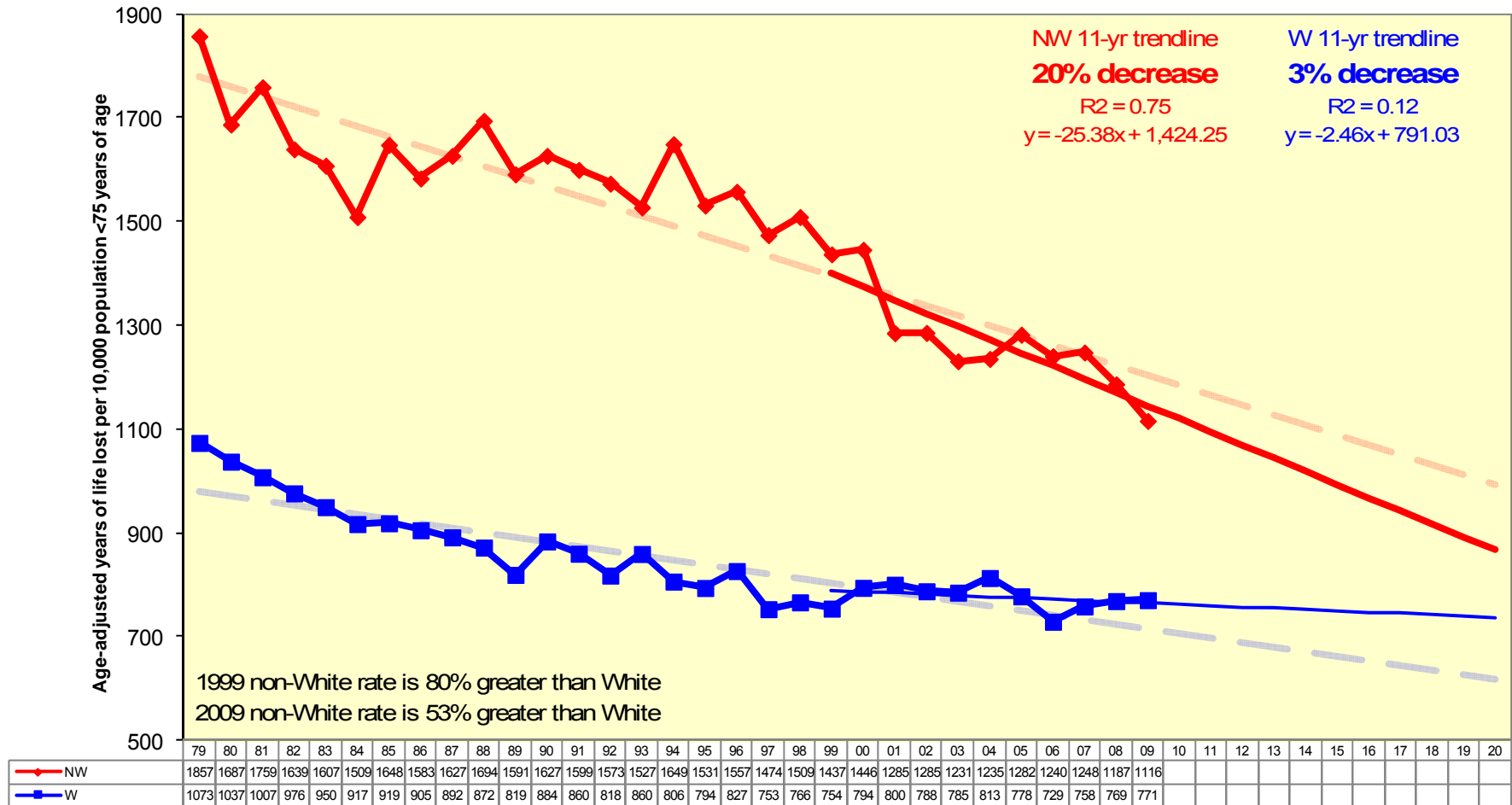
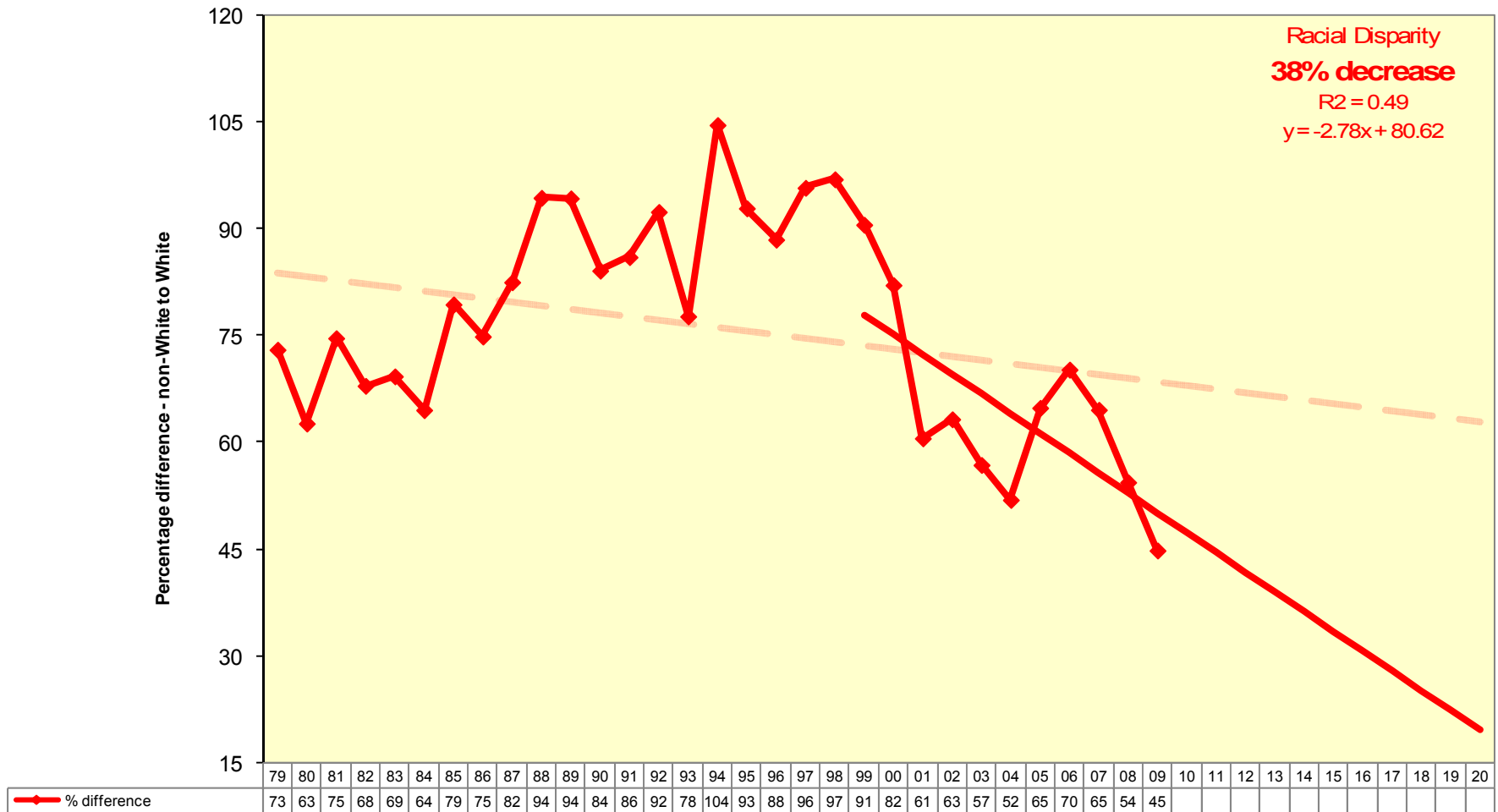


Figure 5.2 v. All Causes of Premature Mortality:  
 Measuring disparity in age-adjusted premature mortality rates by race for ENC29,  
 1979-2009 with projections to 2020





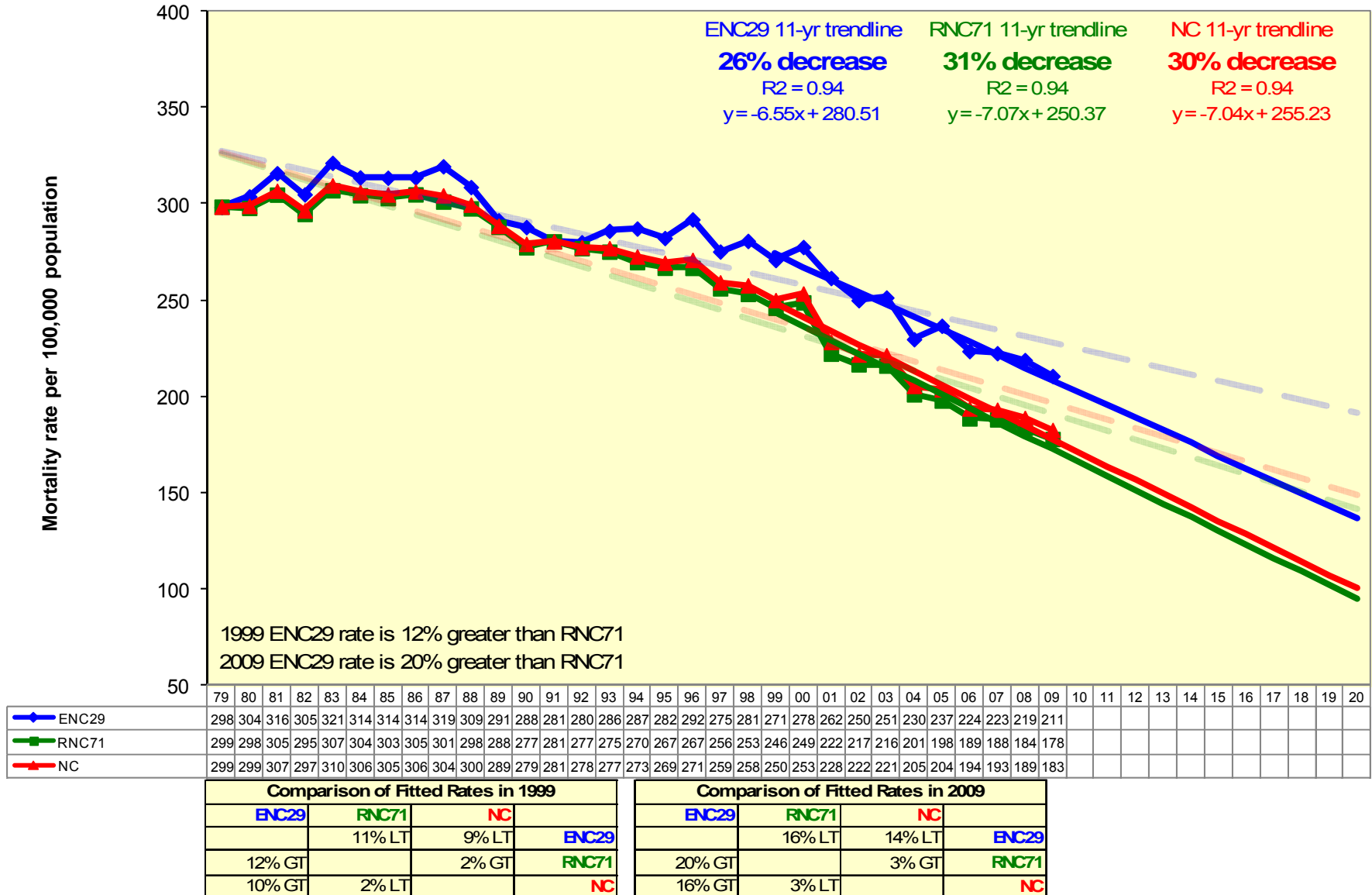
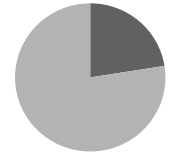
## 6. Trends and Disparities in Mortality in ENC29: Ten Specific Leading Causes of Death, 1979-2009

## Diseases of Heart

- Based on the 10 year trend line, ENC's heart disease mortality rate is decreasing, but not as quickly as RNC and NC, resulting in an increased geographical disparity. In 1999, ENC's rate was 11% greater than RNC; by 2009, the disparity between the two was 20%.
- ENC's age-adjusted mortality rate is decreasing a bit more quickly than RNC, NC and the US. The ENC rate was 12% greater than RNC in 2009 and convergence in the future appears likely.
- The trend for males, both non-White and White, are converging with those of non-White and White females. Non-White males continue to have the highest rate for all demographic groups.
- The 10-year trend lines by race show an estimated 36% decrease in heart disease mortality rates for both Whites and non-Whites.
- The 10-year increasing trend line for racial disparity is unreliable.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.1 i. Diseases of Heart:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020



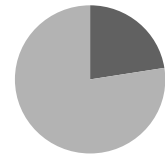
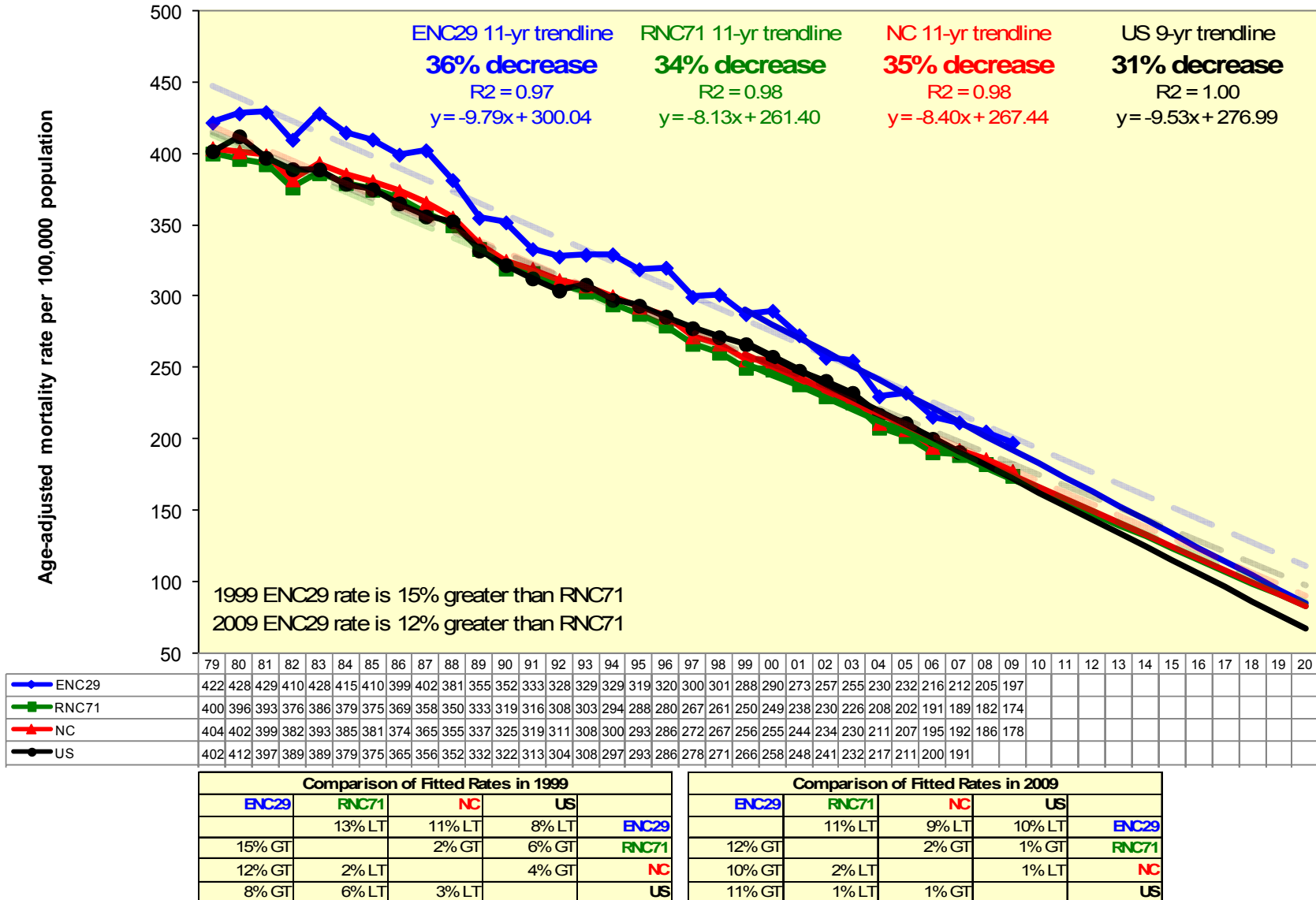


Figure 6.1 ii. Diseases of Heart:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2009 with projections to 2020



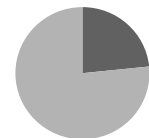
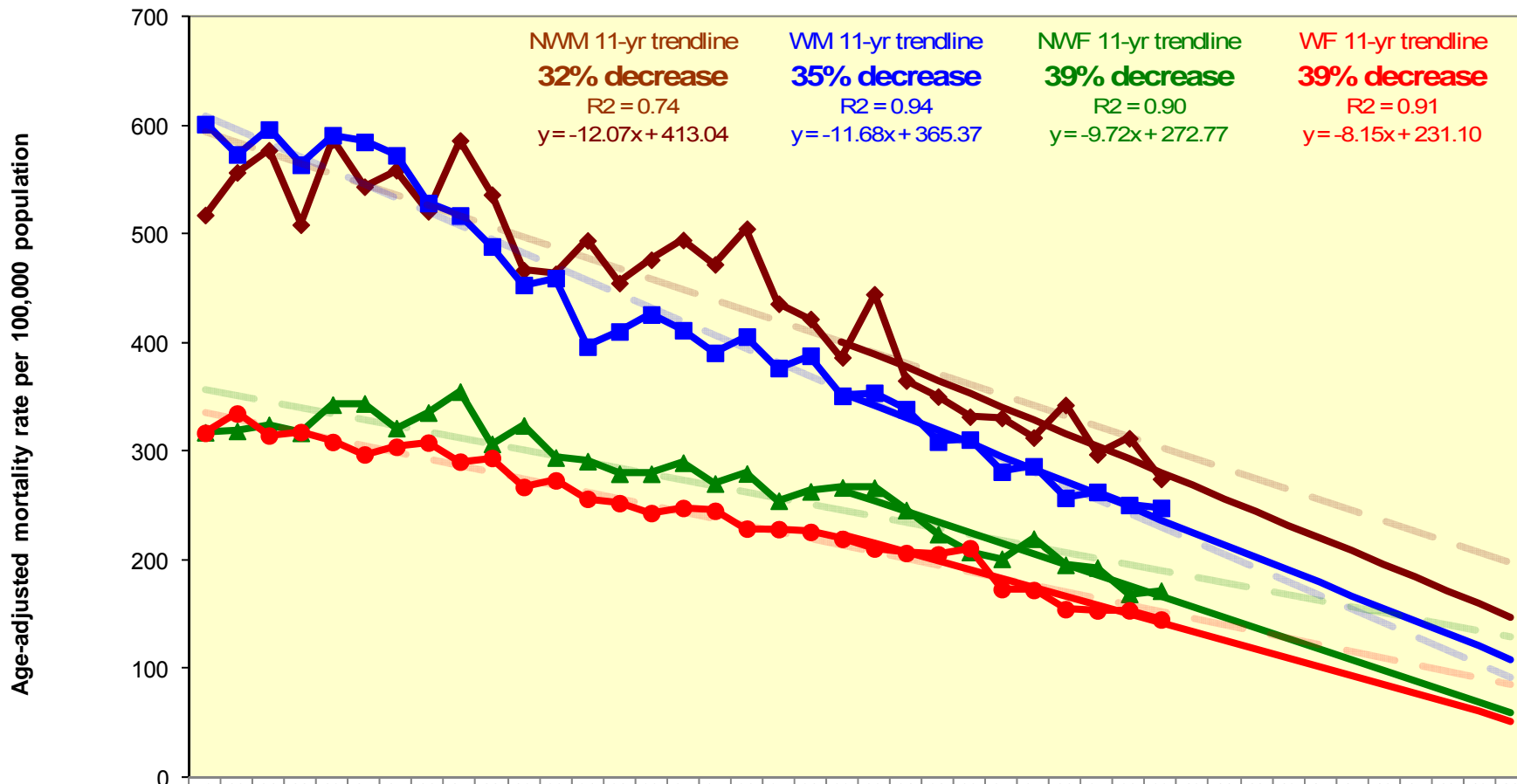


Figure 6.1 iii. Diseases of Heart:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020



	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20				
NWM	517	557	577	508	587	543	559	521	586	536	467	463	494	455	476	494	472	505	436	422	386	444	365	350	332	331	313	343	297	312	275															
WM	601	573	596	564	591	585	572	528	517	488	453	459	396	410	426	411	391	405	377	388	351	354	339	309	311	281	286	257	263	251	248															
NWF	317	319	324	317	343	344	321	336	355	307	324	294	291	279	279	289	270	279	254	263	267	266	246	224	207	201	219	195	193	169	172															
WF	317	335	314	318	309	297	304	308	290	294	267	273	256	252	243	248	245	229	228	226	219	210	206	205	211	173	172	155	153	154	145															

Comparison of Fitted Rates in 1999				Comparison of Fitted Rates in 2009			
NWM	WM	NWF	WF	NWM	WM	NWF	WF
	12% LT	34% LT	44% LT	15% LT	40% LT	49% LT	NWM
13% GT		25% LT	37% LT	18% GT		29% LT	40% LT
51% GT	34% GT		15% LT	67% GT	42% GT		15% LT
79% GT	58% GT	18% GT		95% GT	66% GT	17% GT	



Figure 6.1 iv. Diseases of Heart:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

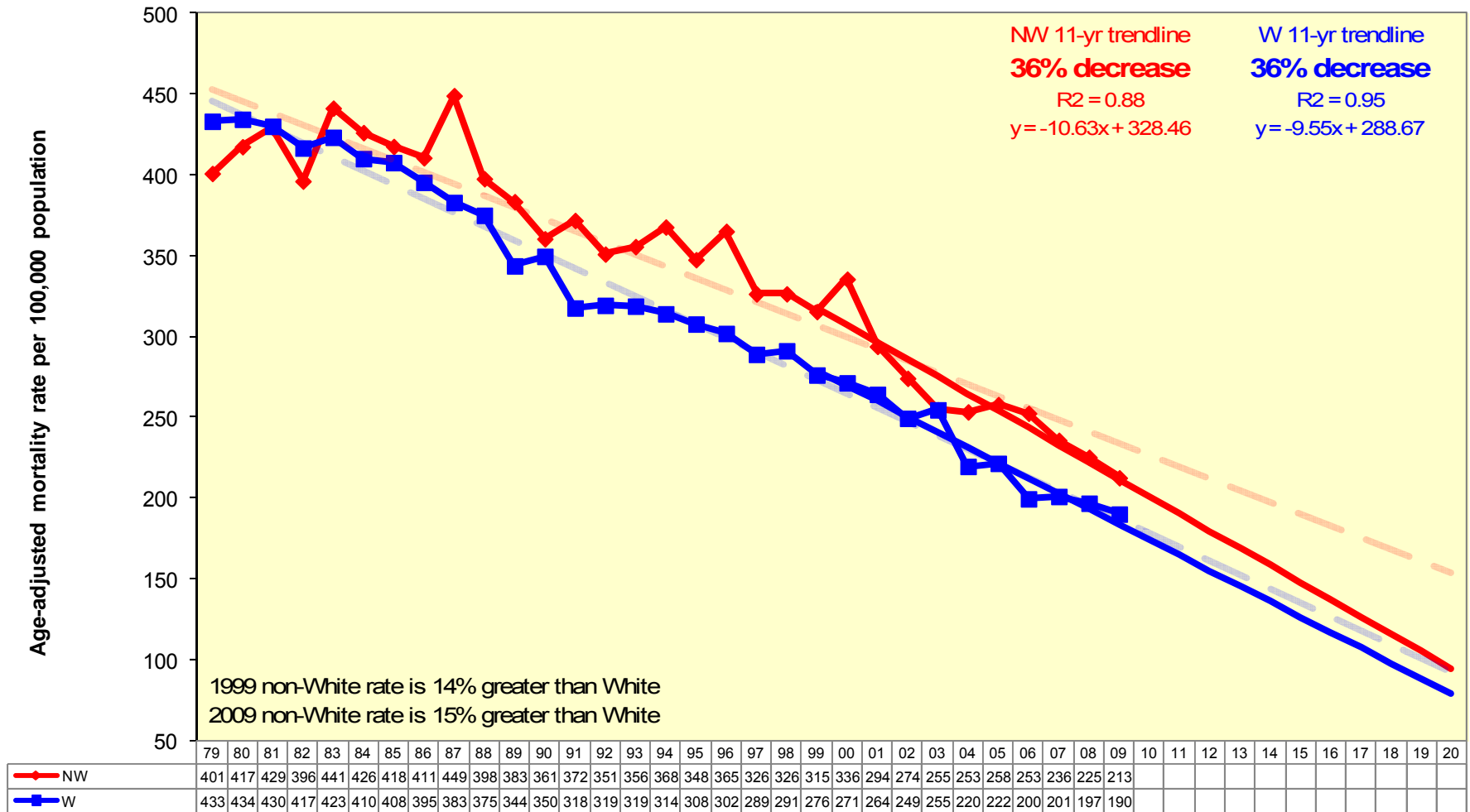
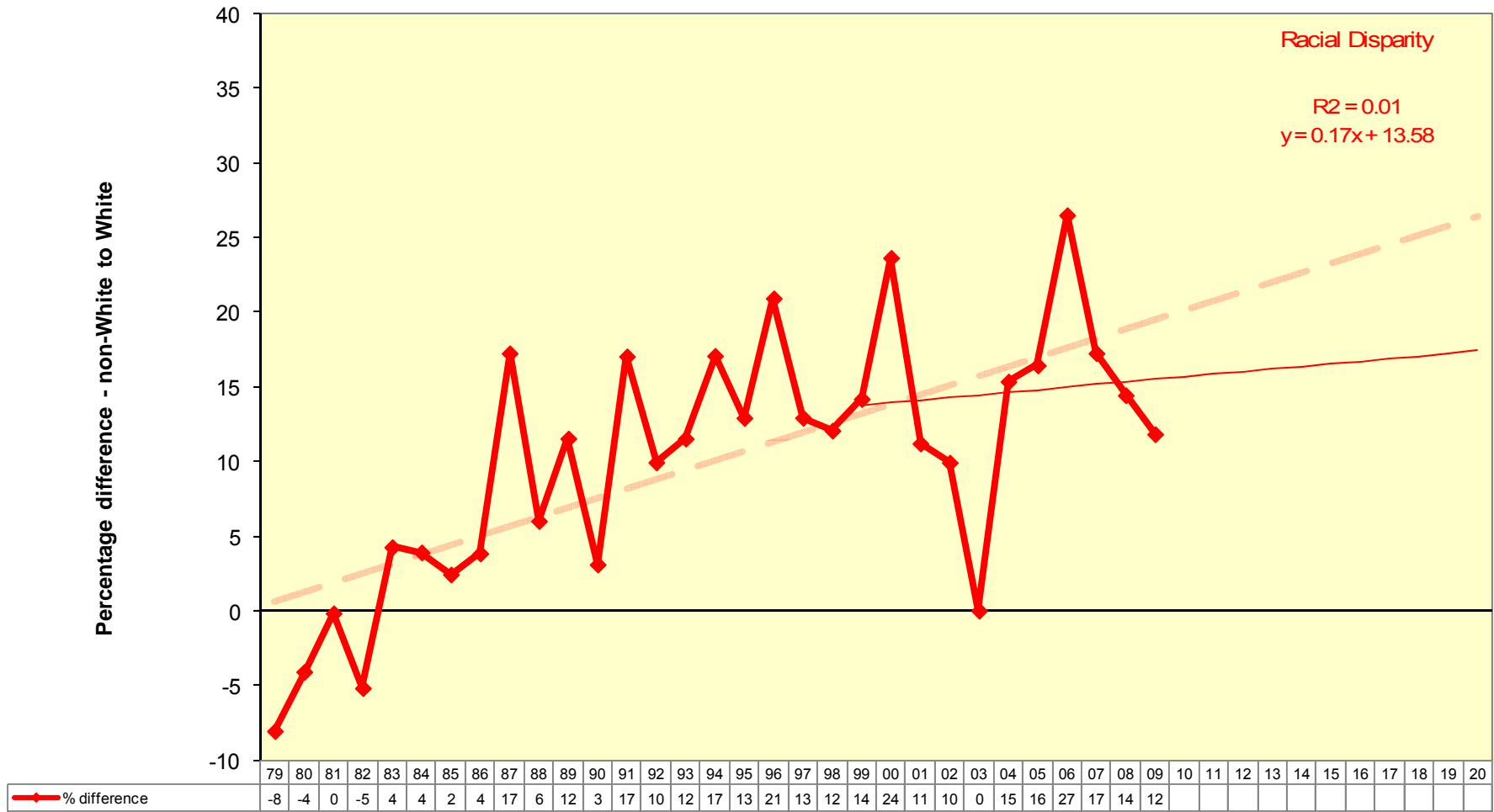
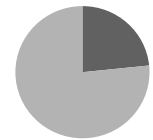


Figure 6.1 v. Diseases of Heart:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1979-2009 with projections to 2020



## Cancer - Trachea, Bronchus, Lung

- The 10-year trend line for ENC crude mortality due to Cancer – TBL is unreliable though continually higher than the rates for RNC and NC. In 2009, the ENC rate was 16% greater than RNC.
- During the period 1999-2009, the age-adjusted rate for ENC is decreasing at a greater rate than RNC, US, and NC and convergence in the near future is suggested. All four rates remain significantly higher than the goal set by *Healthy People 2010* of less than 44.9 deaths per 100,000.
- The mortality rate trends for males (White and non-White) are decreasing; convergence with the increasing female trends is suggested in the future. For the first time in 20 years, White males have the highest mortality rate due to Cancer-TBL in 2009.
- The non-White mortality rate for this cancer continues to decrease over the 10-year period and is diverging from the White rate. In 2009, the non-White rate was 16% less than the White rate.
- The moderately reliable trend for racial disparity has continued to decrease significantly over the 10 year period.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.2 i. Cancer - Trachea, Bronchus, Lung:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

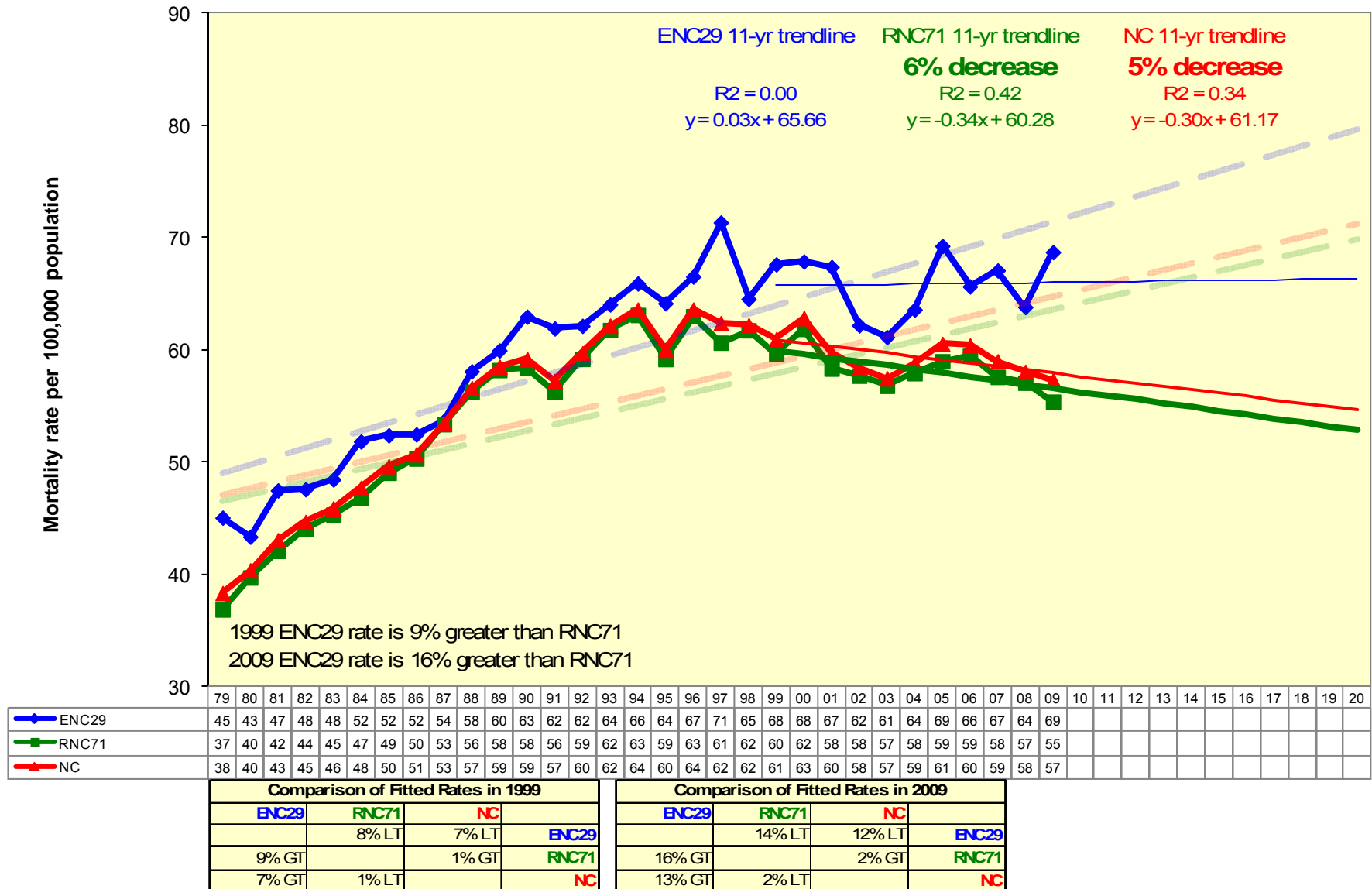


Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

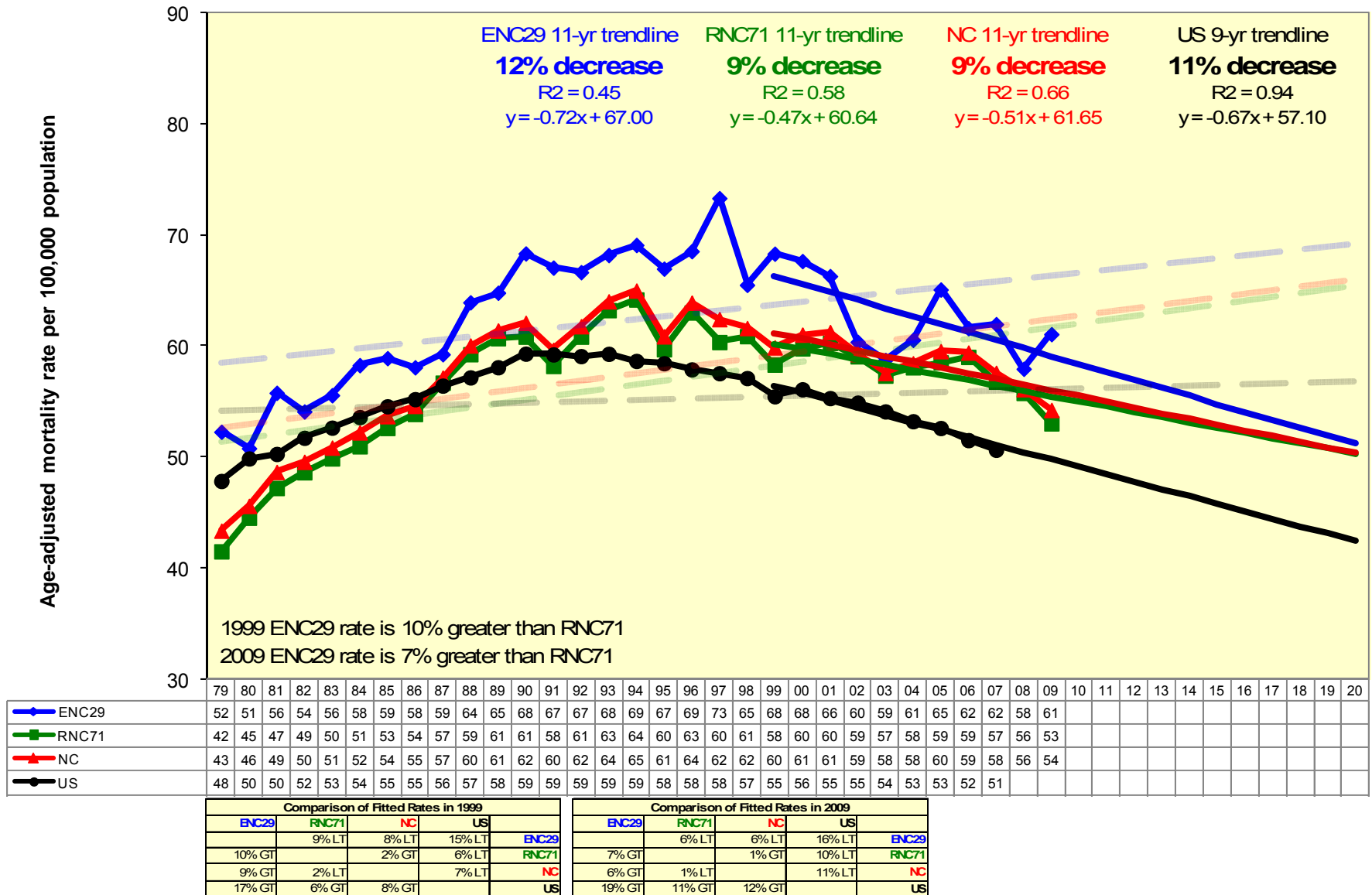


Figure 6.2 iii. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

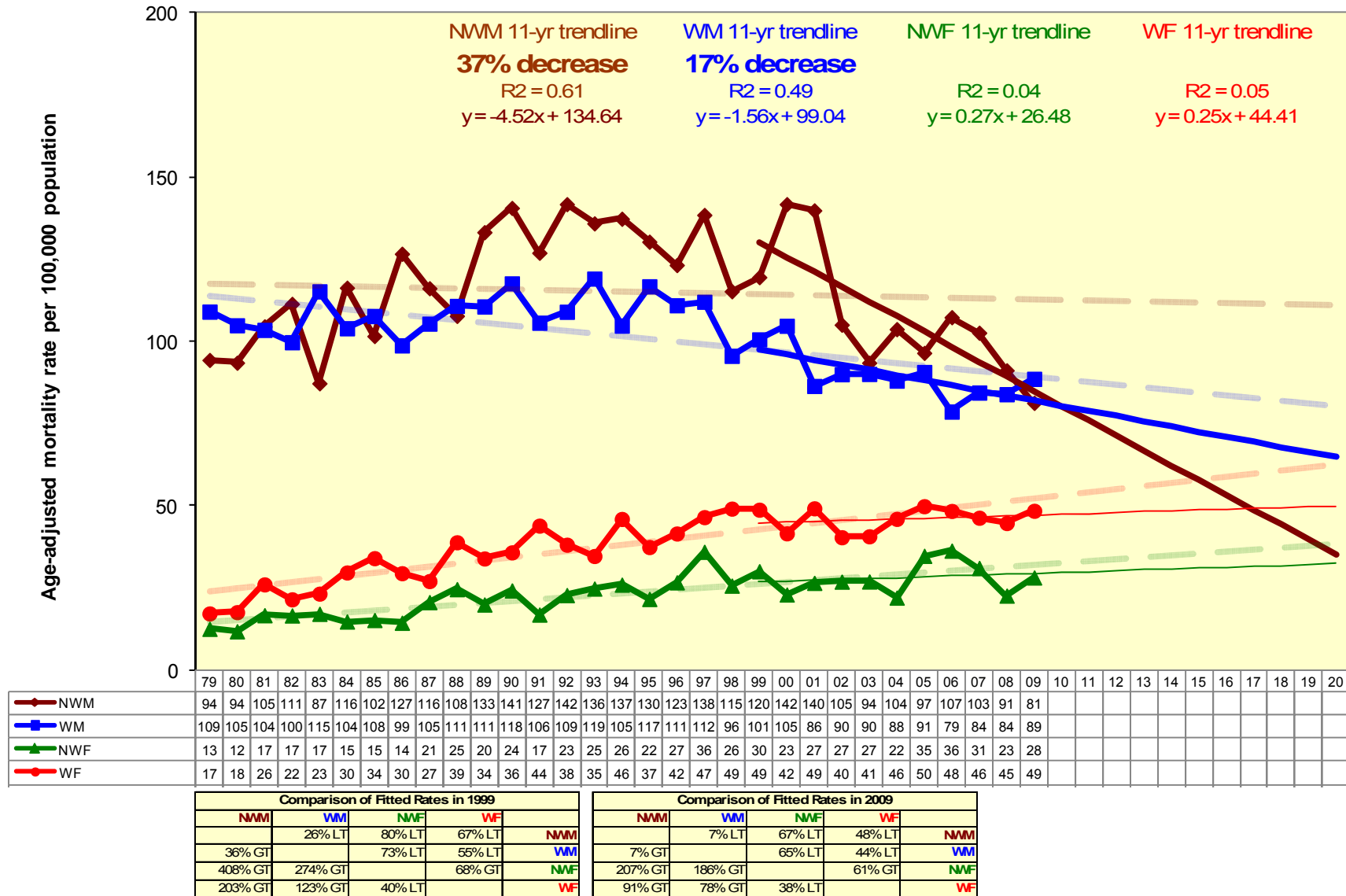
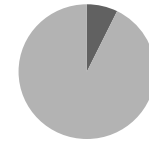
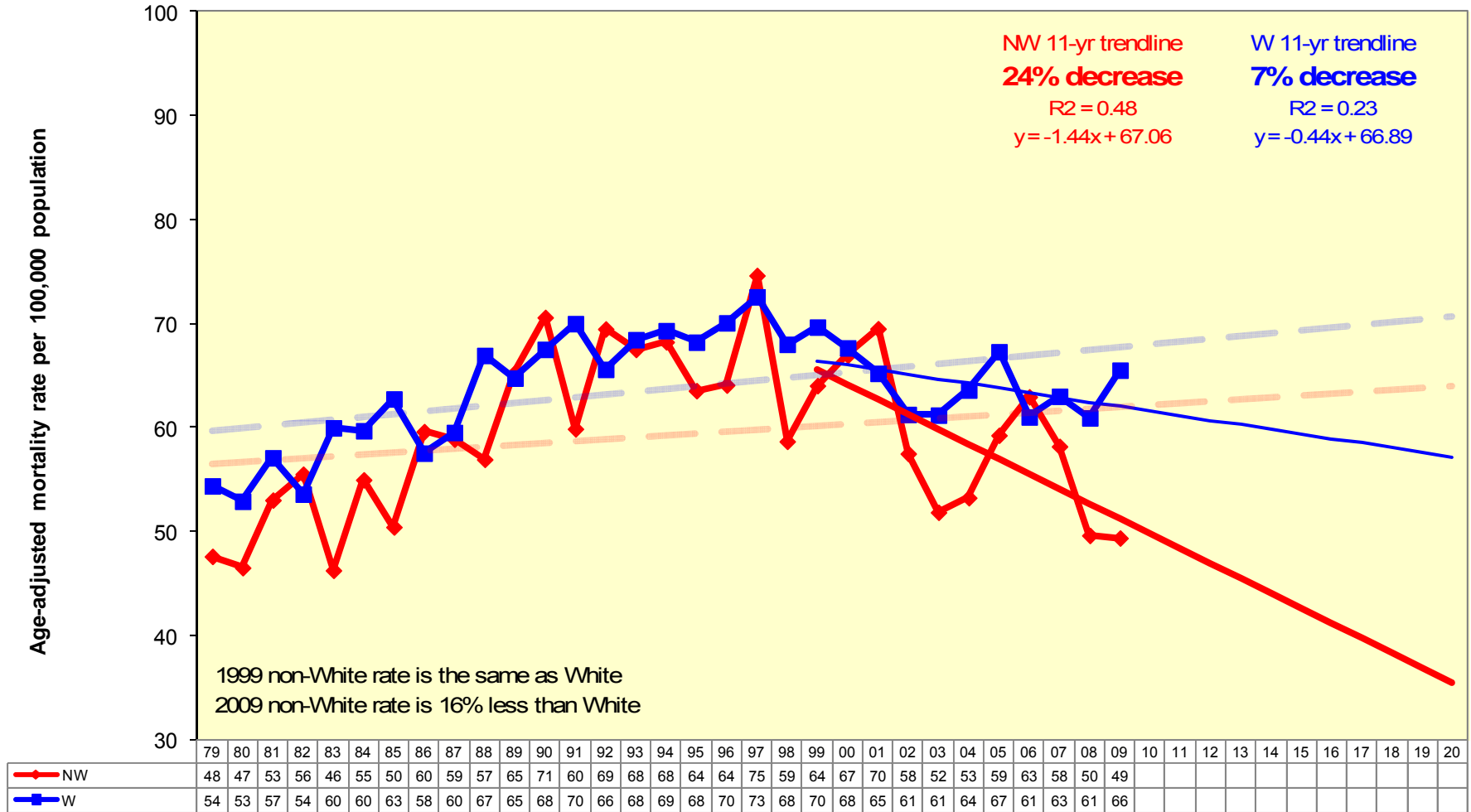


Figure 6.2 iv. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020



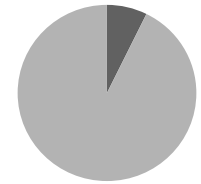
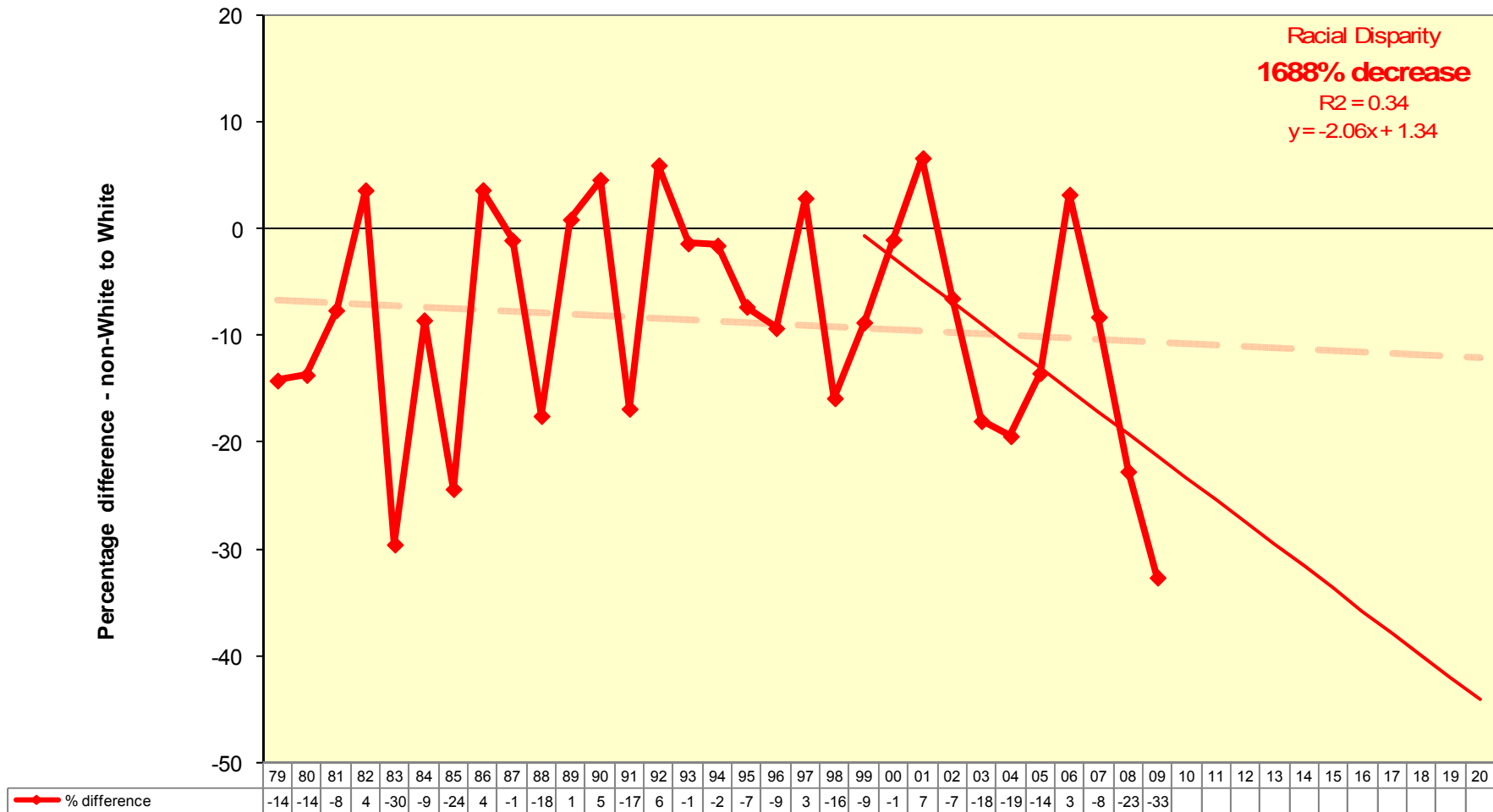


Figure 6.2 v. Cancer - Trachea, Bronchus, Lung:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020





# Cerebrovascular Disease

- ENC's cerebrovascular disease mortality trend line is decreasing but is diverging slightly from both RNC and NC. In 2009, the ENC rate was 22% greater than RNC.
- The ENC age-adjusted cerebrovascular disease mortality rate is decreasing and converging on the RNC and NC rates.
- Projected to 2020, the *Healthy People 2010* goal of less than 48 deaths per 100,000 could be achieved in the region.
- Although both non-White males and non-White females continue to have the highest cerebrovascular disease mortality rates, the rates are decreasing and converging on White male and White female rates. The non-White male rate in 2009 was 70% greater than the rate for White males; the non-White female rate was 36% greater than the rate for White females.
- The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of Whites but remains 52% greater than Whites in 2009.
- The trend for racial disparity from 1999-2009 shows a 26% increase in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.3 i. Cerebrovascular Disease:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

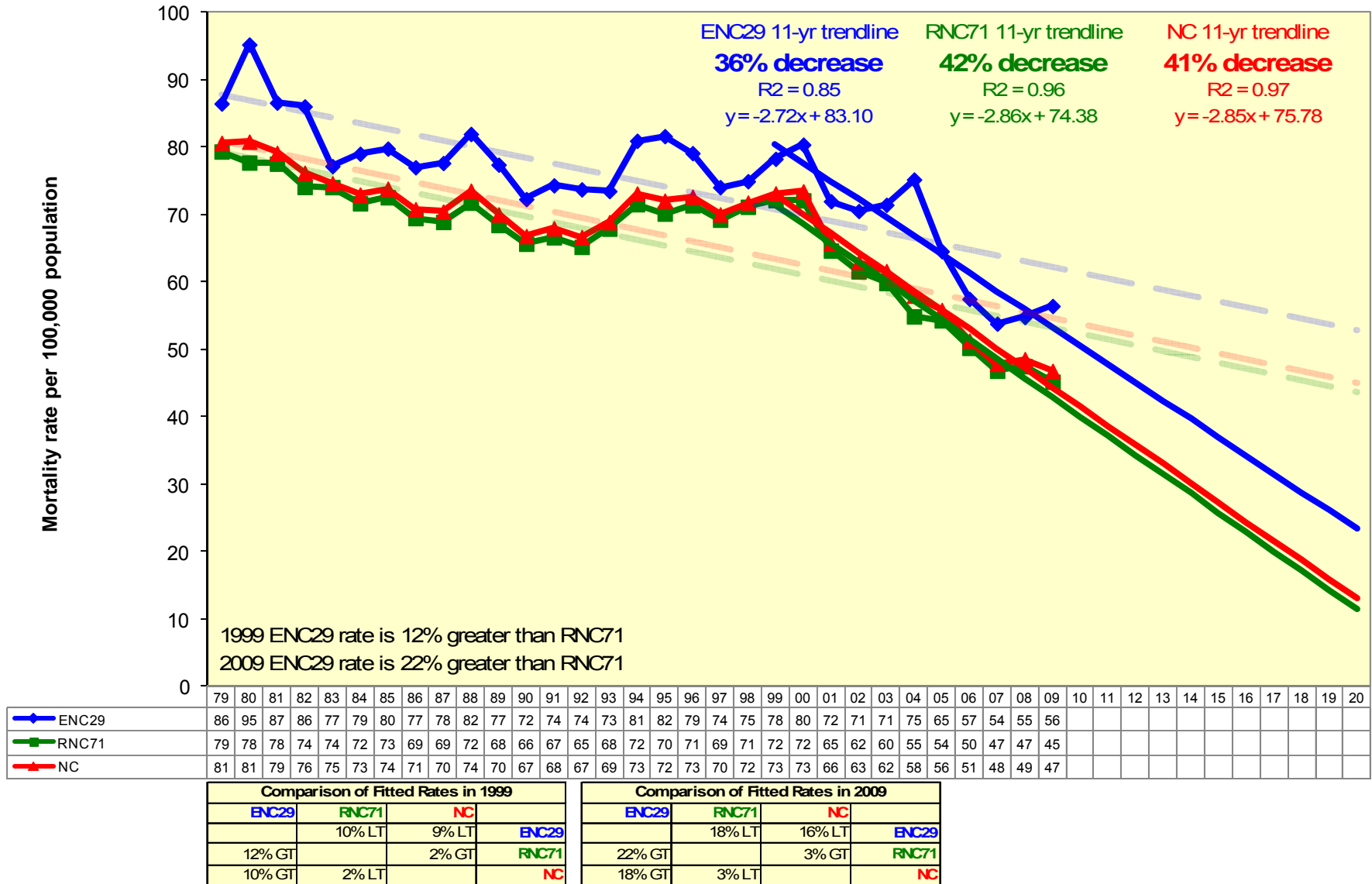




Figure 6.3 ii. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

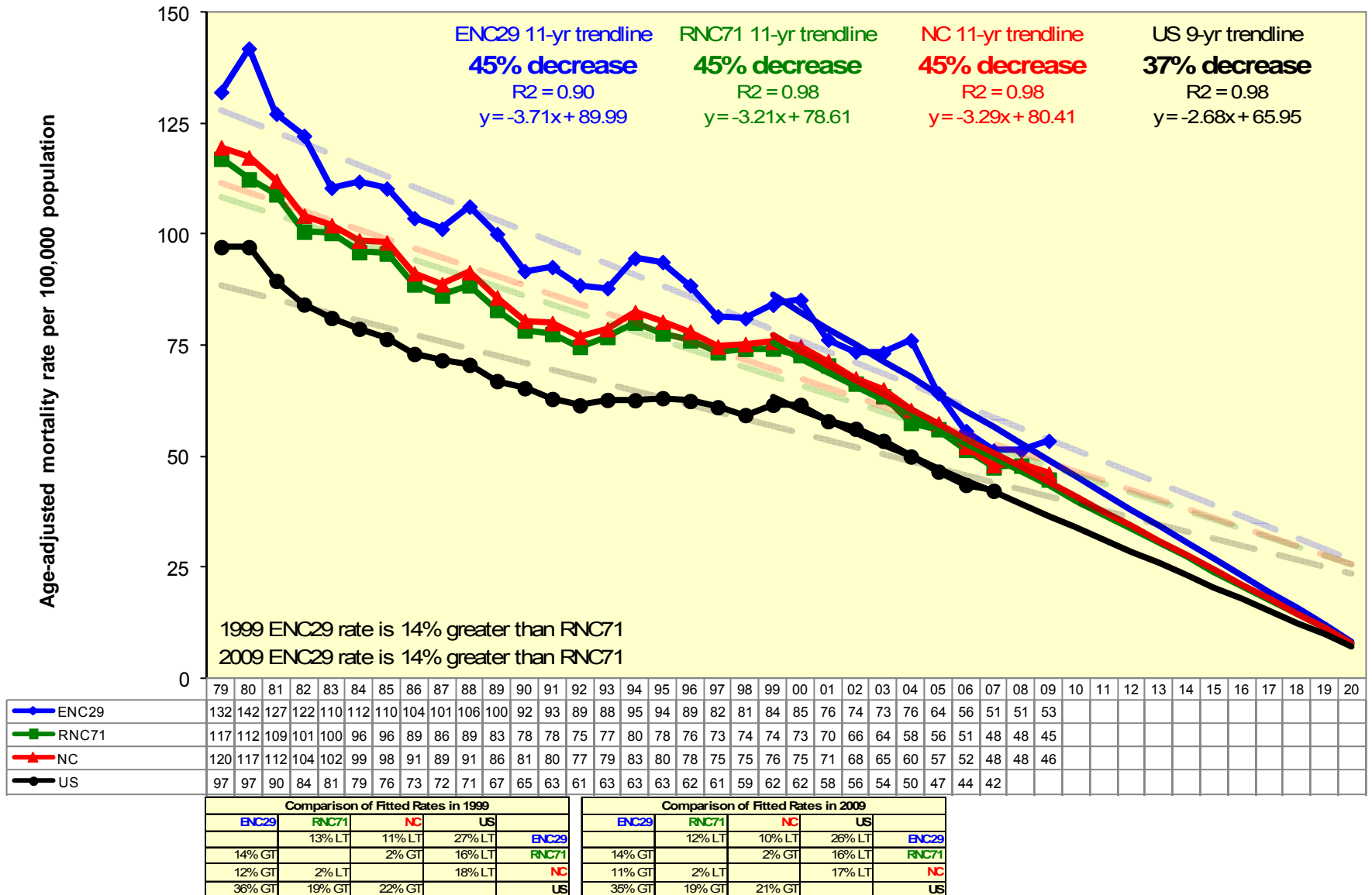


Figure 6.3 iii. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

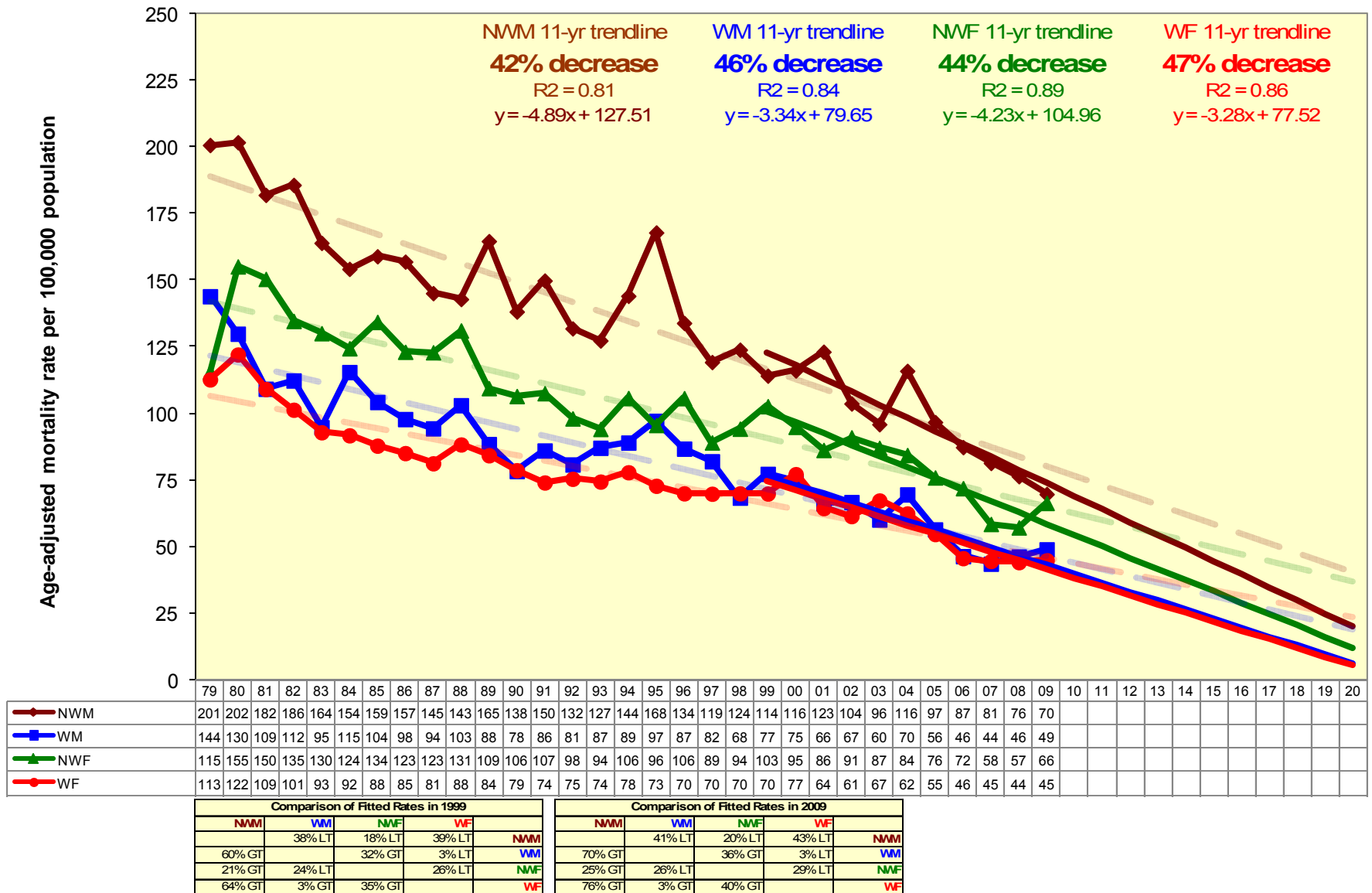


Figure 6.3 iv. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

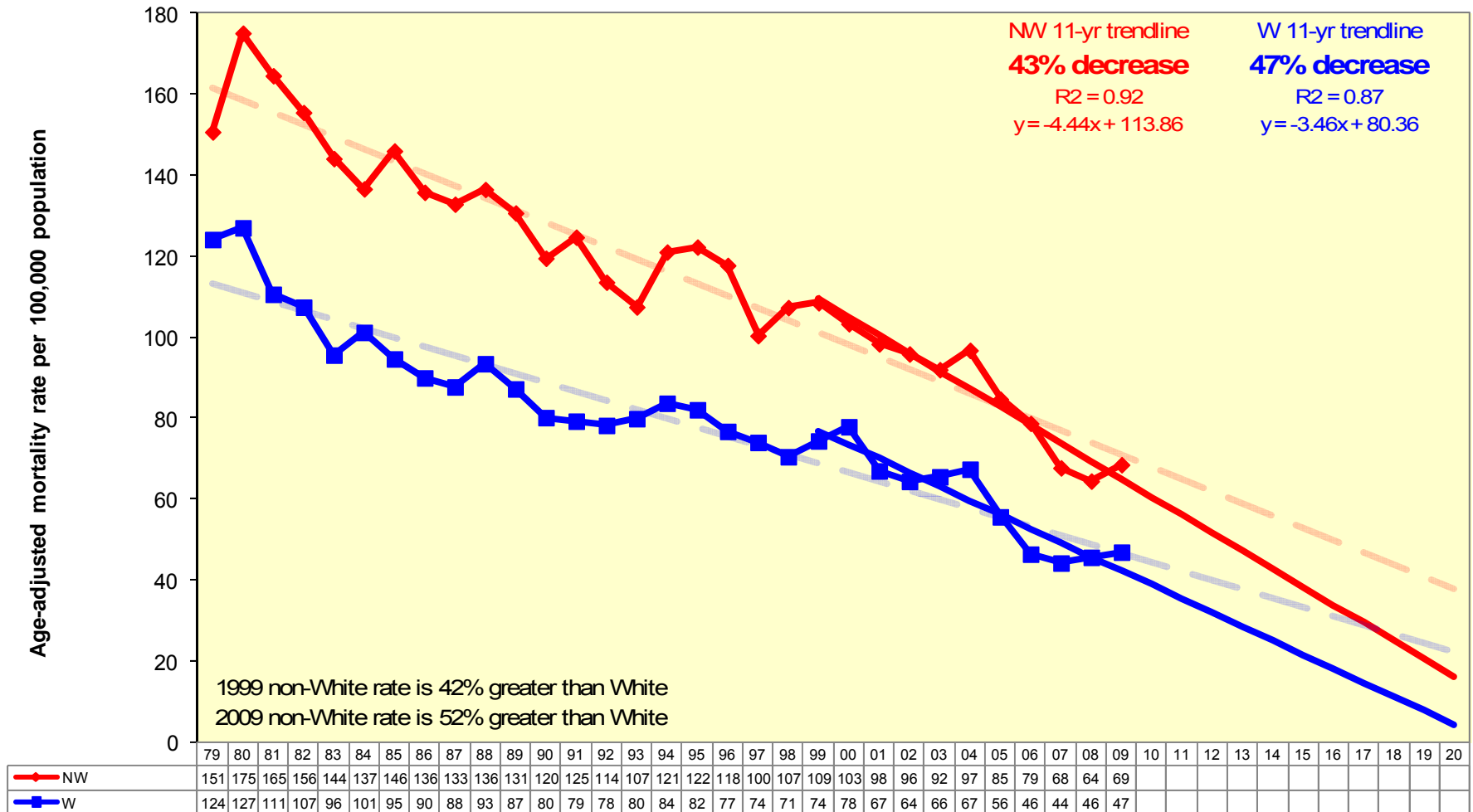
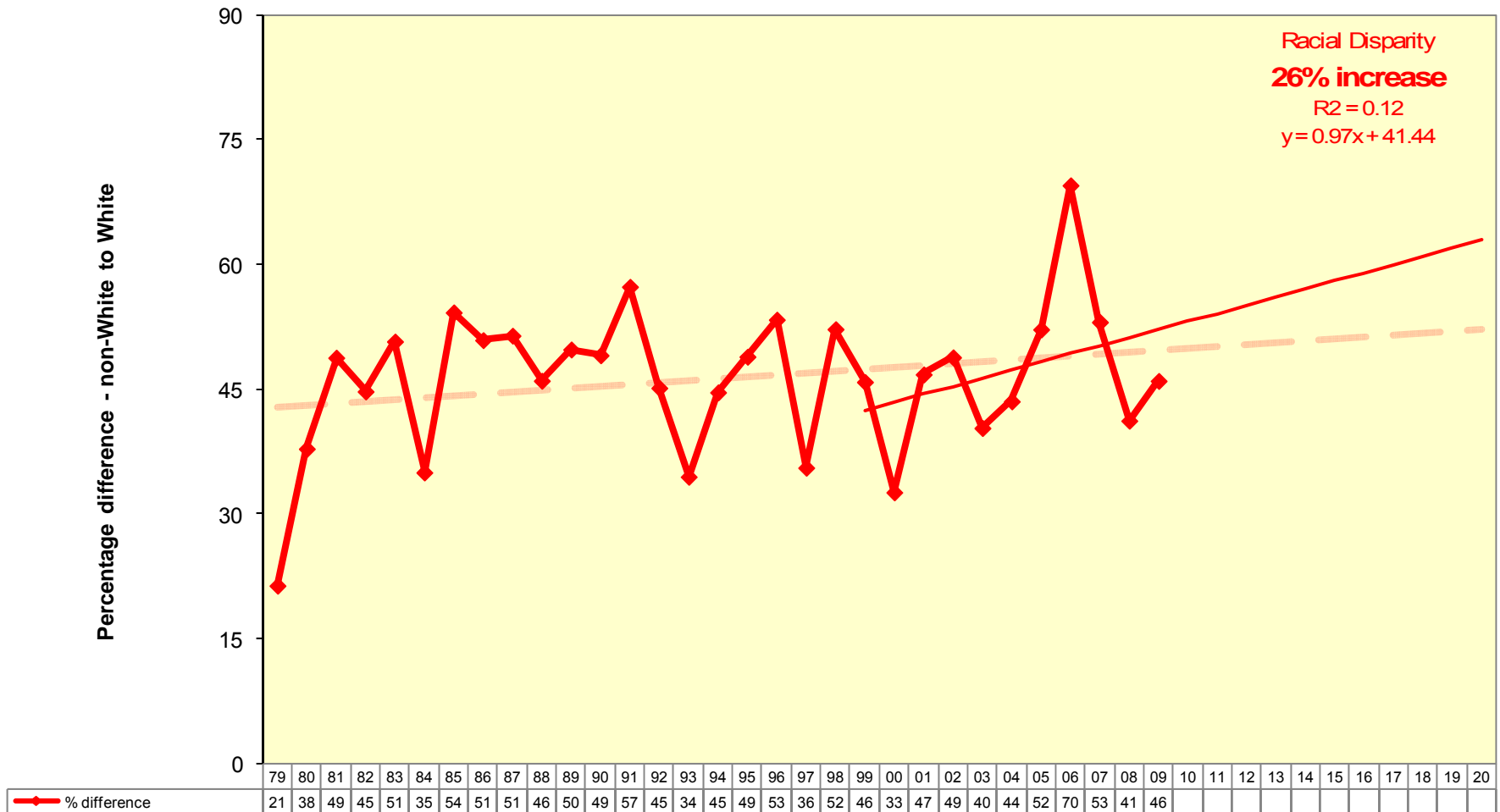


Figure 6.3 v. Cerebrovascular Disease:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1979-2009 with projections to 2020



# Chronic Lower Respiratory Diseases

- The 30-year CLRD mortality rate for ENC is increasing. However, the 10-year trend for ENC appears to be decreasing in a moderately reliable trend. In 2009, the ENC rate was 3% less than RNC.
- The 10-year CLRD age-adjusted rate for ENC is decreasing and converging with the US rate, remaining lower than RNC and NC. The ENC rate in 2009 was 11% less than RNC, whereas in 1999 the ENC rate was 10% greater than RNC.
- Fitted rates for White males have the greatest rates of decrease. The 10-year trend for non-White females is unreliable.
- The 10-year White mortality rate trend is higher than the non-White trend, although both are decreasing evenly. The non-White rate remains 41% less than the White rate in 2009.
- The trend for racial disparity is not reliable.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.4 i. Chronic Lower Respiratory Diseases:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

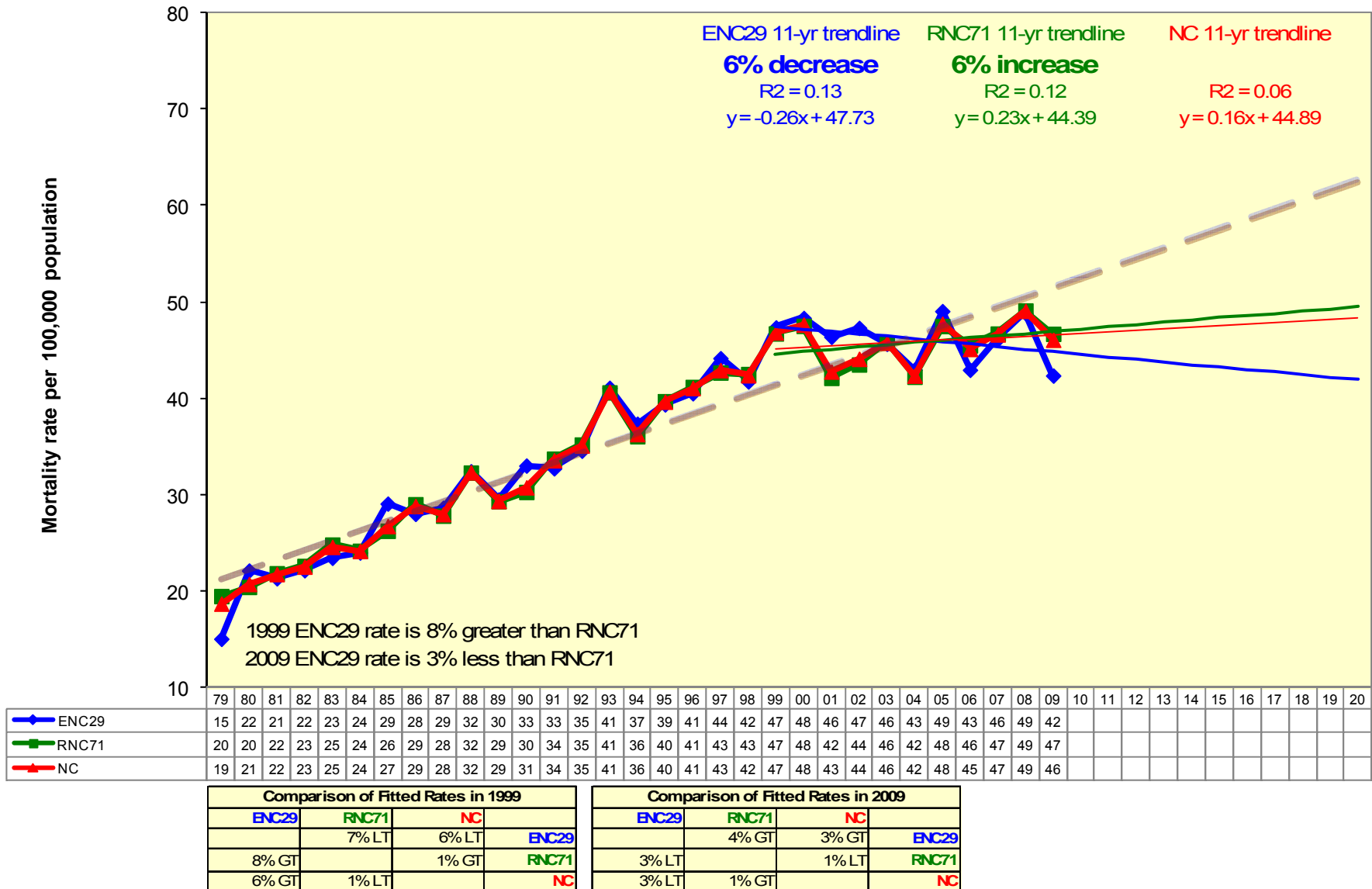




Figure 6.4 ii. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

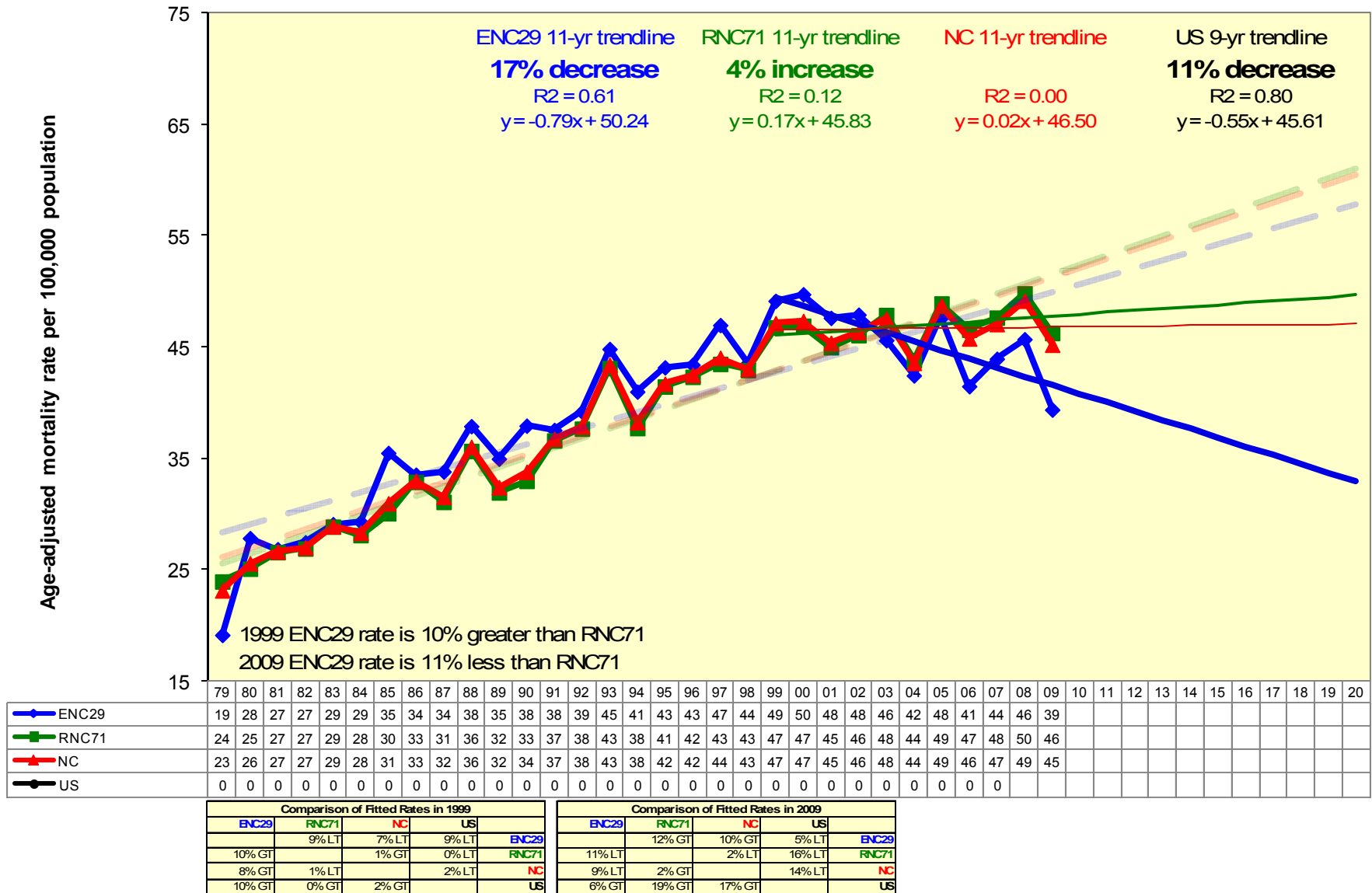
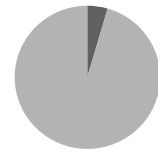


Figure 6.4 iii. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

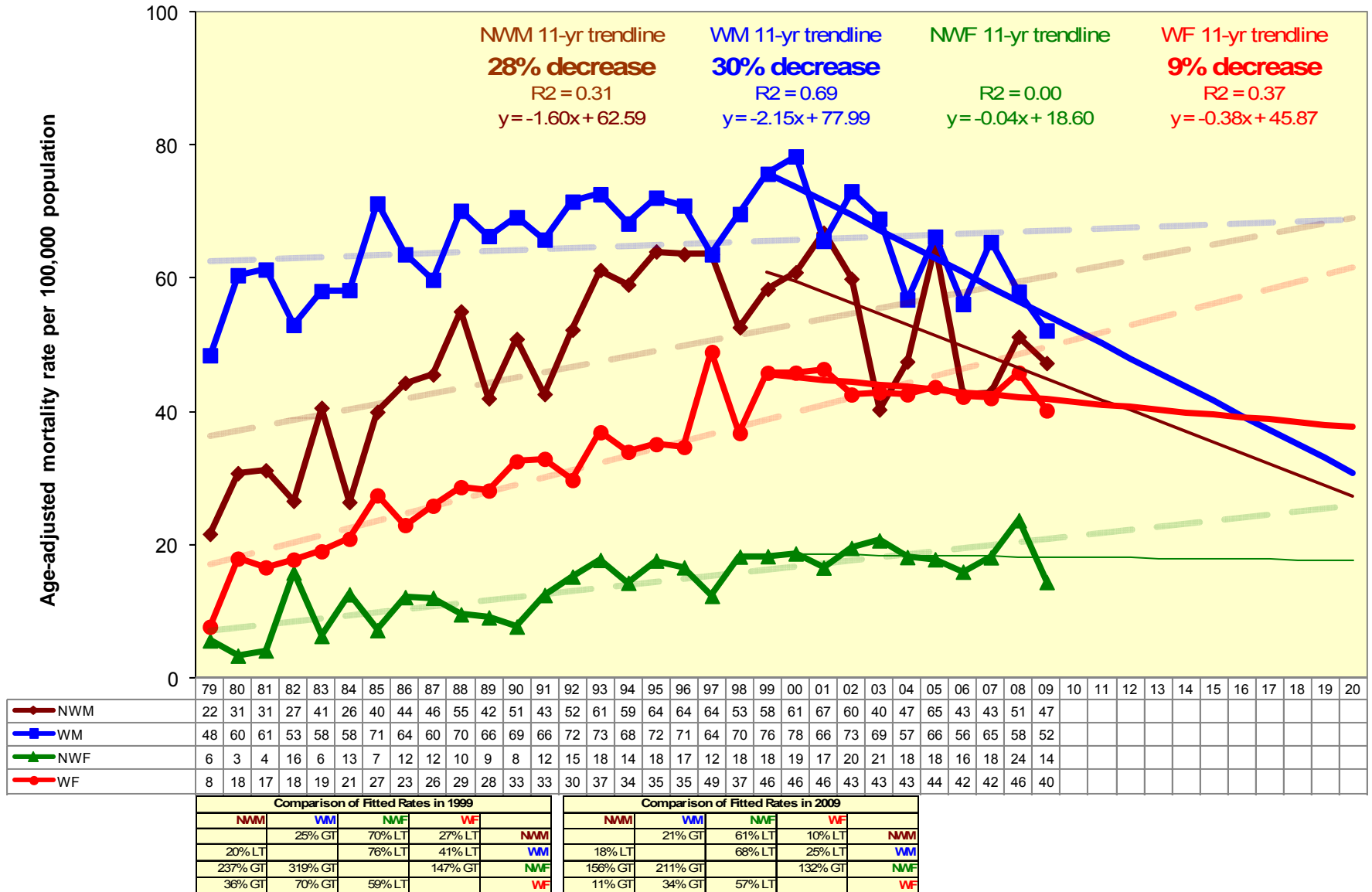


Figure 6.4 iv. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

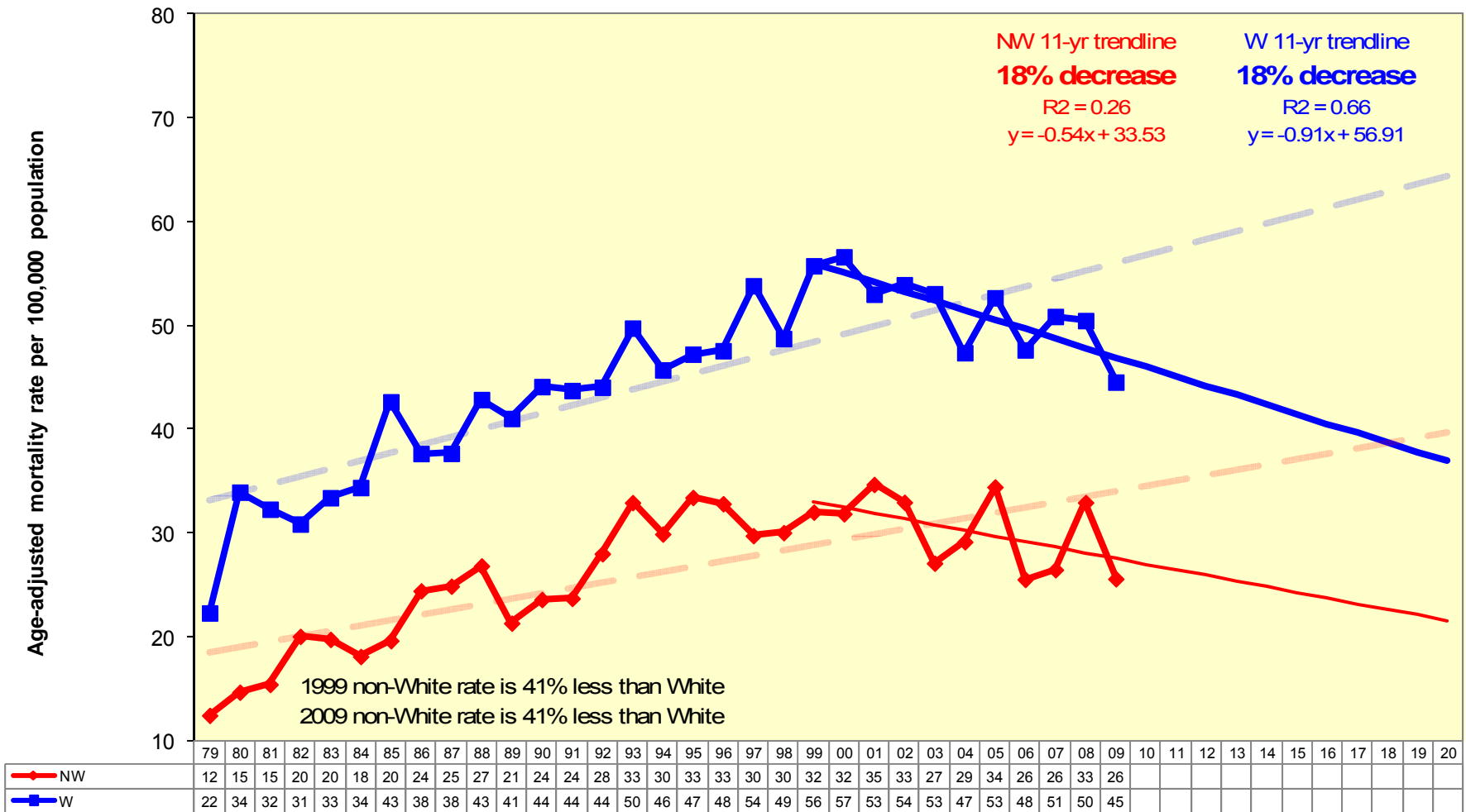
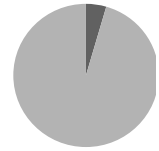
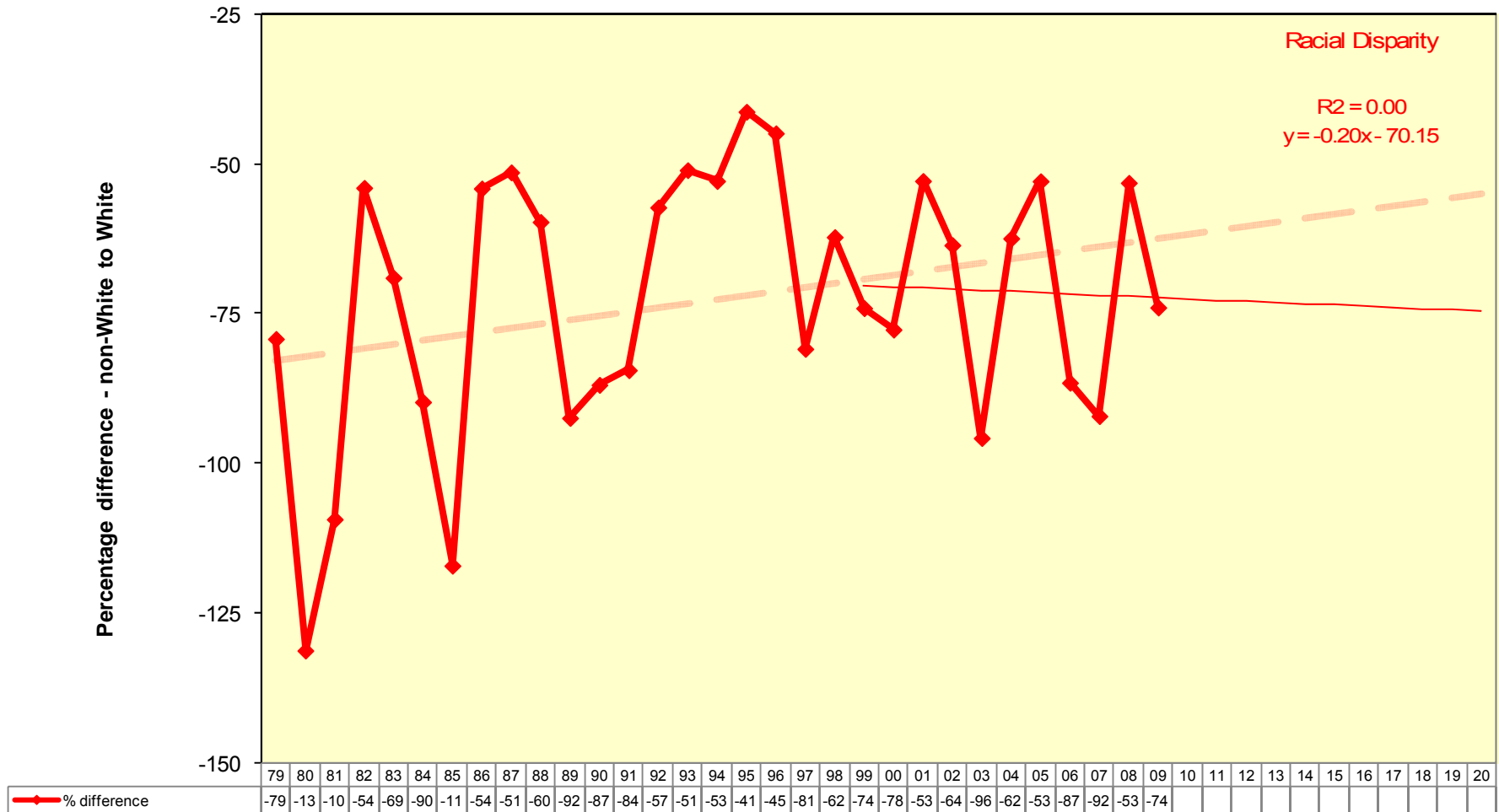
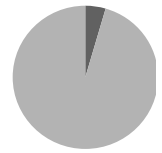


Figure 6.4 v. Chronic Lower Respiratory Diseases:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020



# Diabetes Mellitus

- According to the 10-year trend, diabetes mellitus rates for ENC, RNC and NC are decreasing, but the rate of decline for ENC is not reliable. ENC's mortality rate has continually been divergent from RNC and NC over the past 30 years. In 2009, the rate for ENC is 49% greater than RNC71. In 1999 ENC was 22% greater than RNC71.
- The 10-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 12% for ENC. The rates for RNC71 and NC have fallen below the US rate. In 2009, the ENC age-adjusted diabetes mellitus death rate remains 40% greater than the RNC71 and 34% greater than the US rate.
- The non-White male and non-White female 10-year mortality rates trends are decreasing but remain higher than those of White males and White females.
- Non-White mortality rates decreased 14% between 1999 and 2009 but remain 138% greater than Whites in 2009.
- The trend for racial disparities is unreliable.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.5 i. Diabetes Mellitus:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

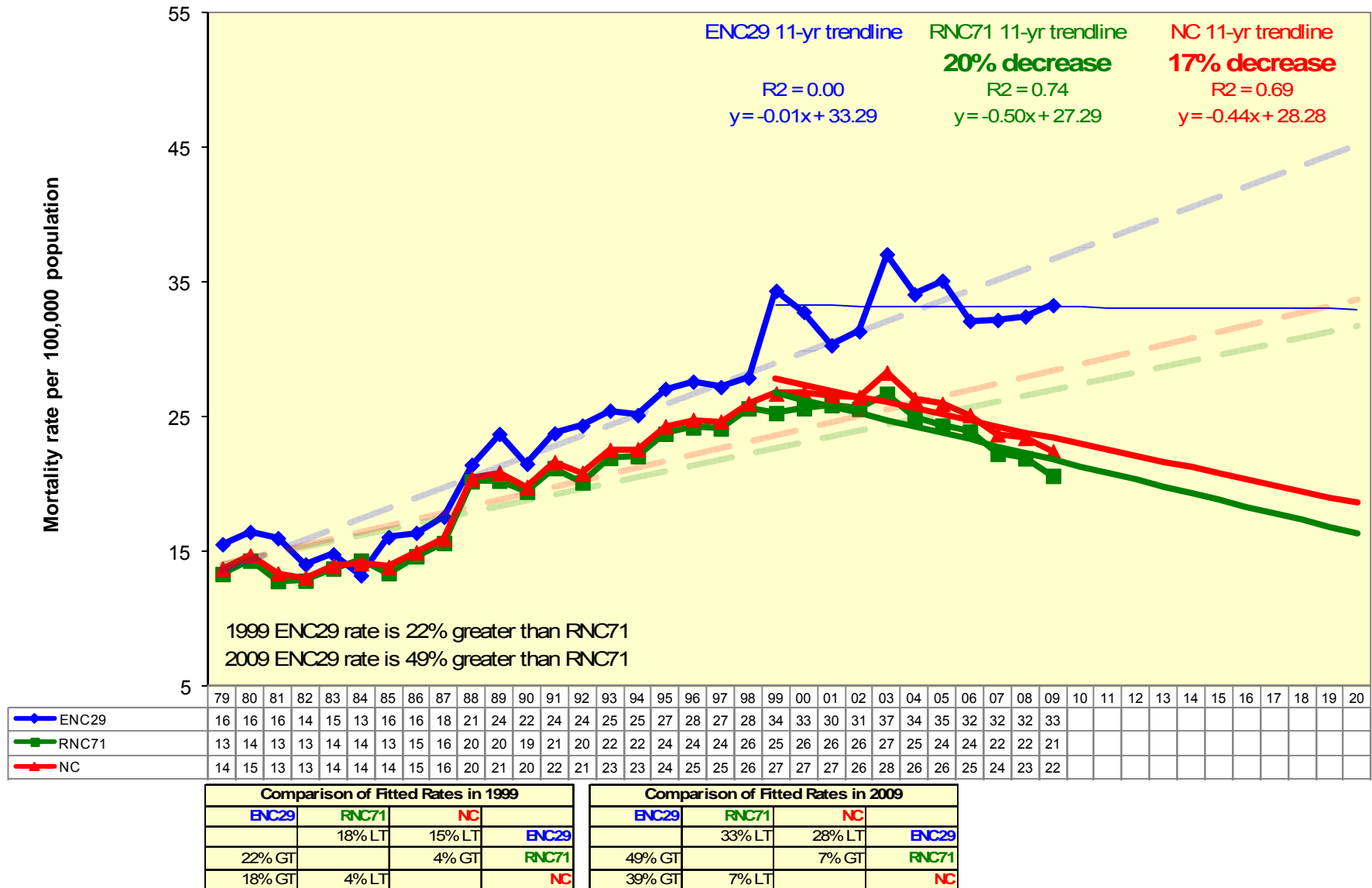
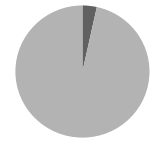


Figure 6.5 ii. Diabetes Mellitus:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

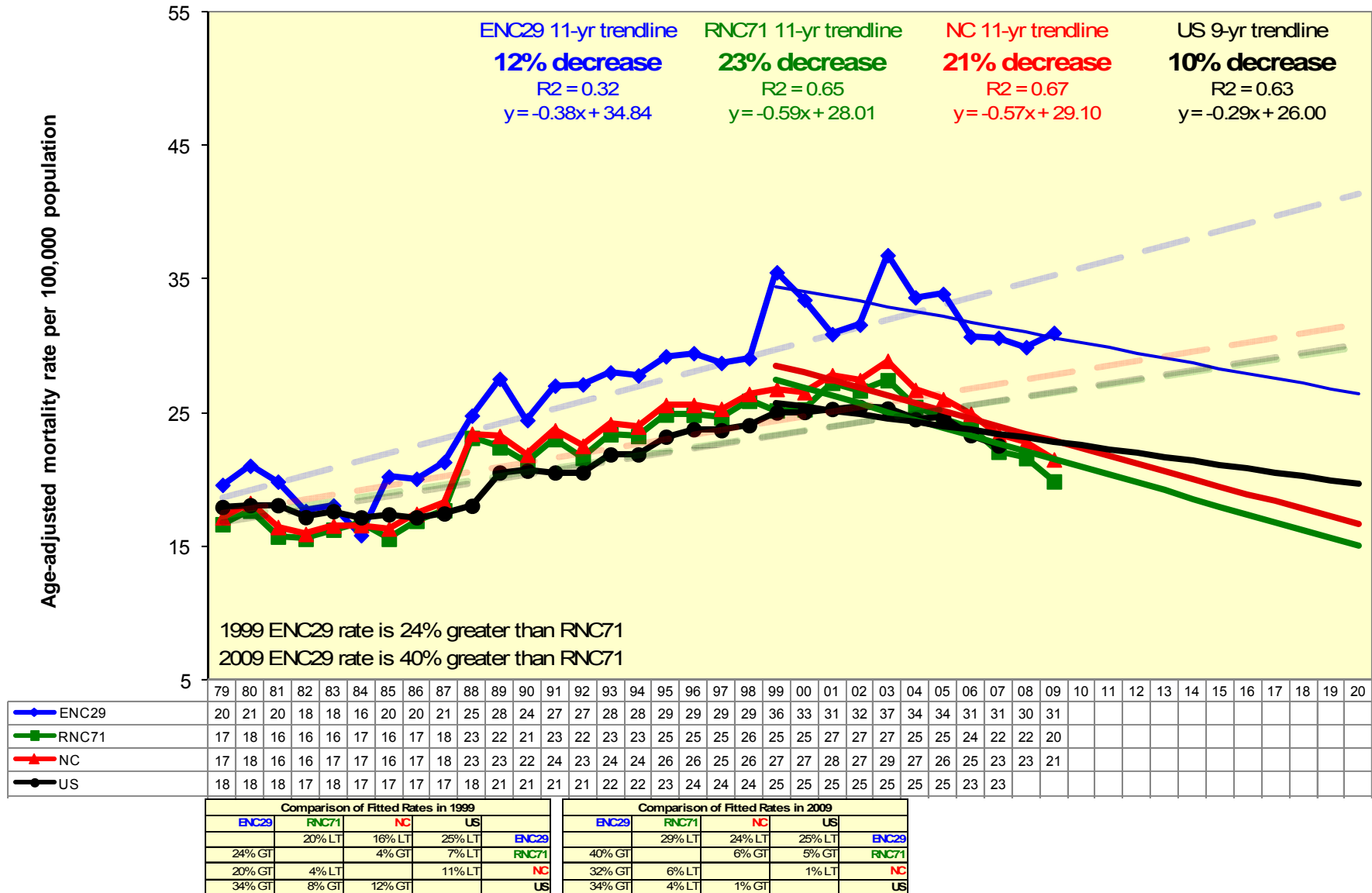
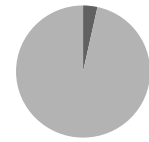


Figure 6.5 iii. Diabetes Mellitus:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

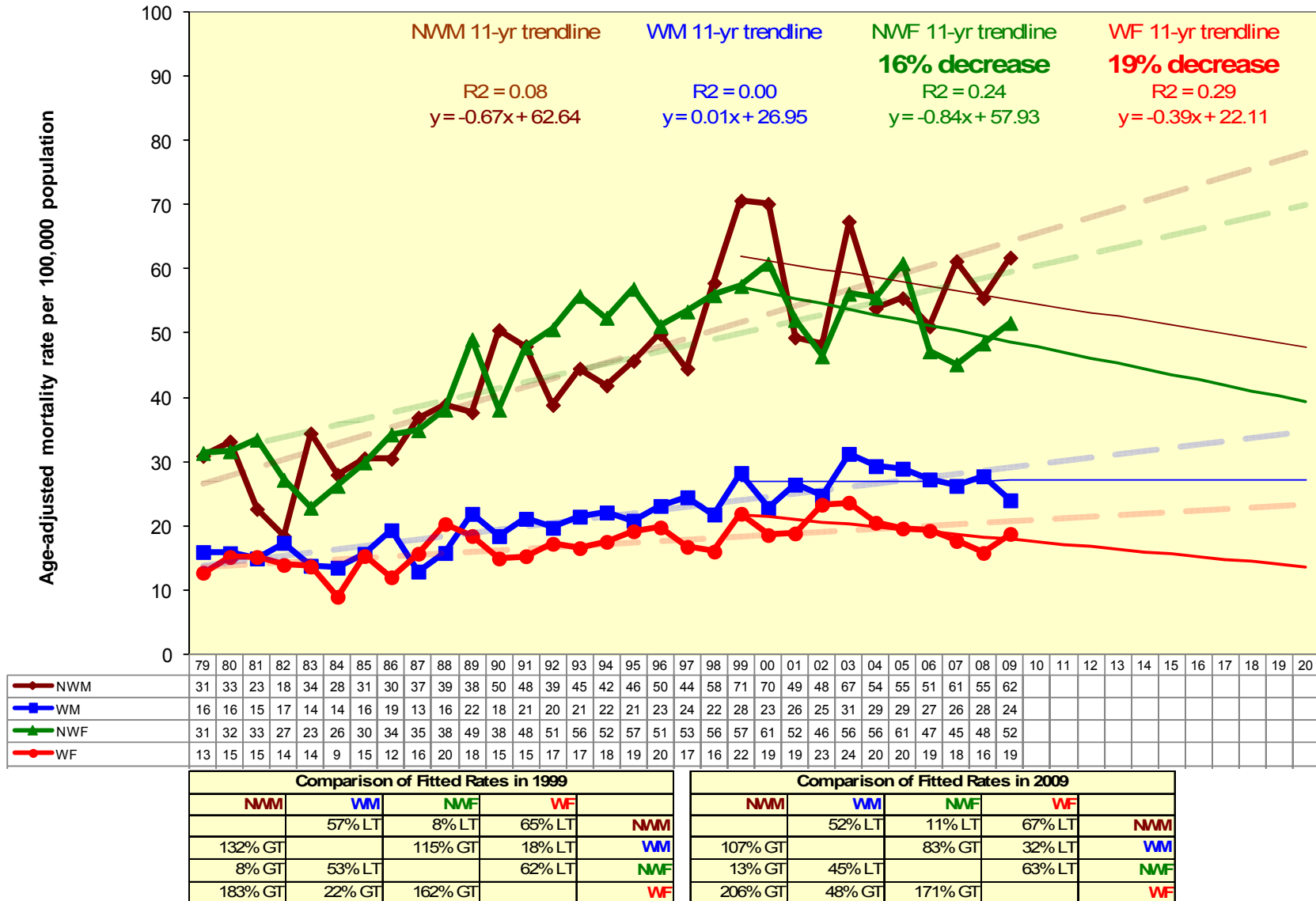
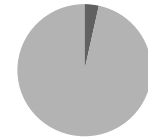




Figure 6.5 iv. Diabetes Mellitus:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

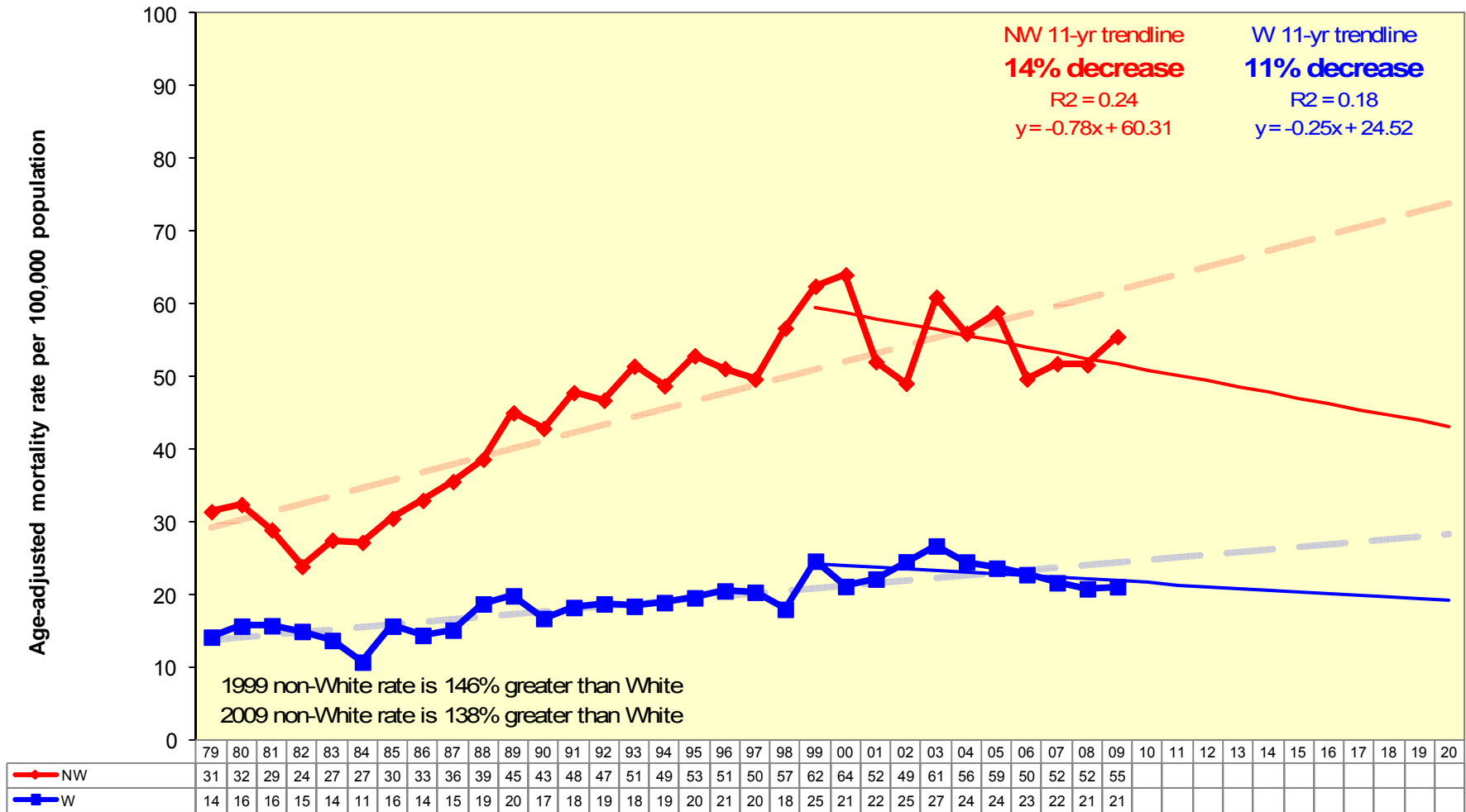
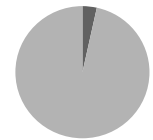
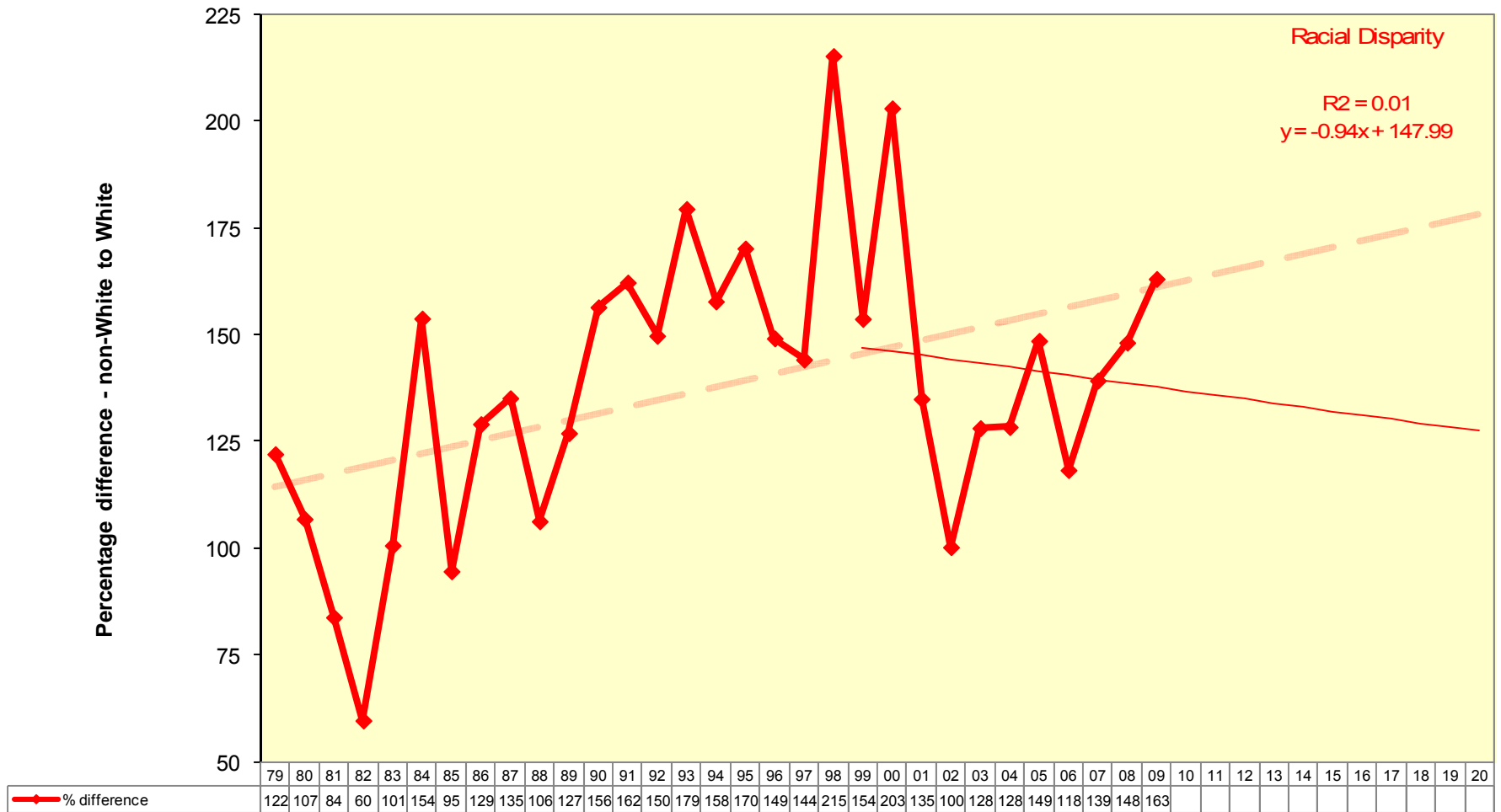
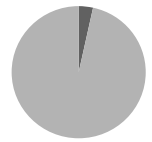


Figure 6.5 v. Diabetes Mellitus:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020



# All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects has increased substantially in ENC (38% over 10 years). The ENC rate trend is almost identical to the RNC and NC trends.
- The age-adjusted mortality 10-year trend lines suggest a regional disparity that favors ENC. The ENC rate is 3% less than the RNC rate in 2009. The ENC rate has increased 28% over 10 years. All trends are higher than the *Healthy People 2010* projected goal of less than 17.5 deaths per 100,000.
- The non-White male rates continue to decrease at a greater rate (30%) than other demographic groups and convergence with White female and non-White female rates is suggested in the future. The White male rate is now the highest rate of all demographic groups and has increased 47% over 10 years. White females had the greatest rate of increase (97%) over 10 years.
- Non-White rates have decreased by 27% over 10 years, whereas white rates have increased 63%, causing these two rates to diverge significantly. In 2009, the non-White rate is 37% less than the White rate.
- The racial disparity associated with deaths from unintentional injuries favors non-Whites.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.6 i. All Other Unintentional Injuries and Adverse Effects:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

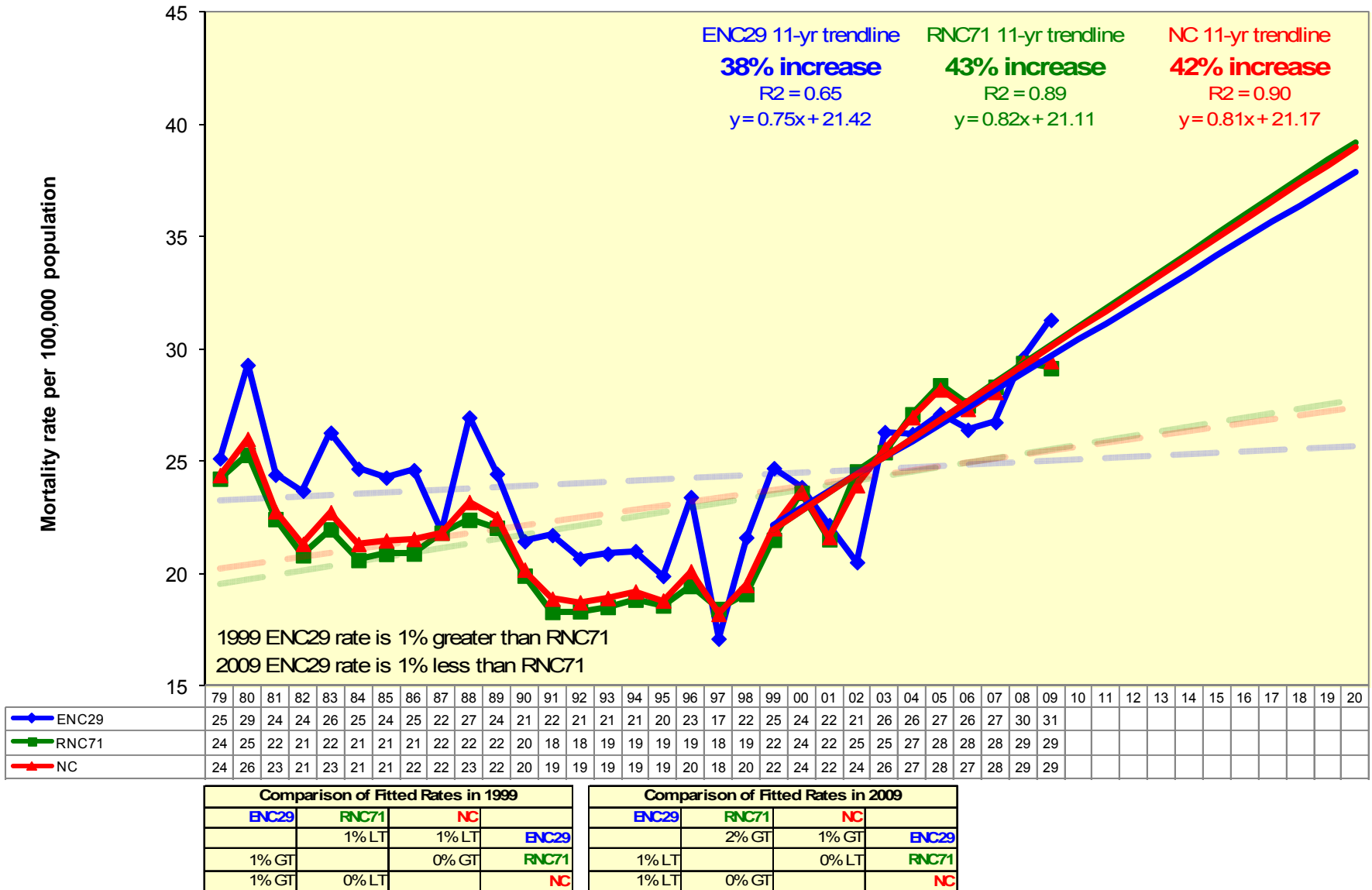
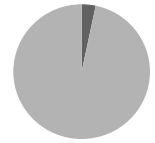
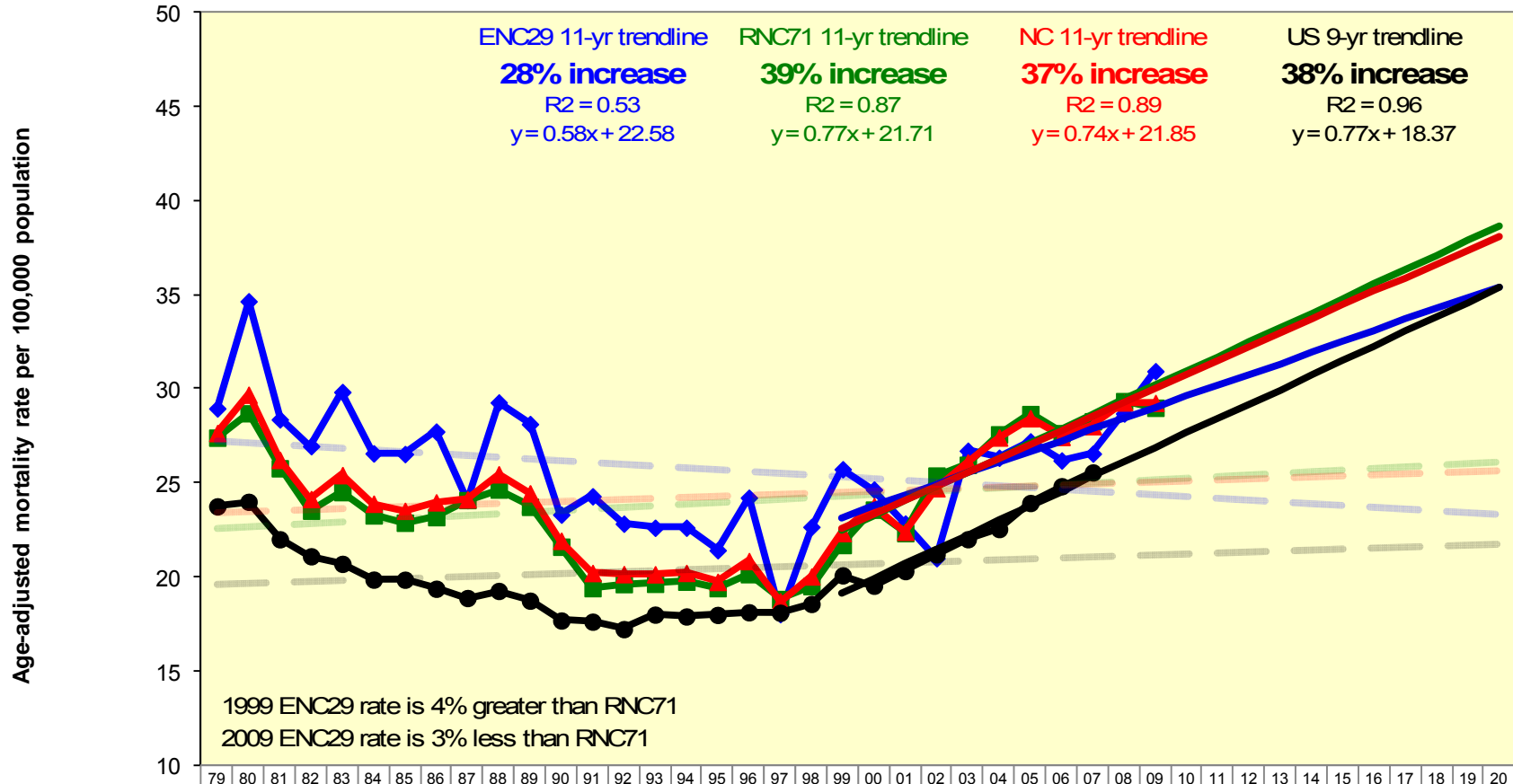
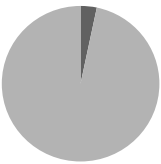


Figure 6.6 ii. All Other Unintentional Injuries and Adverse Effects:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2009 with projections to 2020

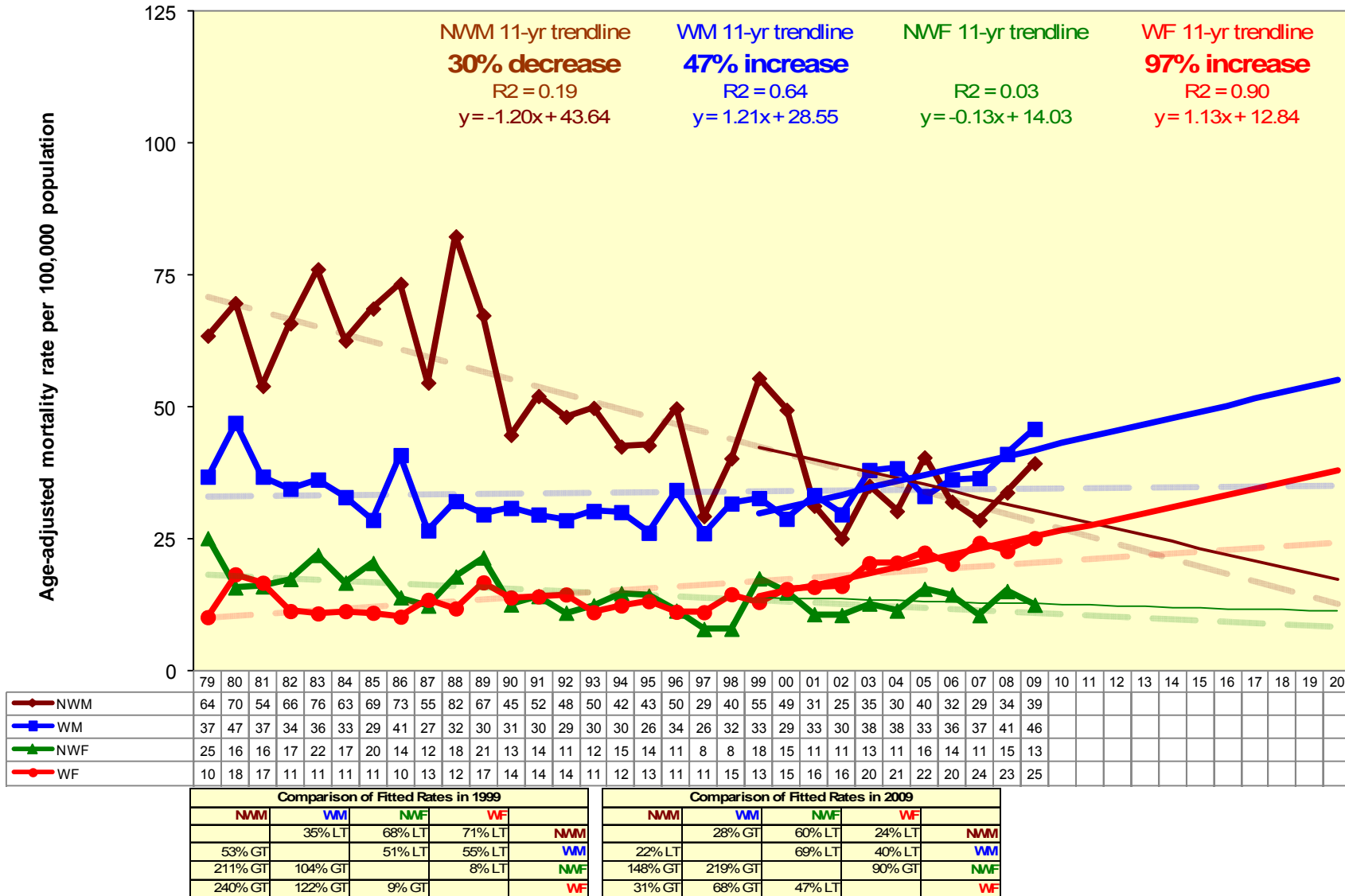
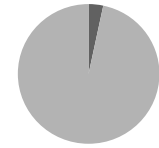


ENC29	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20							
RNC71	27	29	26	24	25	23	23	23	24	25	24	22	19	20	20	20	19	20	19	20	22	24	22	25	26	28	29	28	28	29	29																		
NC	28	30	26	24	25	24	24	24	24	25	24	22	20	20	20	20	20	21	19	20	22	24	22	25	26	27	28	27	28	29	29																		
US	24	24	22	21	21	20	20	19	19	19	19	18	18	17	18	18	18	18	18	18	19	20	20	20	21	22	23	24	25	26																			

Comparison of Fitted Rates in 1999				
ENC29	RNC71	NC	US	
	4% LT	3% LT	19% LT	ENC29
4% GT		1% GT	15% LT	RNC71
3% GT	1% LT		16% LT	NC
23% GT	18% GT	19% GT		US

Comparison of Fitted Rates in 2009				
ENC29	RNC71	NC	US	
	3% GT	3% GT	8% LT	ENC29
3% LT		1% LT	11% LT	RNC71
3% LT	1% GT		11% LT	NC
9% GT	13% GT	12% GT		US

Figure 6.6 iii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2009 with projections to 2020



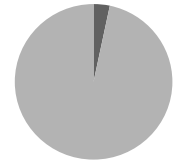
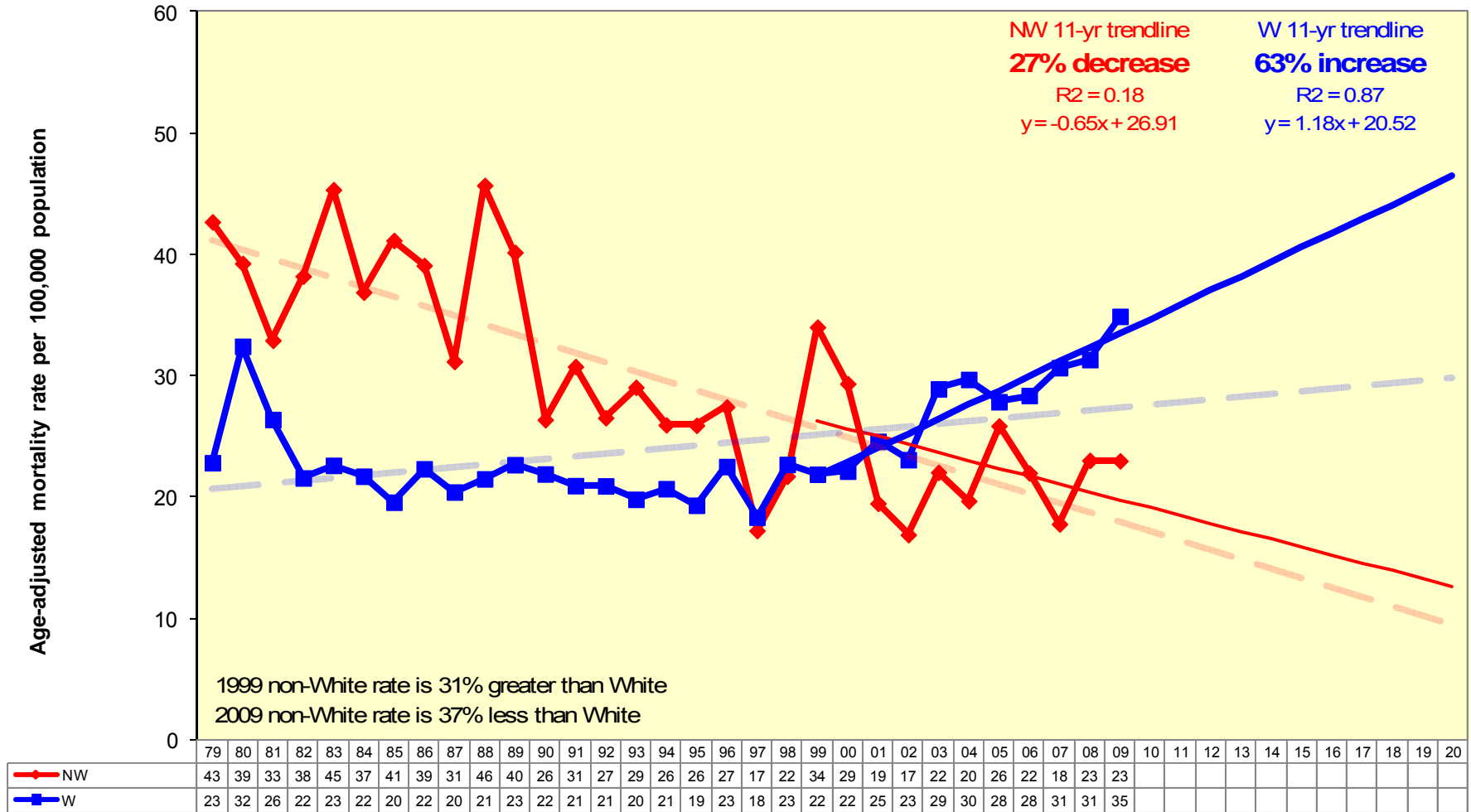


Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020



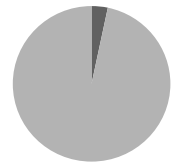
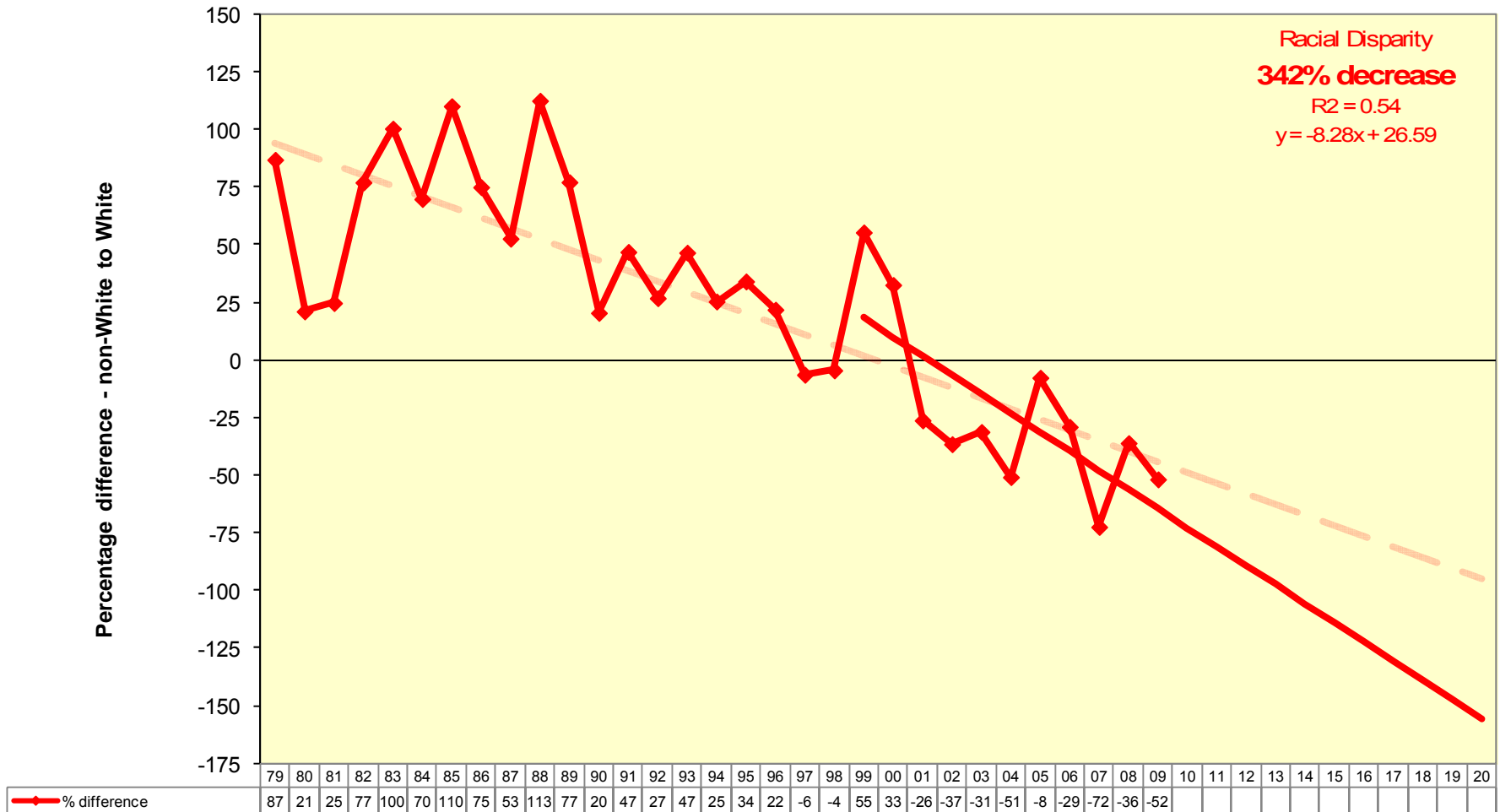


Figure 6.6 v. All Other Unintentional Injuries and Adverse Effects:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020





# Alzheimers Disease

- The Alzheimer's mortality rate is increasing at a rate of 5.2% per year, showing a 57% increase over the 10-year period, more than 10% above the rate of increase in RNC71 and NC.
- The age-adjusted mortality 10 year trend line suggests a regional disparity that favors ENC29. The ENC29 rate is 26% less than the RNC71 rate in 2009.
- The mortality rate for females, both White and non-White, is greater than that of non-White and White males.
- The non-White mortality rate for Alzheimer's has been increasing continually but remains less than the White mortality rate by 21% in 2009.
- The trend for racial disparity is not reliable, but currently favors non-Whites in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.7 i. Alzheimers Disease:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

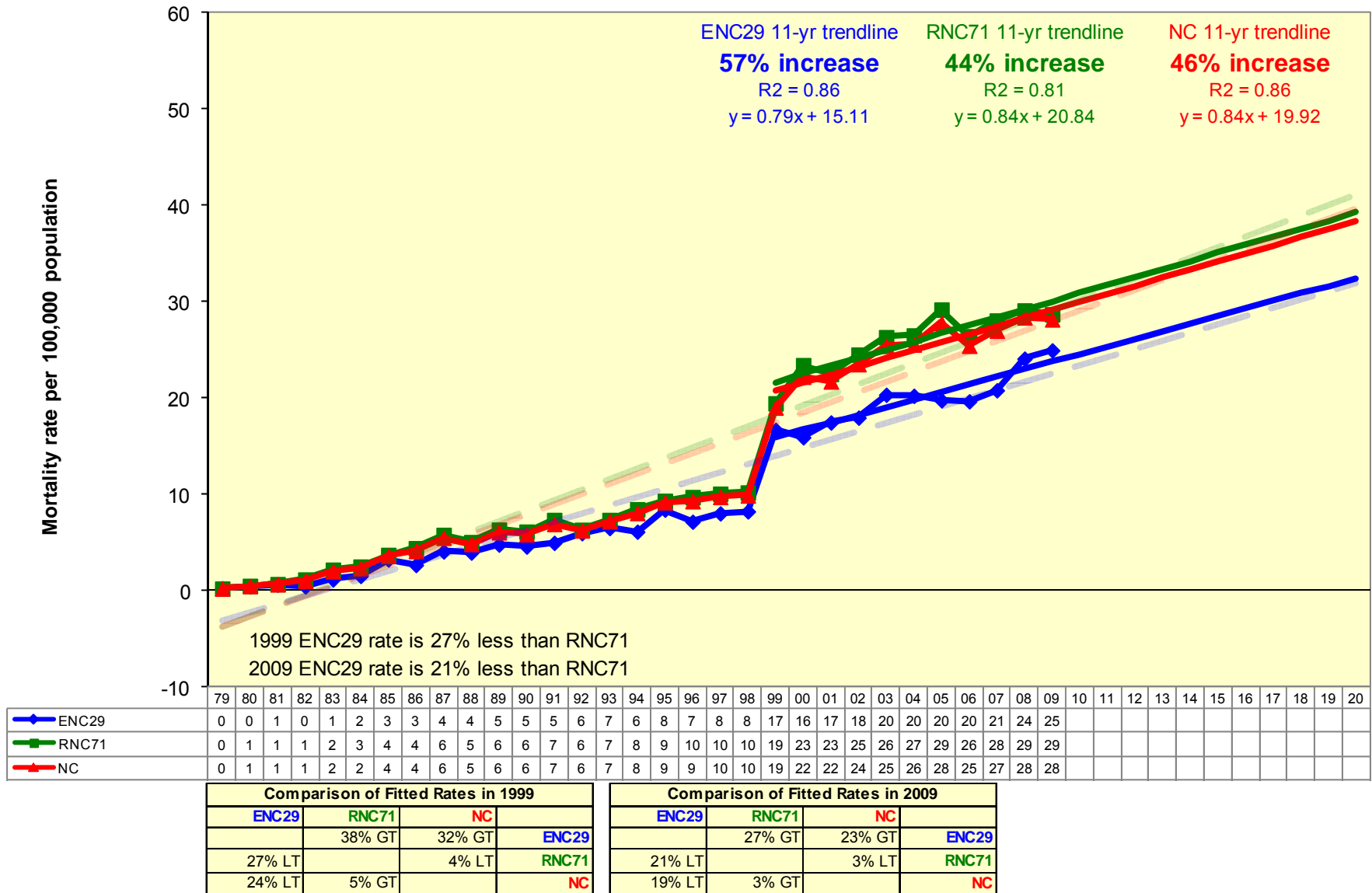
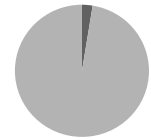


Figure 6.7 ii. Alzheimers Disease:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

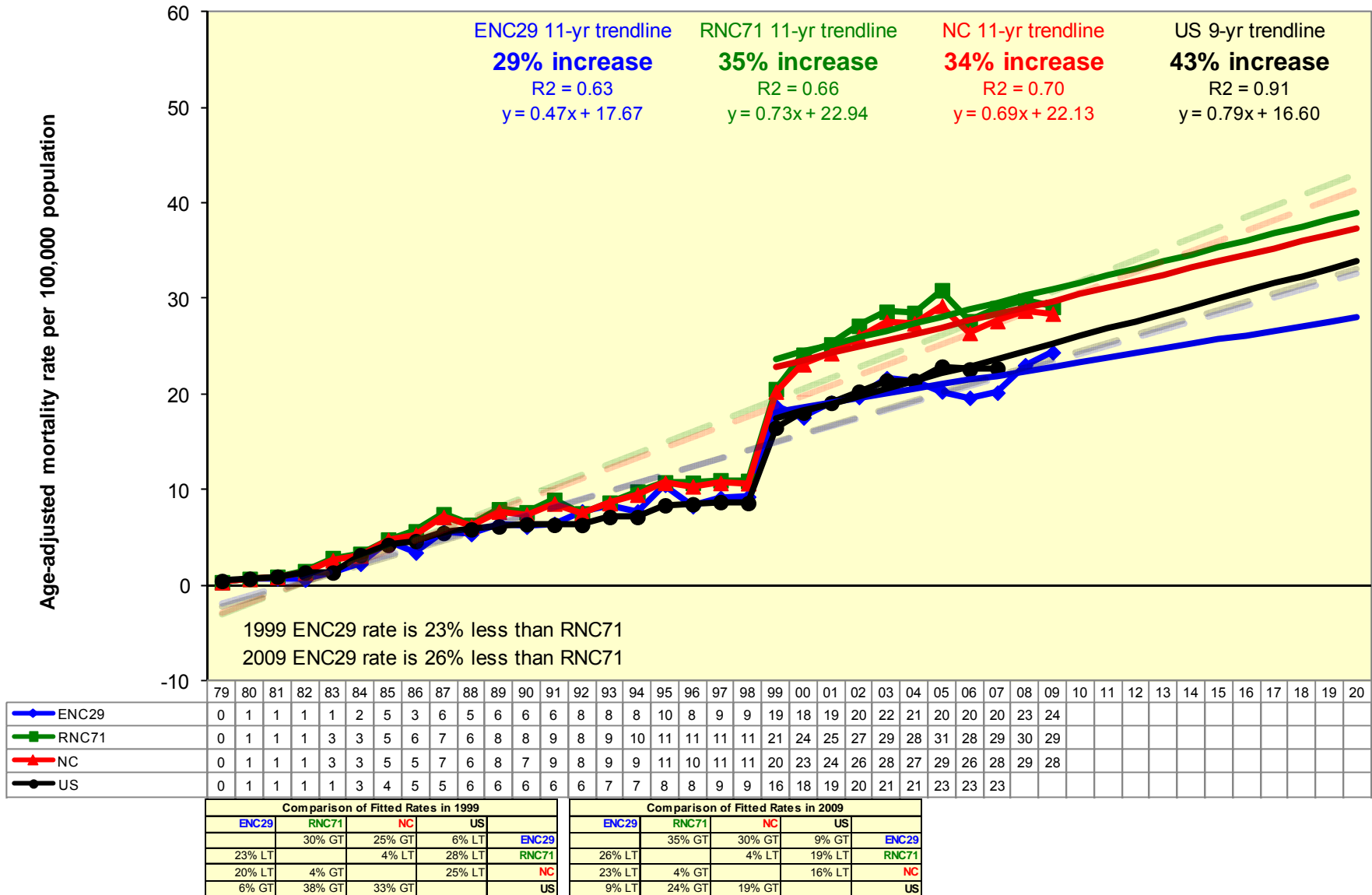
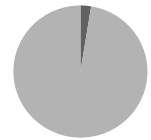


Figure 6.7 iii. Alzheimers Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

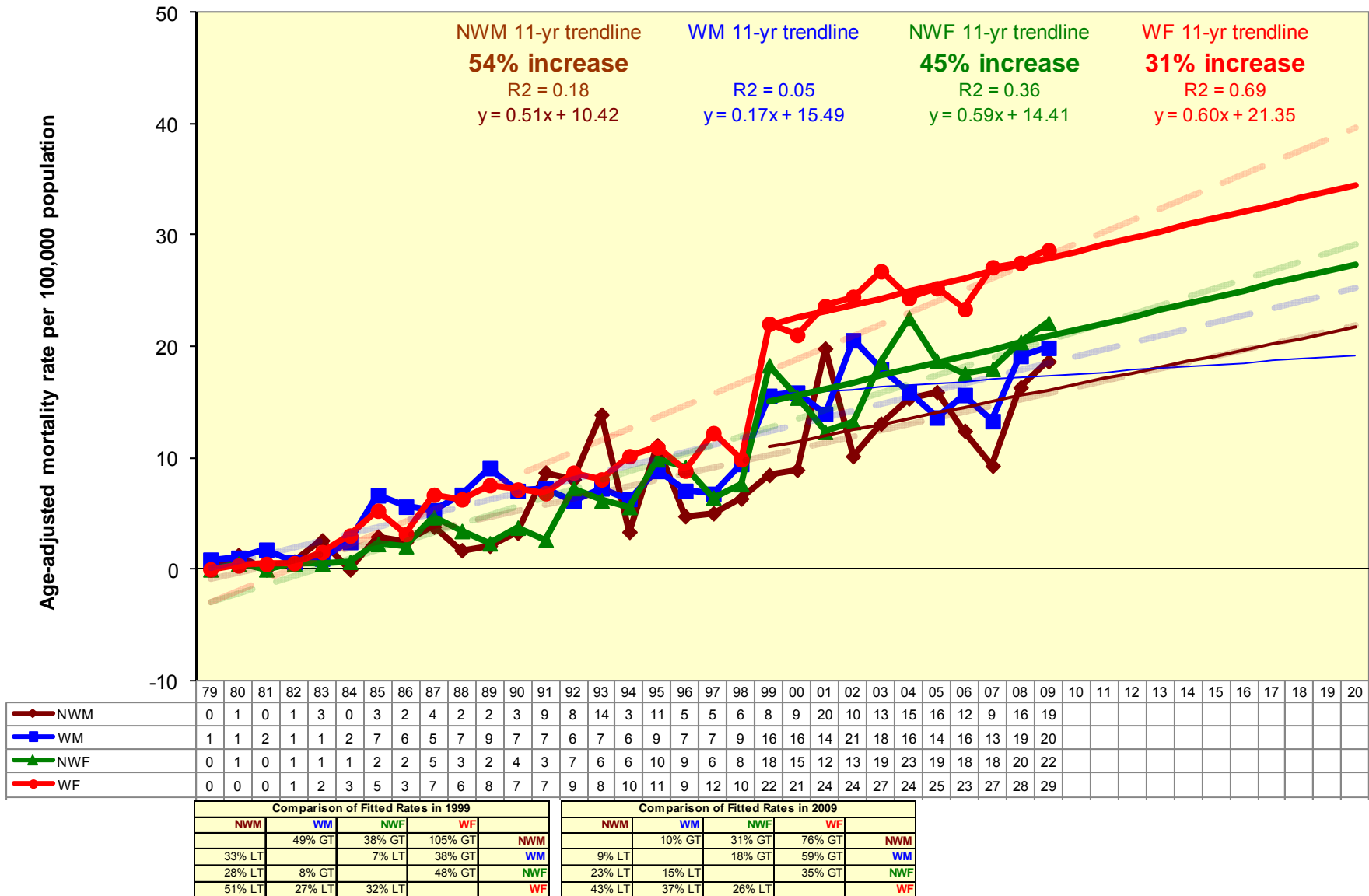
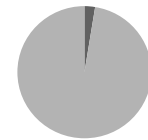


Figure 6.7 iv. Alzheimers Disease:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

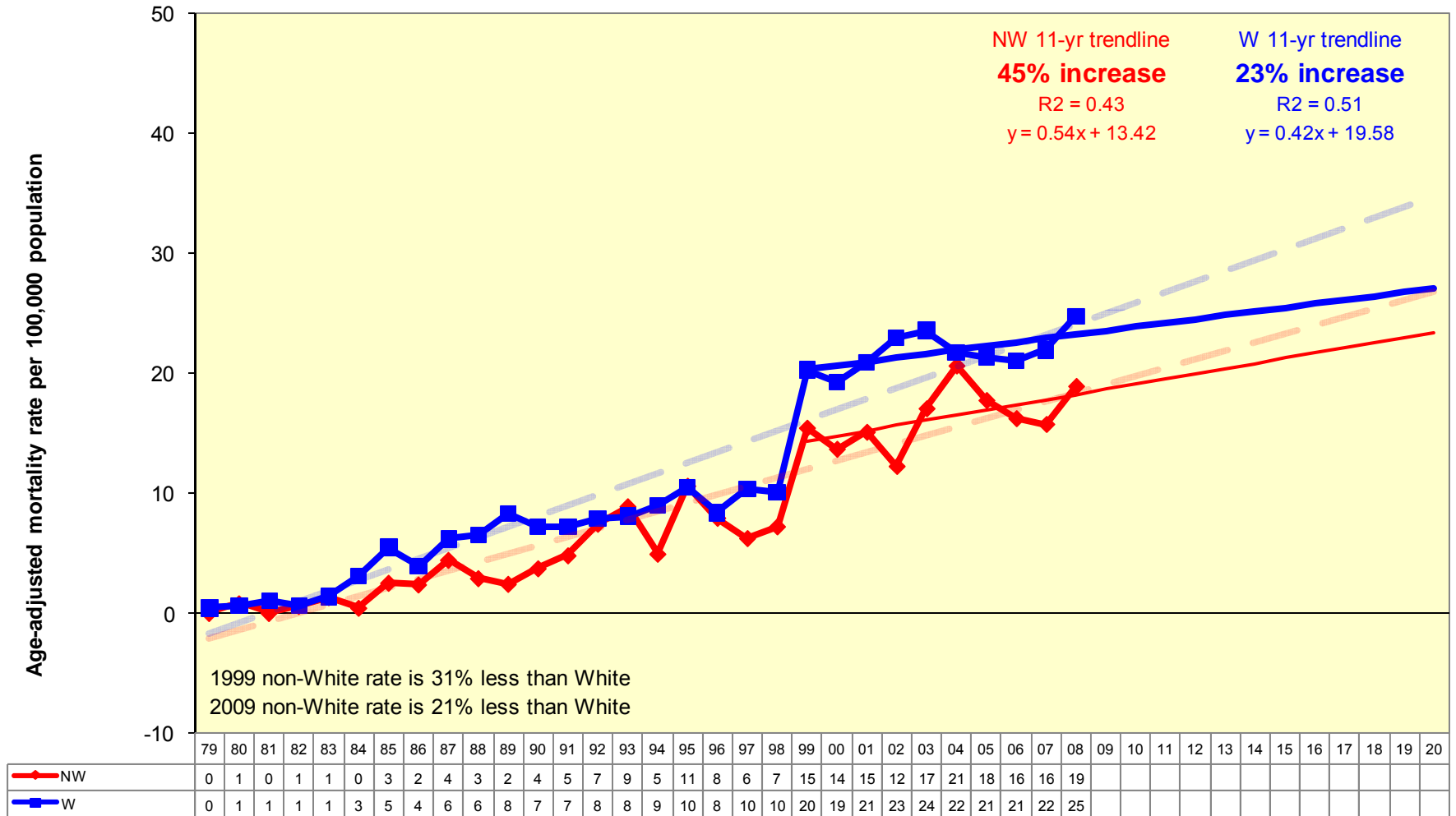
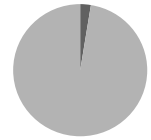
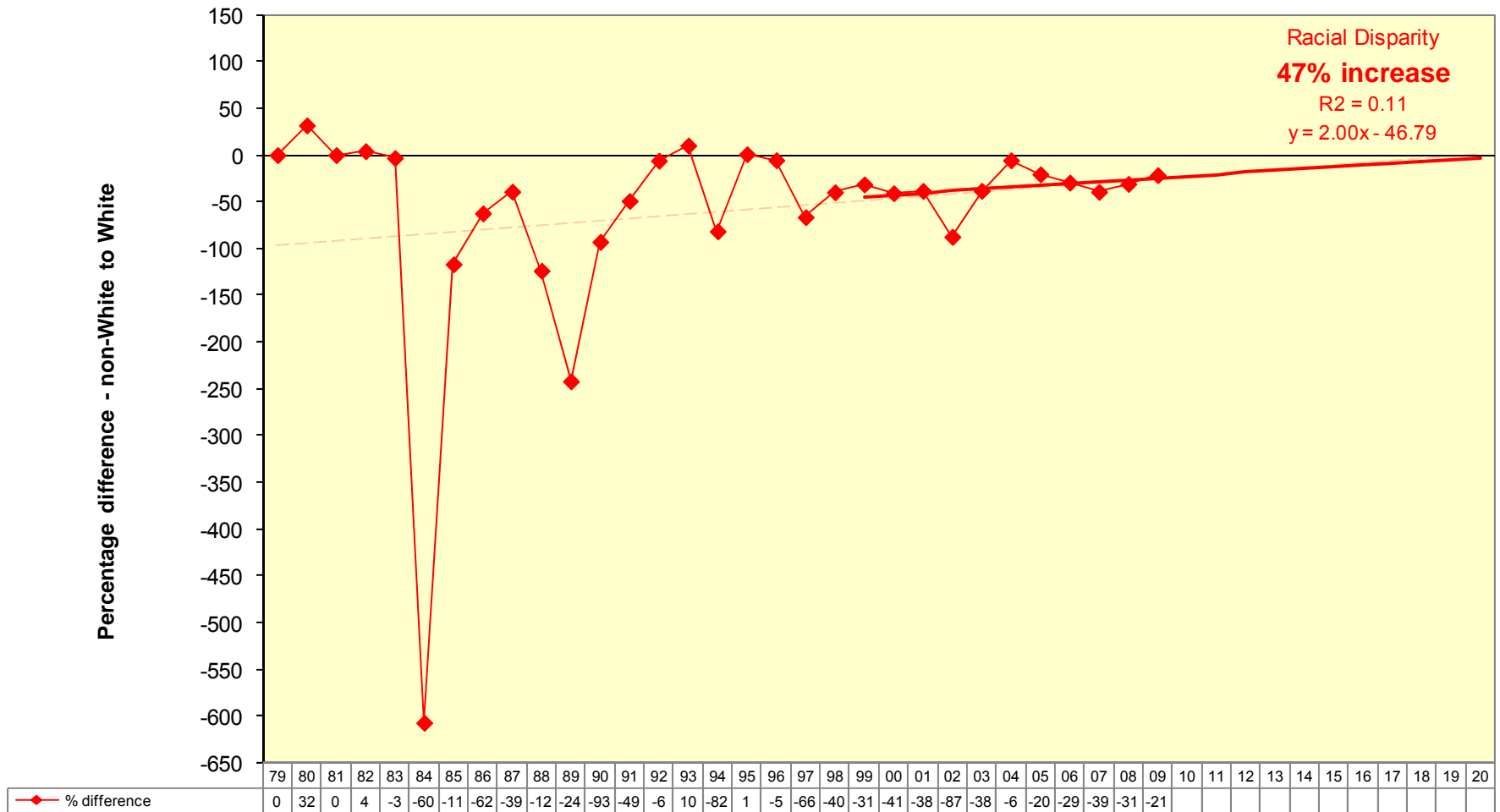
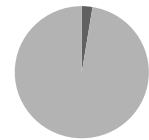


Figure 6.7 v. Alzheimers Disease:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1979-2009 with projections to 2020



# Nephritis, Nephrotic Syndrome, and Nephrosis

- Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 39% over 10 years, a rate divergent from those of RNC and NC. While these other regions have also experienced large increases, the ENC rate of increase remains the greatest.
- With age-adjustment, ENC and RNC have increased by 20% over the past 10 years. Since both regions are increasing at the same rate, convergence in the future seems unlikely.
- The 10-year trend for non-White males is unreliable but continues to remain the demographic group with the highest mortality rates.
- In 2009, the non-White rate was 123% greater than the White rate. Both the non-White and White rate are increasing, although the non-White rate trend is unreliable.
- A moderately reliable trend shows a 33% decrease in racial disparity over the 10-year period.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.8 i. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

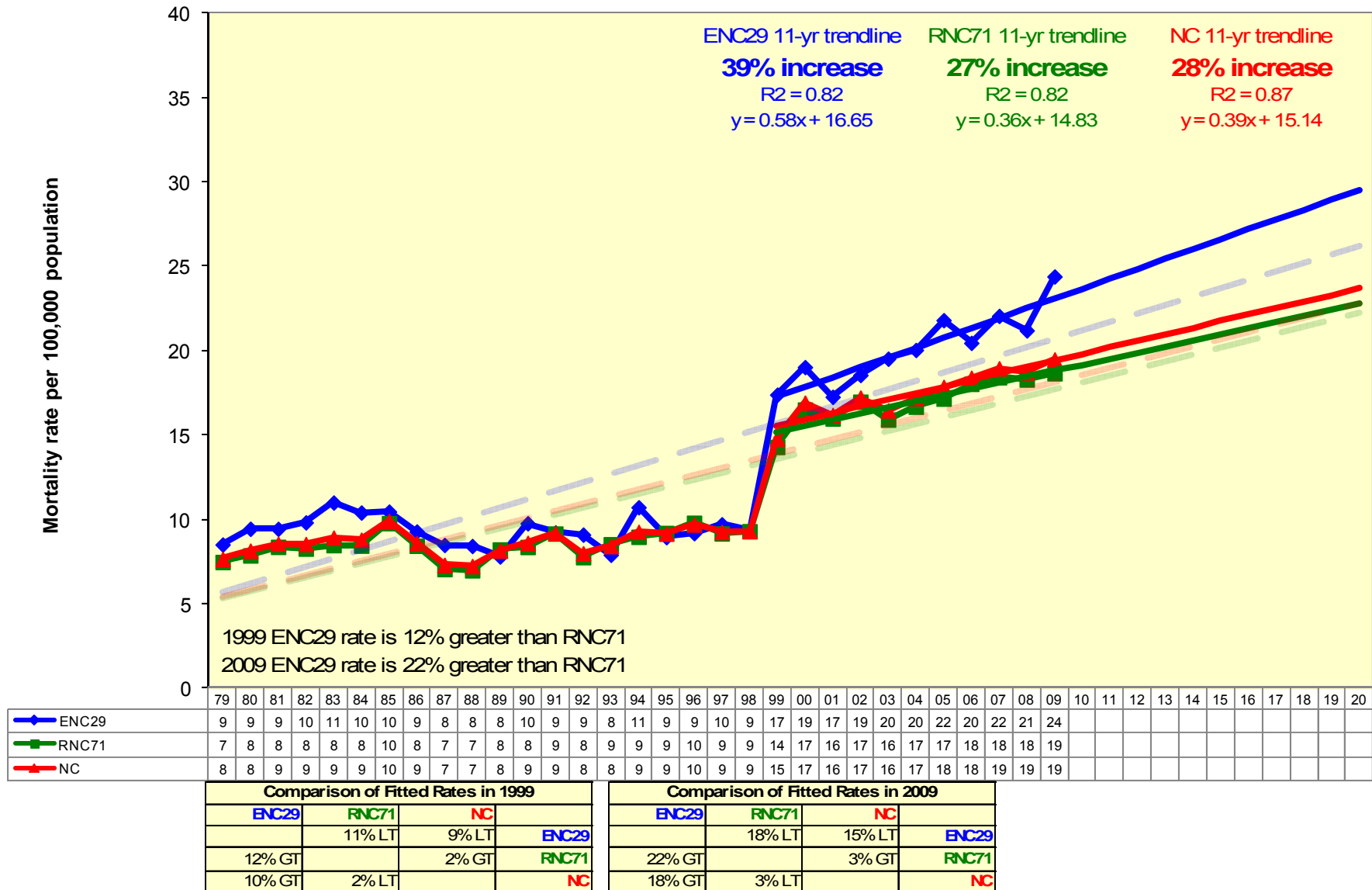
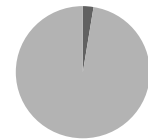




Figure 6.8 ii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2009 with projections to 2020

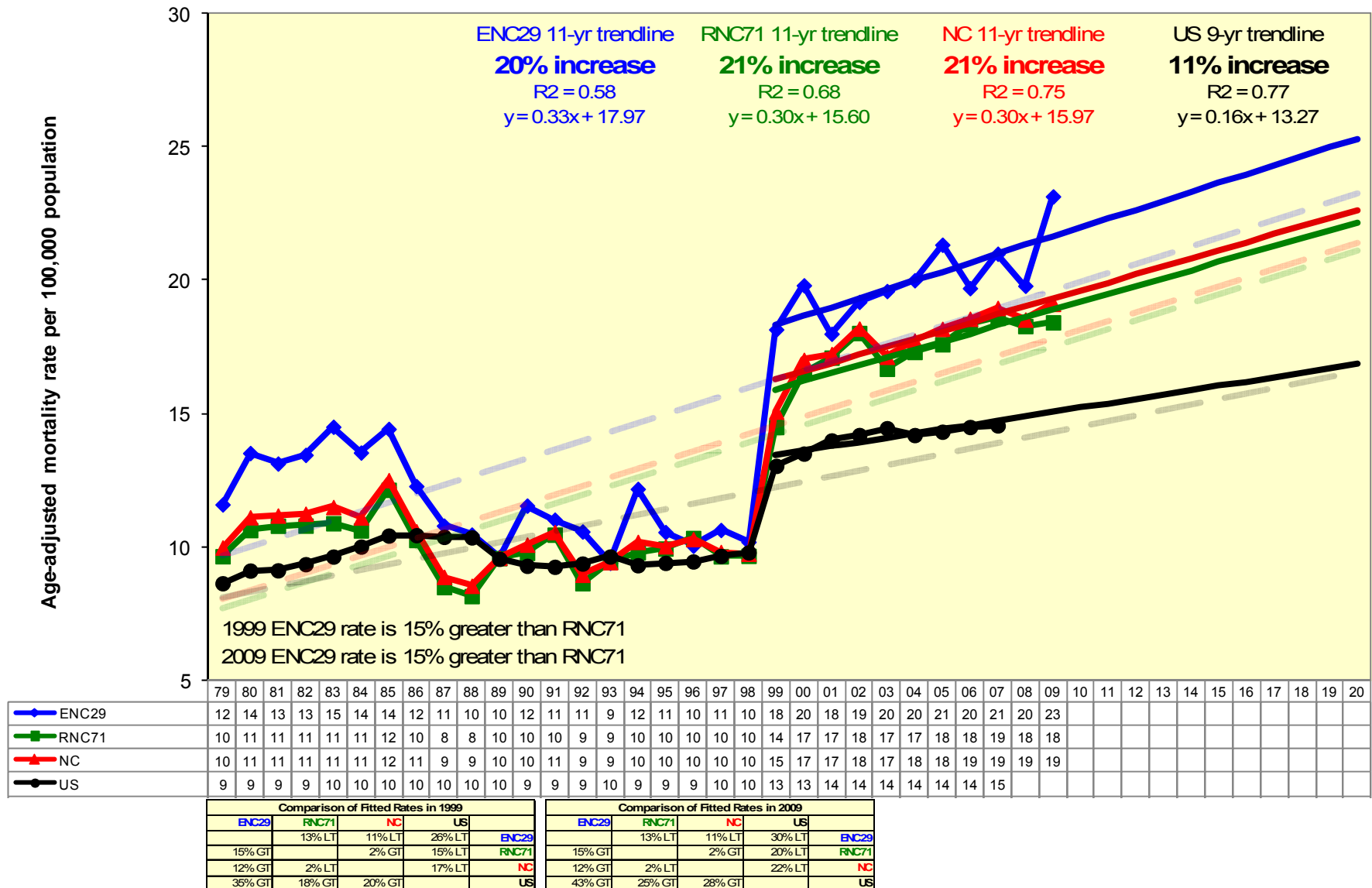
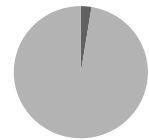


Figure 6.8 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2009 with projections to 2020

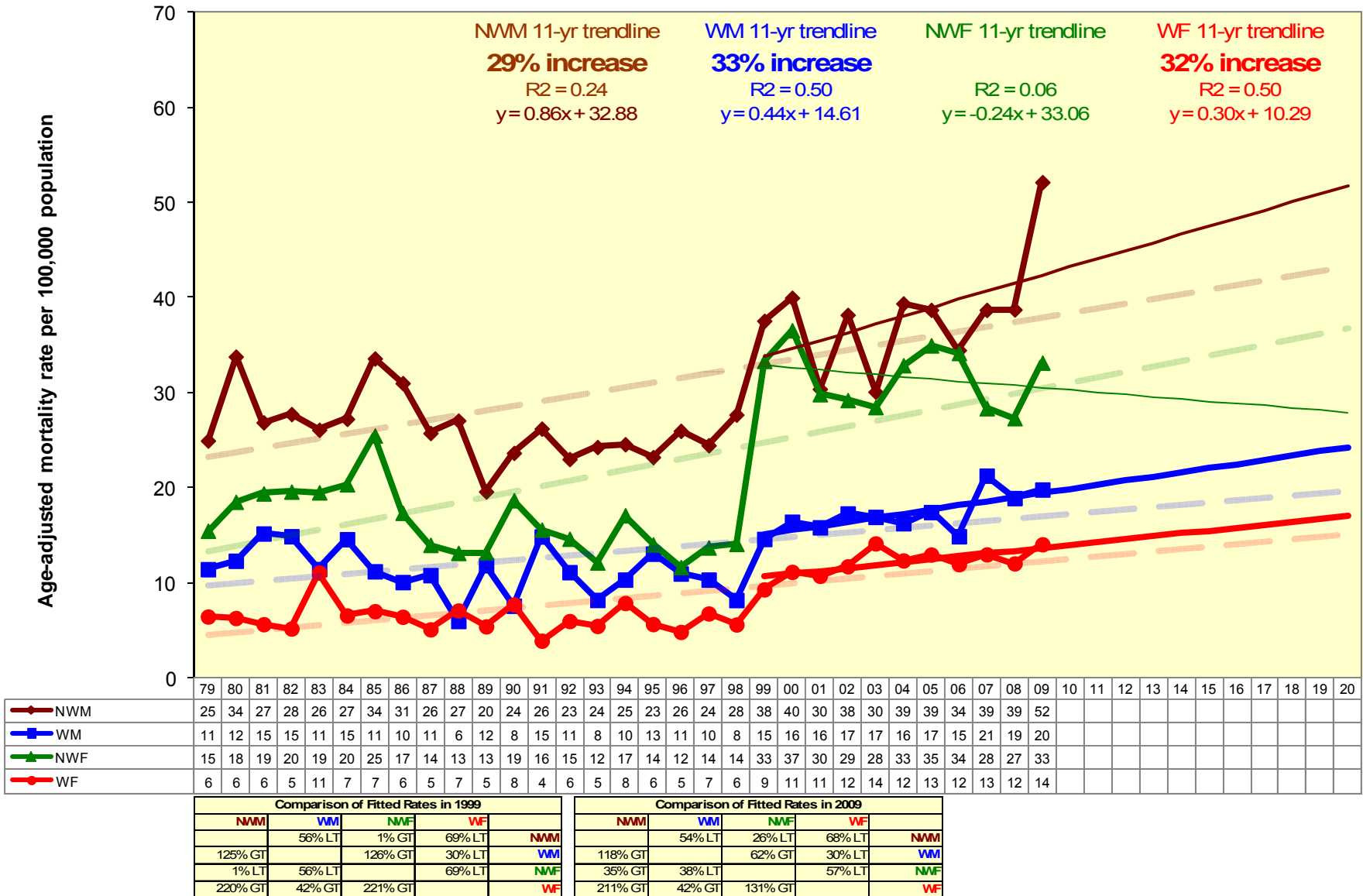
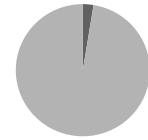


Figure 6.8 iv. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

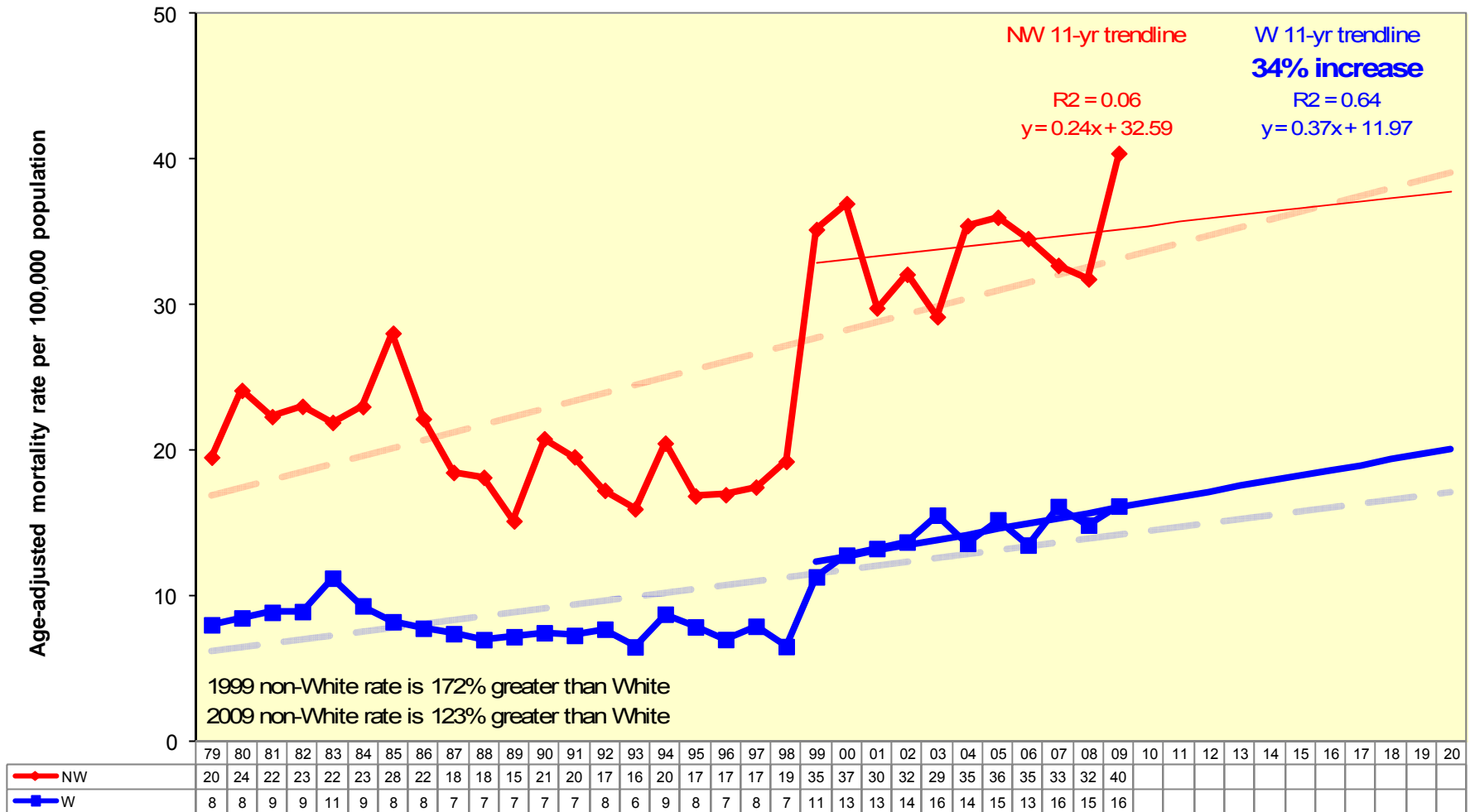
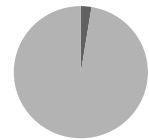
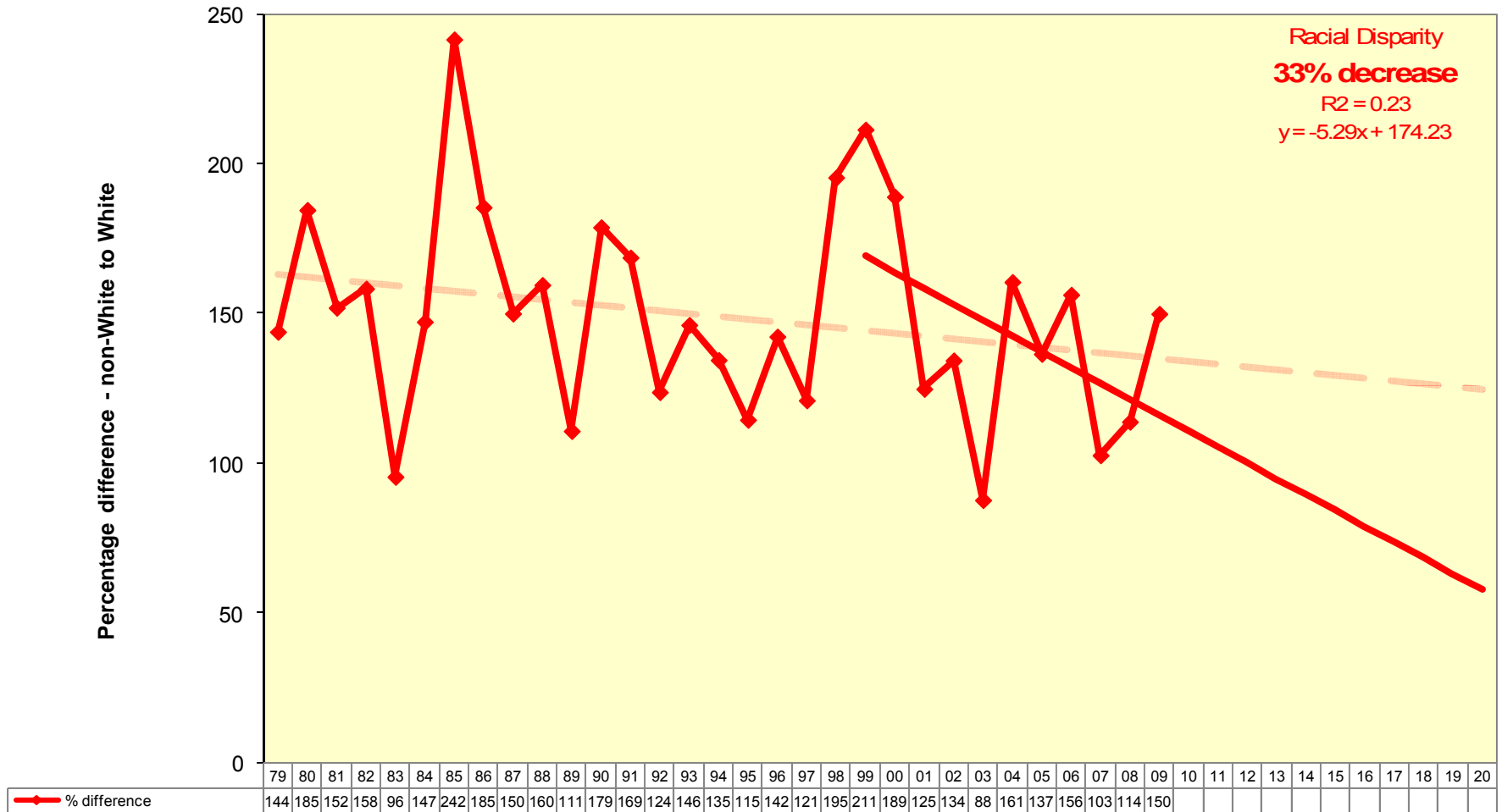
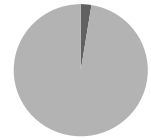


Figure 6.8 v. Nephritis, Nephrotic Syndrome, and Nephrosis:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1979-2009 with projections to 2020



# Pneumonia and Influenza

- The mortality rates for pneumonia and influenza have all been decreasing over the 1999-2009 period. ENC is decreasing less (20% over the 10-year period) and therefore diverging from RNC and NC.
- The age-adjusted mortality rates for all NC regions are decreasing at very similar rates (decreasing approximately 3.2% annually), and all declining at a rate slightly greater than the US (2.9% decrease annually).
- The age-adjusted mortality rates for both genders of both races appear to be decreasing with Non-White males and White males remaining the highest. White females have seen the greatest decrease, 36% from 1999-2009.
- Non-White rates were 3% less than White rates in 2009. The trend lines suggest a convergence in the future.
- The 10-year trend in racial disparity is not reliable.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.9 i. Pneumonia and Influenza:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

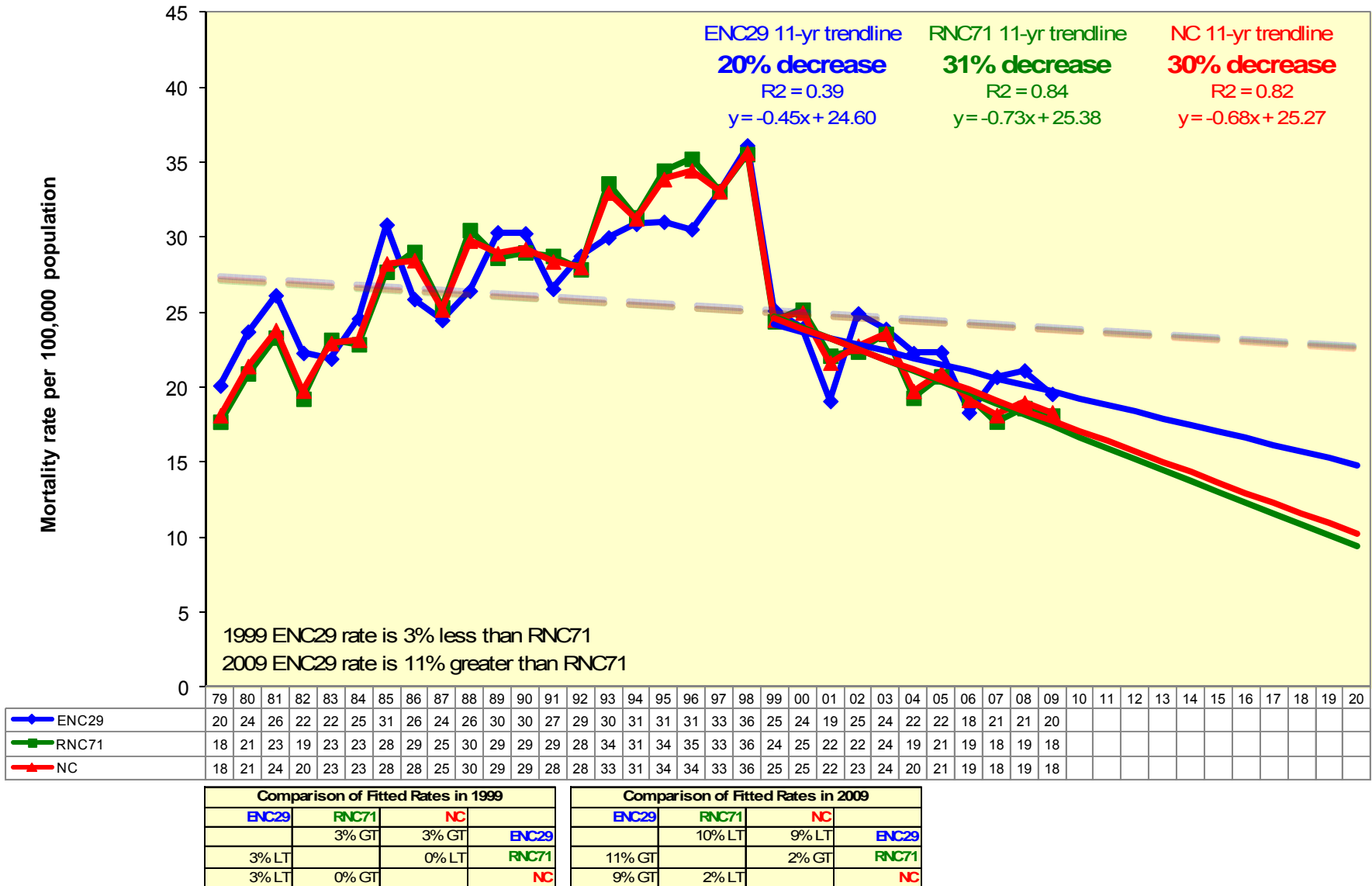
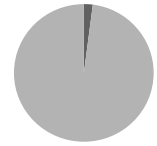
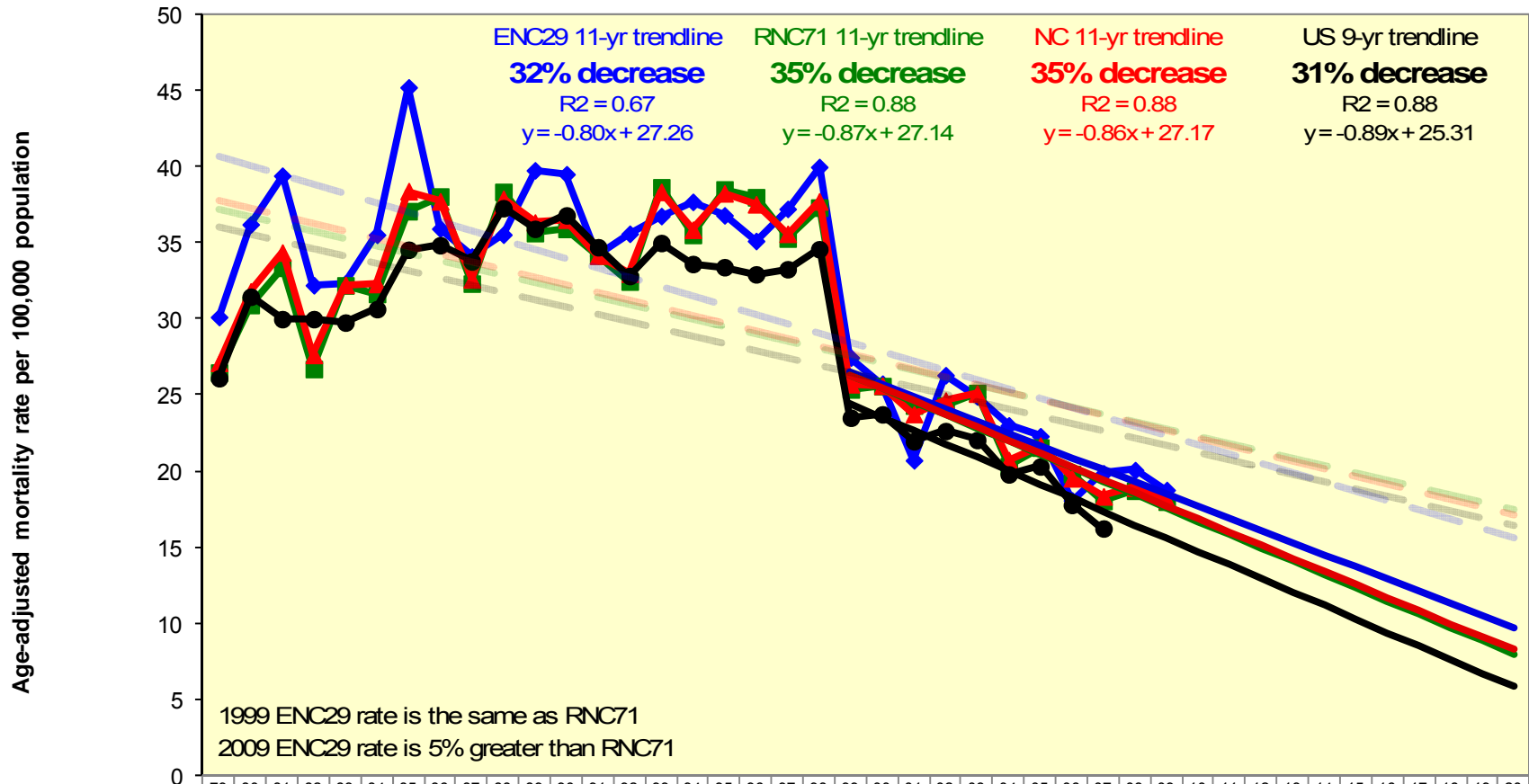
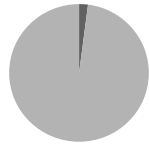


Figure 6.9 ii. Pneumonia and Influenza:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2009 with projections to 2020



	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20						
ENC29	30	36	39	32	32	36	45	36	34	36	40	40	34	36	37	38	37	35	37	40	27	26	21	26	25	23	22	18	20	20	19																	
RNC71	26	31	33	27	32	32	37	38	32	38	36	36	34	32	39	36	39	38	35	37	25	26	24	24	25	20	22	20	18	19	18																	
NC	27	32	34	28	32	32	38	38	33	38	36	37	34	33	38	36	38	38	36	38	26	26	24	25	25	21	22	20	18	19	18																	
US	26	31	30	30	30	31	35	35	34	37	36	37	35	33	35	34	33	33	33	35	24	24	22	23	22	20	20	18	16																			

Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	US
	0% LT	0% LT	7% LT
0% GT		0% GT	7% LT
0% GT	0% LT		7% LT
8% GT	7% GT	7% GT	

Comparison of Fitted Rates in 2009			
ENC29	RNC71	NC	US
	4% LT	4% LT	15% LT
5% GT		1% GT	11% LT
4% GT	1% LT		11% LT
17% GT	12% GT	13% GT	

Figure 6.9 iii. Pneumonia and Influenza:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

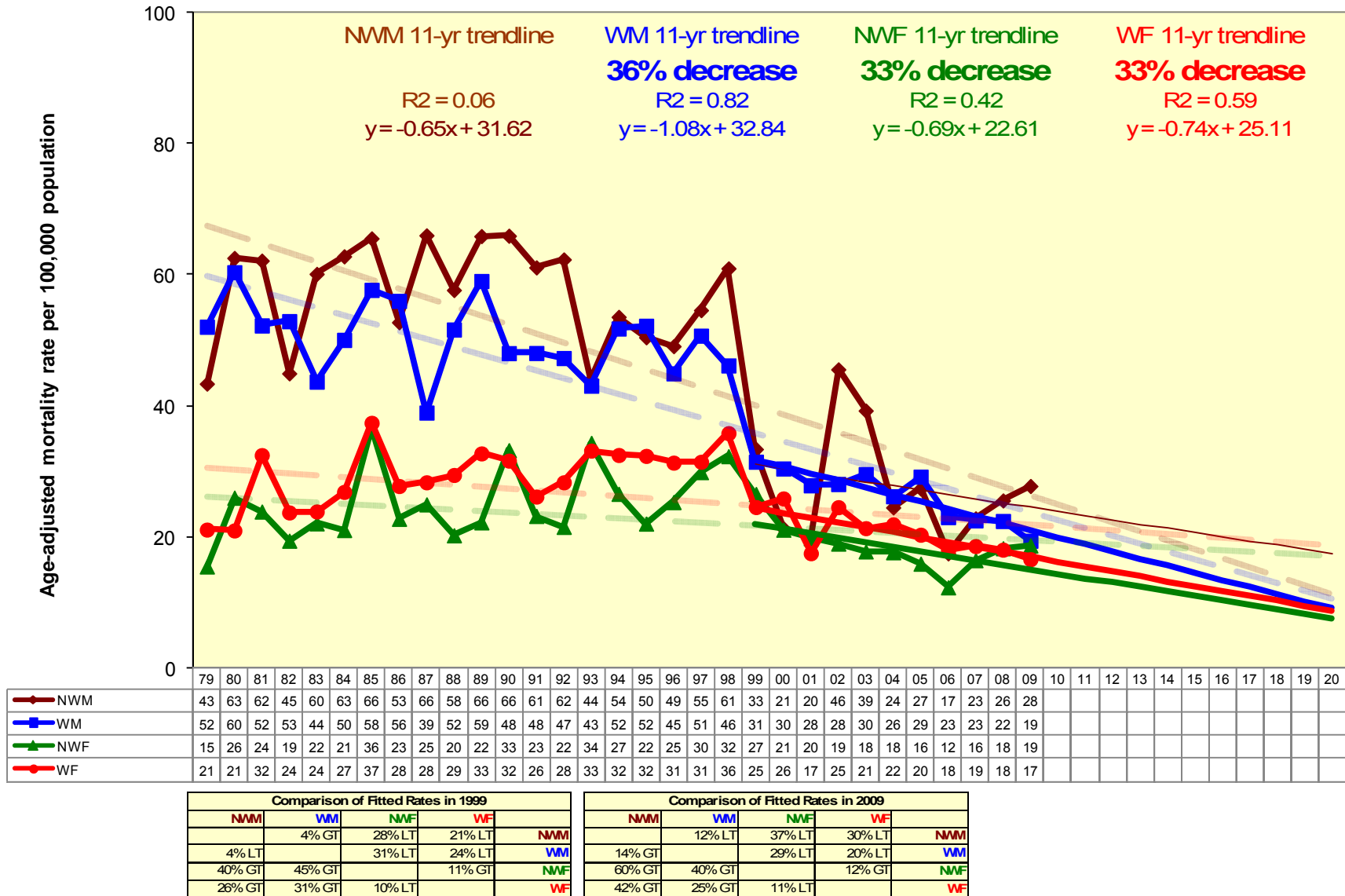
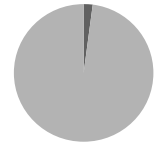




Figure 6.9 iv. Pneumonia and Influenza:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

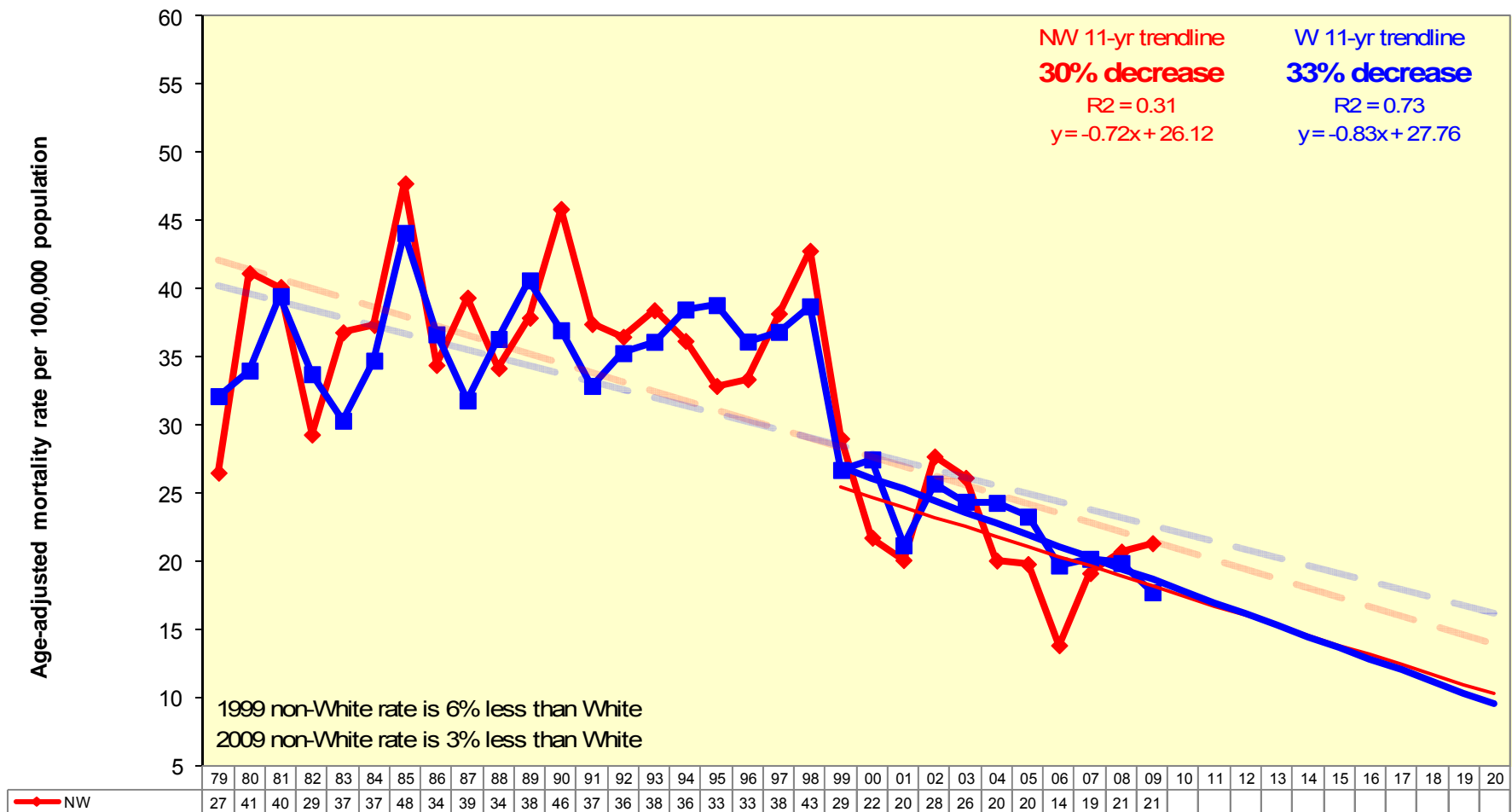
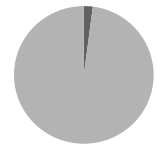
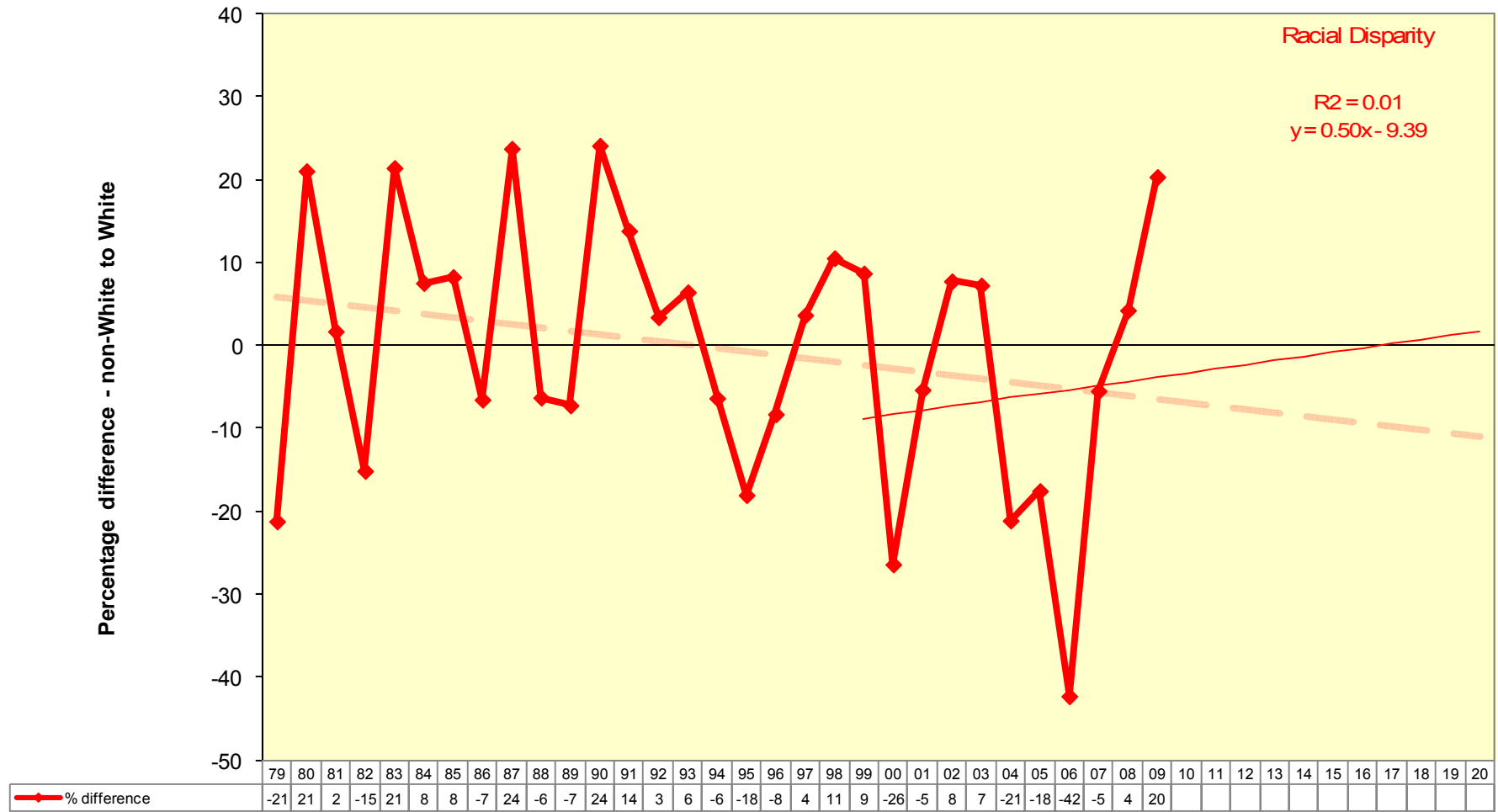
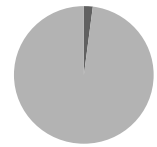


Figure 6.9 v. Pneumonia and Influenza:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020



# Unintentional Motor Vehicle Injuries

- ENC's unintentional motor vehicle injury rate is moderately reliable and is higher than the RNC rate (32% greater than RNC in 2009).
- The ENC age-adjusted rate is 29% greater than RNC and 45% greater than the US rate in 2009. The ENC rate is declining, although not as quickly as RNC or NC.
- The 10 year trend for non-White males is declining. The trend for White males is not reliable. The non-White female mortality rate has decreased 47% over the 10-year period and has achieved the *HP2010* goal of less than 9.2 deaths per 100,000.
- The non-White rates have decreased by 25% and converged with the White rates suggesting a reversal in disparity within ENC. In 2009, the non-White rate was 12% less than the White rate compared to 1999 when the non-White rate was 9% greater than the White rate.
- Recent observed rates and fitted rates suggest that the racial disparity in ENC is eliminated, and may actually be favoring non-Whites. With a moderately reliable trend, the racial disparity has decreased by 283% over the 10-year period.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 6.10 i. Unintentional Motor Vehicle Injuries:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

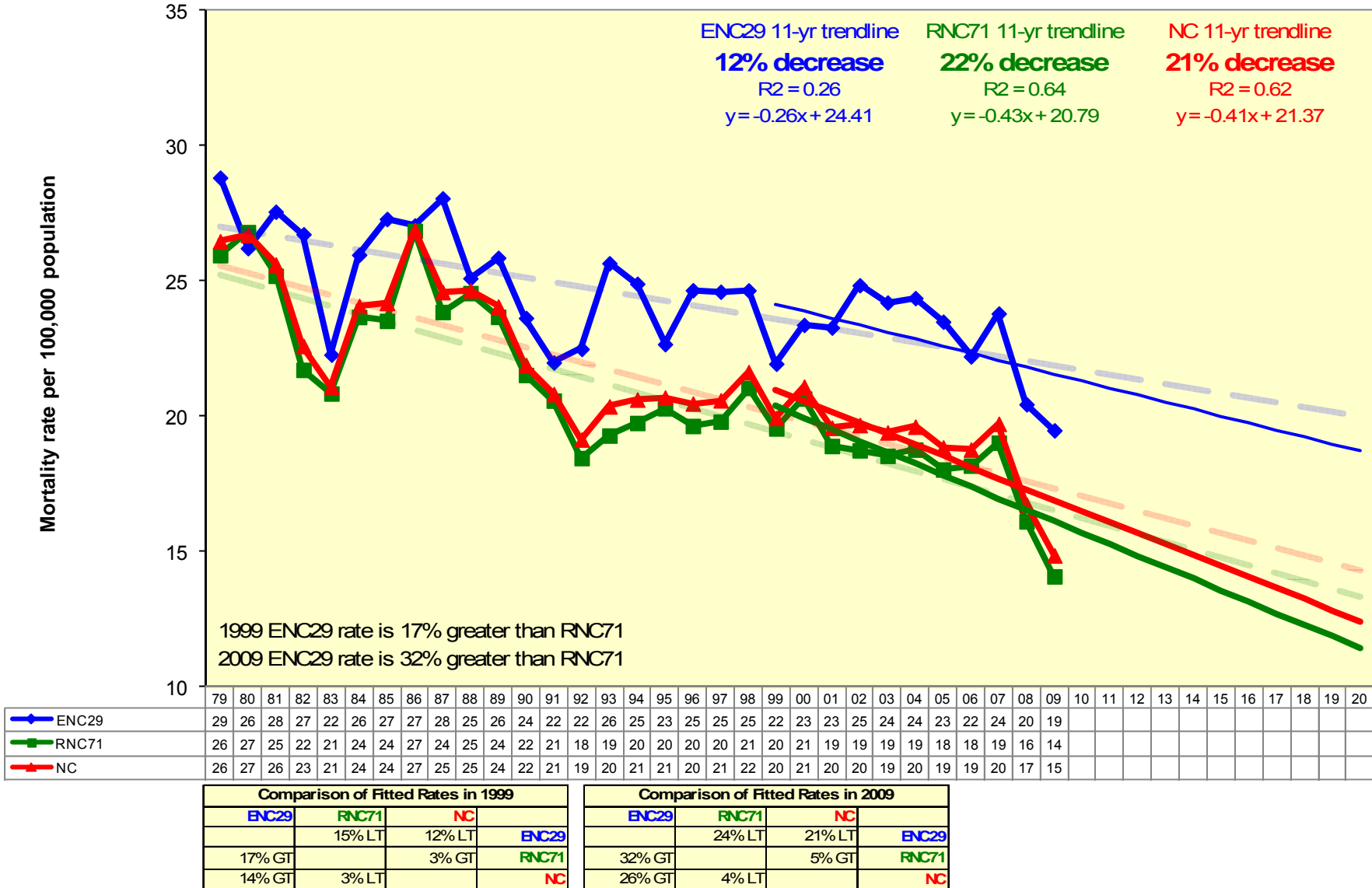
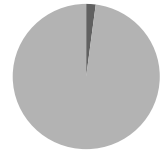


Figure 6.10 ii. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

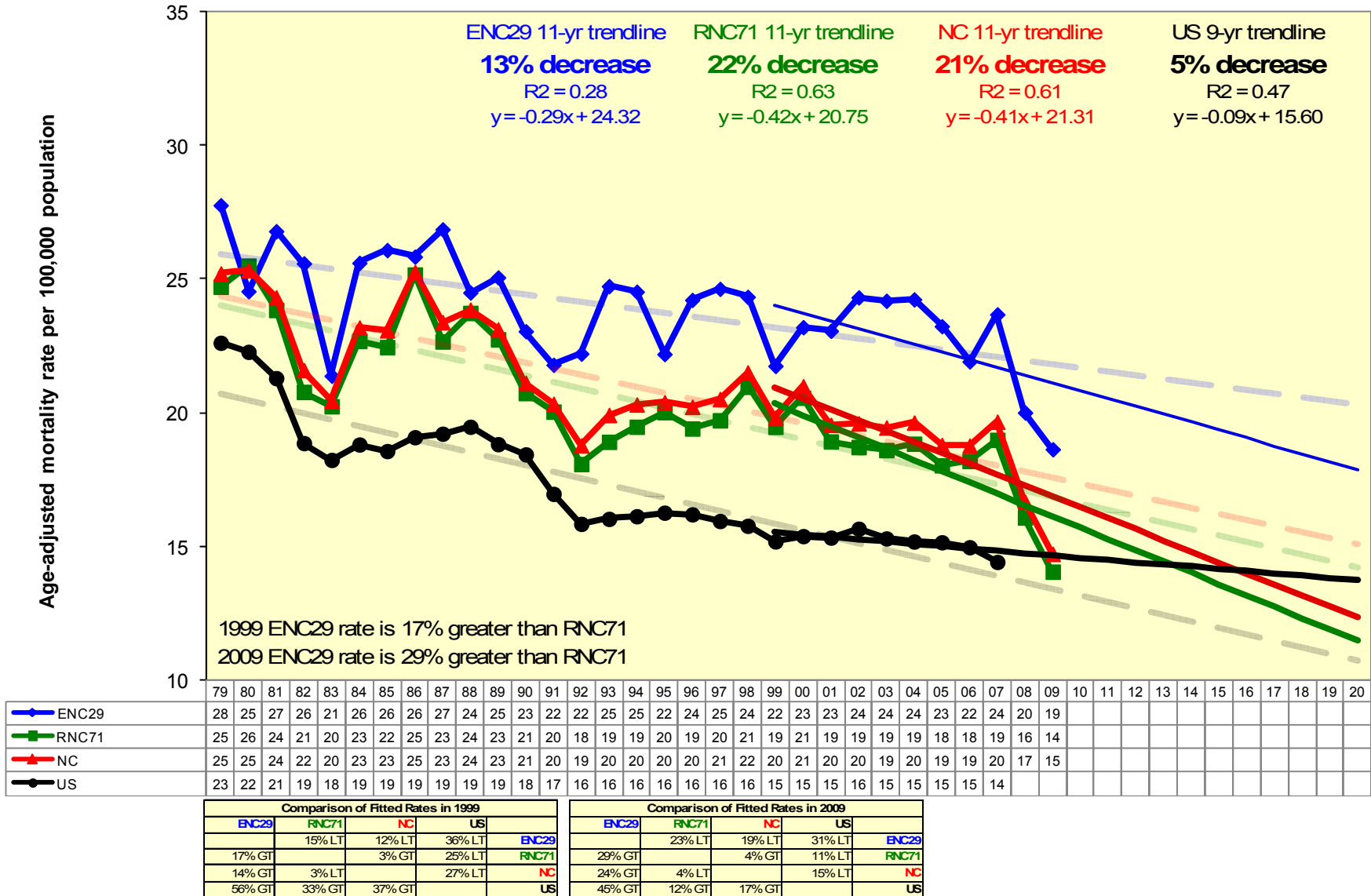
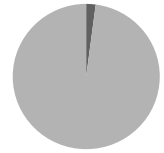


Figure 6.10 iii. Unintentional Motor Vehicle Injuries: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2009 with projections to 2020

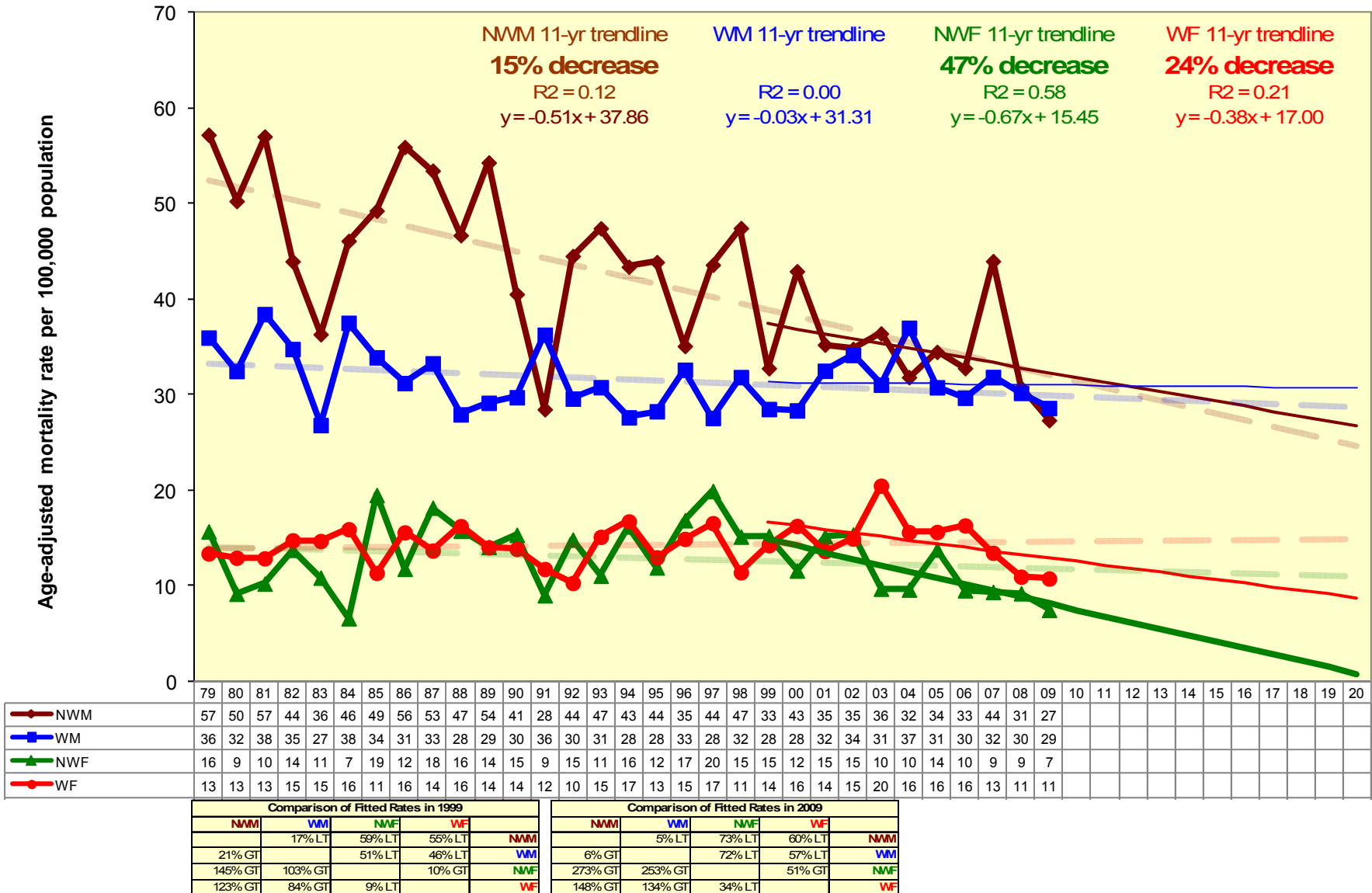
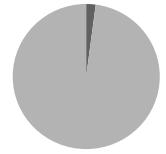
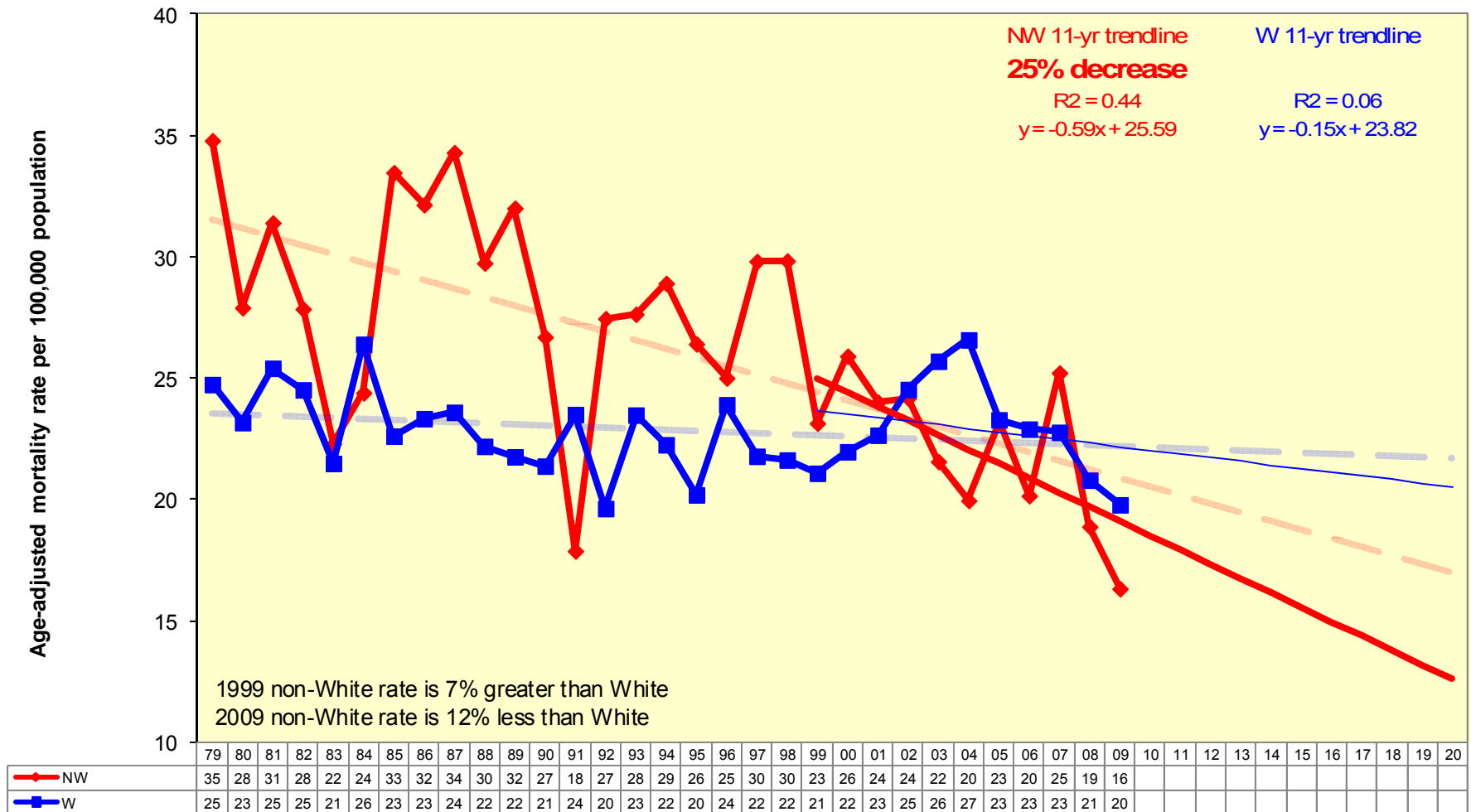
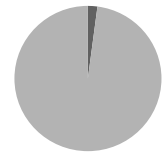


Figure 6.10 iv. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020



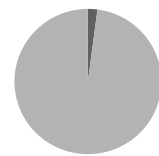
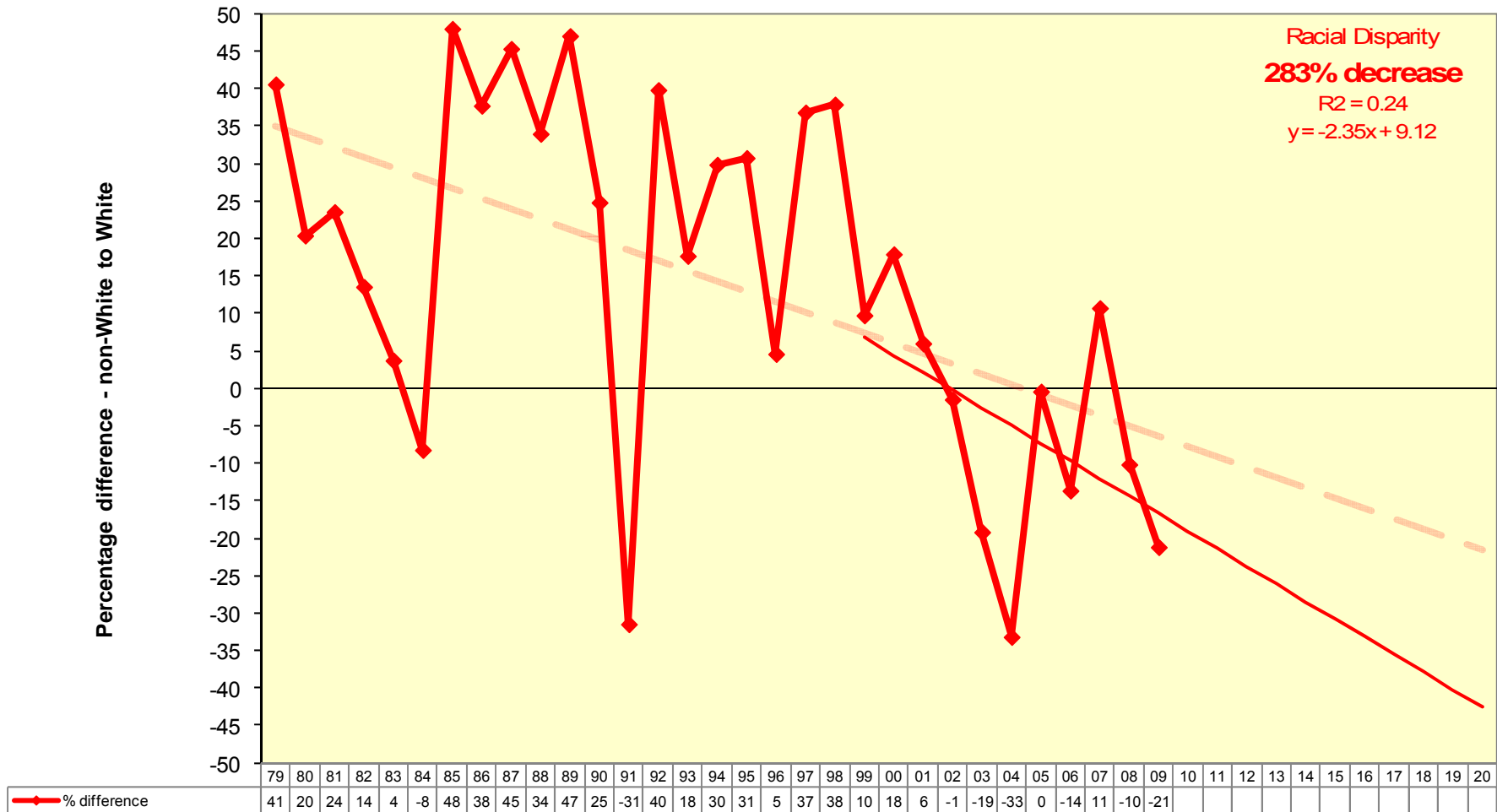


Figure 6.10 v. Unintentional Motor Vehicle Injuries:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020







# 7. Trends and Disparities in Mortality in ENC29: Cancer - All Sites and HIV Disease; 1979-2009

## Cancer - All Sites

- The cancer – all sites mortality rate trend for ENC is unreliable but continuously higher than both RNC and NC rate trends. The 30-year trend shows ENC as increasingly divergent from RNC and NC rate trends. In 2009, the ENC rate was 18% greater than RNC.
- The age-adjusted cancer – all sites mortality trends for all regions are decreasing. ENC continues to have a higher rate than RNC, NC and US.
- The cancer – all sites mortality rates for White males and non-White males are decreasing. Non-White males have seen the greatest decrease from 1999-2009 (24% decrease). White females have reached the *HP2010* goal of fewer than 159.9 deaths per 100,000.
- Both Whites and non-White cancer mortality trends have been decreasing over the 10-year period (11% and 18% decreases, respectively) but the non-White rate remains 16% greater than the White rate in 2009.
- The 10-year trend for racial disparity is moderately reliable and has decreased by 38%.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 7.1 i. Cancer - All Sites:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

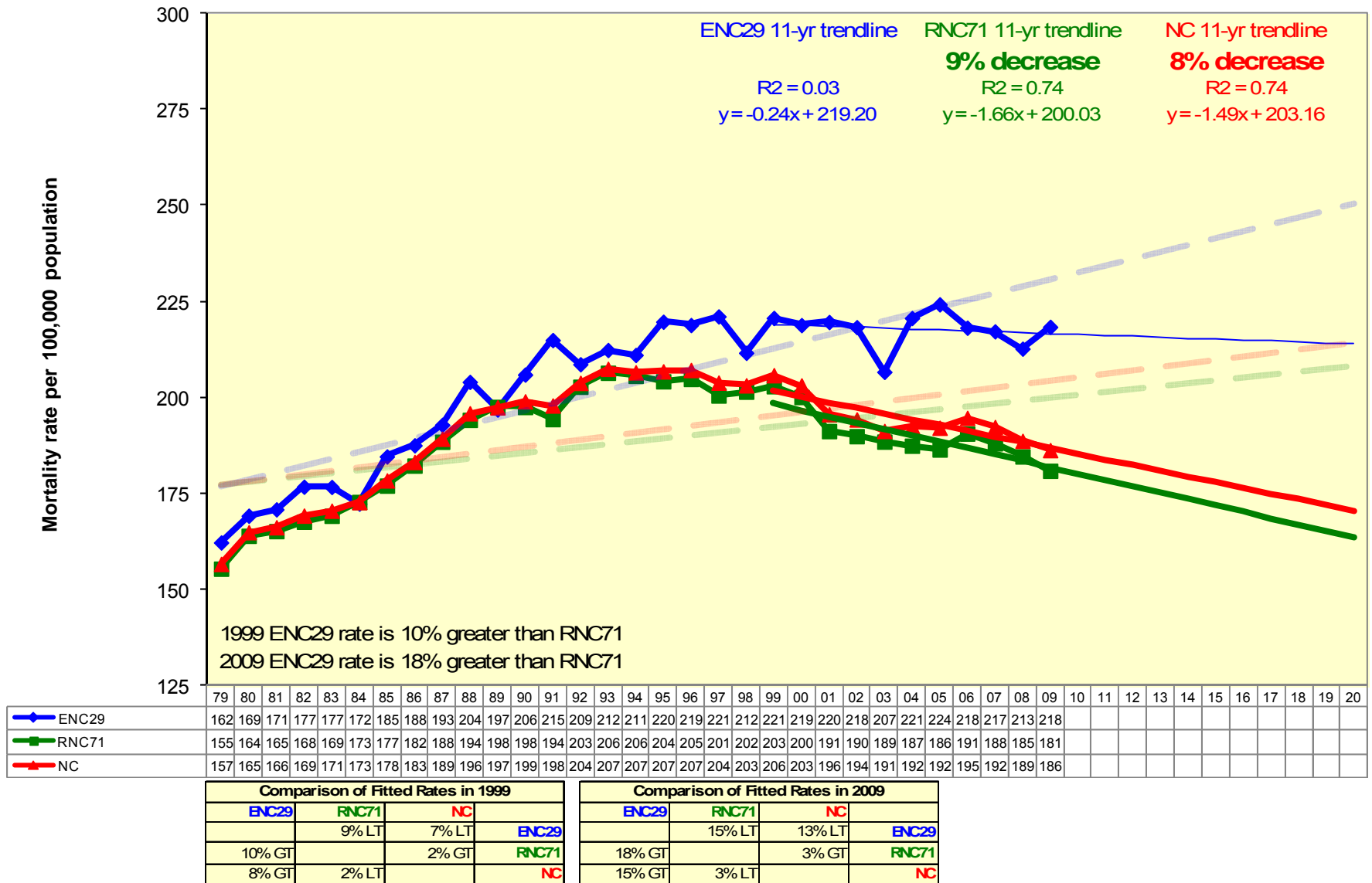


Figure 7.1 ii. Cancer - All Sites:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2009 with projections to 2020

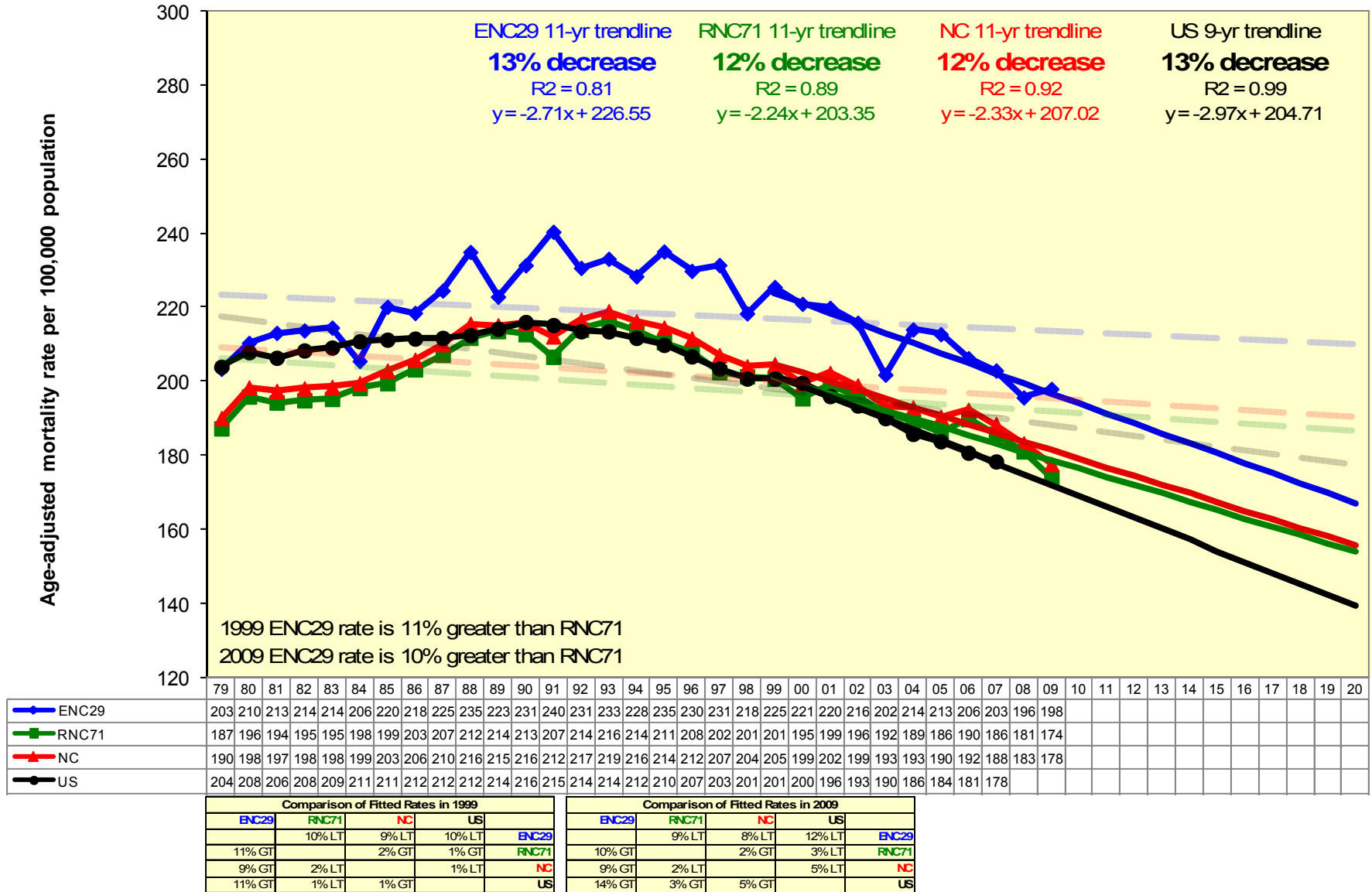


Figure 7.1 iii. Cancer - All Sites:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

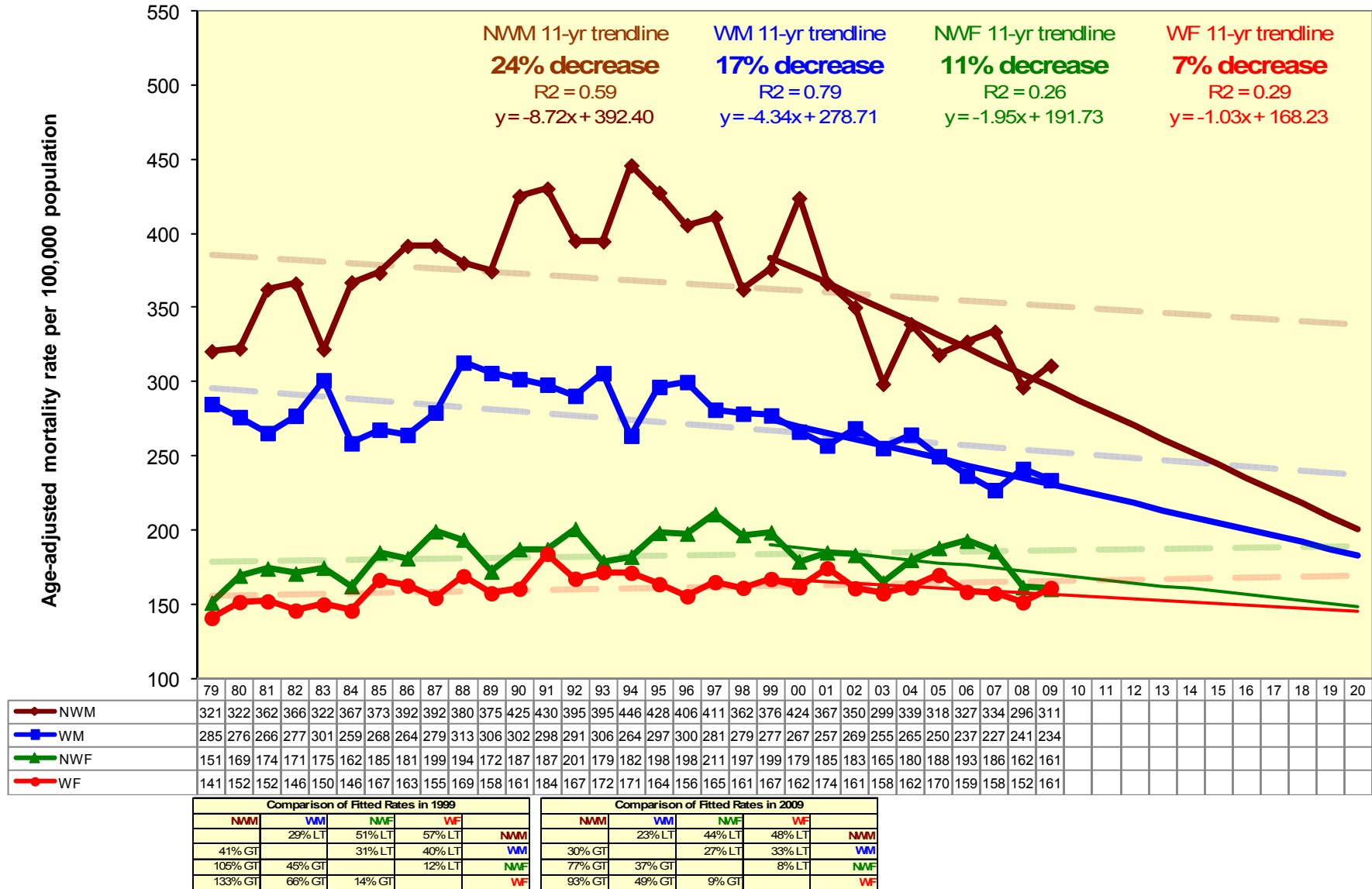


Figure 7.1 iv. Cancer - All Sites:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

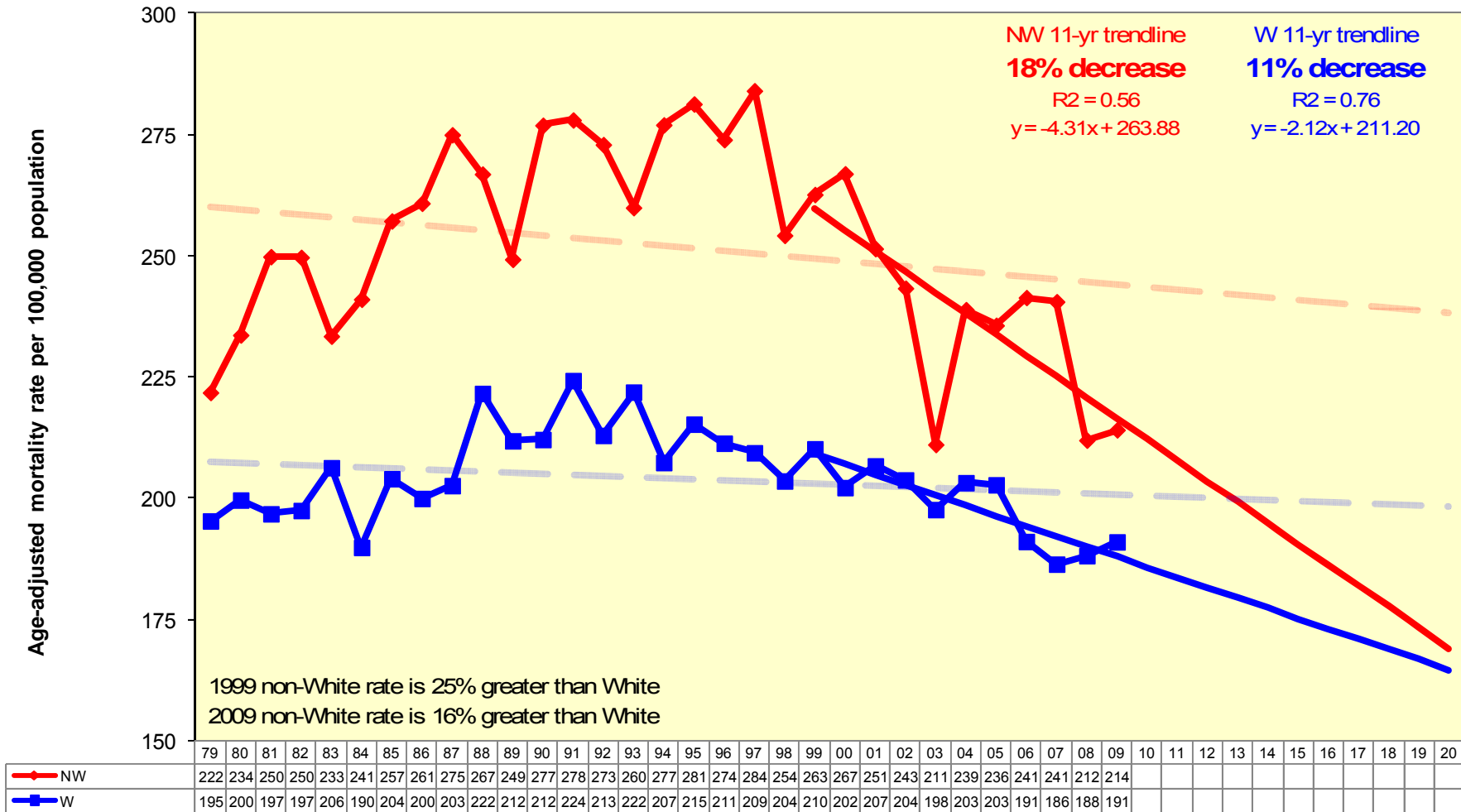
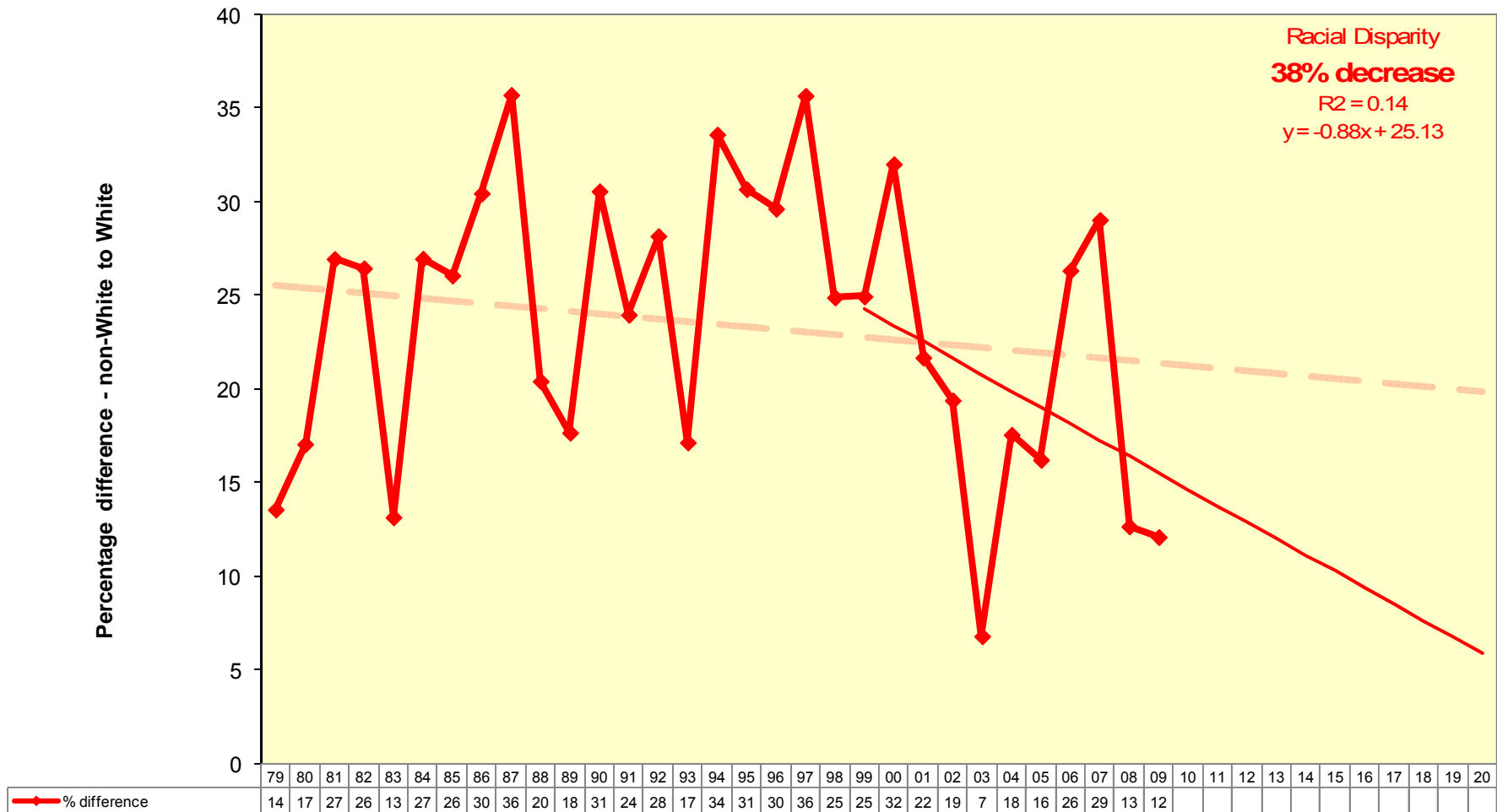
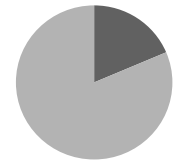


Figure 7.1 v. Cancer - All Sites:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020





# HIV Disease

- According to the 10-year trend lines for HIV mortality, rates are decreasing for all regions but ENC has the smallest rate of decrease. Although the ENC rate has been decreasing, it is still 35% greater than RNC in 2009.
- The age-adjusted rates for all NC regions are similar and are decreasing, suggesting convergence in the future. However, based on current projections, the goal set by *Healthy People 2010* of 0.7 deaths per 100,000 will not be met by any region in NC.
- Non-White males continue to have the highest rates of age-adjusted mortality for all demographic groups. White males had the greatest rate of decline (52% over 10 years) of all groups. Convergence of all trends is projected in the future.
- From 1999-2009, the non-White age-adjusted HIV mortality rate has decreased by 39% but remains 1212% greater than the White rate. Age-adjusted mortality rates for Whites decreased by 51% in a reliable trend.
- In a moderately reliable trend, the 10 year period shows a 108% increase in racial disparity.

Unless otherwise noted, trends are considered reliable if  $R^2 \geq 0.35$ , moderately reliable if  $0.35 > R^2 \geq 0.10$ , and unreliable if  $R^2 < 0.10$ .

Figure 7.2 i. HIV Disease:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1979-2009 with projections to 2020

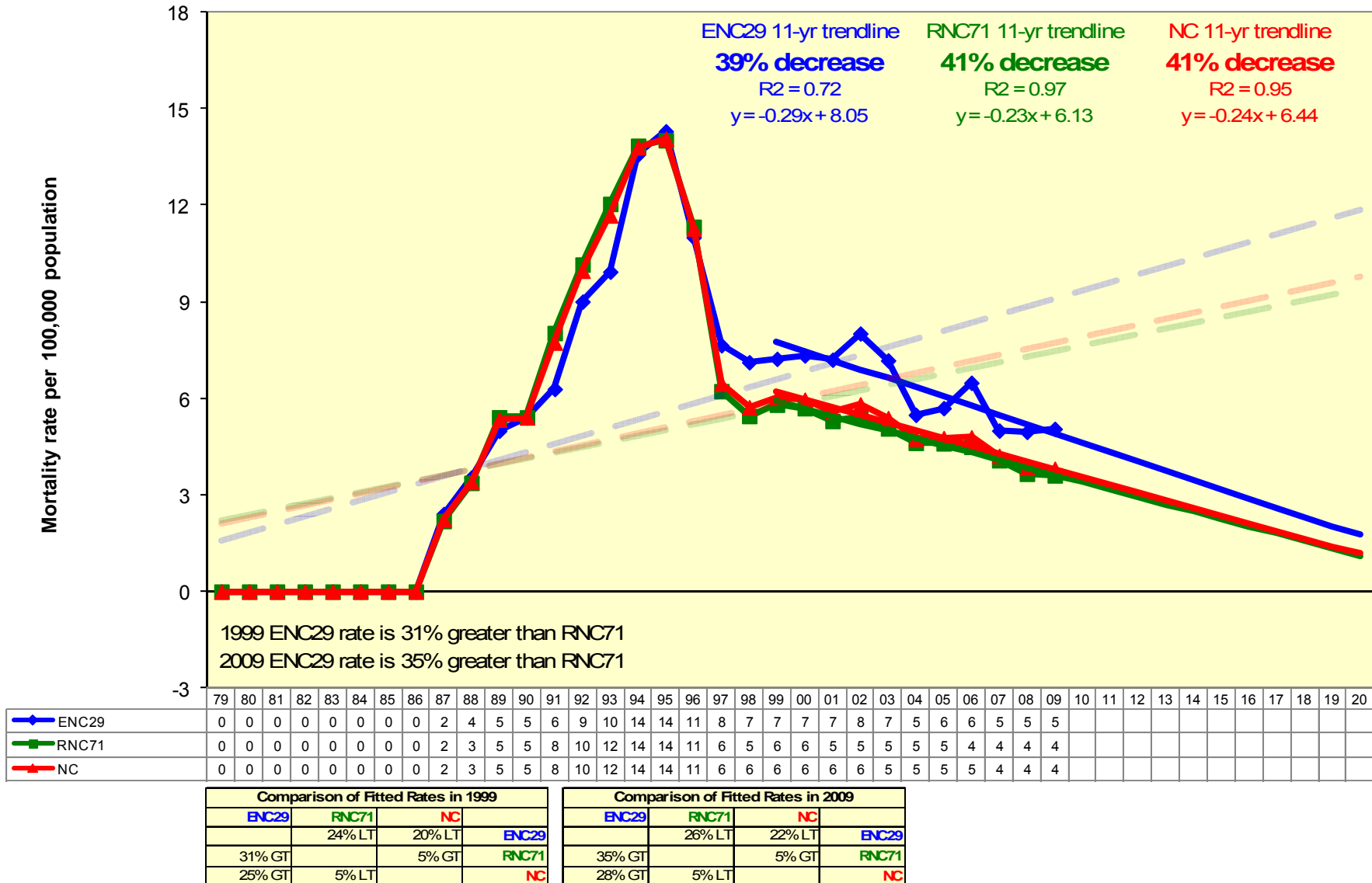
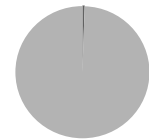


Figure 7.2 ii. HIV Disease:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1979-2009 with projections to 2020

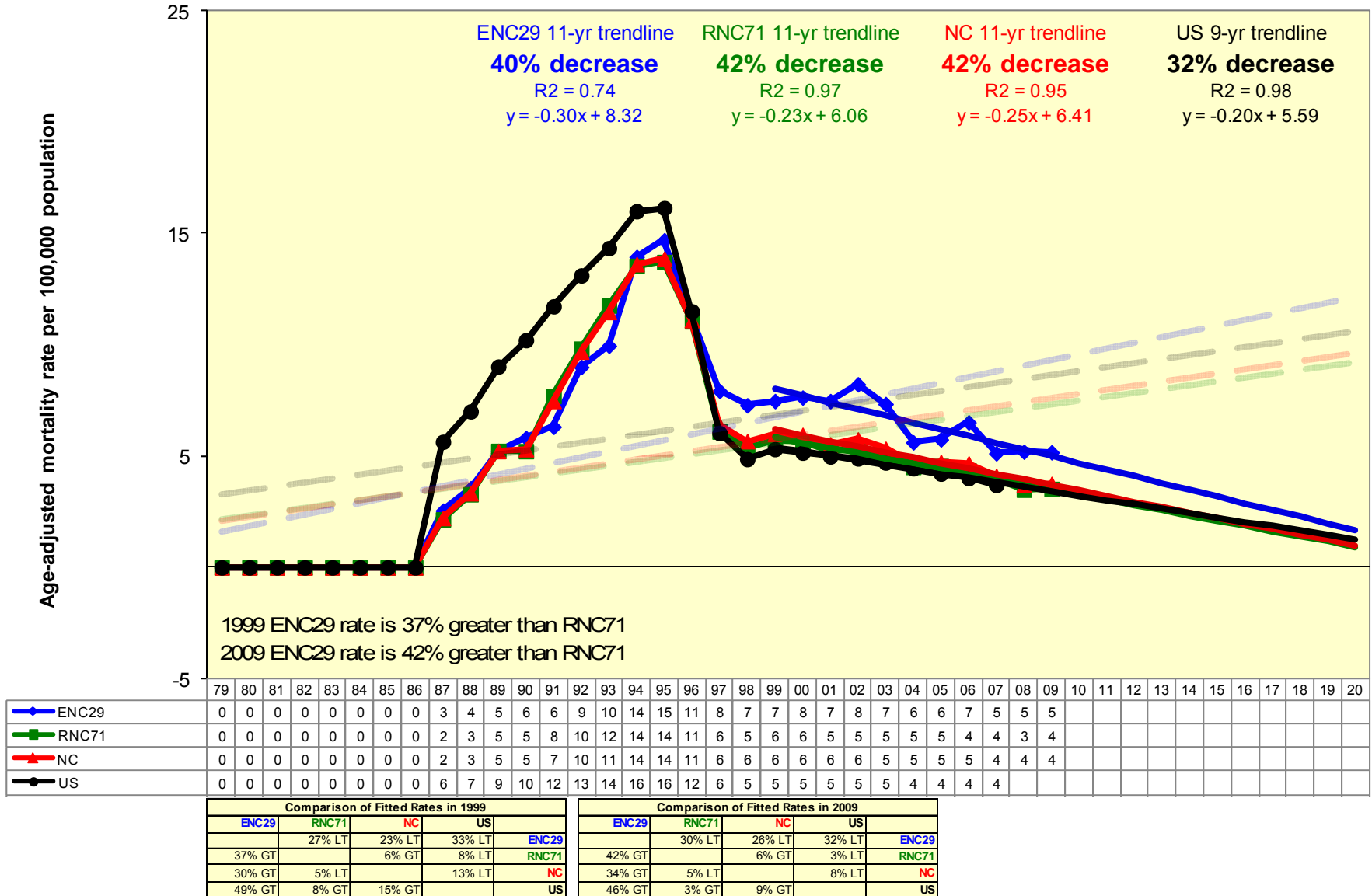
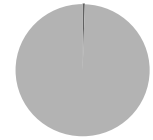


Figure 7.2 iii. HIV Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1979-2009 with projections to 2020

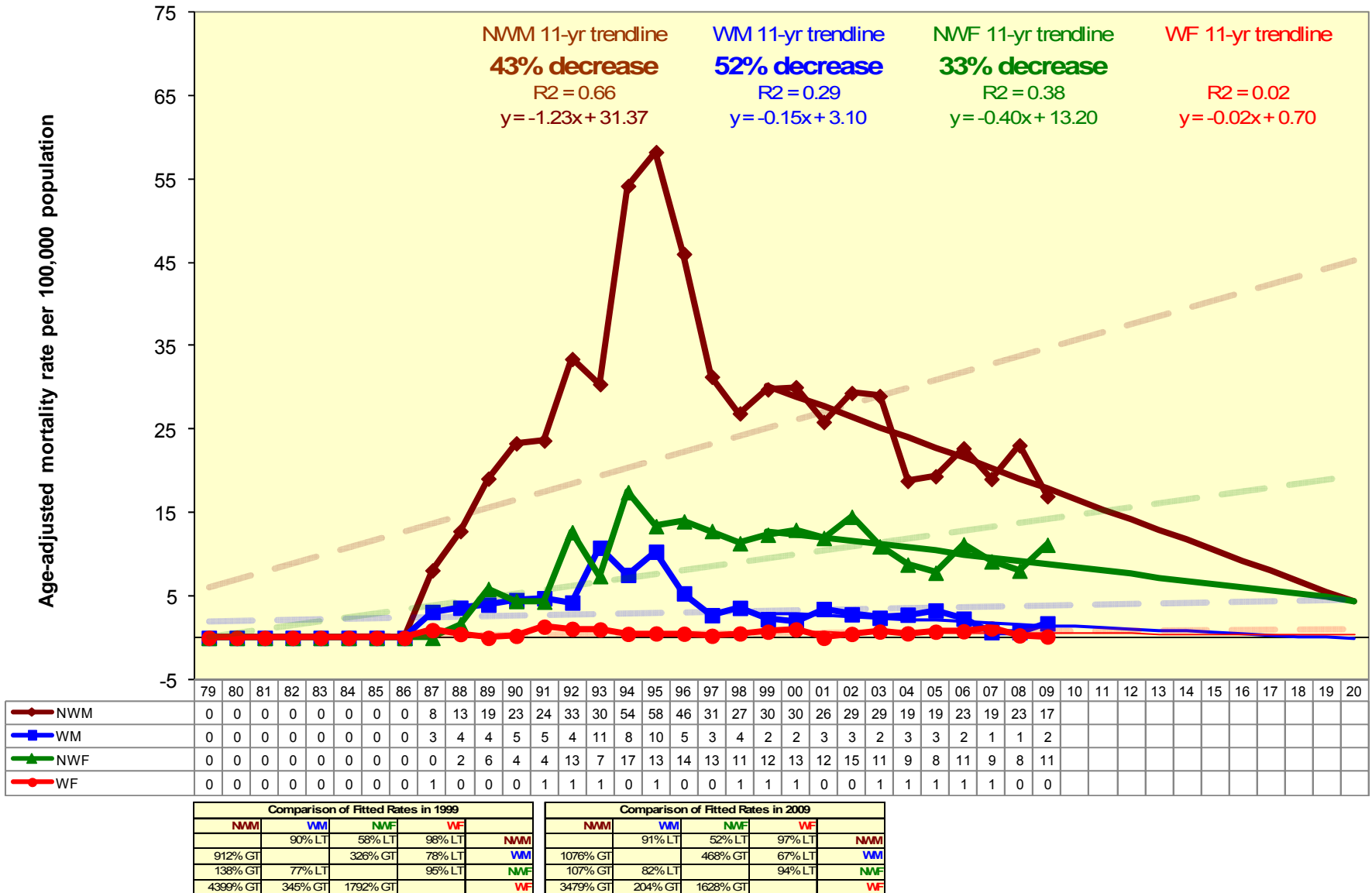


Figure 7.2 iv. HIV Disease:  
Trends in age-adjusted mortality rates by race for ENC29,  
1979-2009 with projections to 2020

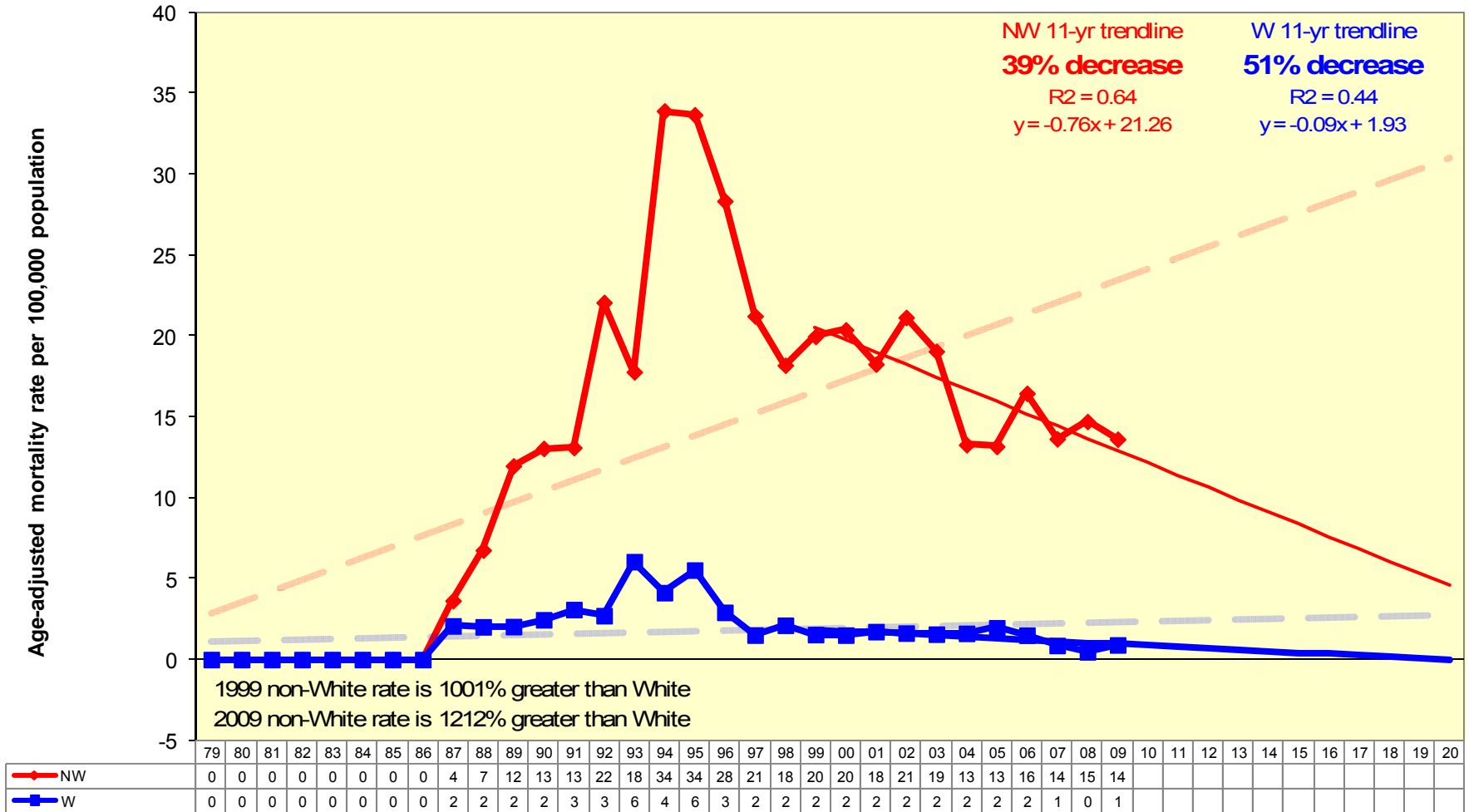
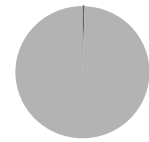
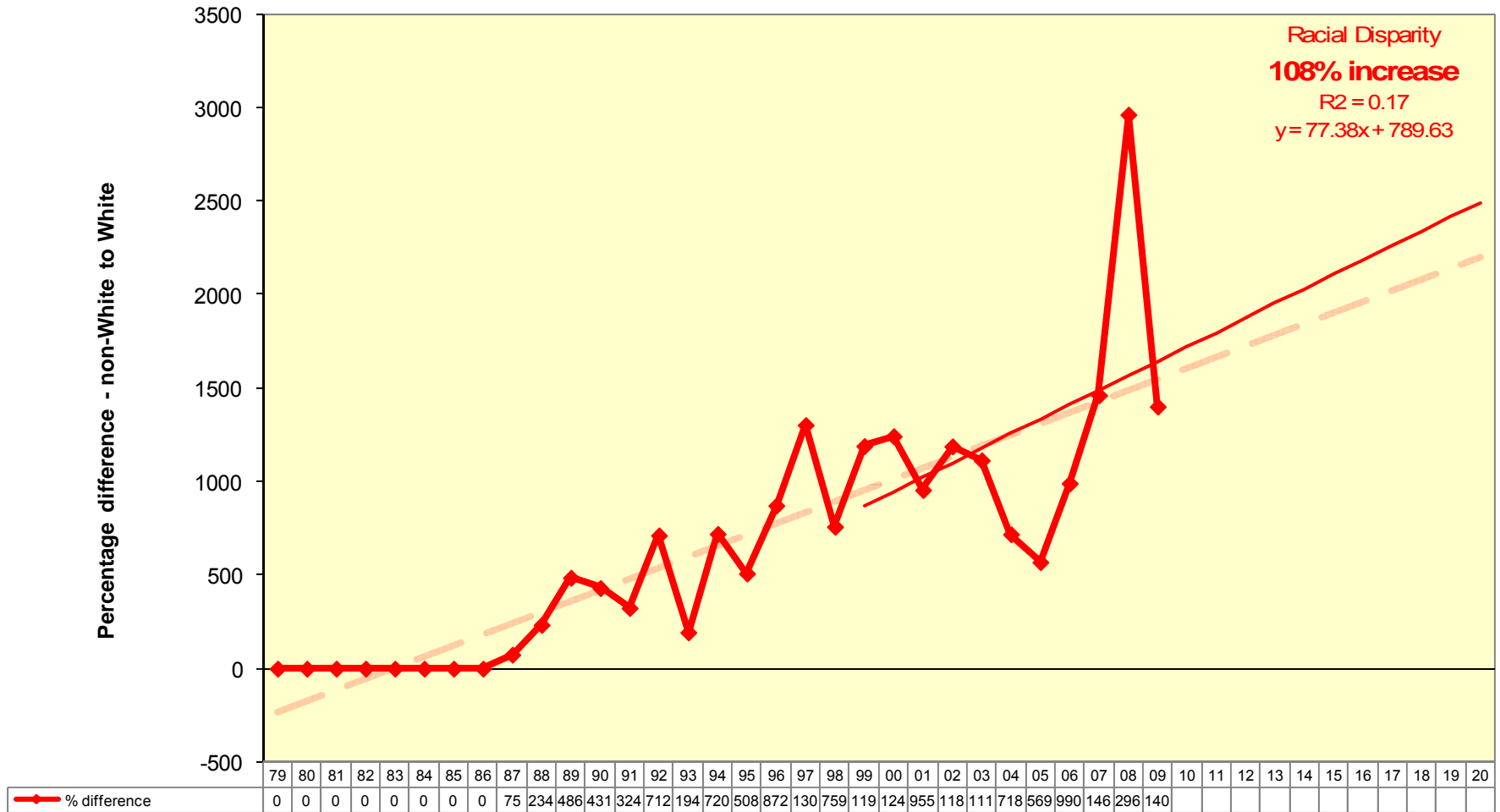
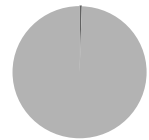


Figure 7.2 v. HIV Disease:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1979-2009 with projections to 2020



## 8. Appendix

Disease	ICD 10 Code	ICD 9 Code
Diseases of Heart	I00-I09, I11, I13, I20-I51	390-398, 402, 404, 410-429
Cerebrovascular Disease	I60-I69	430-434, 436-438
Atherosclerosis	I70	440
Cancer - All Sites	C00-C97	140-208
Cancer - Lip, Oral Cavity, and Pharynx	C00-C14	140-149
Cancer - Stomach	C16	151
Cancer - Colon, Rectum, and Anus	C18-C21	153-154
Cancer - Liver	C22	155
Cancer - Pancreas	C25	157
Cancer - Larynx	C32	161
Cancer - Trachea, Bronchus, and Lung	C33-C34	162
Cancer - Malignant Melanoma of Skin	C43	172
Cancer - Breast	C50	174-175
Cancer - Cervix Uteri	C53	180
Cancer - Ovary	C56	183.0
Cancer - Prostate	C61	185
Cancer - Bladder	C67	188
Cancer - Brain	C71	
Cancer - Non-Hodgkin's Lymphoma	C82-C85	200, 202
Cancer - Leukemia	C91-C95	204-208
HIV Disease	B20-B24	042-044
Septicemia	A40-A41	038
Diabetes Mellitus	E10-E14	250
Pneumonia and Influenza	J10-J18	480-487
Chronic Lower Respiratory Diseases	J40-J47	490-494, 496
Chronic Liver Disease and Cirrhosis	K70, K73-K74	571
Nephritis, Nephrotic Syndrome, and Nephrosis	N00-N07, N17-N19, N25-N27	580-589
Unintentional Motor Vehicle Injuries	V02-V04, V09.0, V09.2, V12-V14, V19.0-V19.2, V19.4-V19.6, V20-V79, V80.3-V80.5, V81.0-V81.1, V82.0-V82.1, V83-V86, V87.0-V87.8, V88.0-V88.8, V89.0, V89.2	E810-E825
All Other Unintentional Injuries and Adverse Effects	V01, V05-V06, V09.1, V09.3-V09.9, V10-V11, V15-V18, V19.3, V19.8-V19.9, V80.0-V80.2, V80.6-V80.9, V81.2-V81.9, V82.2-V82.9, V87.9, V88.9, V89.1, V89.3, V89.9, V90-V99, W00-X59, Y85, Y86	E800-E807, E826-E829, E830-E848, E929.0, E929.1, E850-E869, E880-E928, E929.2-E929.9
Suicide	X60-X84, Y87.0	E950-E959
Homicide	X85-Y09, Y87.1	E960-E969
Legal Intervention	Y35, Y89.0	E970-E978
Alzheimer's Disease	G30	331.0