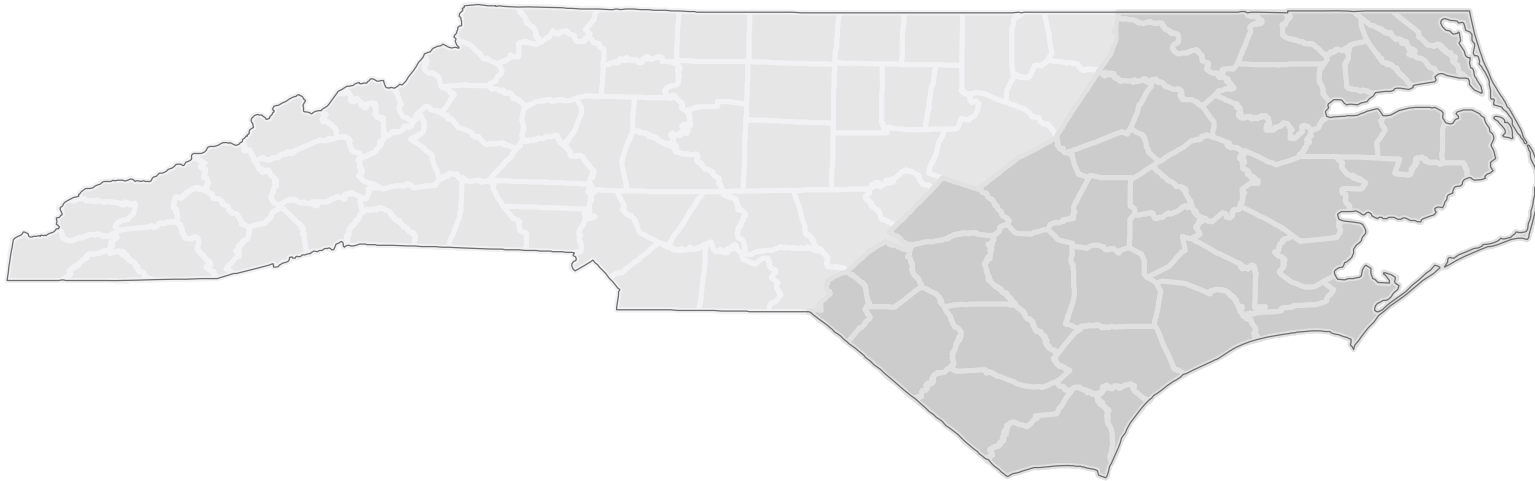


# Trends and Disparities in Mortality in Eastern North Carolina

Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1979-2012



**A Resource for Healthy Communities**

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## 1. Introduction

### Health Indicators Series: A Resource for Healthy Communities August 2014

#### Report Series #2: Mortality Trends for Eastern North Carolina - (1979 to 2012)

*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 Data Explorer* published online 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 State Center for Health Statistics, 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 33-year period (1979-2012), as well as the most recent 14 year period (1999 to 2012). 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 41 counties located in the extreme east of North Carolina and approximates the coastal plain physiographic province of the state. It includes all 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 ENC41 or ENC. The rest of North Carolina is the remaining 59 counties; abbreviated as RNC59 or RNC.



## 2. Data Highlights

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

The following highlights of mortality in the 41 counties of Eastern North Carolina (ENC41) 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 2012, age-adjusted mortality rate for Eastern North Carolina is 831 deaths per 100,000. This rate is 6% higher than the state rate. Within Eastern North Carolina, the non-White rate is 12% higher than the White rate. The non-White male rate is 21% higher than the rate for White males. The non-White female rate is 7% higher than the rate for White females.

The five general leading causes of mortality in Eastern North Carolina (2012) are:

1. Cancer - All Sites
2. Diseases of Heart
3. Chronic Lower Respiratory Diseases
4. Cerebrovascular Diseases
5. All Other Injuries and Unintentional Effects

The five general leading causes of mortality in Eastern North Carolina by race and gender (2012) are:

	Race and Gender			
	non-White Males	White Males	non-White Females	White Females
1st	Cancer - All Sites	Cancer - All Sites	Diseases of Heart	Cancer - All Sites
2nd	Diseases of Heart	Diseases of Heart	Cancer - All Sites	Diseases of Heart
3rd	Cerebrovascular Disease	Chronic Lower Respiratory Diseases	Cerebrovascular Disease	Chronic Lower Respiratory Diseases
4th	Diabetes Mellitus	All Other Unintentional Injuries and Adverse Effects	Diabetes Mellitus	Cerebrovascular Disease
5th	Chronic Lower Respiratory Diseases	Cerebrovascular Disease	Nephritis, Nephrotic Syndrome, and Nephrosis	Alzheimer's Disease

### Trends in Mortality from All Causes

- ENC's all-cause mortality rate over the 14-year trend period is decreasing. ENC's rate is not decreasing as quickly as NC and RNC, creating an increase in regional disparity.
- The age-adjusted, all-cause mortality rate for ENC is decreasing over the 33 year period. Over the 14-year period, the trend shows greater decrease, and suggests the ENC rate will converge with the RNC and NC rates. ENC's fitted rate continues to remain 9% greater than the rate for RNC for 2012.
- The non-White male mortality rate remains higher than the other demographic groups but has had the greatest rate of decrease (30%) in the 13-year trend. Convergence of the non-White male rate with the White male rate is suggested in the near future.

- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 14% greater than the White rate, but the recent 14 year trend suggests they will converge.
- Over the recent 14 year period there is a 53% decrease in racial disparity, in a reliable trend.

#### Trends in Premature Mortality from All Causes of Death

- ENC's premature mortality rate has decreased by 25% over the 14 year period since 1999. However, this trend is diverging slightly from both RNC and NC, whose premature mortality rates decreased by 31% and 29%, respectively.
- The age-adjusted premature mortality rate trend is also decreasing, but remains 24% higher than the RNC rate in 2012.
- The non-White male rate is significantly higher than the rates for any other demographic group, but also has the highest rate of decrease (slope of trend). White females have the lowest rate, which has begun to level off.
- The non-White rate remains 39% greater than the White rate.
- A recent decrease in the premature mortality rate for non-Whites and leveling of the rates for Whites suggests a reduction in racial disparity.

#### Diseases of Heart

- ENC's heart disease mortality rate trend is decreasing but not as quickly as the decrease for RNC and NC, resulting in a slightly increased geographic disparity. In 1999, the fitted rate for ENC was 8% greater than RNC; by 2012 it was 16% greater than RNC.
- While ENC's age-adjusted mortality rate is decreasing at a pace equal to RNC, the ENC fitted rate remains 18% greater than RNC in 2012.
- The non-White male rate remains the highest but convergence with the White male rate is suggested in the future. The non-White female rate remains slightly higher than the White female rate but is decreasing more quickly and is suggested to fall below White females in the future.
- While the non-White rate remains 9% greater than the rate for Whites, the 14-year trends for both are decreasing, and convergence is suggested in the future.
- While the 33-year trend suggests an increase in racial disparity, the moderately reliable 14-year trend line for racial disparity suggests a 42% decrease.

#### Cancer – Trachea, Bronchus, Lung

- While the 33-year trends for Cancer—TBL indicate that all mortality rates are continuing to increase, the 14-year trend line suggests a slight decrease in all three regions. The rate of decrease for ENC is not as great as RNC and NC.
- In 2012, the age-adjusted rate trend for ENC is 9% above the RNC rate and 19% above the US rate. During the period 1999-2012, the ENC rates have decreased at about the same rate as NC.
- The mortality rates for males are decreasing. Female rates are increasing slightly, although the trend for White females is unreliable. In 2012 the non-White male rate was the highest, but is decreasing the most quickly and will likely converge with the trend for White males in the next few years.
- The non-White mortality rate is consistently lower than the White rate. Both rates are decreasing over the 14 year period, but the non-White rate is decreasing a bit more quickly.
- The 14-year trend for racial disparity shows a decrease, but it is not reliable.

### Chronic Lower Respiratory Diseases

- CLRD mortality rates for ENC, RNC, and NC have leveled during the last 14 years. In 1999, the ENC trend was 1% greater than RNC; in 2012 the ENC trend was 10% less than RNC, but the trend is not reliable.
- The 14-year CLRD age-adjusted rate for ENC is decreasing at a faster pace than the US rate. In 2012, the ENC rate trend was 10% less than RNC compared to 1999 when the ENC rate was 9% greater than RNC.
- Fitted rates for non-White males and White males have decreased over 14 years by 38% and 31%, respectively. The rate for White males remains the highest although it is decreasing. The 14-year trends for White females and non-White females are unreliable.
- The 14-year White mortality rates are greater than non-White rates and the rate of decline is less for Whites, leading to a divergence more favorable to non-Whites.
- There is a 30% decrease in the disparity between White rates and non-White rates in a reliable trend.

### Cerebrovascular Disease

- ENC's cerebrovascular disease mortality trend line is decreasing in a similar trend to RNC and NC.
- While the ENC age-adjusted cerebrovascular disease mortality rate is 5% greater than the rate for the rest of the state, it is decreasing and converging on the RNC and NC rates. The *Healthy People 2010* goal of less than 48 deaths per 100,000 was achieved in the region in 2010. In 2012, ENC has a rate of 43 deaths per 100,000.
- Non-Whites have the highest mortality rate for cerebrovascular disease but the rate continues to decrease and converge with the other demographic groups. The greatest relative improvement in cerebrovascular disease mortality over 14 years is by White females who experienced a 56% decrease. The non-White male rate is decreasing and converging with White males, but is still 57% greater in 2012.
- The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of whites but was still 49% greater than the White rate in 2012.
- The 14-year trend for racial disparity is unreliable.

### All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects is increasing in ENC (60% increase over 14 years). The trends for RNC and NC are also increasing and all are expected to converge in the near future.
- The age-adjusted mortality rate trend for ENC, RNC and NC are increasing. All three increased 33% or more over the 14 years.
- The 14 year trends for White males and White females are increasing significantly (67% and 126% increase, respectively). Mortality rates for non-White males decreased 19% over 14 years. The trend for non-White females is relatively level, but not reliable.
- White rates have increased 87% over the 14 year period. Non-White rates have dropped below white rates, and are decreasing 15% in a moderately reliable trend.
- Between 1999 and 2012, racial disparity has decreased by 419%, eliminating the unfavorable disparity in relation to whites, and favoring non-Whites.

### Diabetes Mellitus

- According to the 14-year trend, all diabetes mellitus mortality rates are decreasing but the rate of decline is less for ENC suggesting a divergence from RNC and NC. In 2012, the rate trend for ENC was 45% greater than RNC. In 1999 ENC was 28% greater than RNC.
- The 14-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 23% for ENC. In 2012, the ENC age-adjusted diabetes mellitus rate trend remained 46% greater than RNC and 34% greater than the US.

- Rates for all subgroups are decreasing over the recent 14 year period. Rates for non-White males remain the highest. The rate for White males is decreasing the least (11% over 14 years).
- The non-White mortality rate trend decreased over 14 years by 27% but remain 127% greater than the White rate in 2012.
- The decreasing trend for racial disparity is moderately reliable and suggests a 16% decrease.

#### Alzheimer's Disease

- The Alzheimer's mortality rate for ENC shows a 96% increase over the 14 year period. ENC's rate of increase was larger than RNC (38%) and NC (49%) but the rate trend for ENC still remains 30% less than RNC.
- In 2012, the age-adjusted rate trend for ENC has increased 64% over the 14 years. This is a larger increase than both RNC and NC (27% and 53% respectively), although those rates are higher.
- The mortality rates for females, both White and non-White, are greater than that of non-White and White males in an increasingly divergent 14-year trend.
- The non-White mortality rate for Alzheimer's remains 3% less than the White mortality rate in 2012 but the 14-year trend suggests convergence in the near future.
- The 14-year moderately-reliable trend suggests a future increase in disparity that favors whites.

#### Unintentional Motor Vehicle Injuries

- ENC's unintentional motor vehicle mortality rate trend is decreasing but is still 55% greater than RNC in 2012.
- The ENC age-adjusted rate trend is 55% greater than RNC and 60% greater than the US. Rates for ENC, RNC and NC are all decreasing.
- The trends for all groups are declining. The trend for non-White males is the highest. The trend for non-White females is the lowest and has decreased the most (42% over 14 years).
- The non-White rates have decreased by 34% over the 14-year period and converged with the White rates, suggesting a reversal in disparity within ENC.
- The trend for racial disparity is not reliable.

#### Nephrities, Nephrotic Syndrome, and Nephrosis

- Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 26% over 14 years. While other regions have also experienced increases during this time period, ENC rates have increased more, and were 18% greater than RNC in 2012.
- With age-adjustment, ENC has increased by 9% over the 14-year period.
- The 14 year trends for non-White males and females are continually above those for White males and females but are not reliable. The demographic group with the greatest rate of increase is White males, increasing 29% over 14 years.
- In 2012, the non-White rate trend was 125% greater than the White rate, but it is not a reliable trend.
- The trend for racial disparity is moderately reliable and suggests a 19% decrease in racial disparity.

#### Pneumonia and Influenza

- Mortality due to pneumonia and influenza is decreasing (32%) over the 14 year period for ENC, NC, and RNC. The rate trend for ENC is slightly below the rates for the others.

- The age-adjusted mortality rates for ENC, RNC and NC are decreasing. For the 14-year trend line ENC has the largest decrease at 44%.
- The trends for all demographic groups are declining. The decrease for non-White males was highest (52%), which was followed by White males (47%), non-White females (45%), and White females (40%).
- In 1999 the non-White rate trend was 1% greater than the White rate, but by 2012, the non-White rate trend was 8% less than the White rate.
- The trend for racial disparity is unreliable.

#### Cancer – All Sites

- The cancer – all sites mortality rates for ENC have decreased slightly (4%) over 14 years. The RNC and NC rates have decreased more than ENC, causing these rates to diverge.
- The age-adjusted cancer – all sites mortality rates for ENC, RNC, NC and the US are all decreasing at about the same pace, although the ENC rate trend is 8% greater than RNC, and 10% greater than the US.
- The rates for non-White males has decreased 31% over 14 years, and is projected to converge with the rate for White males, which show a 21% decrease. The rates for White females and non-White females show a slight decrease and are converging.
- Both White and non-White cancer mortality trends are decreasing over the 14 year period, although the non-White rate remains higher. Non-White rates decreased 24% and White rates decreased 15%, suggesting future convergence.
- The moderately reliable 14-year trend for racial disparity shows a 60% decrease.

#### HIV Disease

- The fitted HIV mortality rate for ENC has been decreasing over the past 14 years, but was still 67% greater than RNC in 2012.
- The 14 year age-adjusted rate trend for ENC had a 47% decrease. The 2012 ENC rate is 75% greater than RNC.
- Non-White males continue to have the highest rates of age-adjusted mortality, but this rate has also decreased 55% in a 14-year reliable trend. The White male rate decreased 46% during that same period and the rate for non-White females decreased 28%. A convergence of the non-White male rate with other rates is expected in the future.
- The 14-year non-White age-adjusted HIV mortality rate has decreased by 47% in a reliable trend. The age-adjusted mortality rate for Whites decreased by 49%, although the absolute rate for this group is much lower.
- In a moderately reliable trend, the 14-year period shows a 22% 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 2012. 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 2012--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 33-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 33 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 2012) 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 6.3 ii the year 2005 is the 7th year in the series, so 7 would be substituted for  $x$  in the equation of the line derived from ENC41’s age-adjusted mortality rate series for a selected cause of death. For chronic lower respiratory diseases (1979 to 2012), the 2005 *expected* or *fitted* age-adjusted rate is calculated to be 46 deaths per 100,000 people. The *observed* age-adjusted rate for 2005 is 47 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 2005 is 1—the model (the equation of the line) *underestimates* the observed value by 1 death. 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 dashed 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 (1999-2012). 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 2012 tables compare the fitted rates calculated for the beginning and end of the observed time series in terms of percent difference. Returning to figure 6.3 ii, ENC41's age-adjusted fitted rate for chronic lower respiratory diseases in 1999 is 9% greater than (GT) RNC's fitted rate. In 2012, ENC41's fitted rate is 10% 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, as indicated in *Healthy Carolinians 2020*, 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).

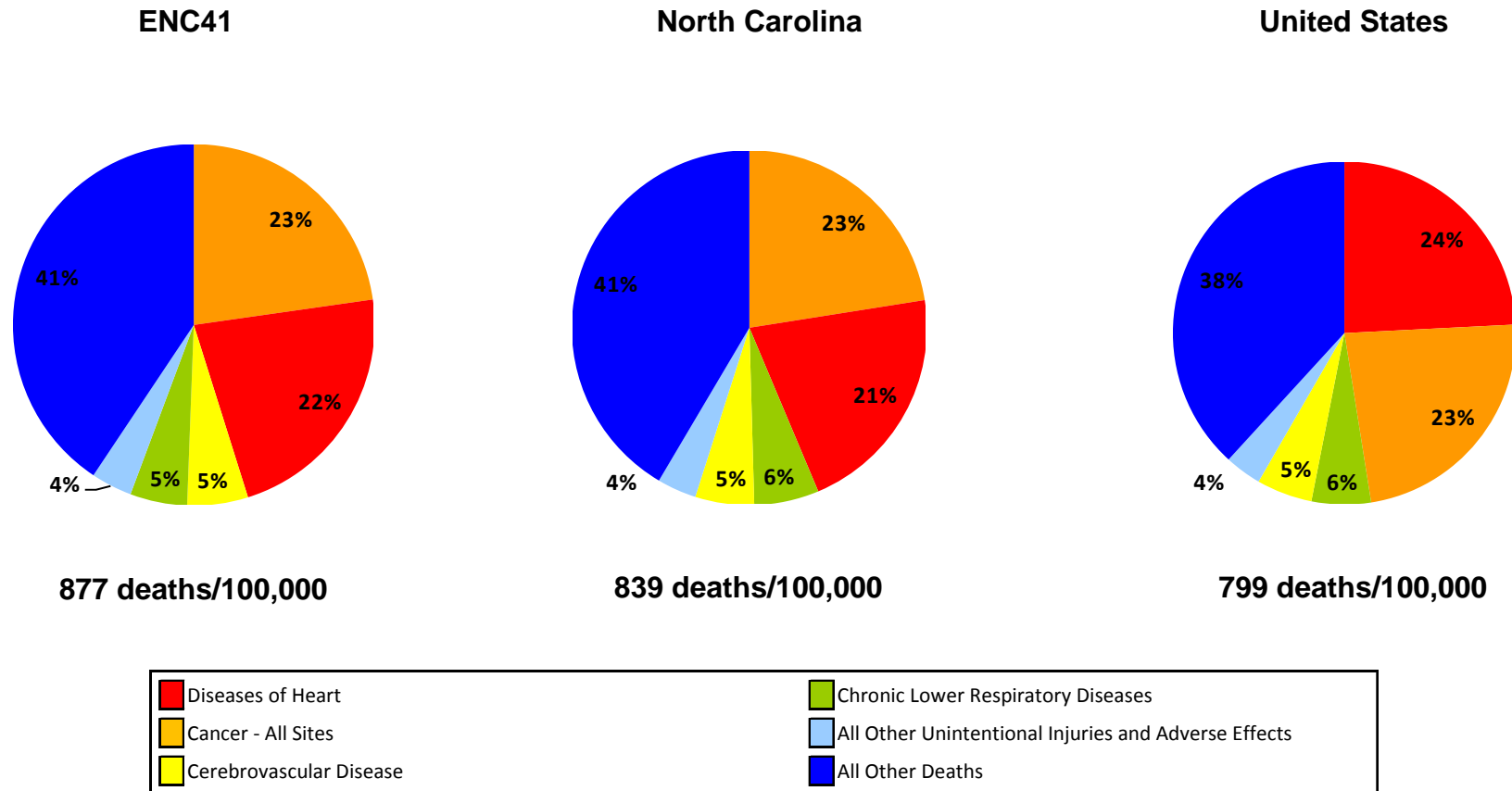
### **Cited References**

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

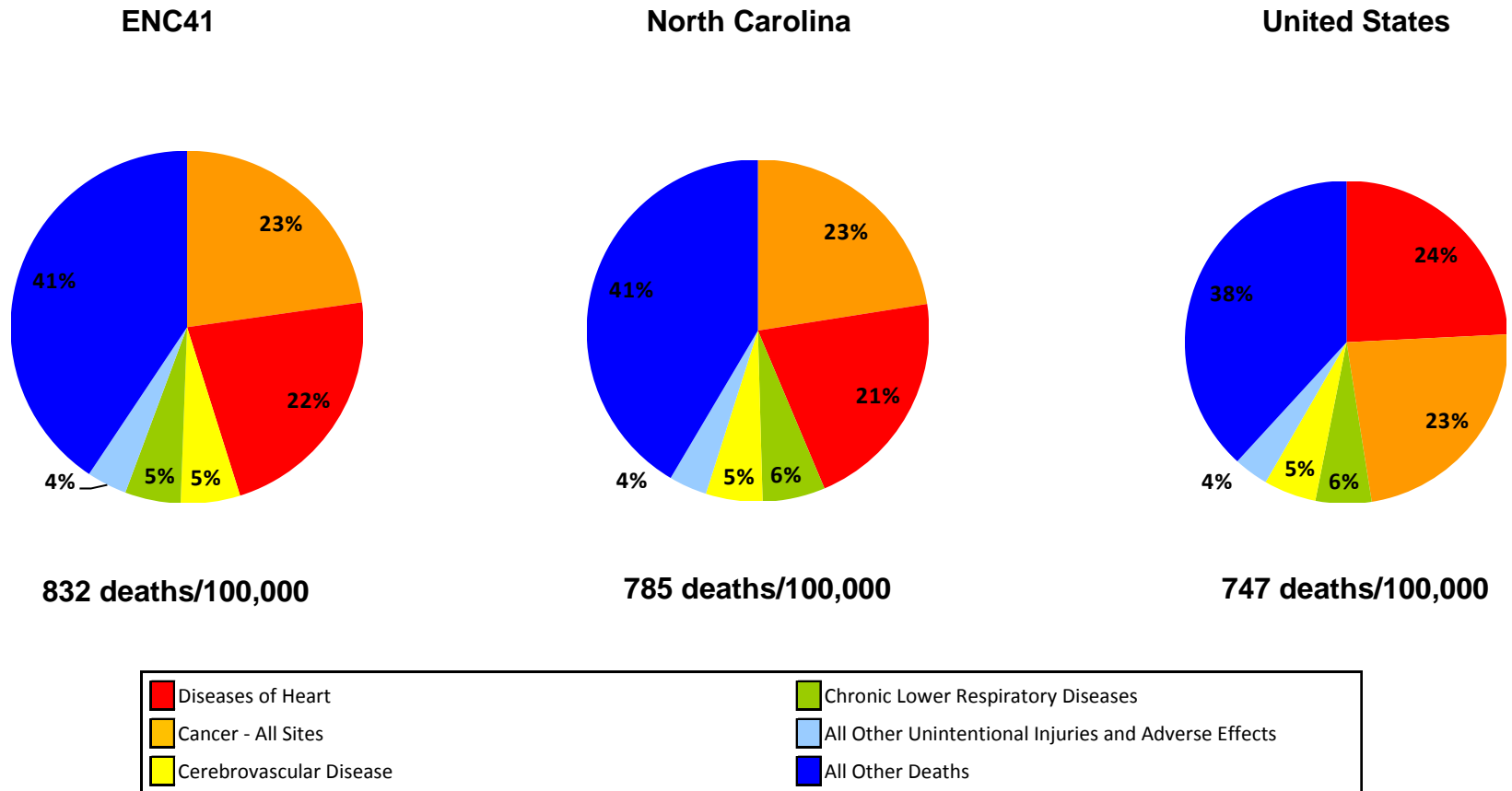
Figure 4.1 i. General leading causes of death for ENC41 (2012), NC (2012), and US (2010). Mortality rate per 100,000 population.



2012 NC rate is 5% higher than 2010 US rate

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (689 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 ENC41 (2012), NC (2012), and US (2010). Age-adjusted mortality rate per 100,000 population.



2012 NC age-adjusted rate is 5% higher than 2010 US age-adjusted rate

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (689 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 ENC41 (2012) by race and gender. Mortality rate per 100,000 population.

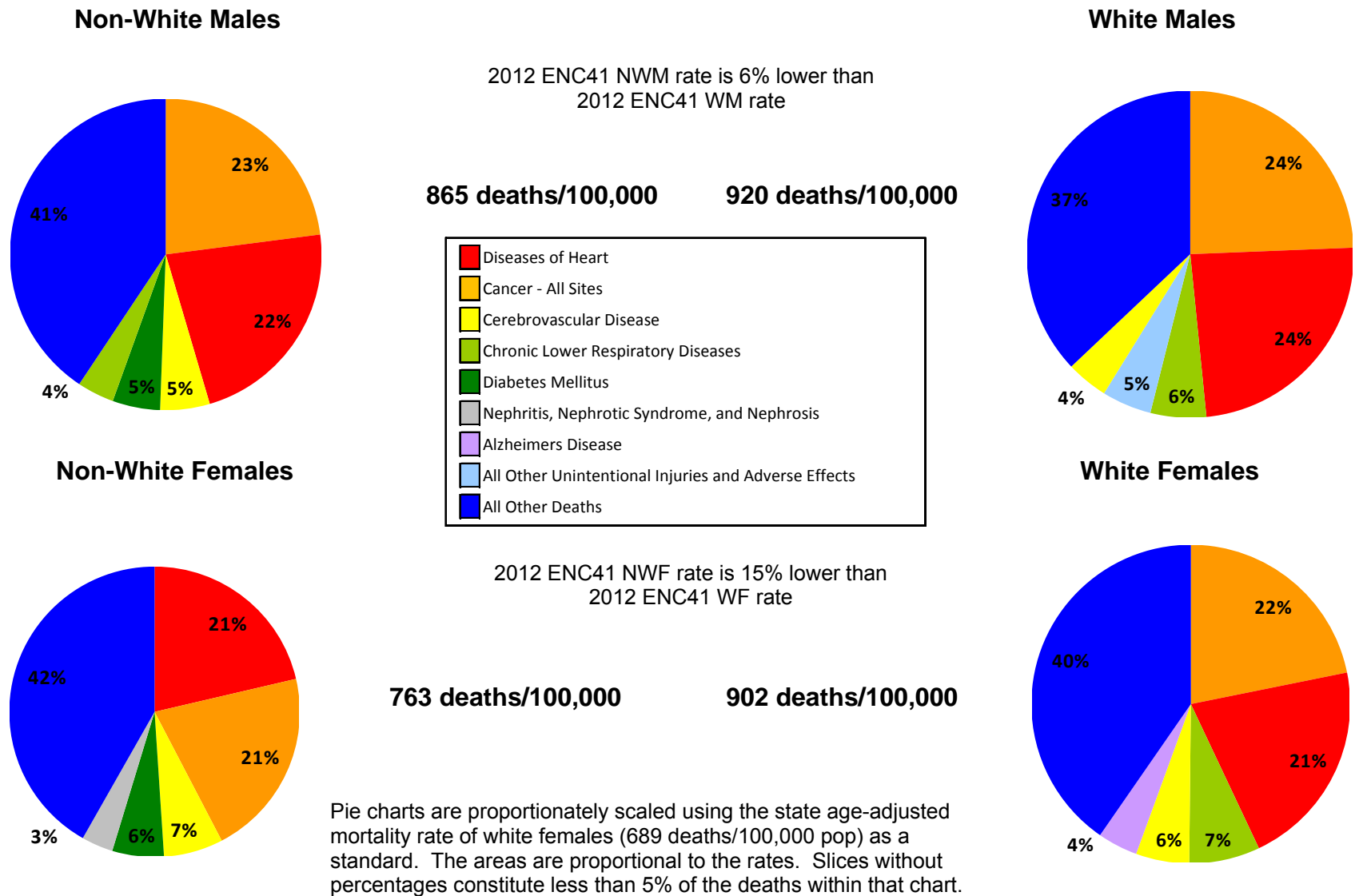


Figure 4.2 ii. General leading causes of death for ENC41 (2012) by race and gender. Age-adjusted mortality rate per 100,000 population.

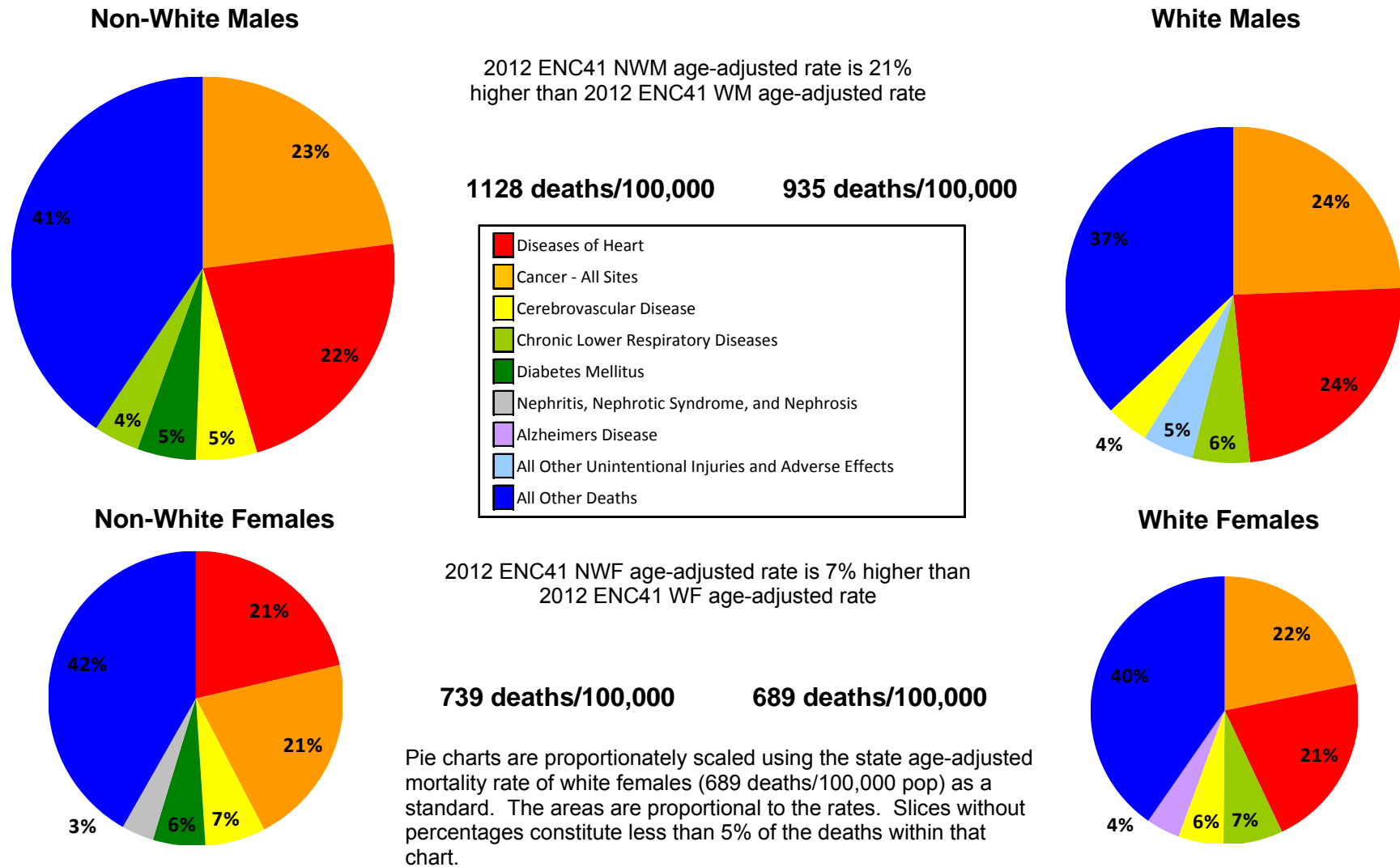
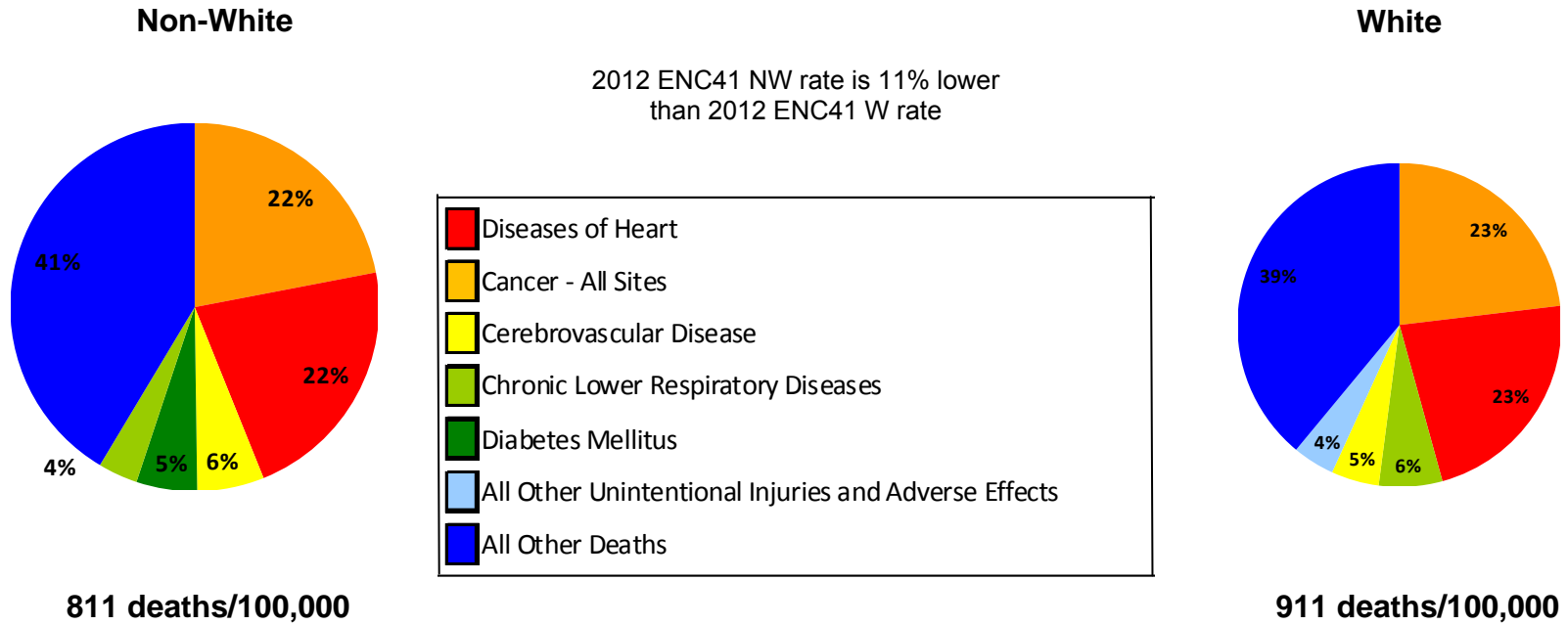
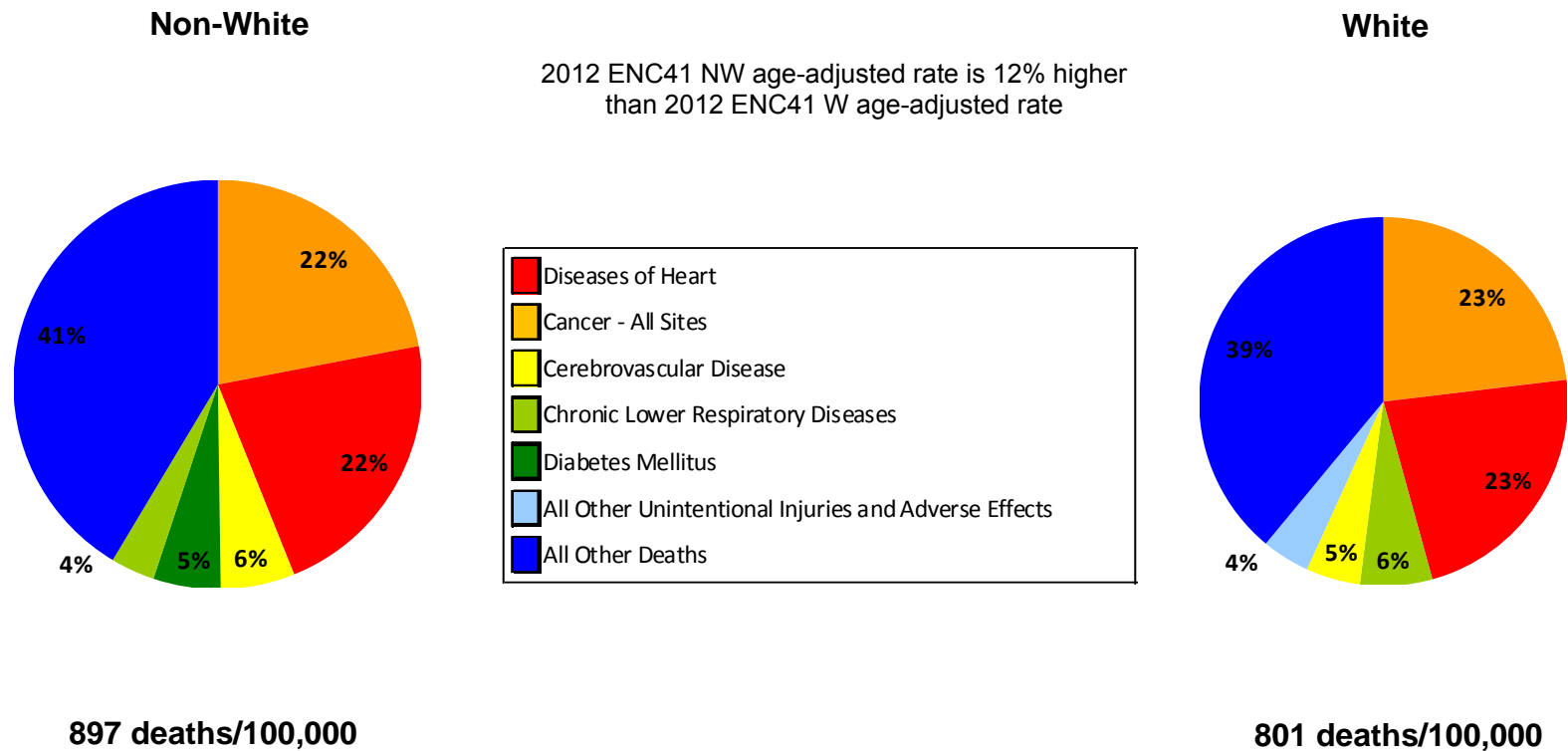


Figure 4.3 i. General leading causes of death for ENC41 (2012) by race.  
Mortality rate per 100,000 population.



Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (689 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 ENC41 (2012) 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 (689 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 ENC41:  
All Causes of Death and  
All Causes of Premature Mortality;  
1979-2012

# All Causes of Death

- ENC's all-cause mortality rate over the 14-year trend period is decreasing. ENC's rate is not decreasing as quickly as NC and RNC, creating an increase in regional disparity.
- The age-adjusted, all-cause mortality rate for ENC is decreasing over the 33 year period. Over the 14-year period, the trend shows greater decrease, and suggests the ENC rate will converge with the RNC and NC rates. ENC's fitted rate continues to remain 9% greater than the rate for RNC for 2012.
- The non-White male mortality rate remains higher than the other demographic groups but has had the greatest rate of decrease (30%) in the 13-year trend. Convergence of the non-White male rate with the White male rate is suggested in the near future.
- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 14% greater than the White rate, but the recent 14 year trend suggests they will converge.
- Over the recent 14 year period there is a 53% decrease in racial disparity, 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 5.1 i. All Causes of Death:  
Trends in mortality rates for ENC41, RNC59, and NC  
1979-2012 with projections to 2020

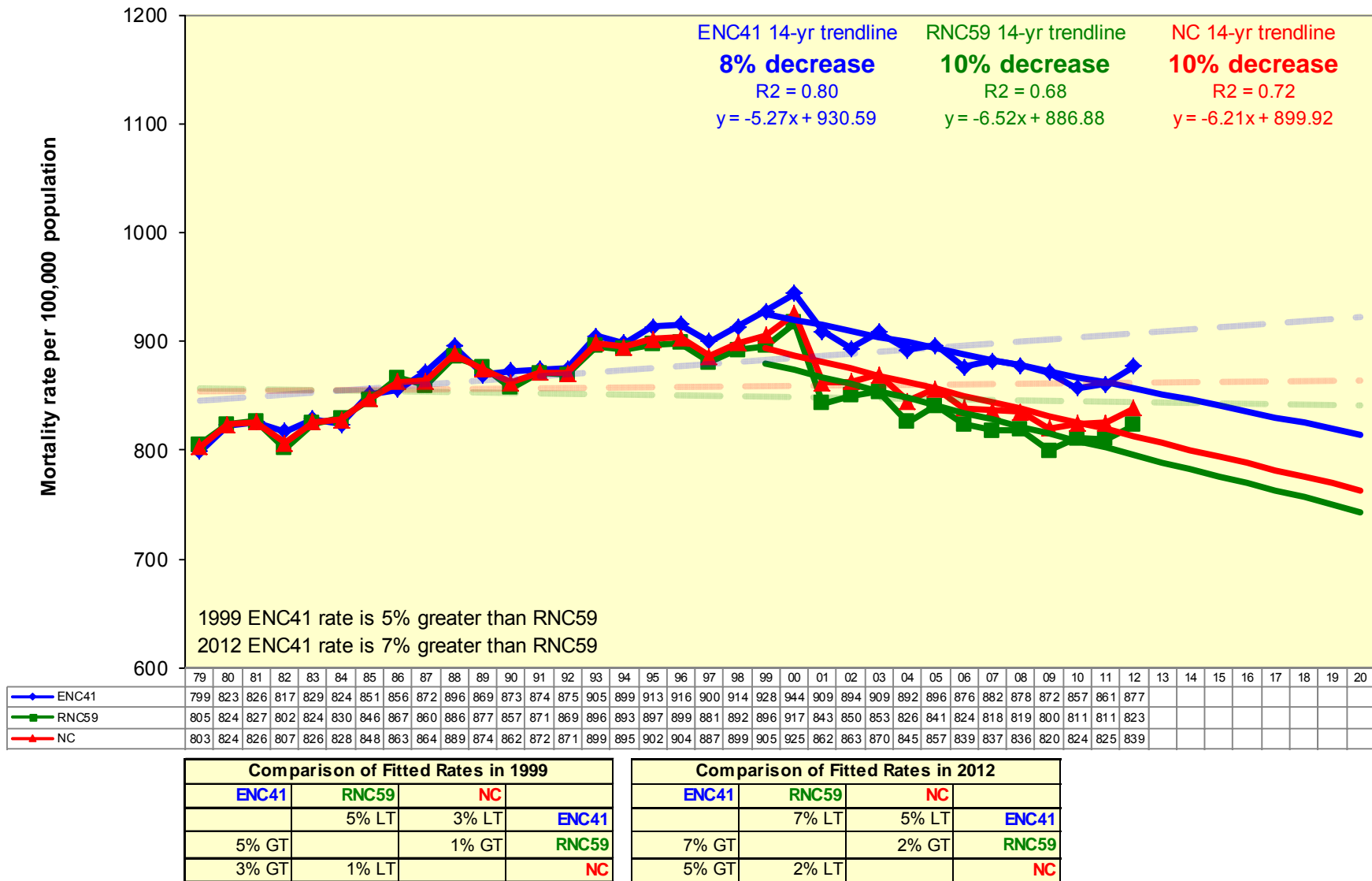
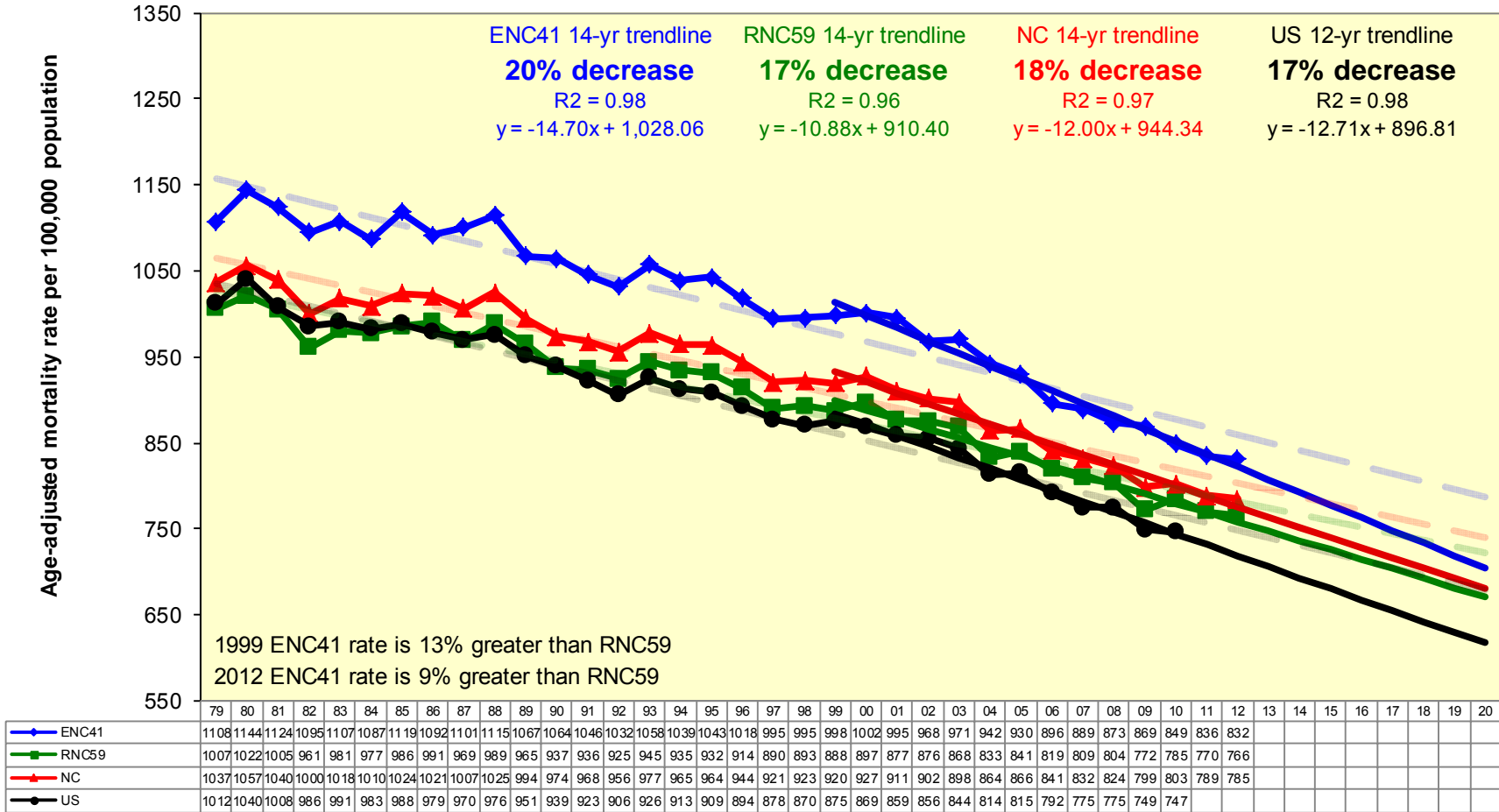




Figure 5.1 ii. All Causes of Death:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2012 with projections to 2020



Comparison of Fitted Rates in 1999				
ENC41	RNC59	NC	US	
	11% LT	8% LT	13% LT	ENC41
13% GT		4% GT	1% LT	RNC59
9% GT	4% LT		5% LT	NC
15% GT	2% GT	5% GT		US

Comparison of Fitted Rates in 2012				
ENC41	RNC59	NC	US	
	8% LT	6% LT	13% LT	ENC41
9% GT		3% GT	5% LT	RNC59
6% GT	2% LT		7% LT	NC
14% GT	5% GT	8% GT		US

Figure 5.1 iii. All Causes of Death:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

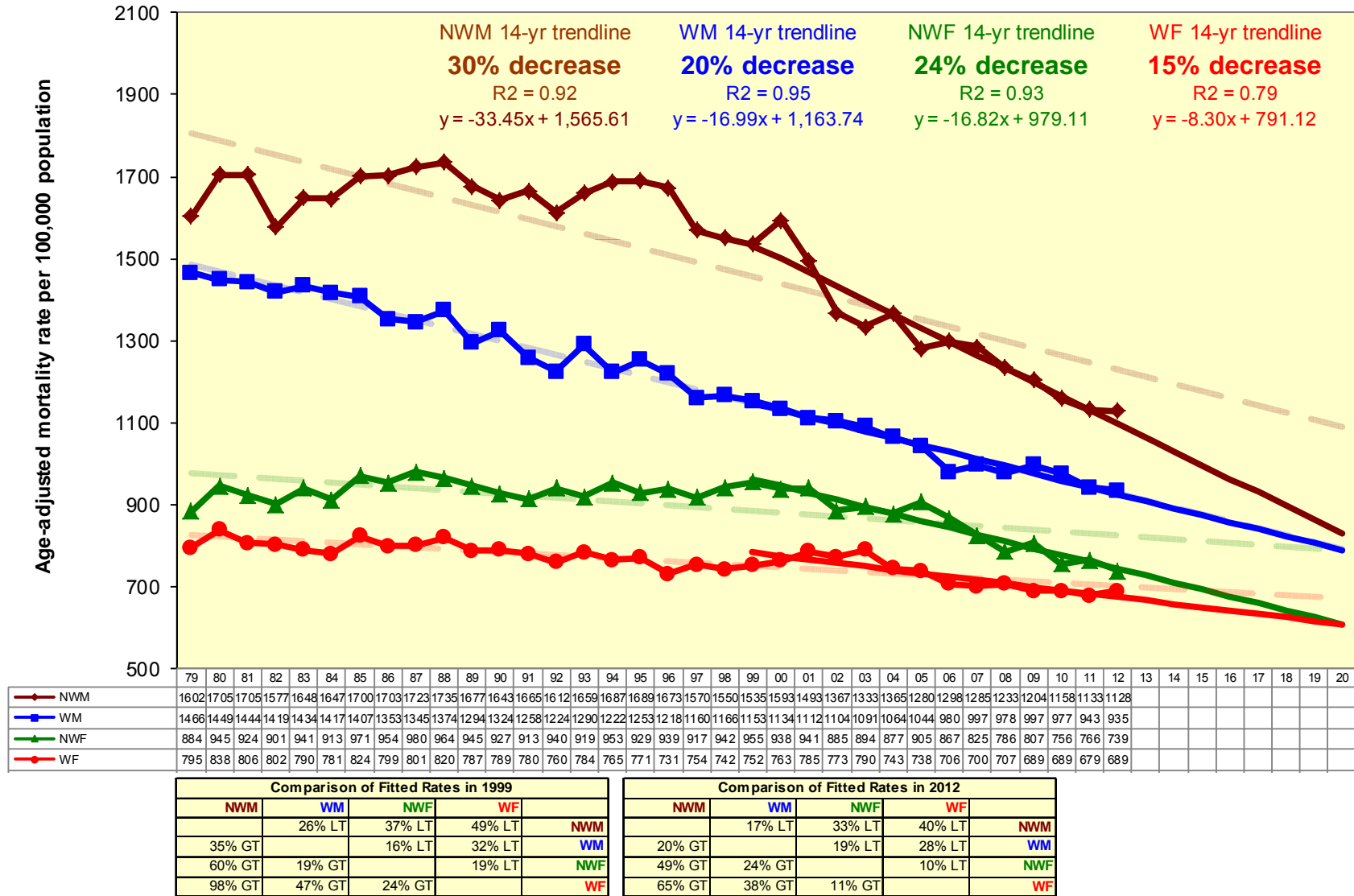


Figure 5.1 iv. All Causes of Death:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

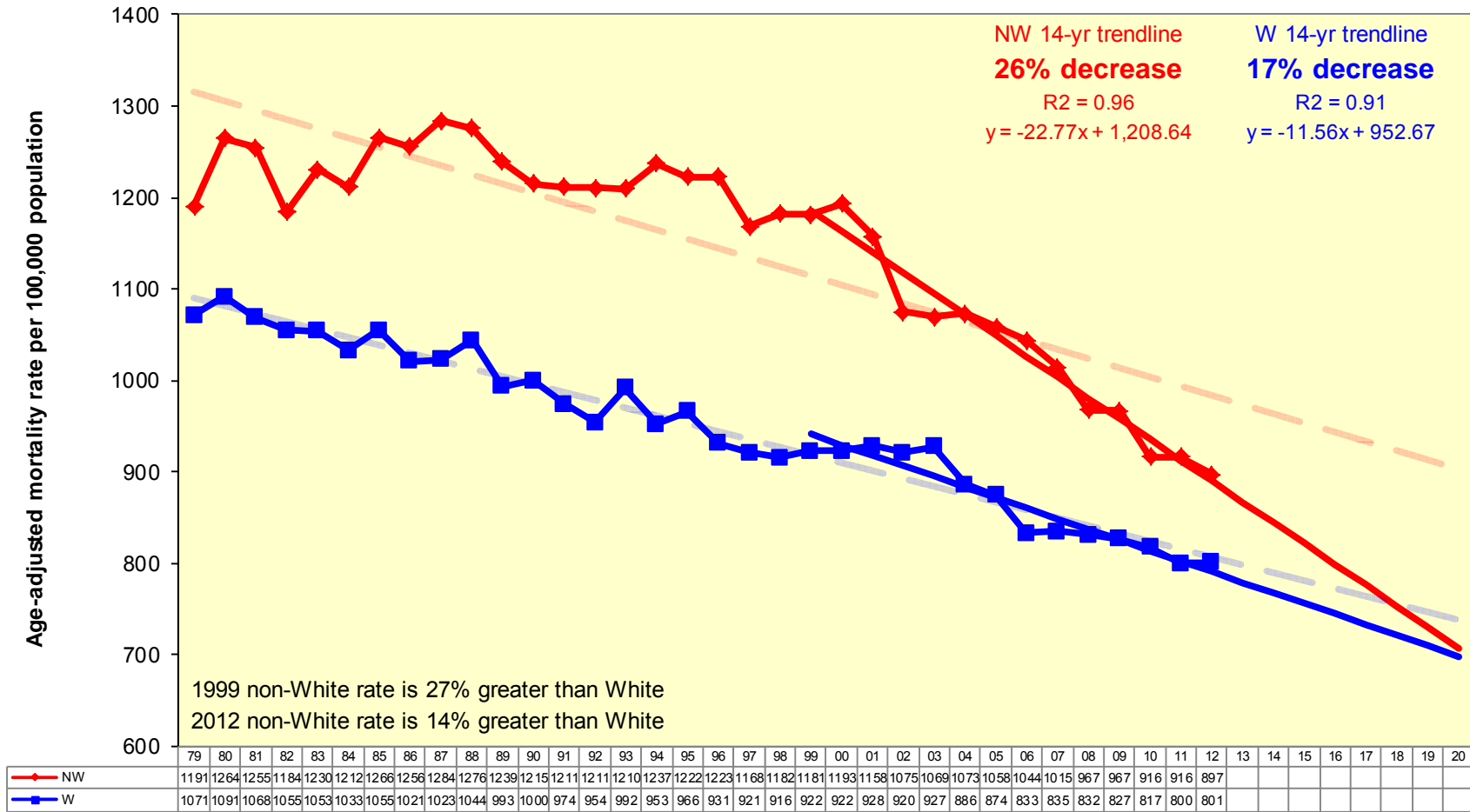
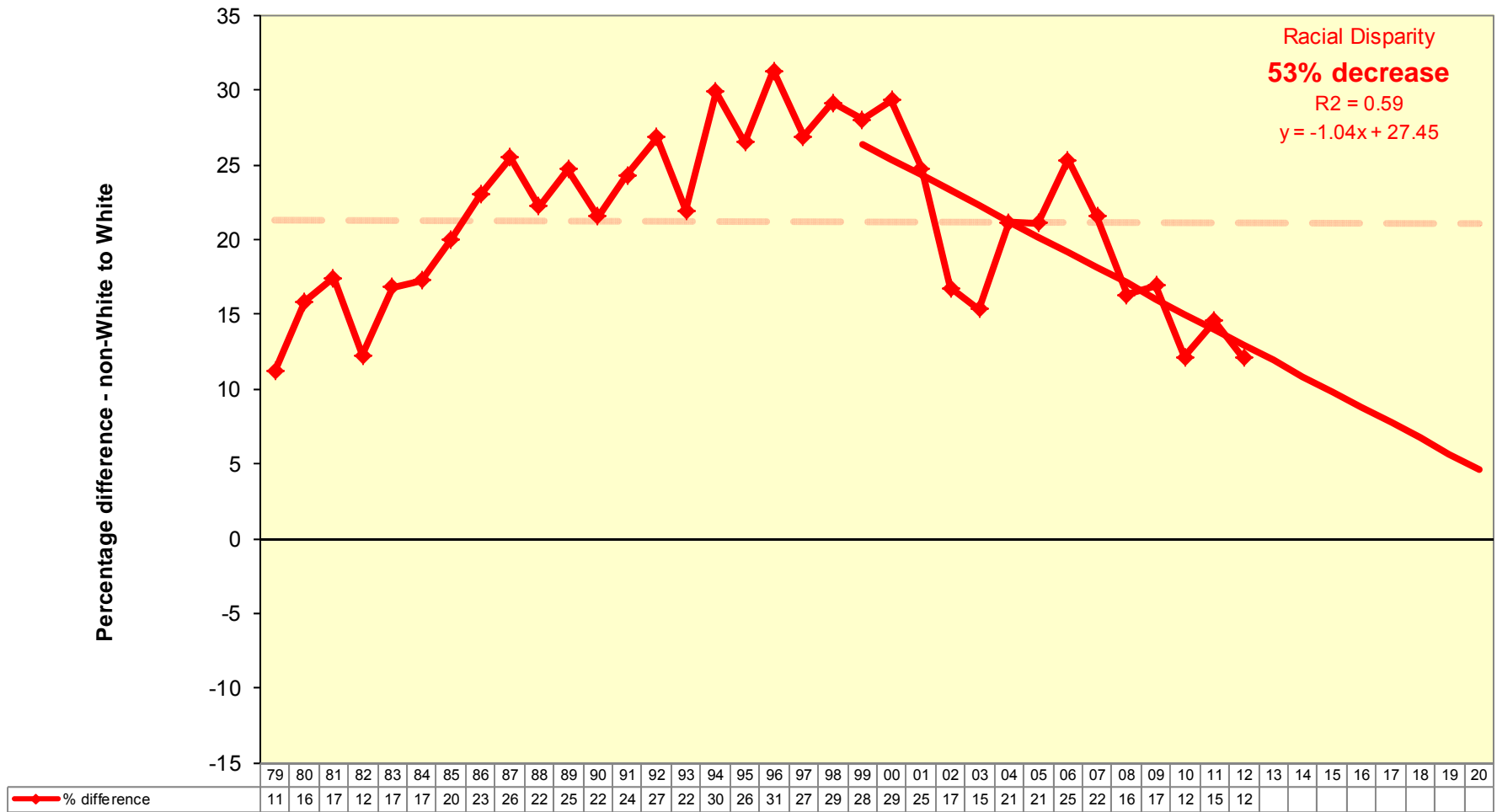


Figure 5.1 v. All Causes of Death:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020

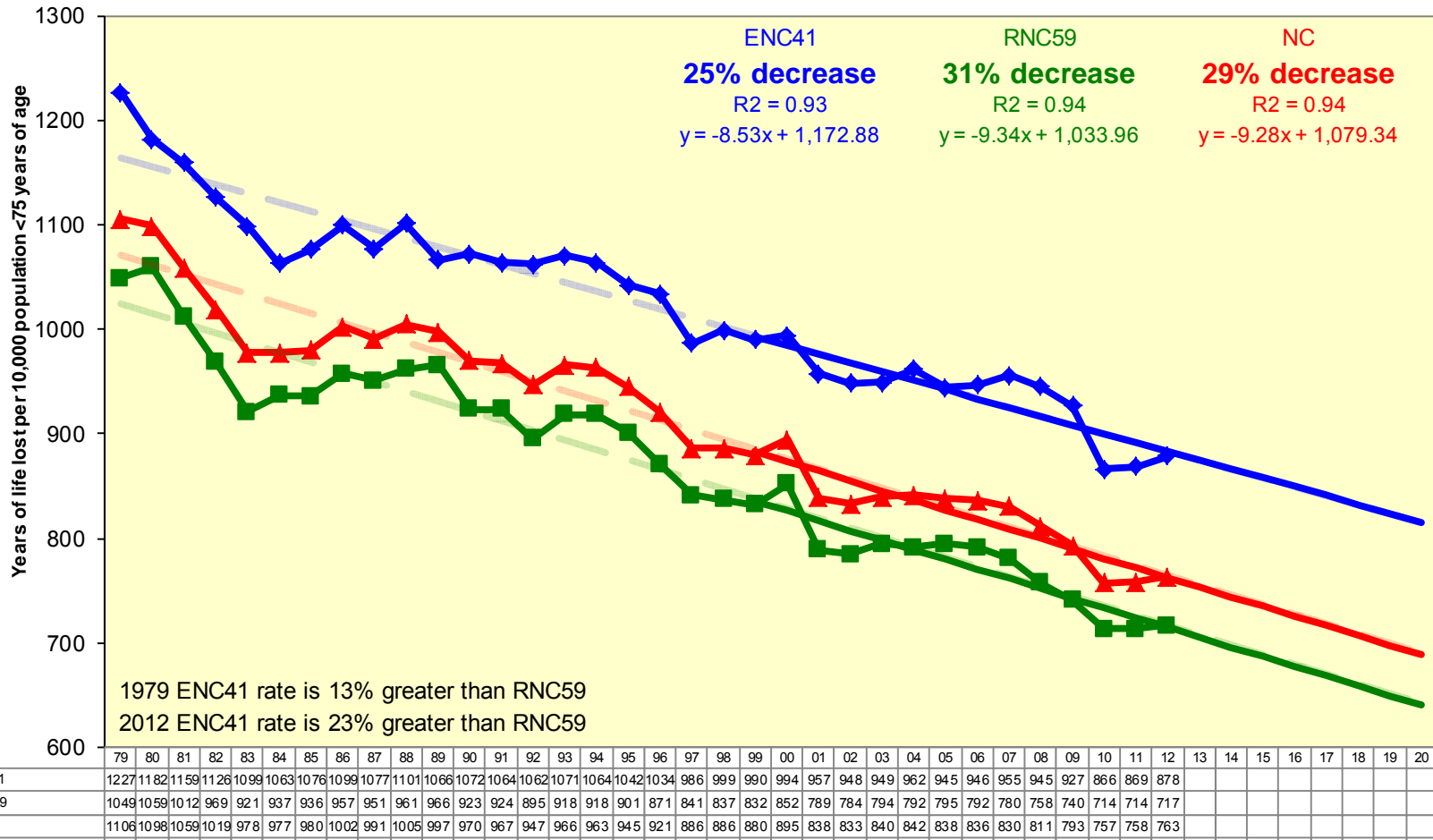


# All Causes of Premature Mortality

- ENC's premature mortality rate has decreased by 25% over the 14 year period since 1999. However, this trend is diverging slightly from both RNC and NC, whose premature mortality rates decreased by 31% and 29%, respectively.
- The age-adjusted premature mortality rate trend is also decreasing, but remains 24% higher than the RNC rate in 2012.
- The non-White male rate is significantly higher than the rates for any other demographic group, but also has the highest rate of decrease (slope of trend). White females have the lowest rate, which has begun to level off.
- The non-White rate remains 39% greater than the White rate.
- A recent decrease in the premature mortality rate for non-Whites and leveling of the rates for Whites suggests a reduction 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  $R^2 < 0.10$ .

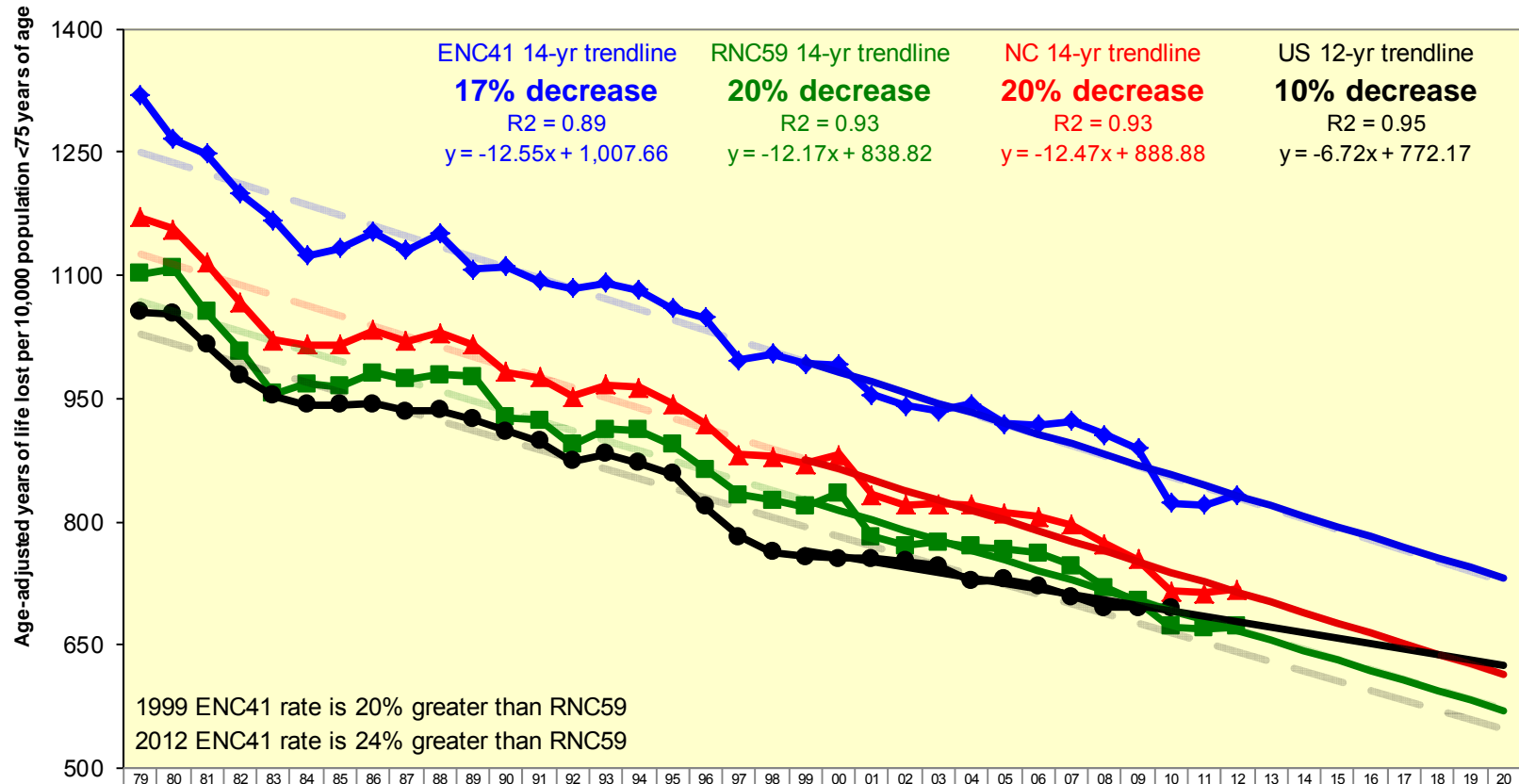
Figure 5.2 i. All Causes of Premature Mortality:  
Trends in premature mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020



Comparison of Fitted Rates in 1979			
ENC41	RNC59	NC	
	12% LT	8% LT	ENC41
13% GT		4% GT	RNC59
9% GT	4% LT		NC

Comparison of Fitted Rates in 2012			
ENC41	RNC59	NC	
	19% LT	13% LT	ENC41
23% GT		7% GT	RNC59
15% GT	6% LT		NC

Figure 5.2 ii. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates for ENC41, RNC59, NC, and US, 1979-2012 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					
ENC41	1319	1266	1249	1200	1167	1124	1133	1153	1131	1151	1107	1111	1093	1085	1091	1082	1060	1048	997	1005	992	991	955	942	935	944	919	918	923	906	889	823	821	833													
RNC59	1102	1109	1056	1008	955	968	965	981	973	979	977	927	924	894	912	912	894	864	833	827	819	836	782	771	775	769	767	762	746	720	703	673	670	672													
NC	1170	1157	1115	1067	1021	1016	1016	1034	1021	1030	1016	983	976	953	967	963	944	920	882	880	871	882	833	821	822	820	811	806	796	773	755	716	713	718													
US	1055	1053	1016	977	954	943	943	944	935	936	925	910	898	874	882	872	858	818	782	763	758	755	755	752	747	728	730	722	709	696	696	696															

Comparison of Fitted Rates in 1999			
ENC41	RNC59	NC	US
	17% LT	12% LT	23% LT
20% GT		6% GT	8% LT
13% GT	6% LT		13% LT
30% GT	9% GT	15% GT	

Comparison of Fitted Rates in 2012			
ENC41	RNC59	NC	US
	19% LT	14% LT	19% LT
24% GT		7% GT	1% GT
16% GT	6% LT		6% LT
23% GT	1% LT	6% GT	

Figure 5.2 iii. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates by race and gender for ENC41, 1979-2012 with projections to 2020

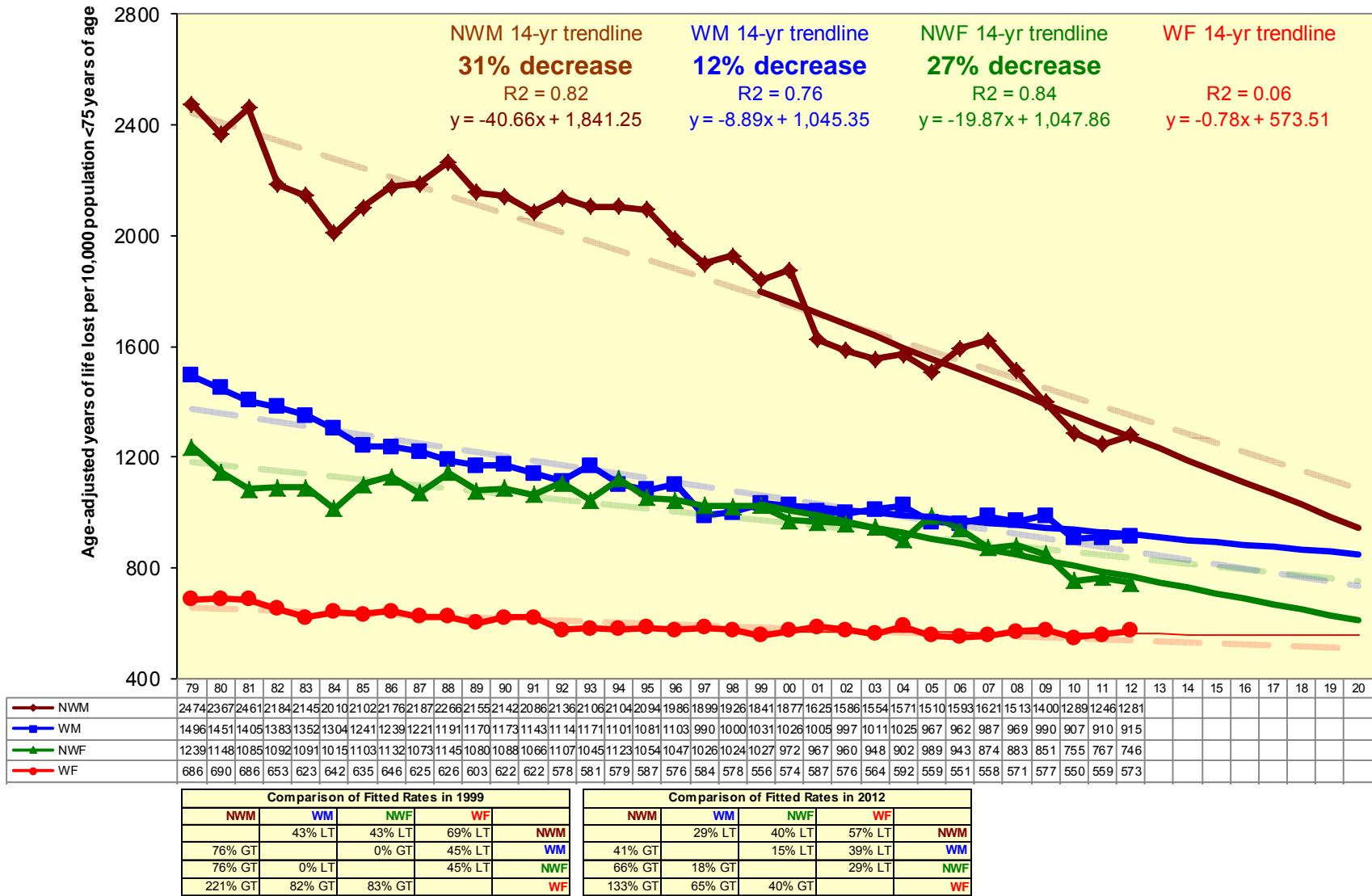




Figure 5.2 iv. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates by race for ENC41,  
1979-2012 with projections to 2020

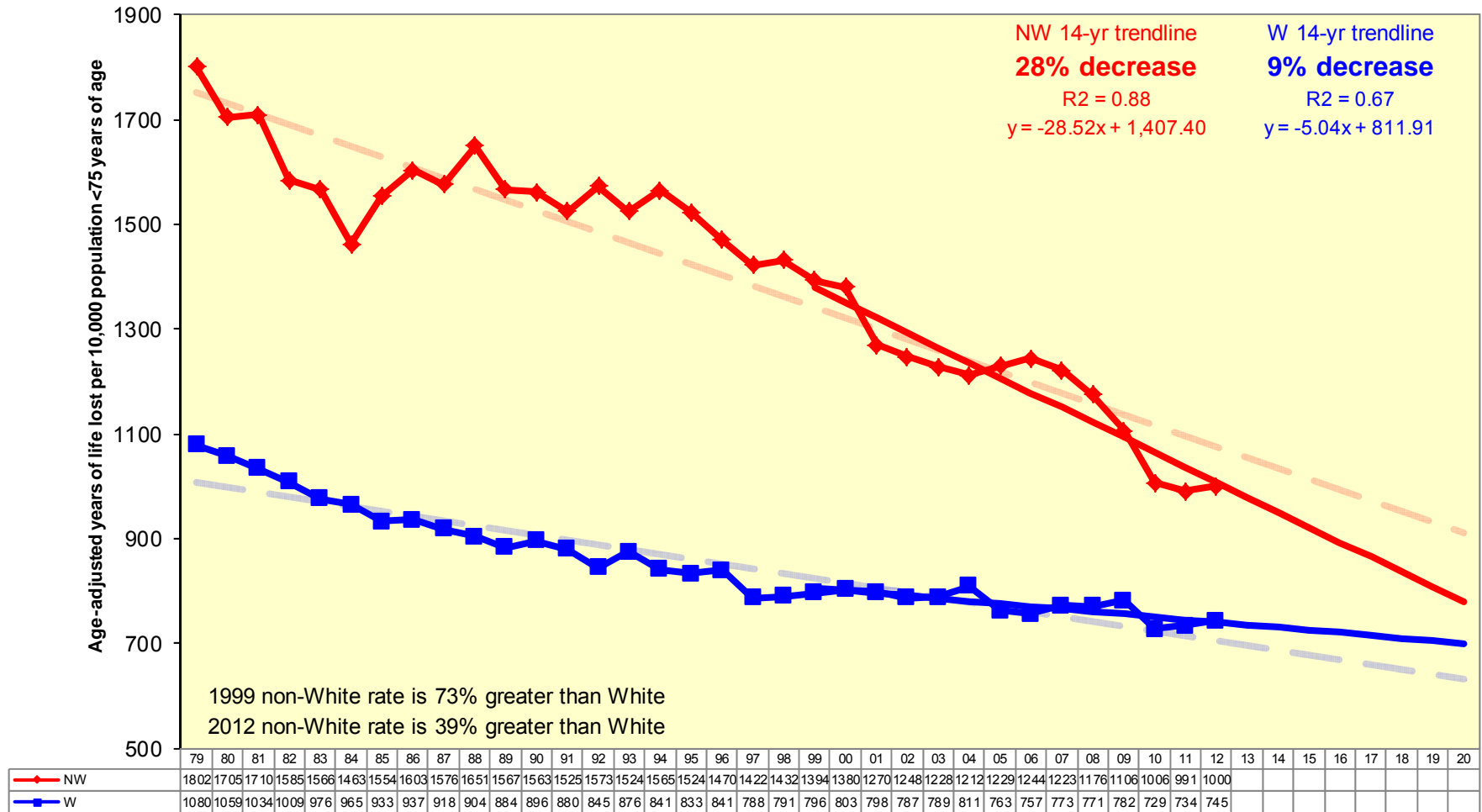
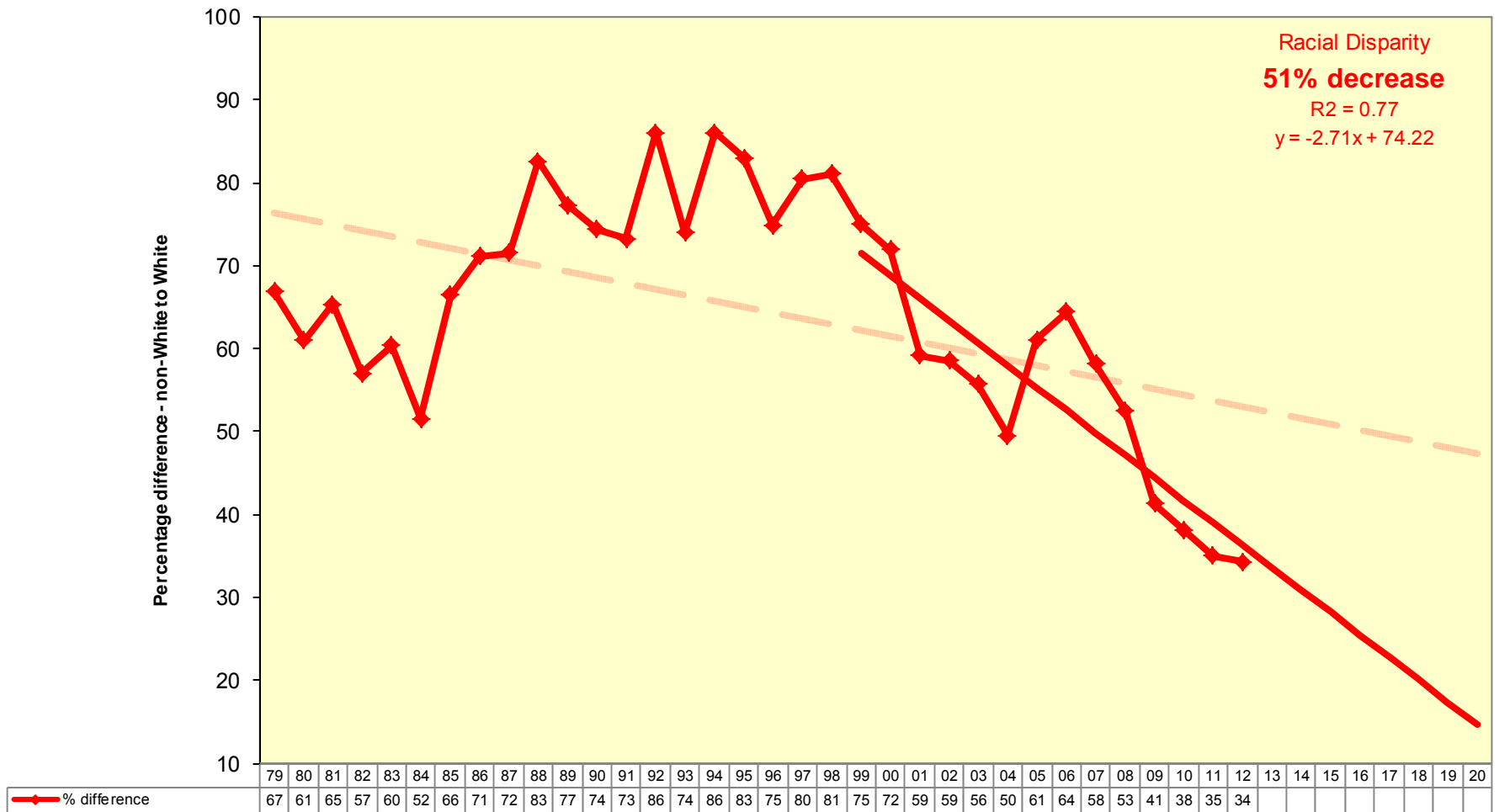


Figure 5.2 v. All Causes of Premature Mortality:  
 Measuring disparity in age-adjusted premature mortality rates by race for ENC41,  
 1979-2012 with projections to 2020





## 6. Trends and Disparities in Mortality in ENC41: Ten Specific Leading Causes of Death, 1979-2012

# Diseases of Heart

- ENC's heart disease mortality rate trend is decreasing but not as quickly as the decrease for RNC and NC, resulting in a slightly increased geographic disparity. In 1999, the fitted rate for ENC was 8% greater than RNC; by 2012 it was 16% greater than RNC.
- While ENC's age-adjusted mortality rate is decreasing at a pace equal to RNC, the ENC fitted rate remains 18% greater than RNC in 2012.
- The non-White male rate remains the highest but convergence with the White male rate is suggested in the future. The non-White female rate remains slightly higher than the White female rate but is decreasing more quickly and is suggested to fall below White females in the future.
- While the non-White rate remains 9% greater than the rate for Whites, the 14-year trends for both are decreasing, and convergence is suggested in the future.
- While the 33-year trend suggests an increase in racial disparity, the moderately reliable 14-year trend line for racial disparity suggests a 42% decrease.

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 ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

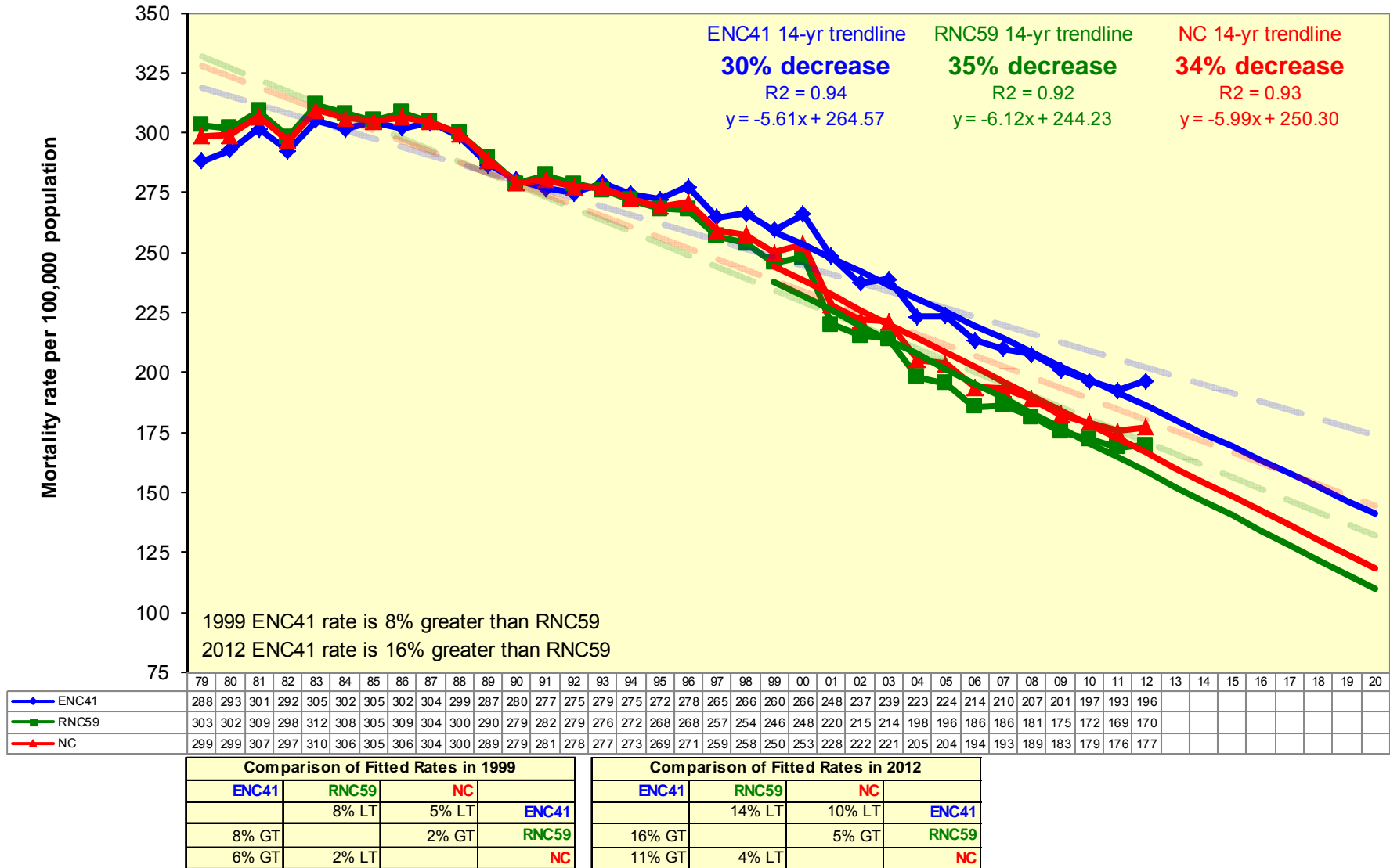
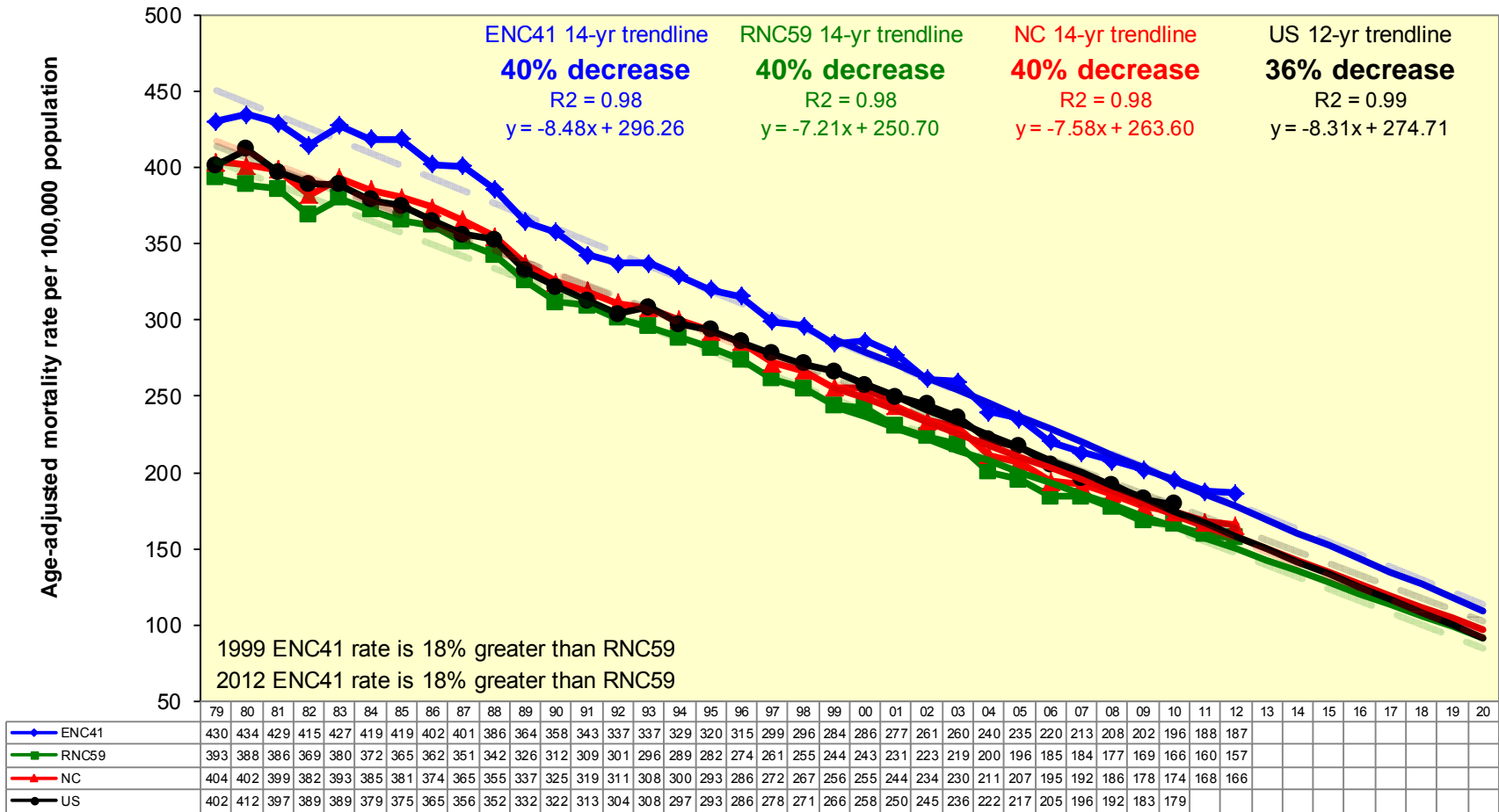


Figure 6.1 ii. Diseases of Heart:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2012 with projections to 2020



Comparison of Fitted Rates in 1999				
ENC41	RNC59	NC	US	
	15% LT	11% LT	7% LT	ENC41
18% GT		5% GT	10% GT	RNC59
12% GT	5% LT		4% GT	NC
8% GT	9% LT	4% LT		US

Comparison of Fitted Rates in 2012				
ENC41	RNC59	NC	US	
	16% LT	11% LT	10% LT	ENC41
18% GT		5% GT	6% GT	RNC59
13% GT	5% LT		1% GT	NC
12% GT	6% LT	1% LT		US

Figure 6.1 iii. Diseases of Heart:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

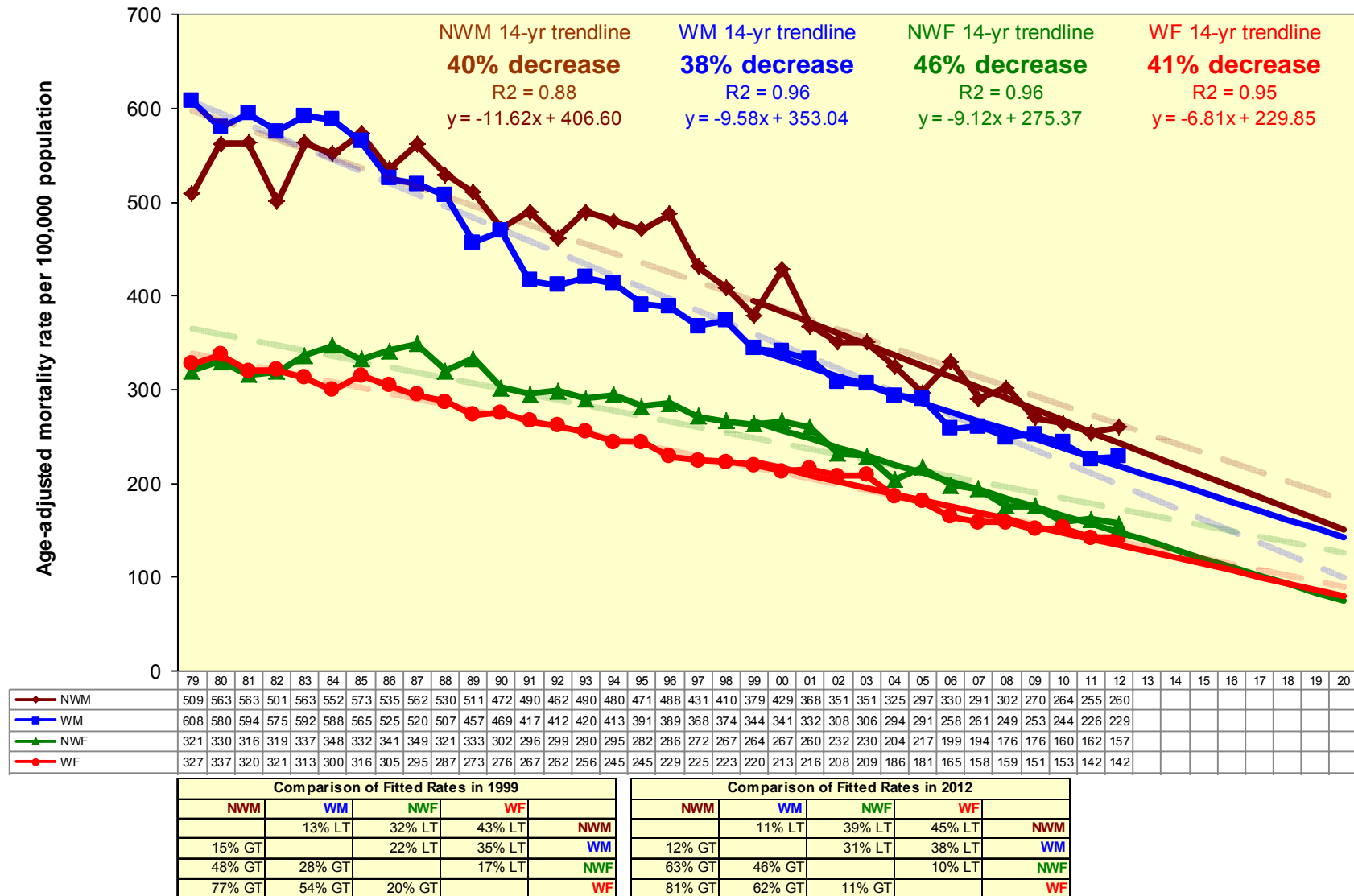




Figure 6.1 iv. Diseases of Heart:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

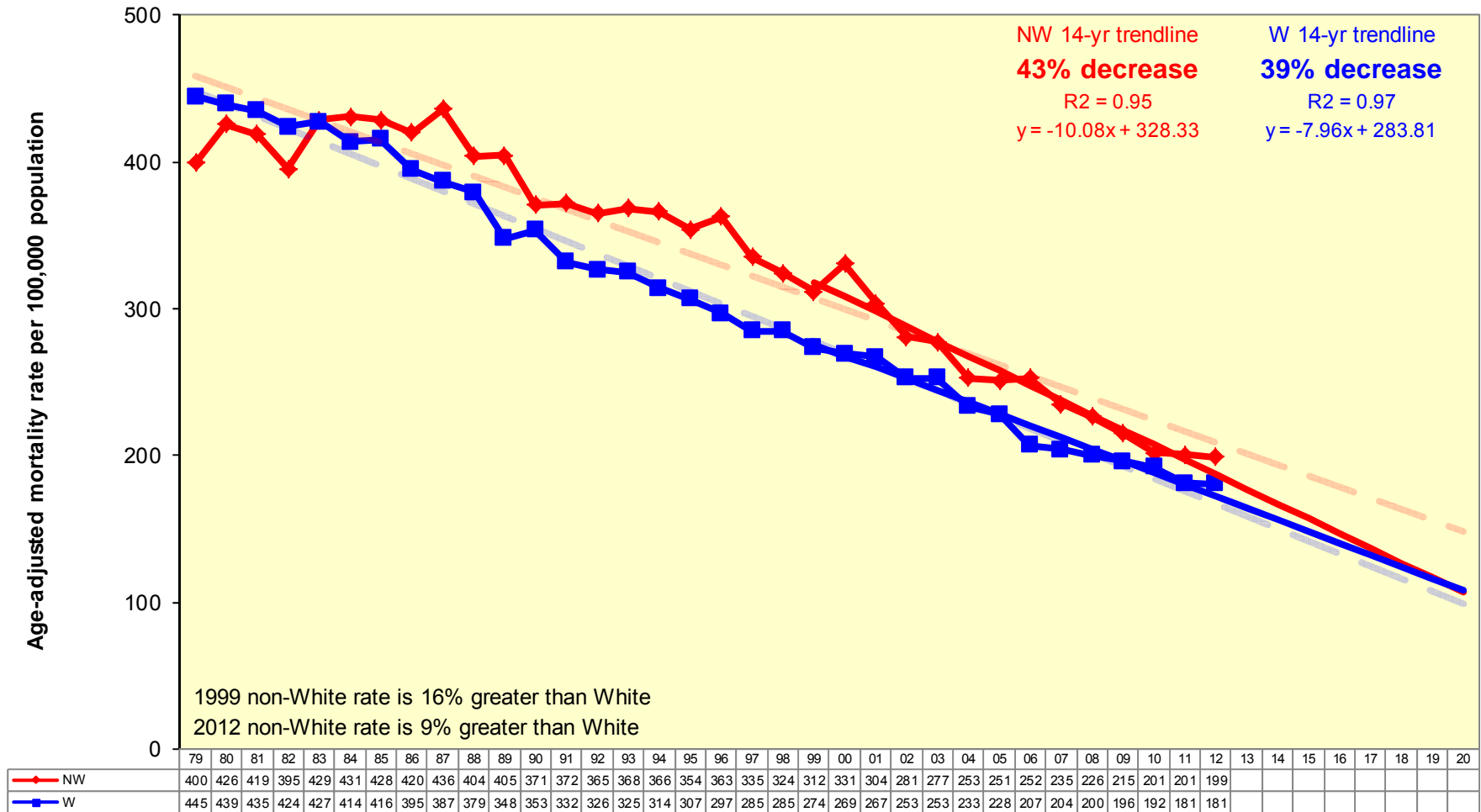
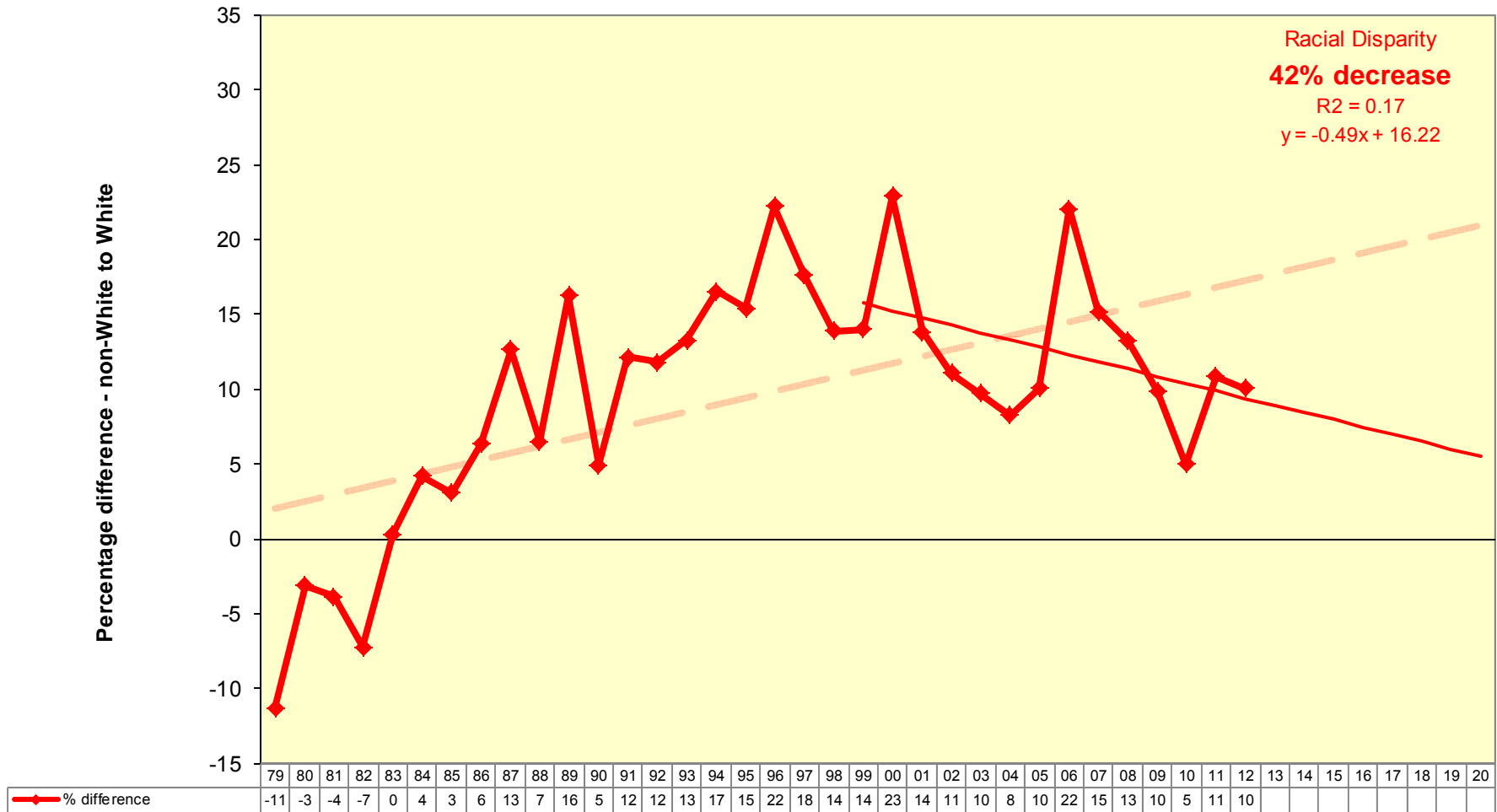


Figure 6.1 v. Diseases of Heart:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020



## Cancer - Trachea, Bronchus, Lung

- While the 33-year trends for Cancer—TBL indicate that all mortality rates are continuing to increase, the 14-year trend line suggests a slight decrease in all three regions. The rate of decrease for ENC is not as great as RNC and NC.
- In 2012, the age-adjusted rate trend for ENC is 9% above the RNC rate and 19% above the US rate. During the period 1999-2012, the ENC rates have decreased at about the same rate as NC.
- The mortality rates for males are decreasing. Female rates are increasing slightly, although the trend for White females is unreliable. In 2012 the non-White male rate was the highest, but is decreasing the most quickly and will likely converge with the trend for White males in the next few years.
- The non-White mortality rate is consistently lower than the White rate. Both rates are decreasing over the 14 year period, but the non-White rate is decreasing a bit more quickly.
- The 14-year trend for racial disparity shows a decrease, but it 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 6.2 i. Cancer - Trachea, Bronchus, Lung:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

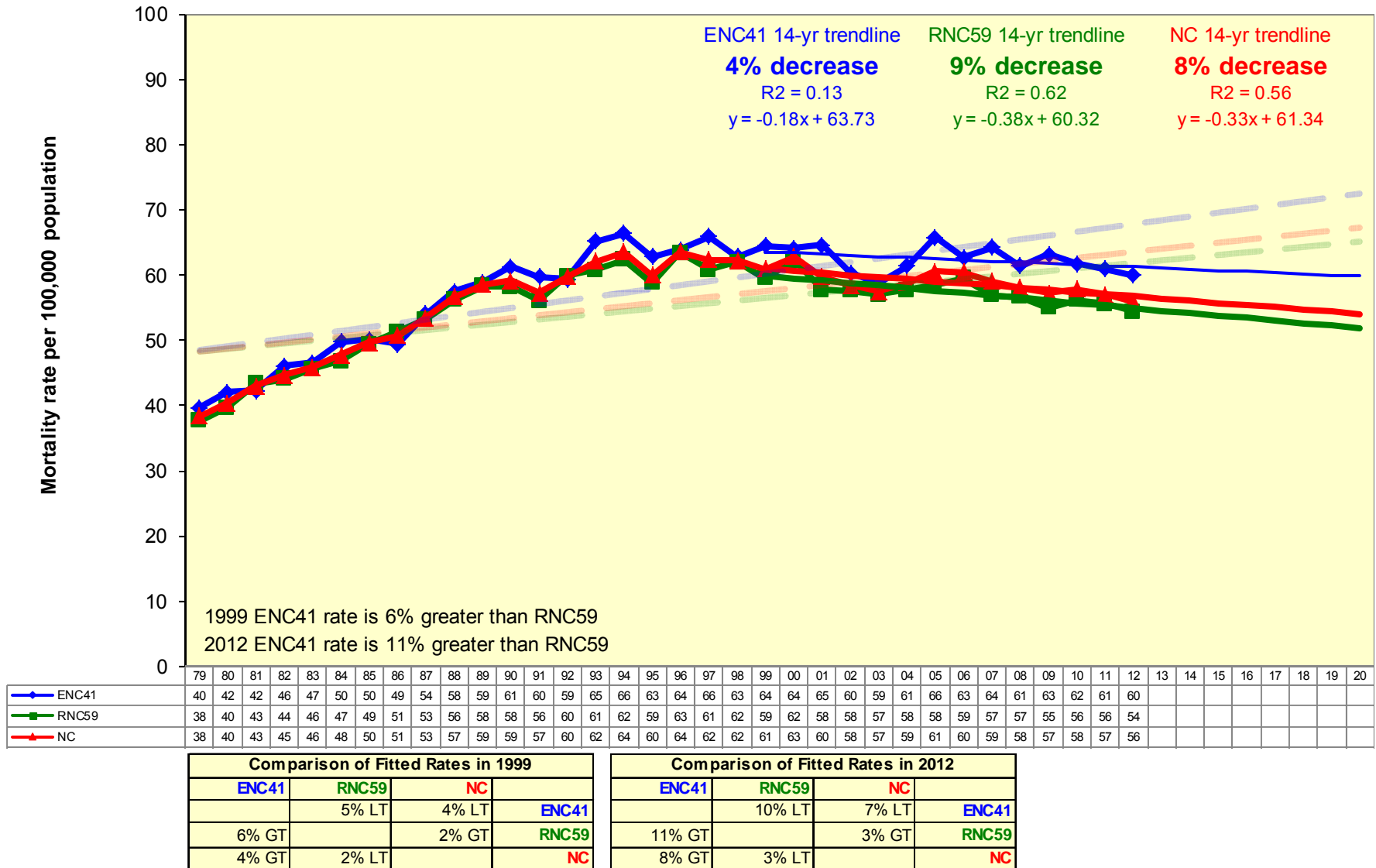


Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

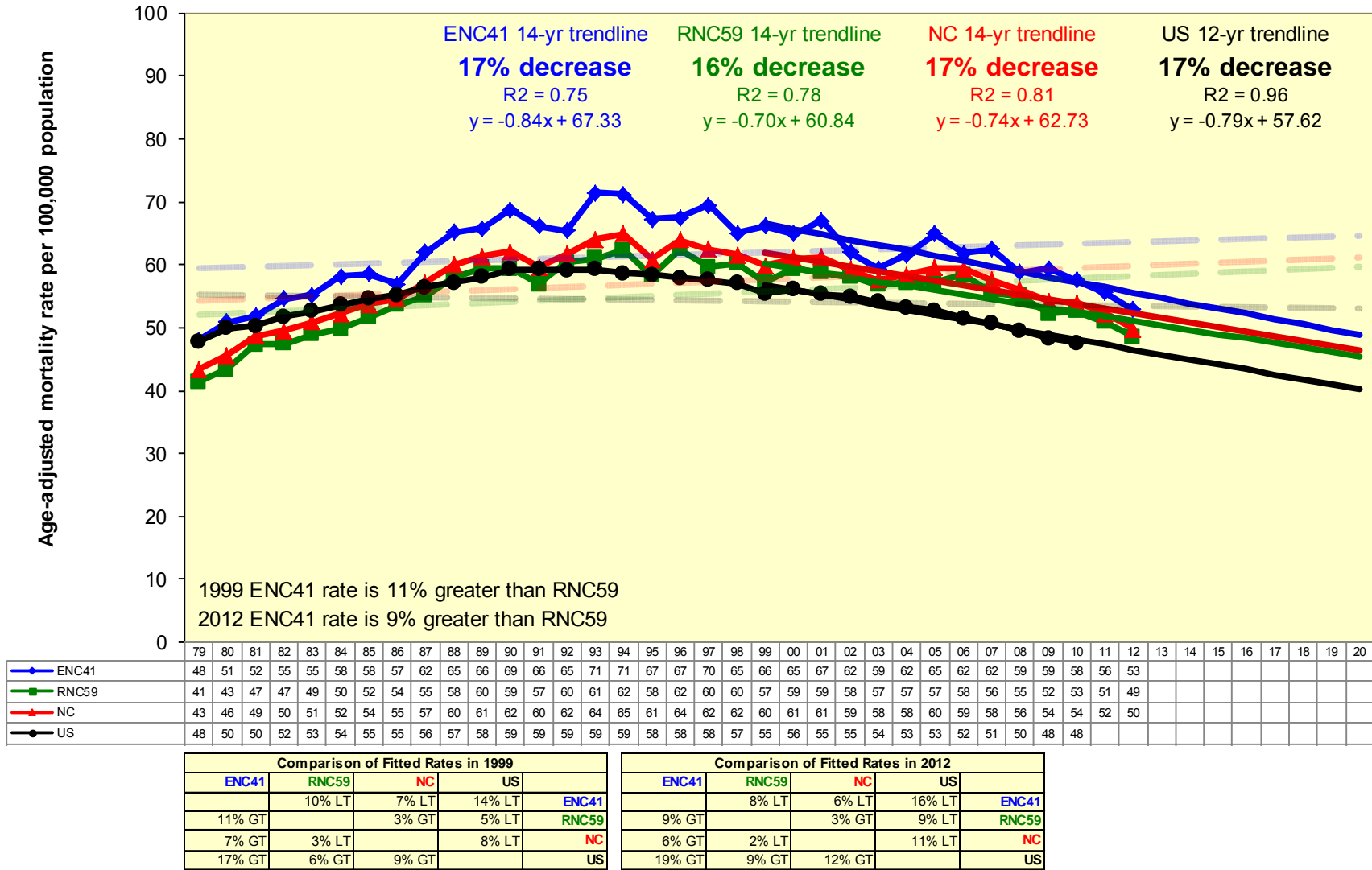


Figure 6.2 iii. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

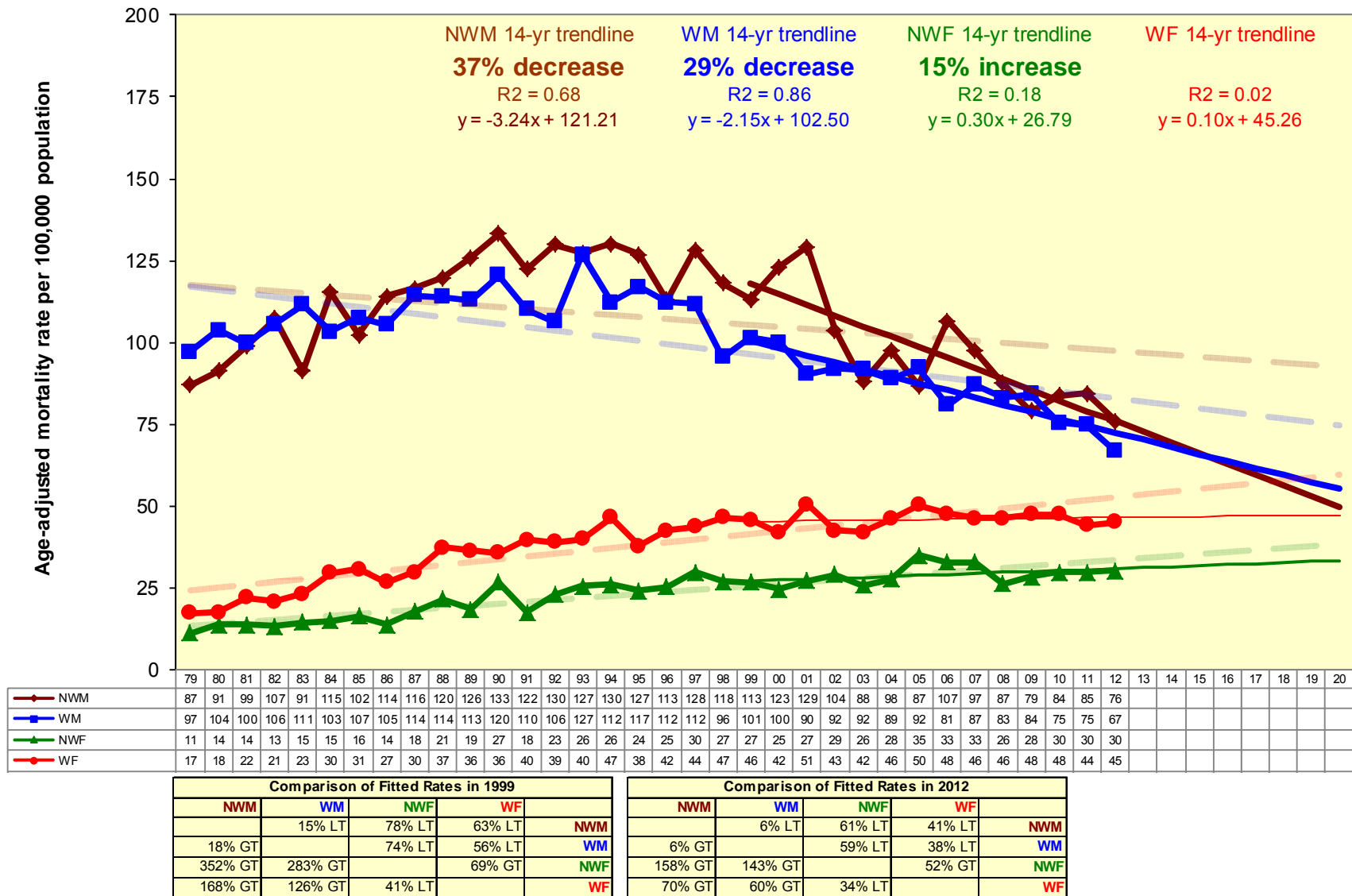


Figure 6.2 iv. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

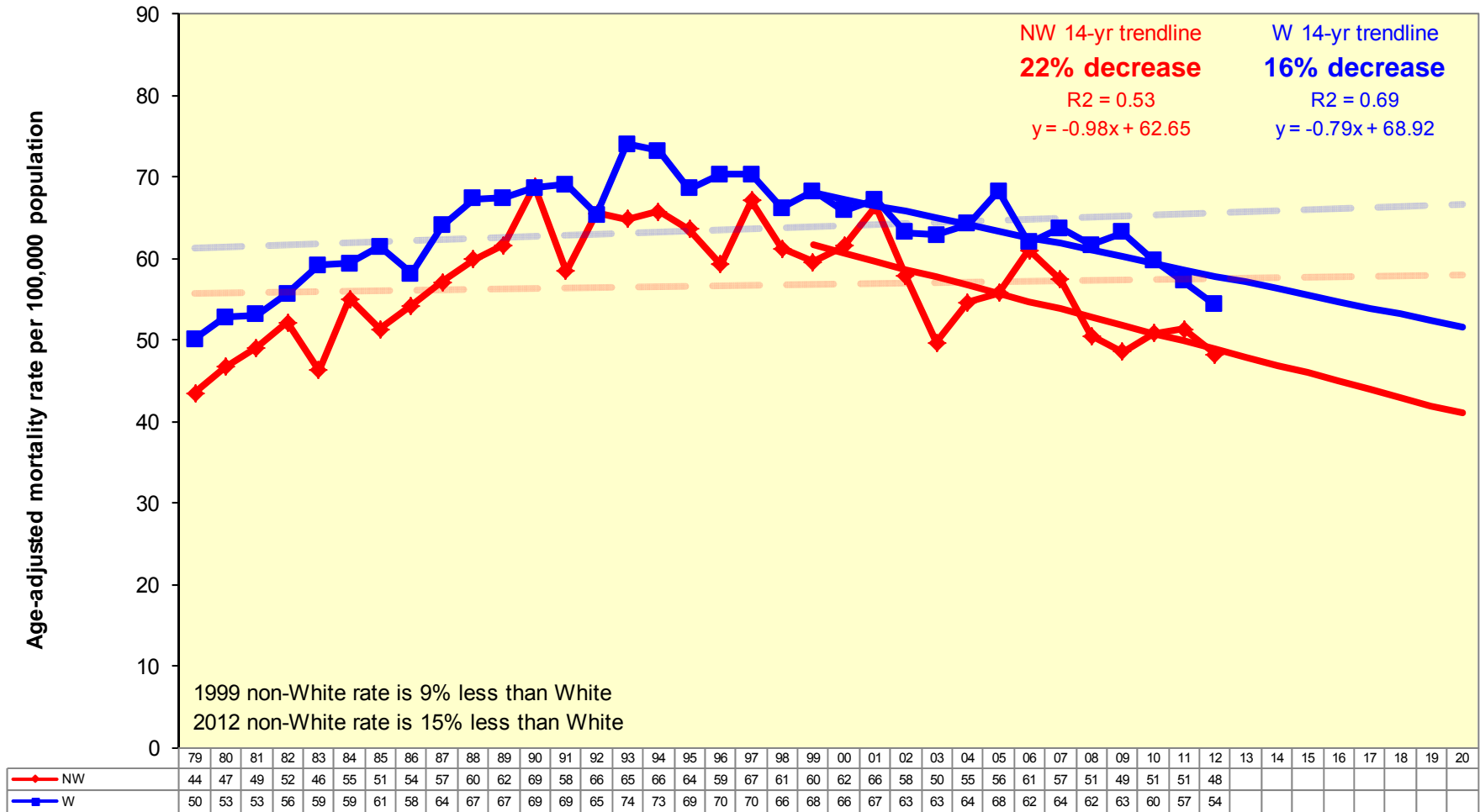
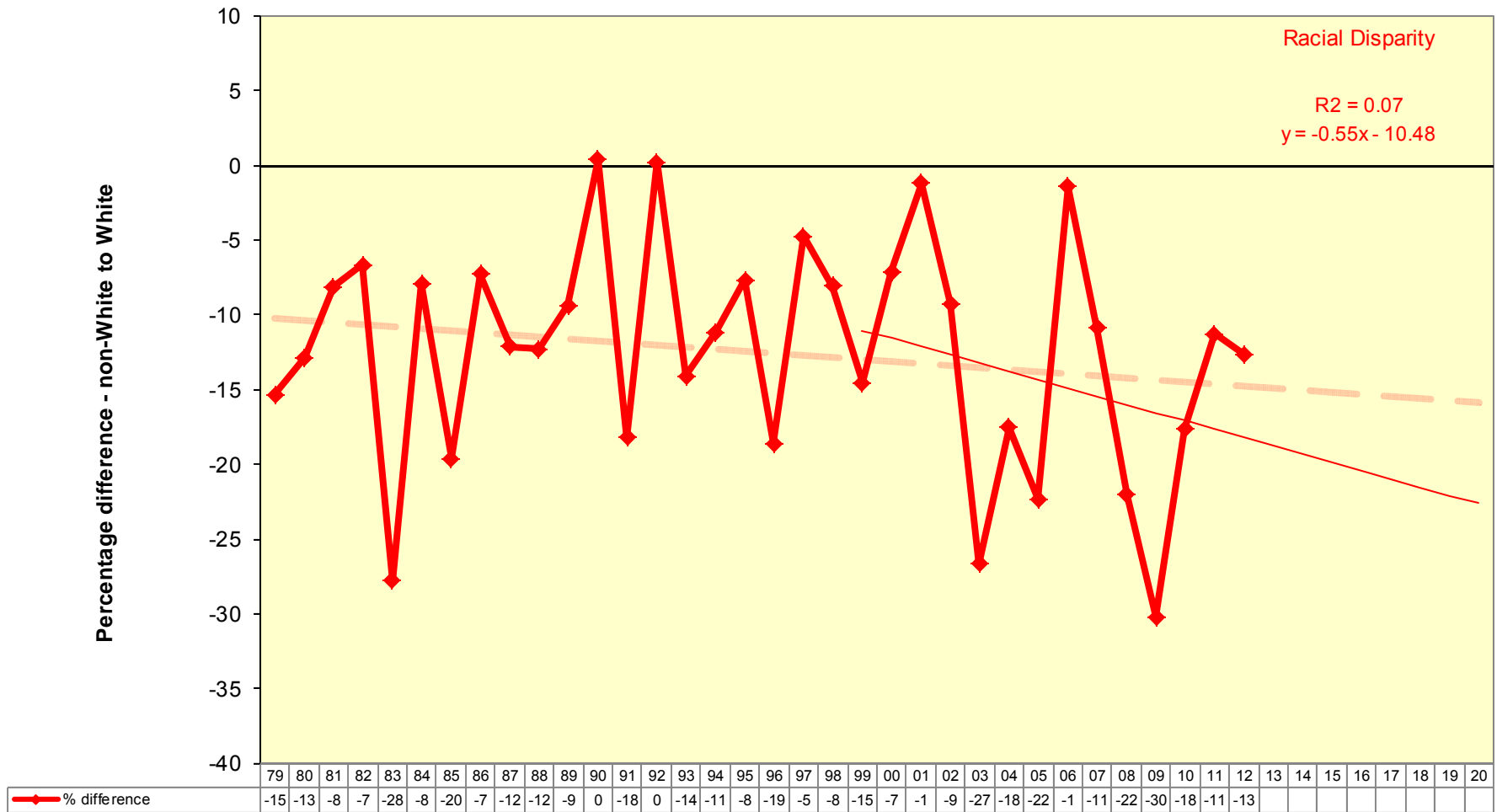


Figure 6.2 v. Cancer - Trachea, Bronchus, Lung:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020





# Chronic Lower Respiratory Diseases

- CLRD mortality rates for ENC, RNC, and NC have leveled during the last 14 years. In 1999, the ENC trend was 1% greater than RNC; in 2012 the ENC trend was 10% less than RNC, but the trend is not reliable.
- The 14-year CLRD age-adjusted rate for ENC is decreasing at a faster pace than the US rate. In 2012, the ENC rate trend was 10% less than RNC compared to 1999 when the ENC rate was 9% greater than RNC.
- Fitted rates for non-White males and White males have decreased over 14 years by 38% and 31%, respectively. The rate for White males remains the highest although it is decreasing. The 14-year trends for White females and non-White females are unreliable.
- The 14-year White mortality rates are greater than non-White rates and the rate of decline is less for Whites, leading to a divergence more favorable to non-Whites.
- There is a 30% decrease in the disparity between White rates and non-White rates 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 6.3 i. Chronic Lower Respiratory Diseases:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

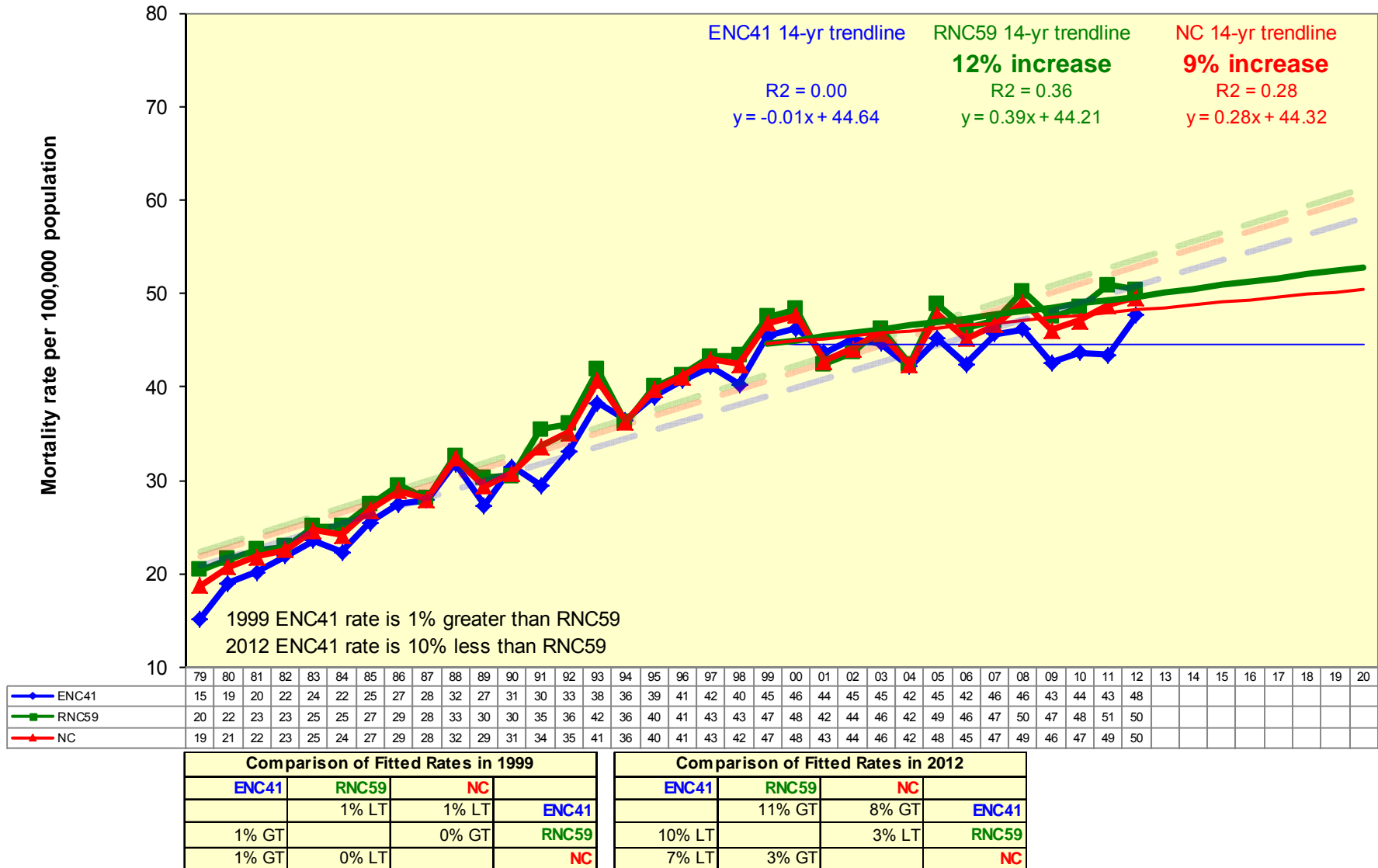


Figure 6.3 ii. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

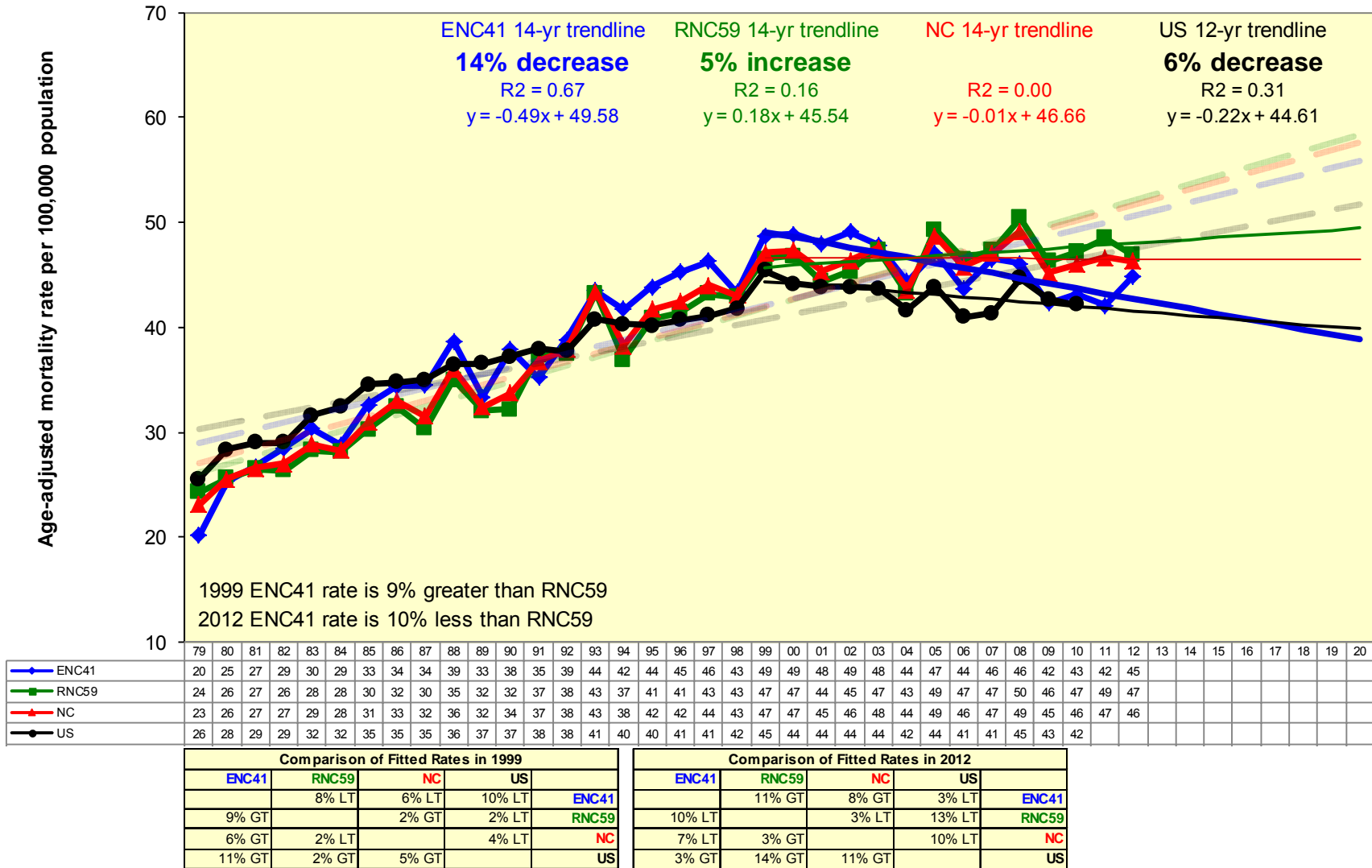


Figure 6.3 iii. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

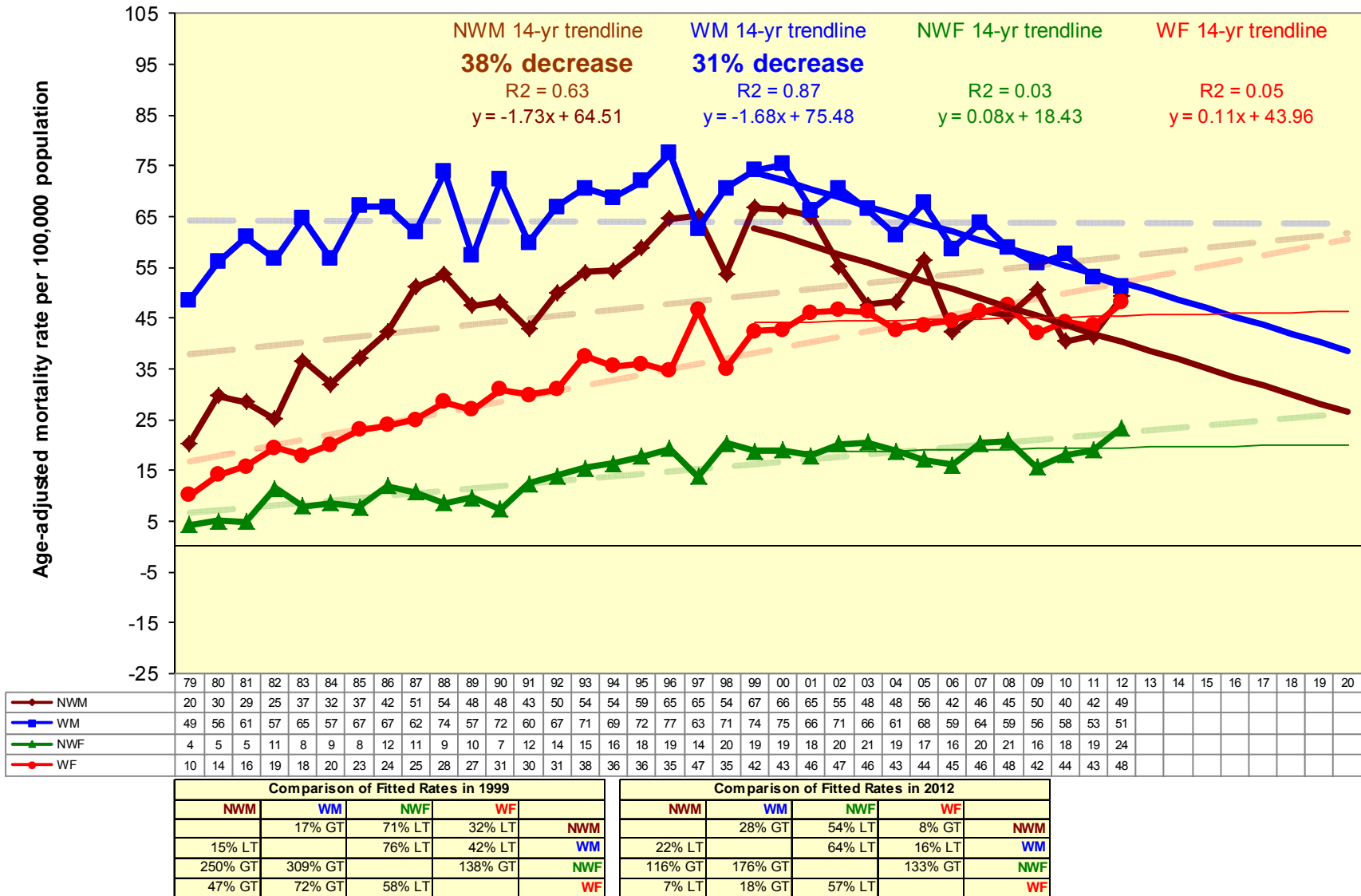


Figure 6.3 iv. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

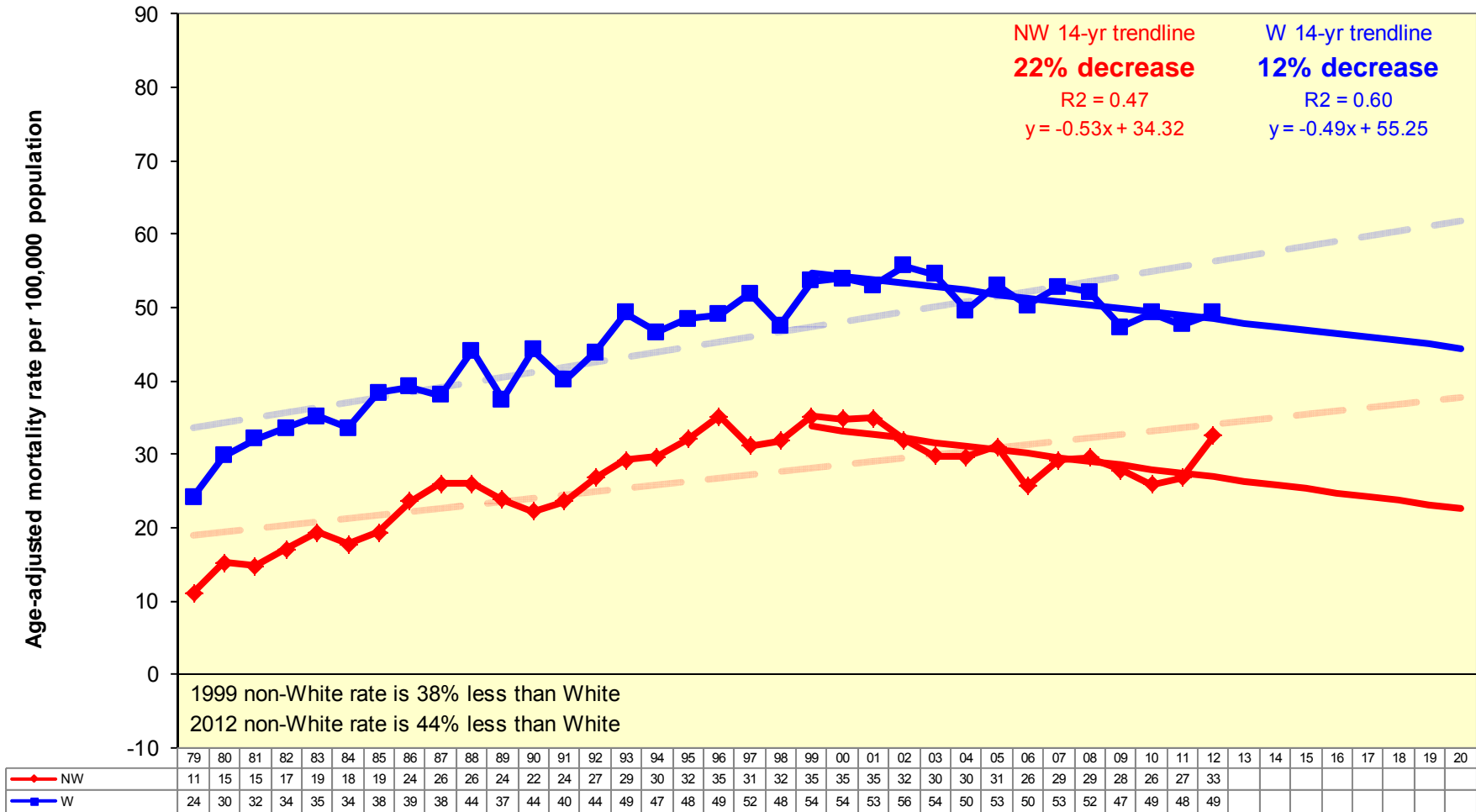
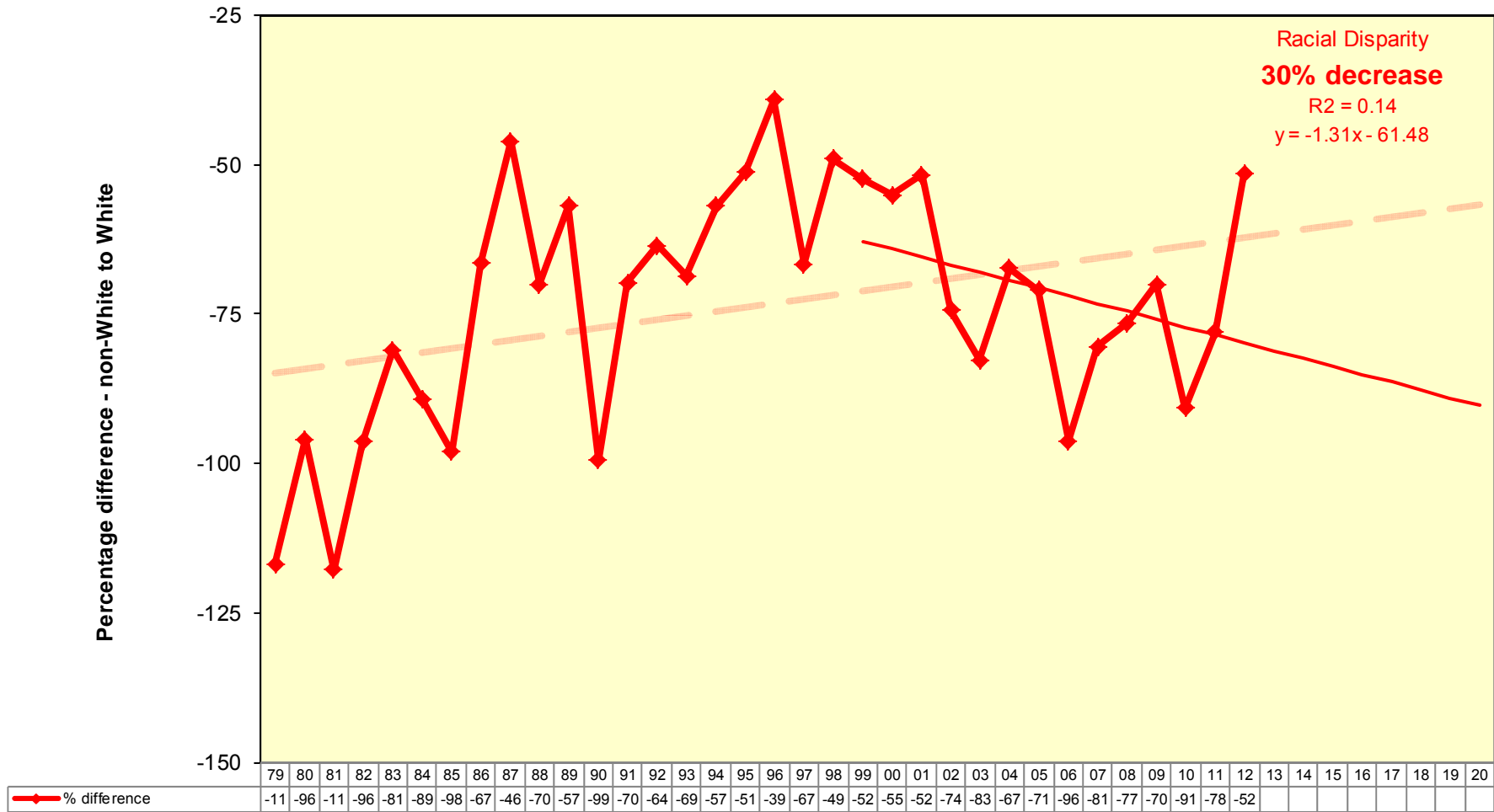


Figure 6.3 v. Chronic Lower Respiratory Diseases:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020



# Cerebrovascular Disease

- ENC's cerebrovascular disease mortality trend line is decreasing in a similar trend to RNC and NC.
- While the ENC age-adjusted cerebrovascular disease mortality rate is 5% greater than the rate for the rest of the state, it is decreasing and converging on the RNC and NC rates. The *Healthy People 2010* goal of less than 48 deaths per 100,000 was achieved in the region in 2010. In 2012, ENC has a rate of 43 deaths per 100,000.
- Non-Whites have the highest mortality rate for cerebrovascular disease but the rate continues to decrease and converge with the other demographic groups. The greatest relative improvement in cerebrovascular disease mortality over 14 years is by White females who experienced a 56% decrease. The non-White male rate is decreasing and converging with White males, but is still 57% greater in 2012.
- The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of whites but was still 49% greater than the White rate in 2012.
- The 14-year trend 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 6.4 i. Cerebrovascular Disease:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

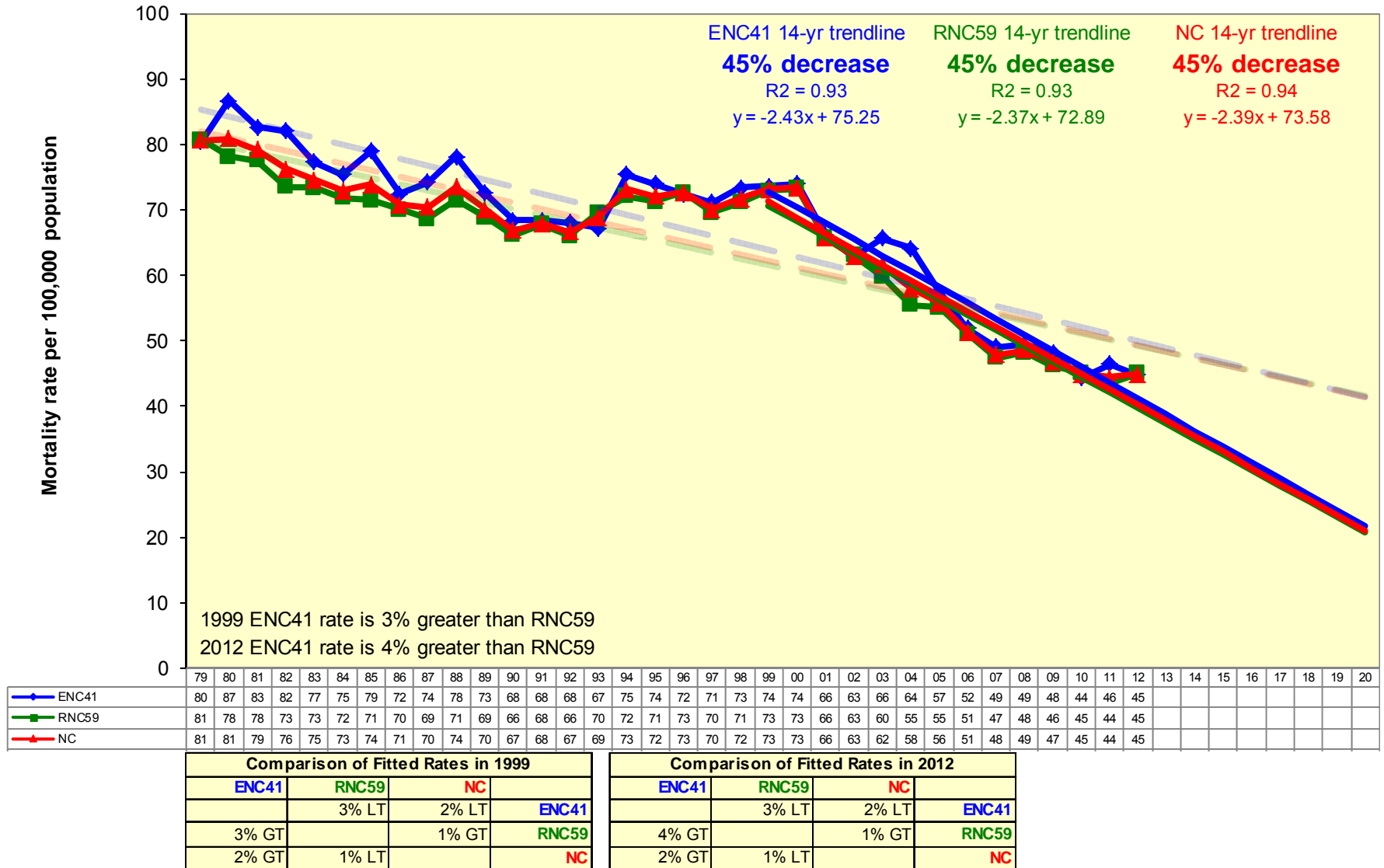
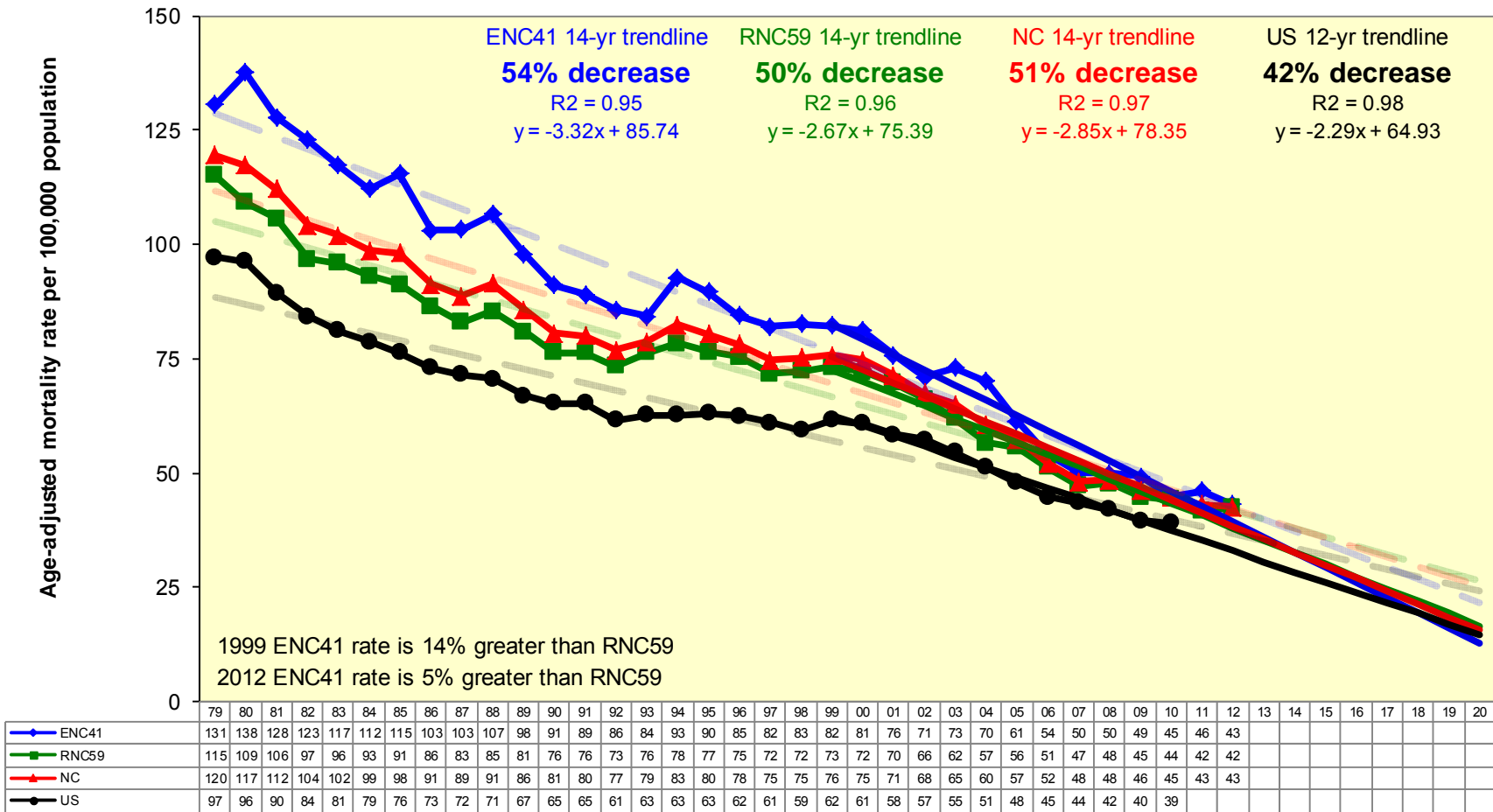




Figure 6.4 ii. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020



Comparison of Fitted Rates in 1999				
ENC41	RNC59	NC	US	
	12% LT	9% LT	24% LT	ENC41
14% GT		4% GT	14% LT	RNC59
9% GT	4% LT		17% LT	NC
32% GT	16% GT	21% GT		US

Comparison of Fitted Rates in 2012				
ENC41	RNC59	NC	US	
	5% LT	3% LT	17% LT	ENC41
5% GT		1% GT	13% LT	RNC59
3% GT	1% LT		15% LT	NC
21% GT	15% GT	17% GT		US

Figure 6.4 iii. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

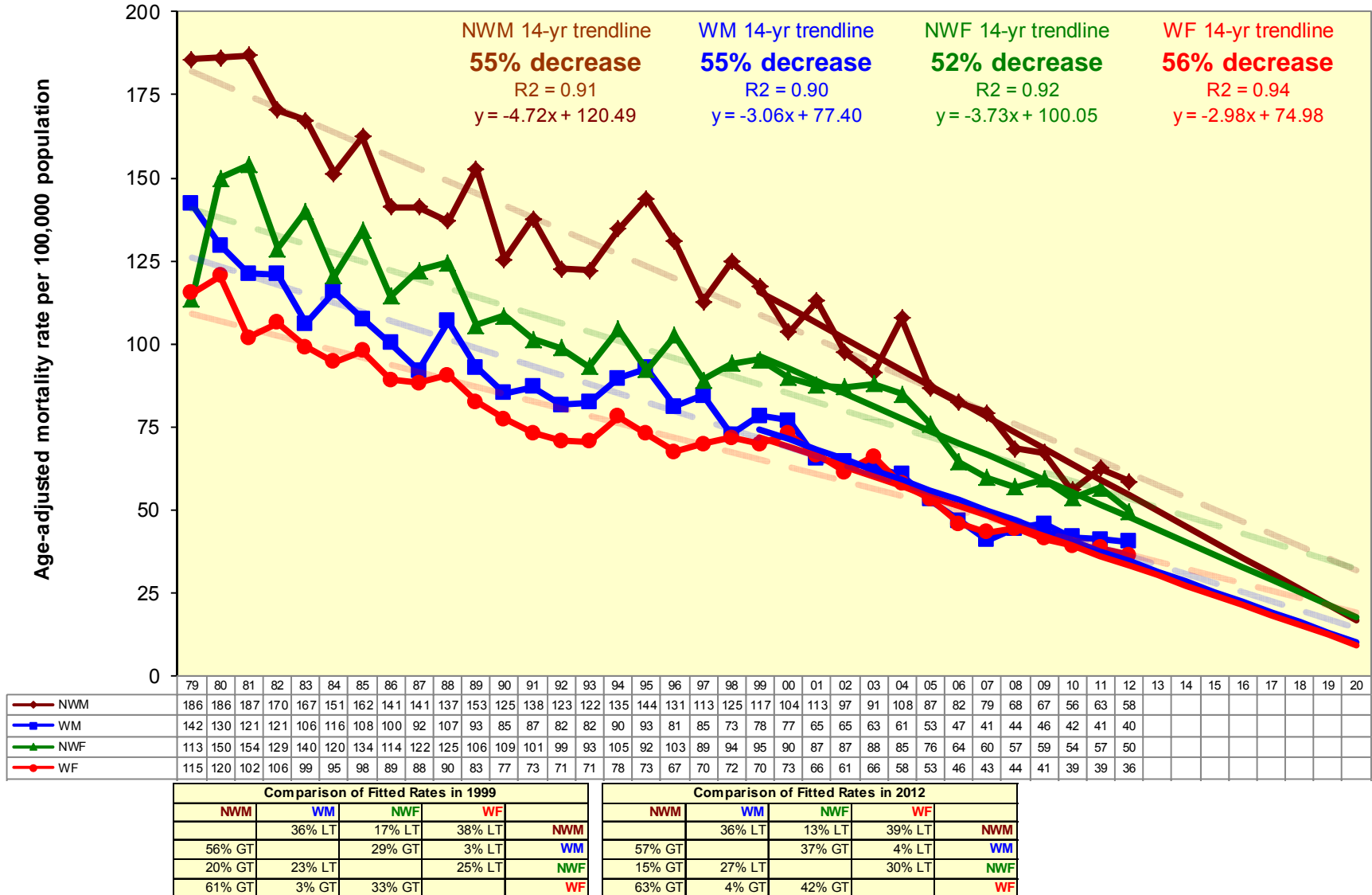


Figure 6.4 iv. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

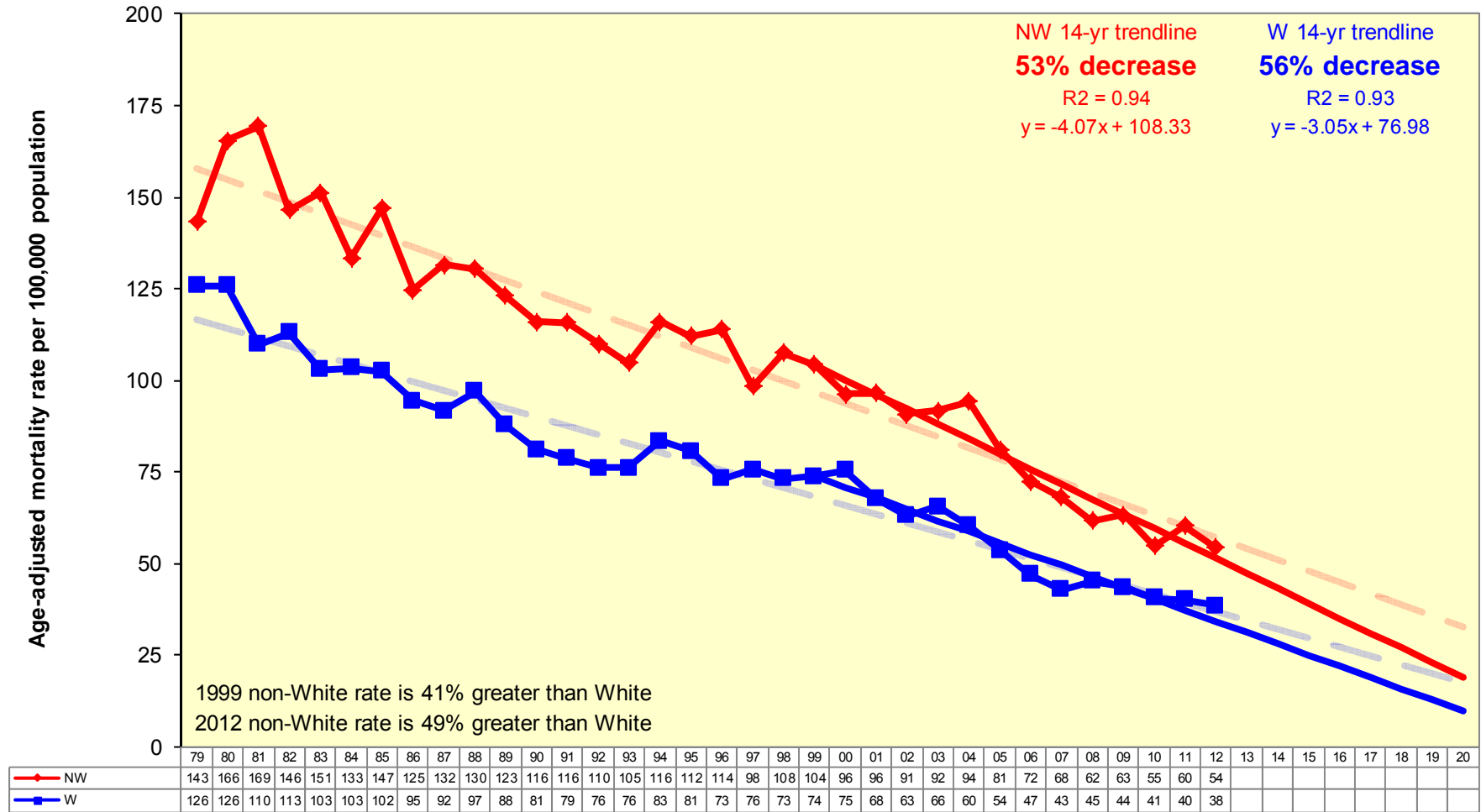
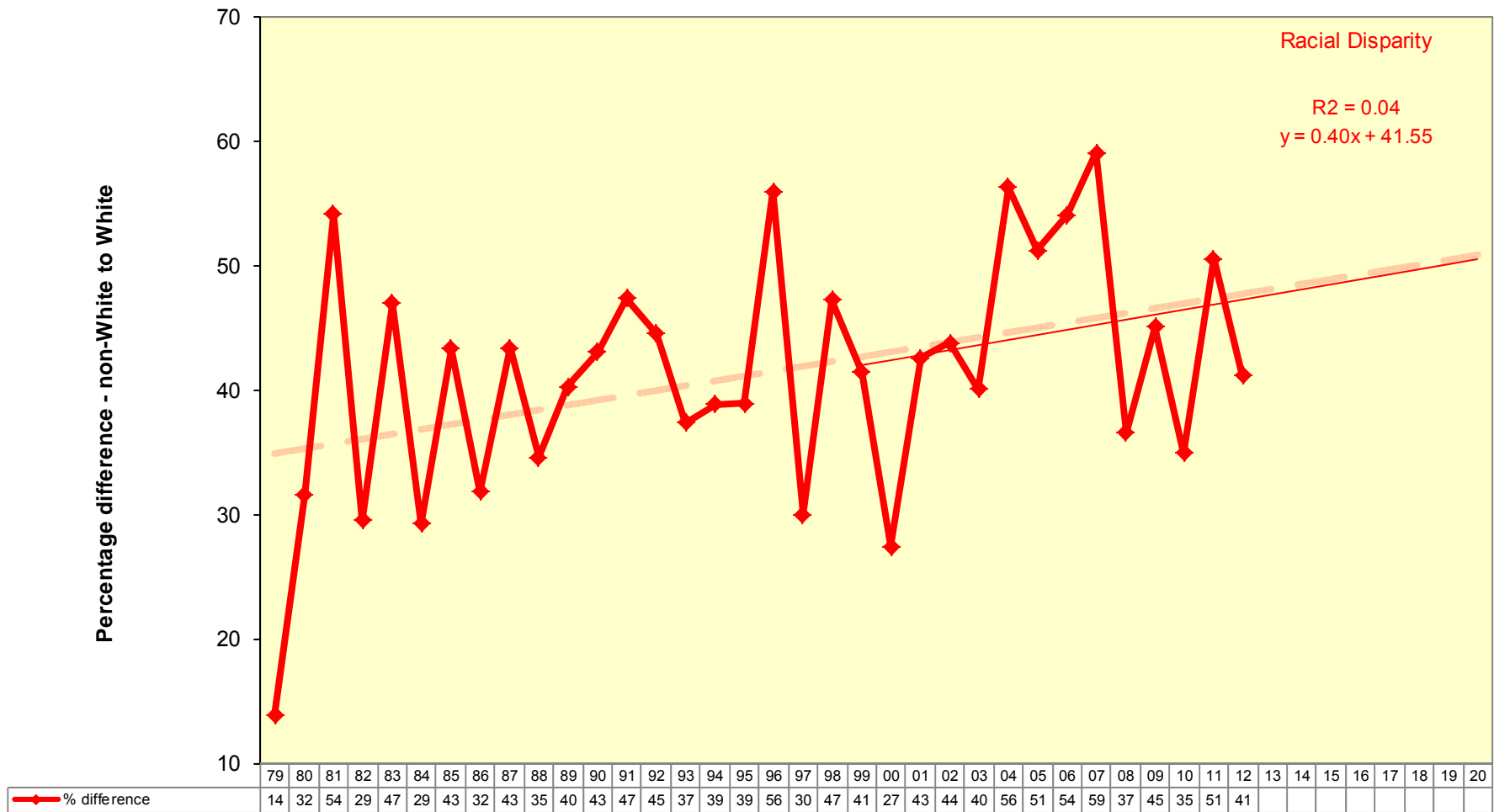


Figure 6.4 v. Cerebrovascular Disease:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020



# All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects is increasing in ENC (60% increase over 14 years). The trends for RNC and NC are also increasing and all are expected to converge in the near future.
- The age-adjusted mortality rate trend for ENC, RNC and NC are increasing. All three increased 33% or more over the 14 years.
- The 14 year trends for White males and White females are increasing significantly (67% and 126% increase, respectively). Mortality rates for non-White males decreased 19% over 14 years. The trend for non-White females is relatively level, but not reliable.
- White rates have increased 87% over the 14 year period. Non-White rates have dropped below white rates, and are decreasing 15% in a moderately reliable trend.
- Between 1999 and 2012, racial disparity has decreased by 419%, eliminating the unfavorable disparity in relation to whites, and favoring

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. All Other Unintentional Injuries and Adverse Effects:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

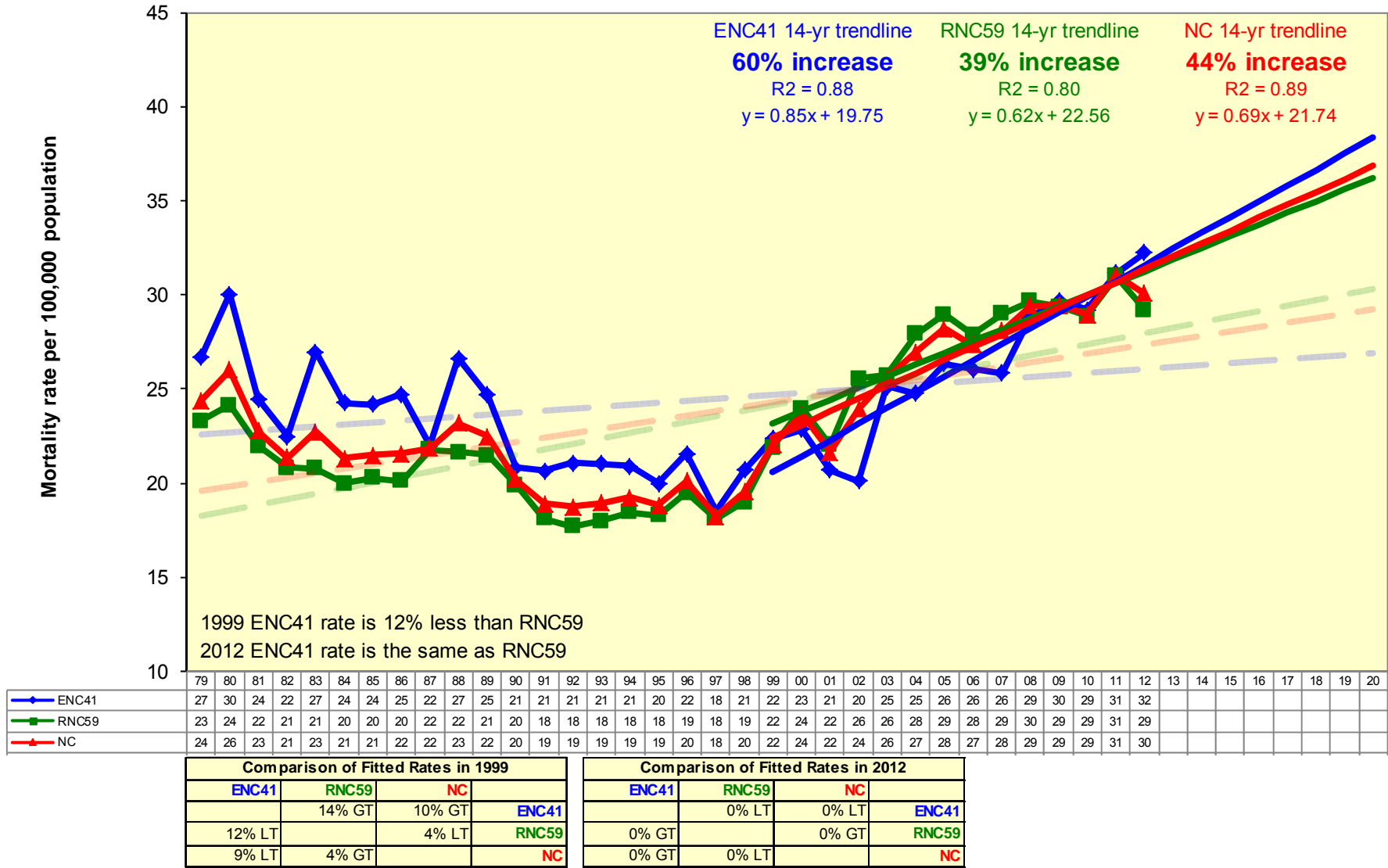


Figure 6.5 ii. All Other Unintentional Injuries and Adverse Effects:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

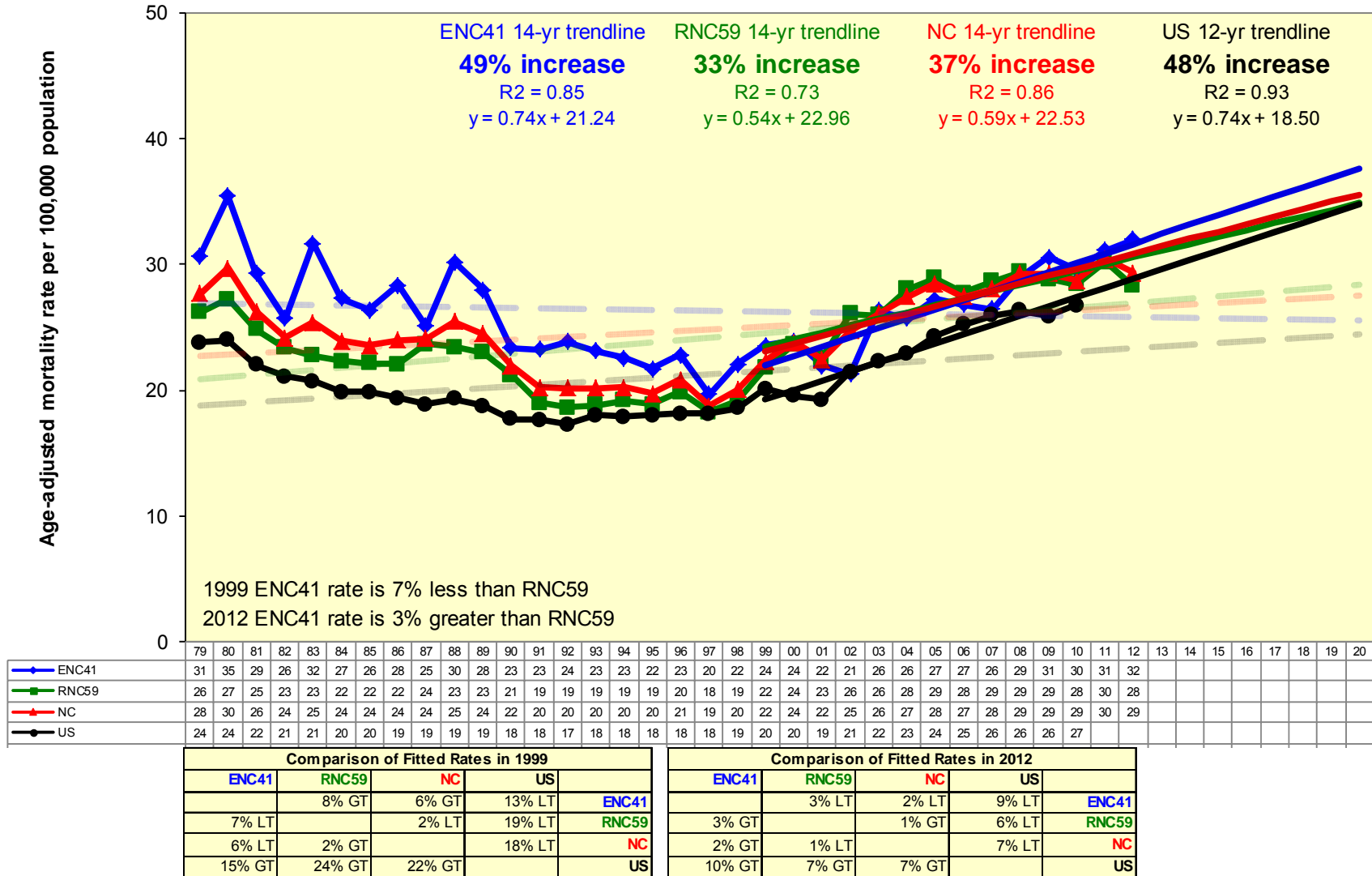


Figure 6.5 iii. All Other Unintentional Injuries and Adverse Effects:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

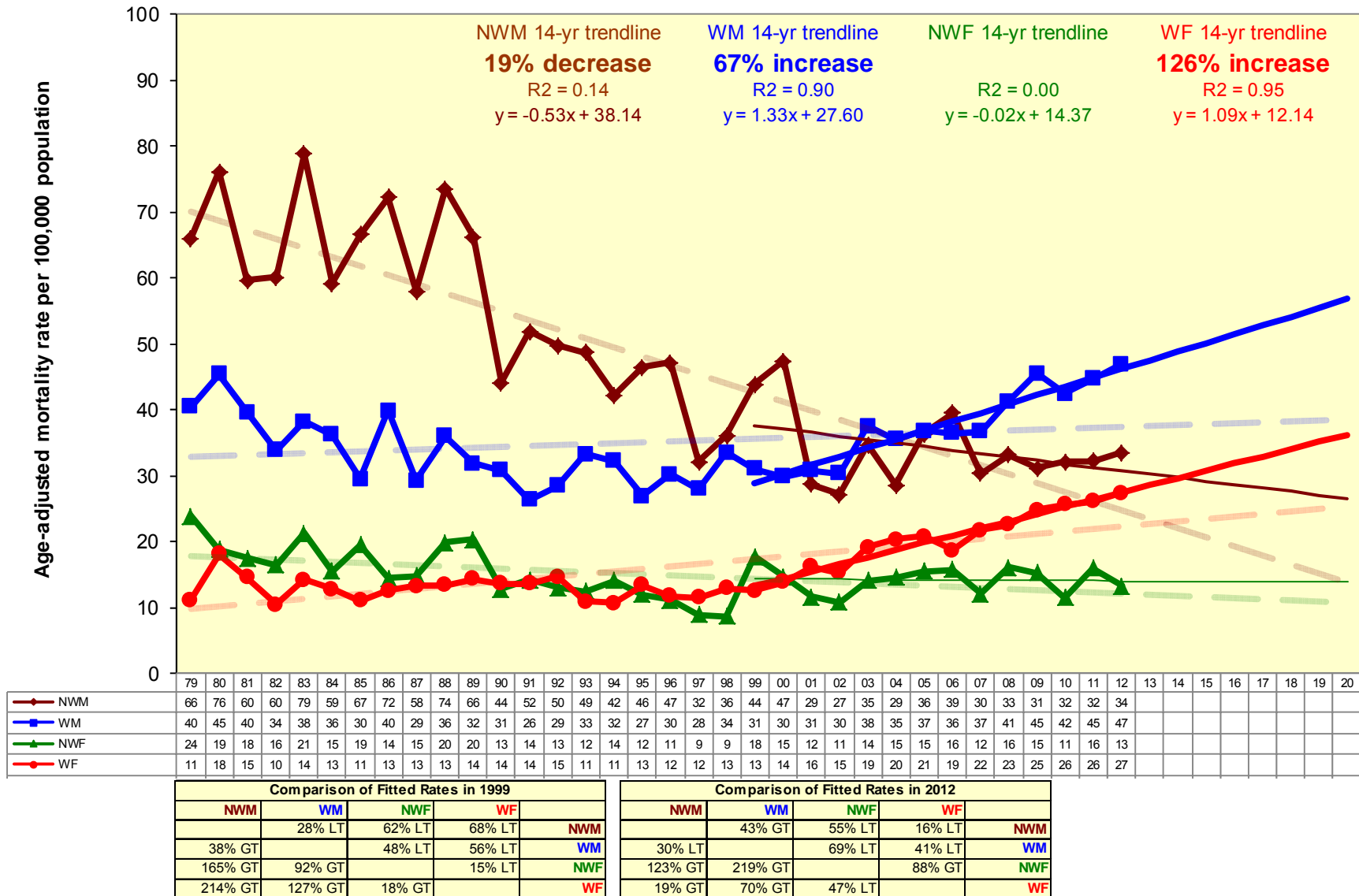




Figure 6.5 iv. All Other Unintentional Injuries and Adverse Effects:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

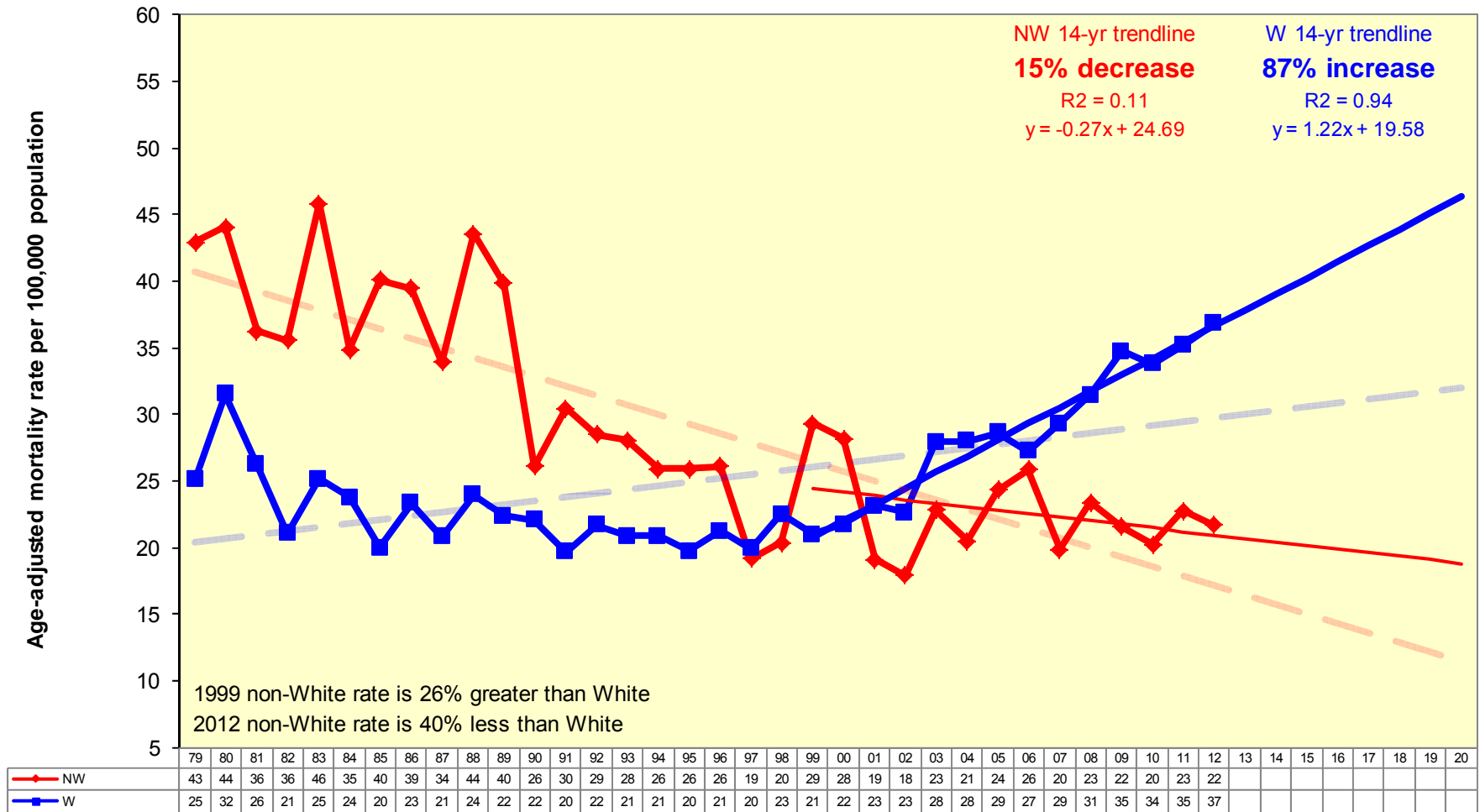
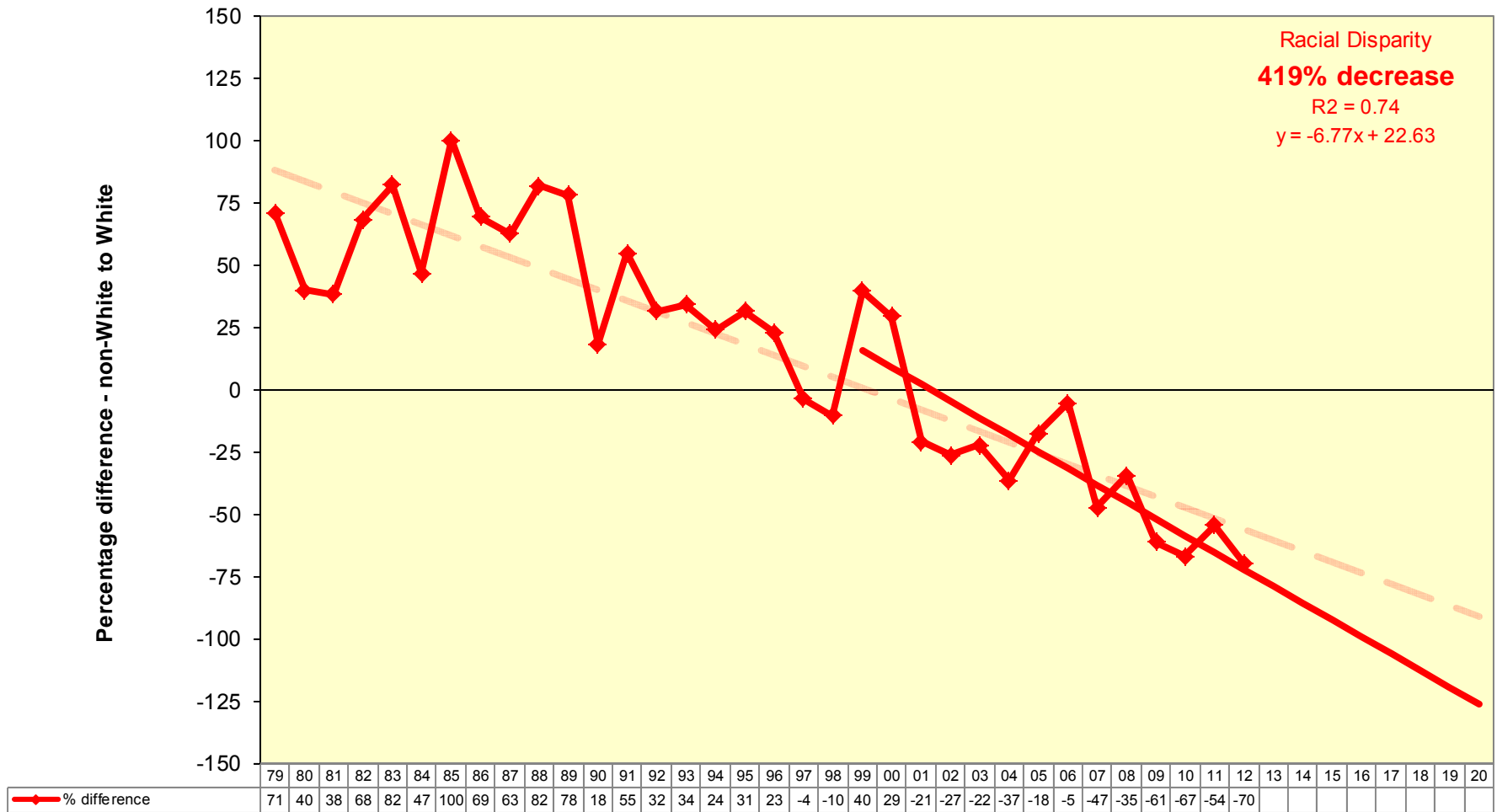


Figure 6.5 v. All Other Unintentional Injuries and Adverse Effects:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020



# Diabetes Mellitus

- According to the 14-year trend, all diabetes mellitus mortality rates are decreasing but the rate of decline is less for ENC suggesting a divergence from RNC and NC. In 2012, the rate trend for ENC was 45% greater than RNC. In 1999 ENC was 28% greater than RNC.
- The 14-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 23% for ENC. In 2012, the ENC age-adjusted diabetes mellitus rate trend remained 46% greater than RNC and 34% greater than the US.
- Rates for all subgroups are decreasing over the recent 14 year period. Rates for non-White males remain the highest. The rate for White males is decreasing the least (11% over 14 years).
- The non-White mortality rate trend decreased over 14 years by 27% but remain 127% greater than the White rate in 2012.
- The decreasing trend for racial disparity is moderately reliable and suggests a 16% decrease.

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. Diabetes Mellitus:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

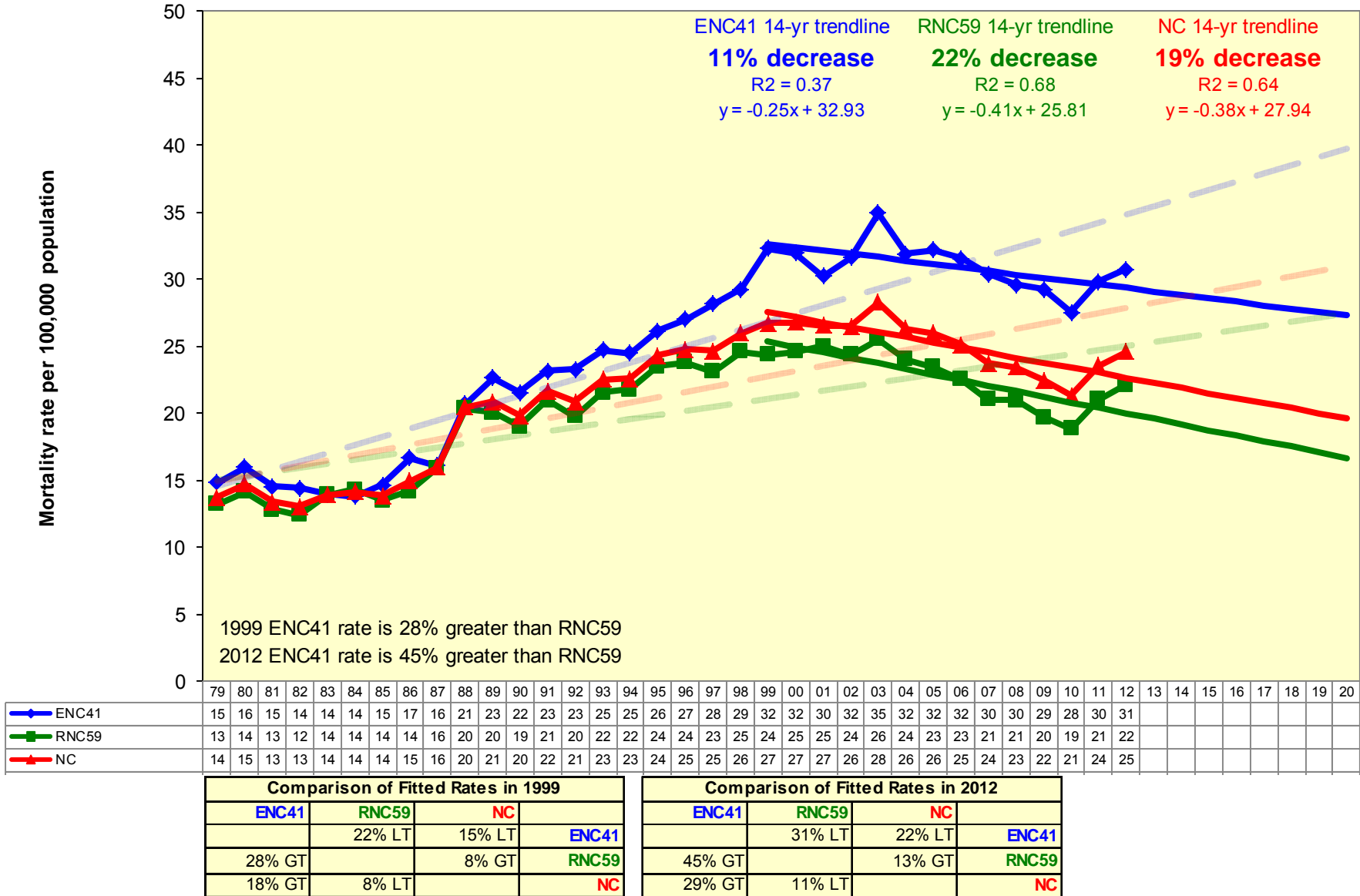


Figure 6.6 ii. Diabetes Mellitus:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

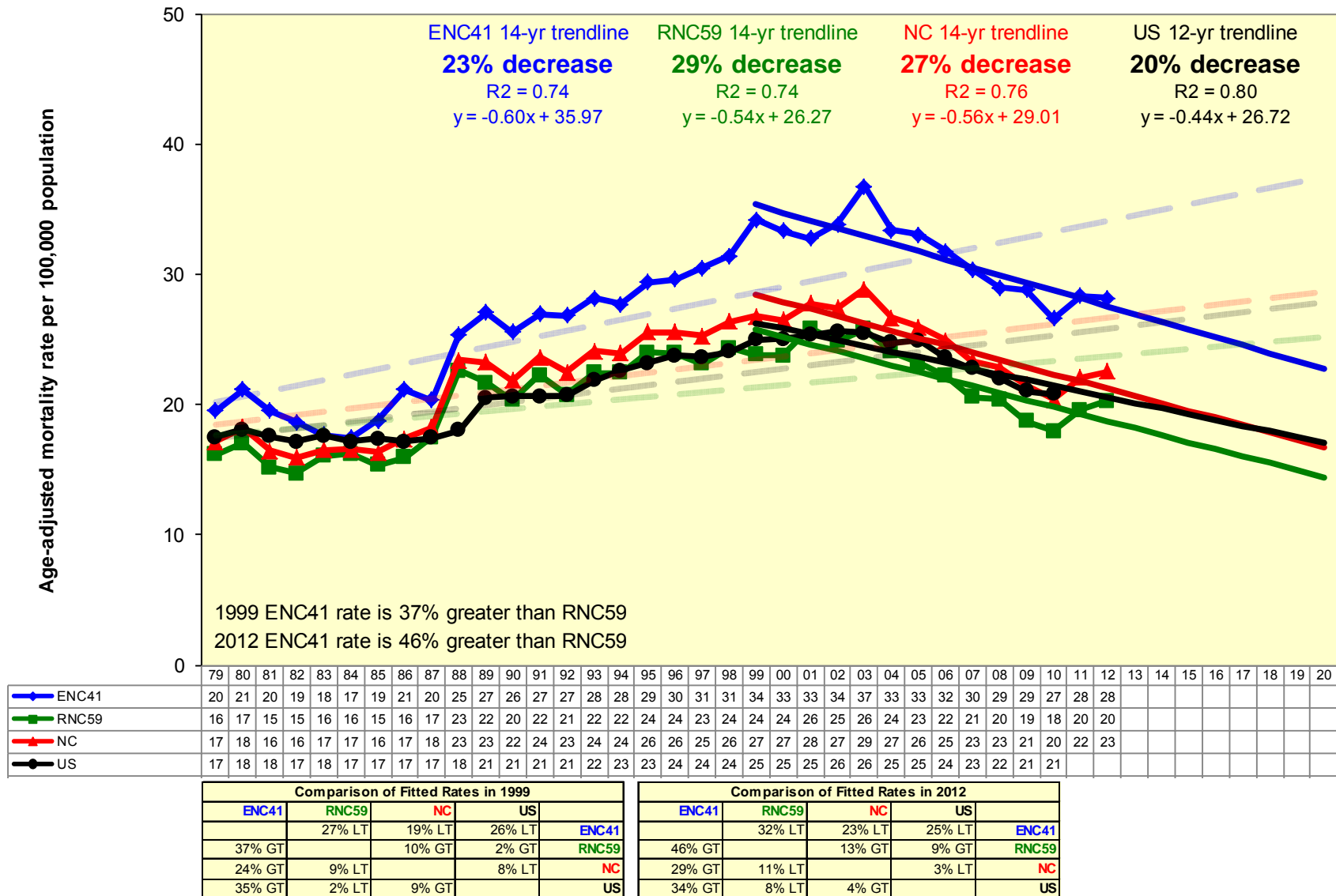


Figure 6.6 iii. Diabetes Mellitus:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

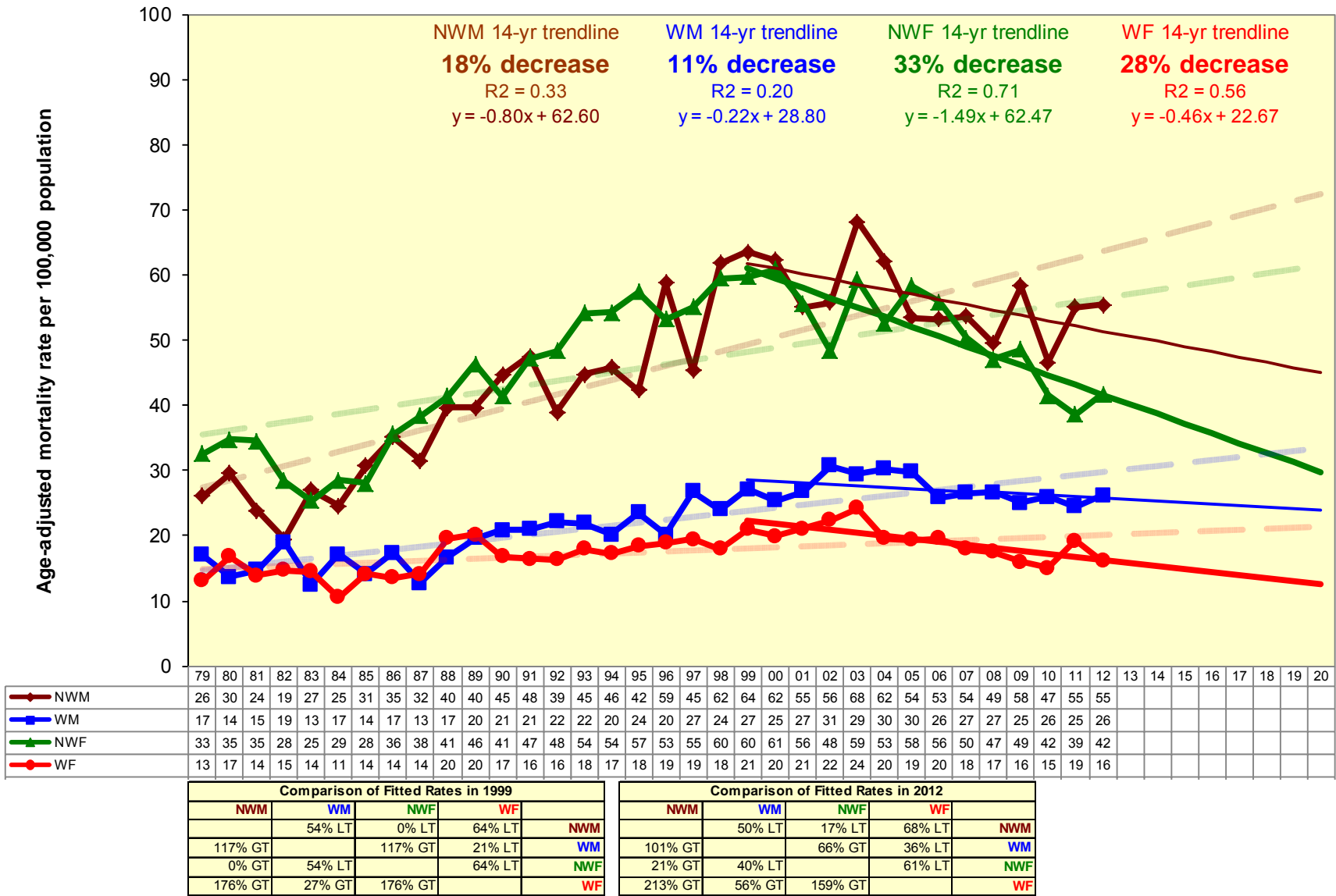


Figure 6.6 iv. Diabetes Mellitus:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

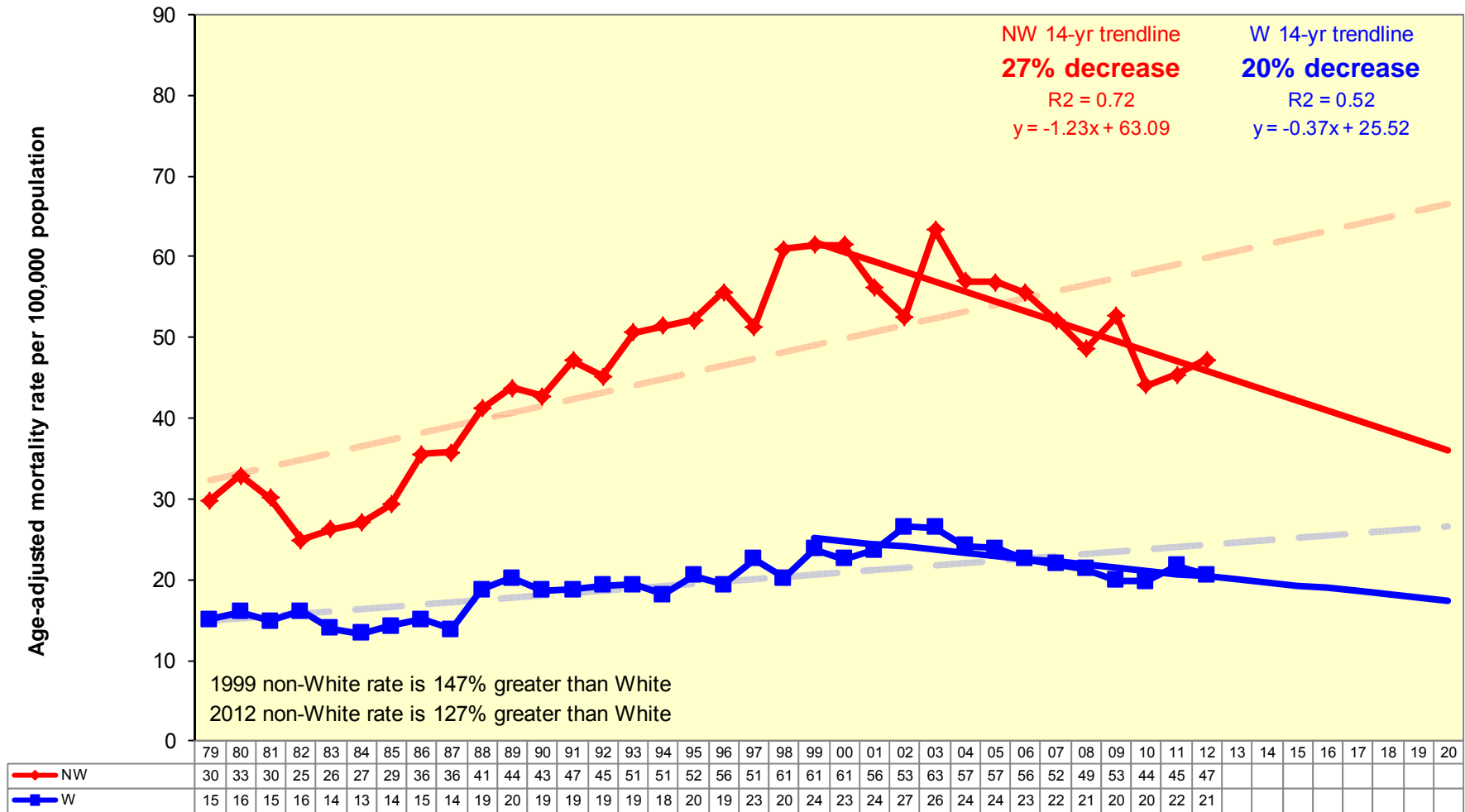
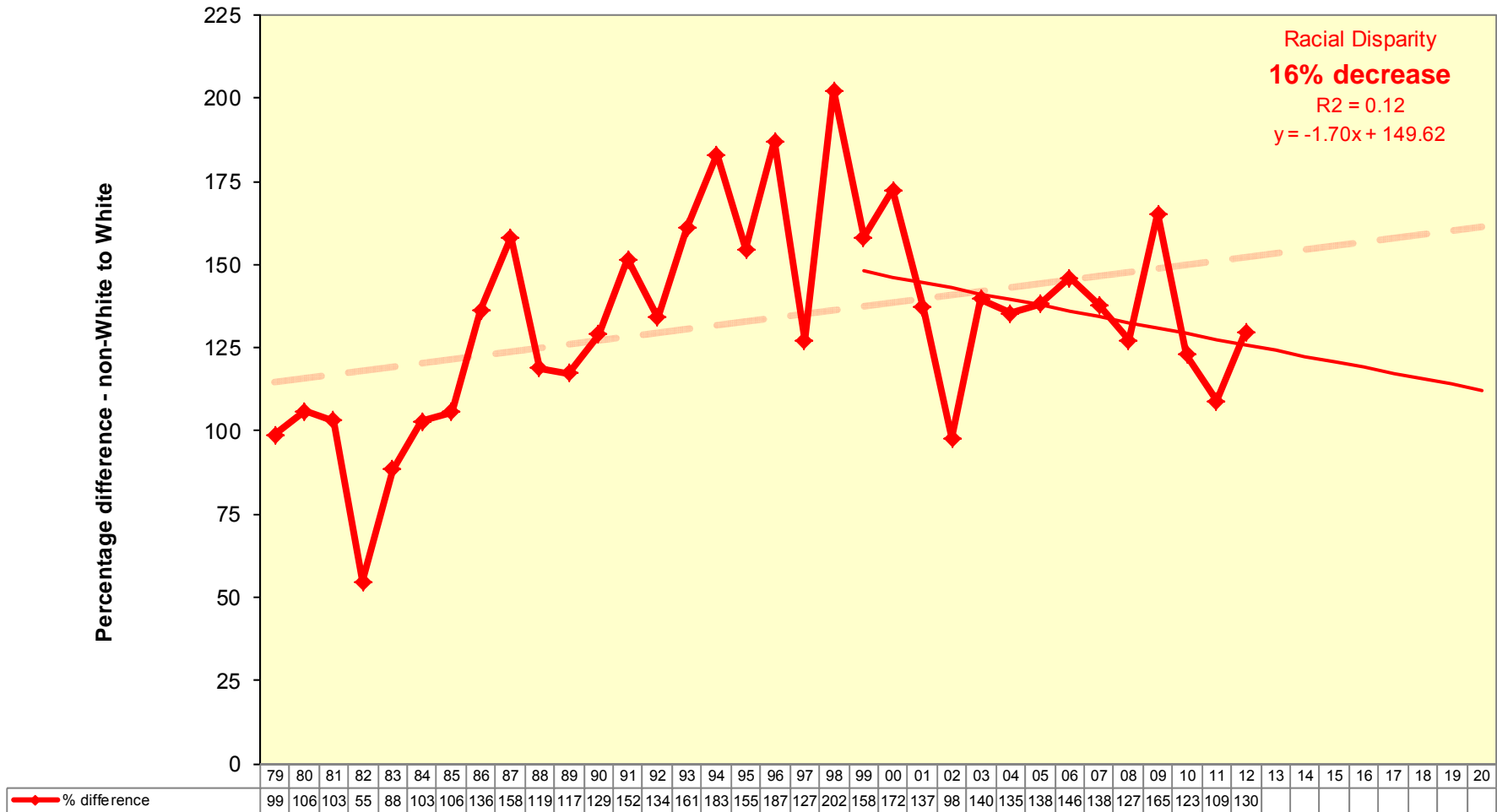


Figure 6.6 v. Diabetes Mellitus:  
Measuring disparity in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020





# Alzheimer's Disease

- The Alzheimer's mortality rate for ENC shows a 96% increase over the 14 year period. ENC's rate of increase was larger than RNC (38%) and NC (49%) but the rate trend for ENC still remains 30% less than RNC.
- In 2012, the age-adjusted rate trend for ENC has increased 64% over the 14 years. This is a larger increase than both RNC and NC (27% and 53% respectively), although those rates are higher.
- The mortality rates for females, both White and non-White, are greater than that of non-White and White males in an increasingly divergent 14-year trend.
- The non-White mortality rate for Alzheimer's remains 3% less than the White mortality rate in 2012 but the 14-year trend suggests convergence in the near future.
- The 14-year moderately-reliable trend suggests a future increase in disparity that favors 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 6.7 i. Alzheimer's Disease:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

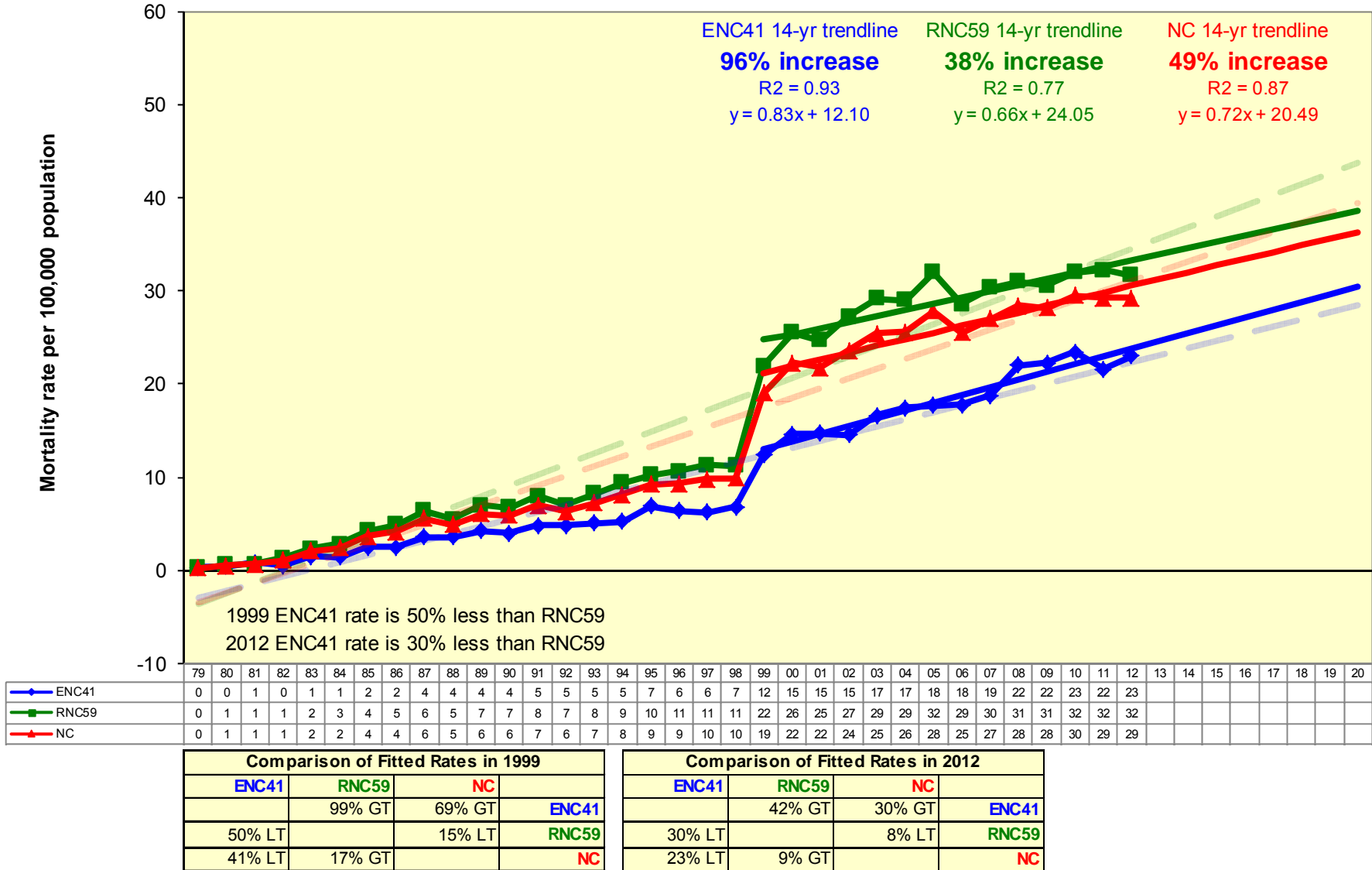


Figure 6.7 ii. Alzheimer's Disease:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

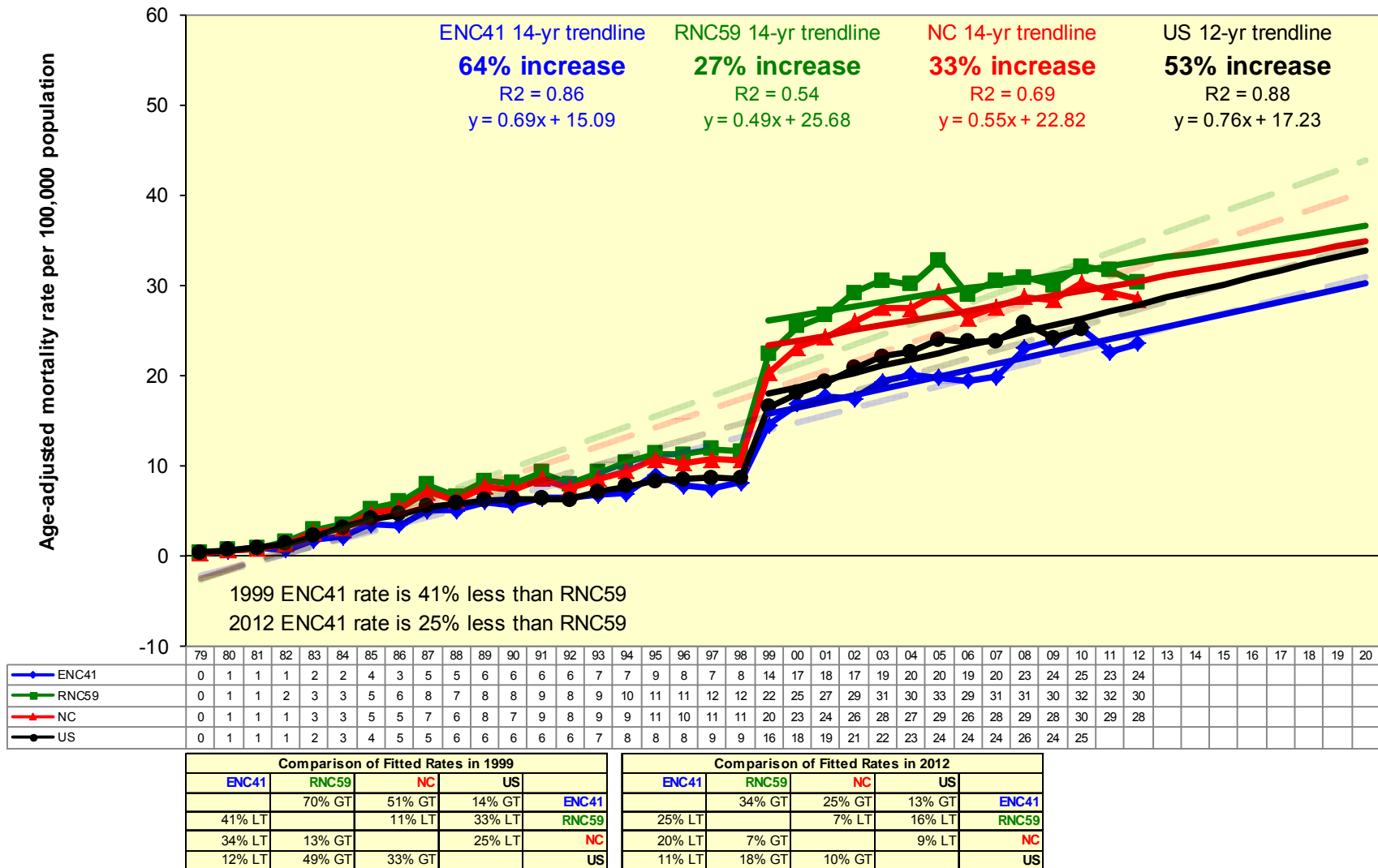


Figure 6.7 iii. Alzheimer's Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

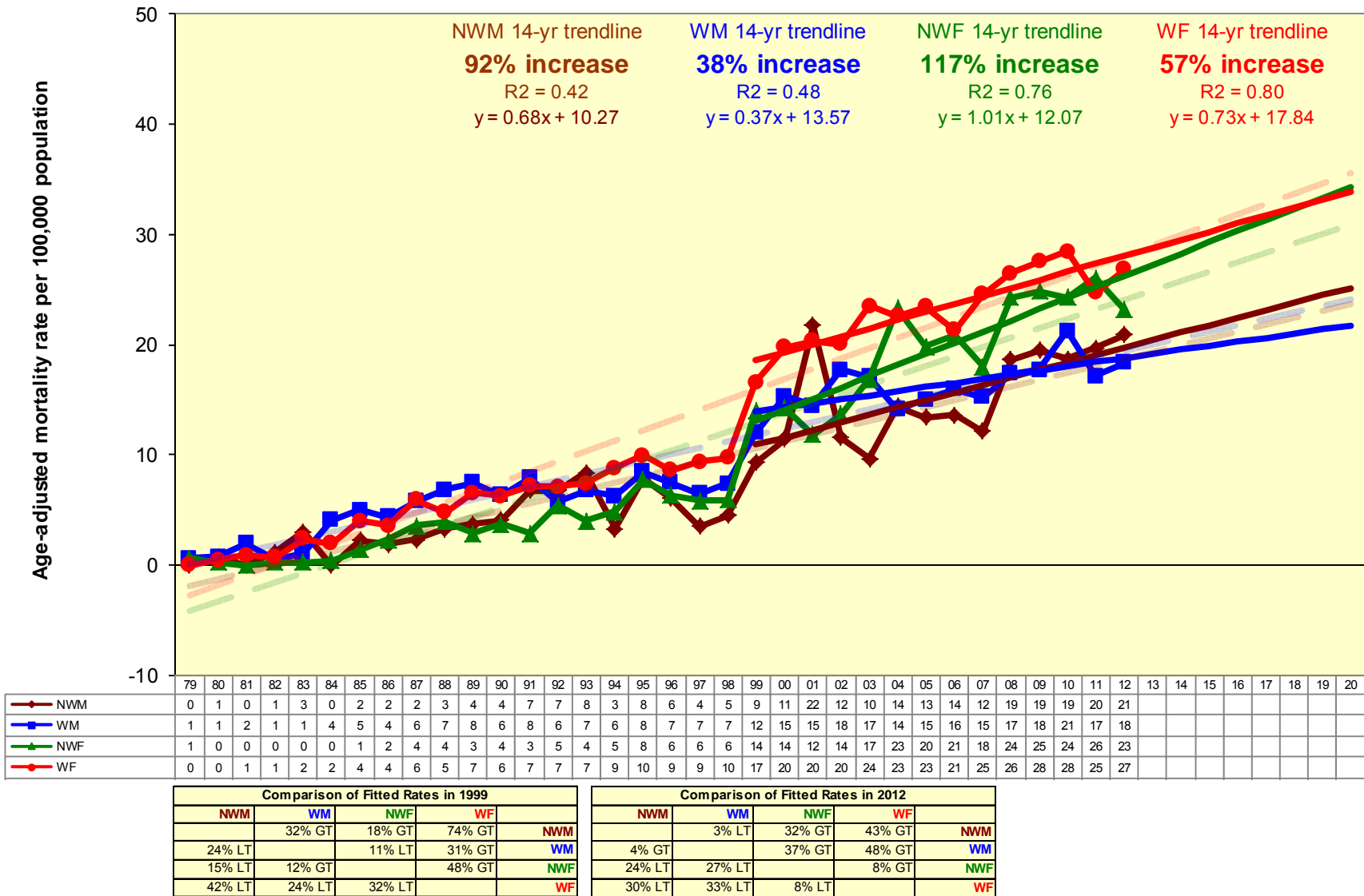


Figure 6.7 iv. Alzheimer's Disease:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

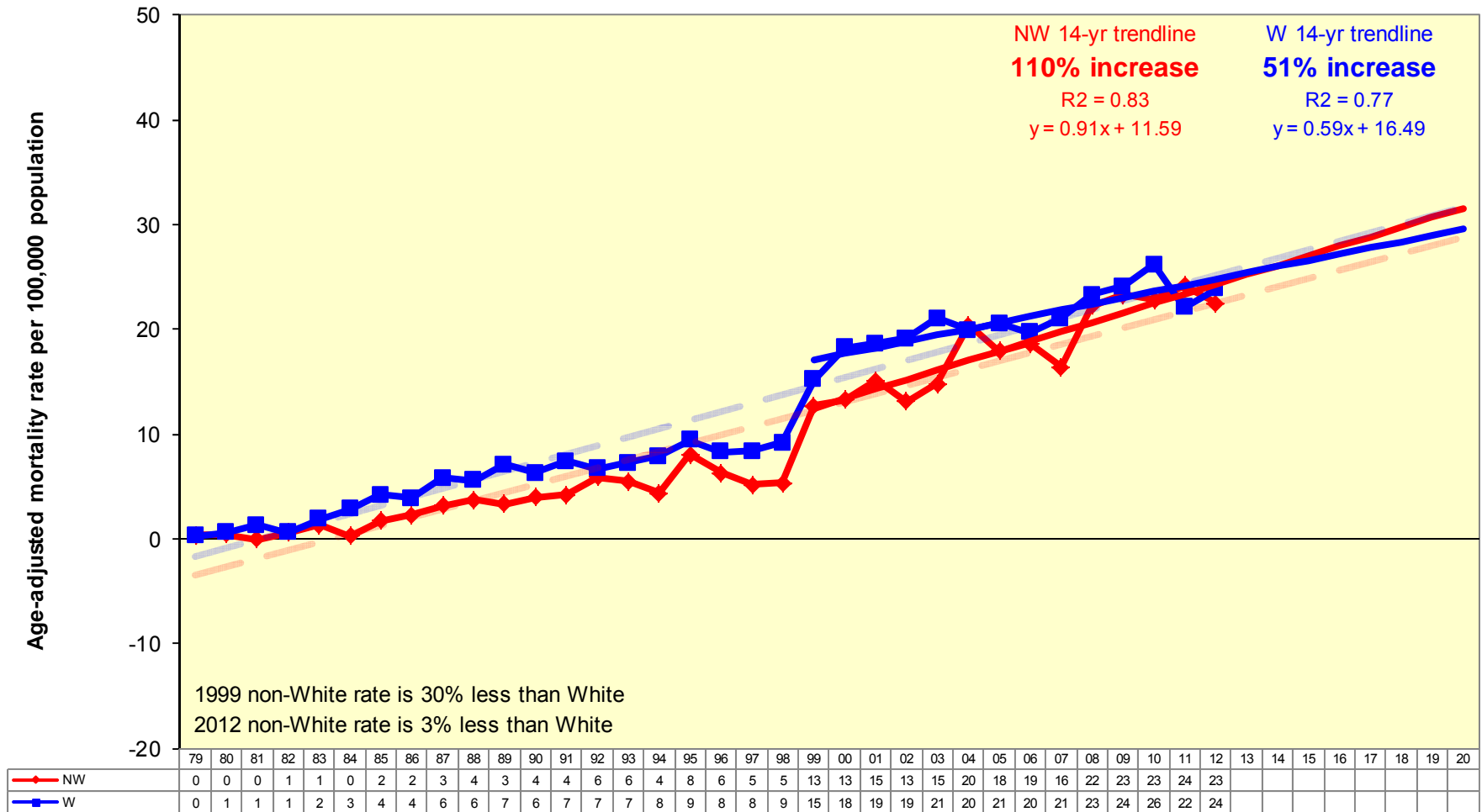
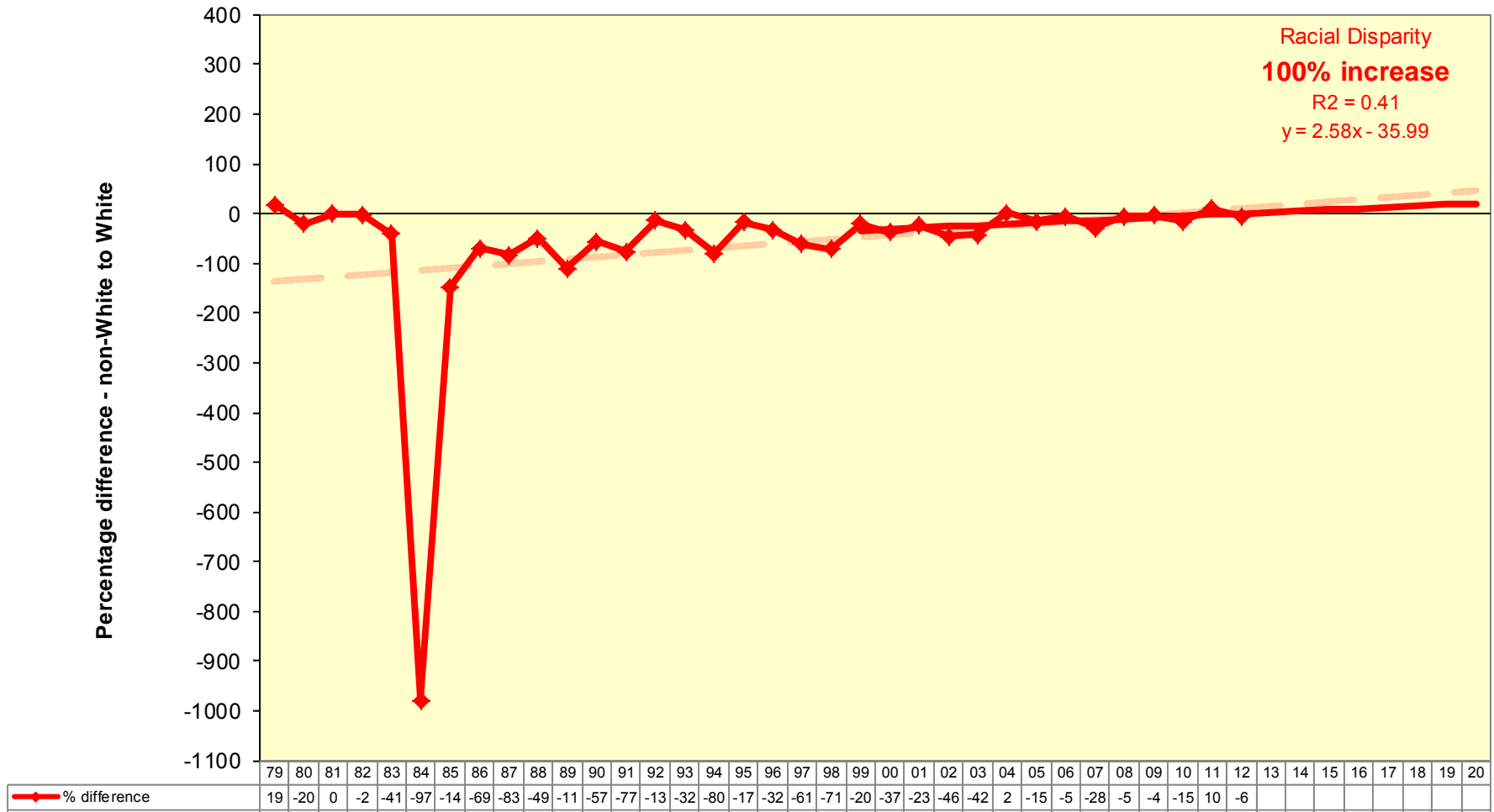


Figure 6.7 v. Alzheimer's Disease:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020



# Unintentional Motor Vehicle Injuries

- ENC's unintentional motor vehicle mortality rate trend is decreasing but is still 55% greater than RNC in 2012.
- The ENC age-adjusted rate trend is 55% greater than RNC and 60% greater than the US. Rates for ENC, RNC and NC are all decreasing.
- The trends for all groups are declining. The trend for non-White males is the highest. The trend for non-White females is the lowest and has decreased the most (42% over 14 years).
- The non-White rates have decreased by 34% over the 14-year period and converged with the White rates, suggesting a reversal in disparity within ENC.
- 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 6.8 i. Unintentional Motor Vehicle Injuries:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

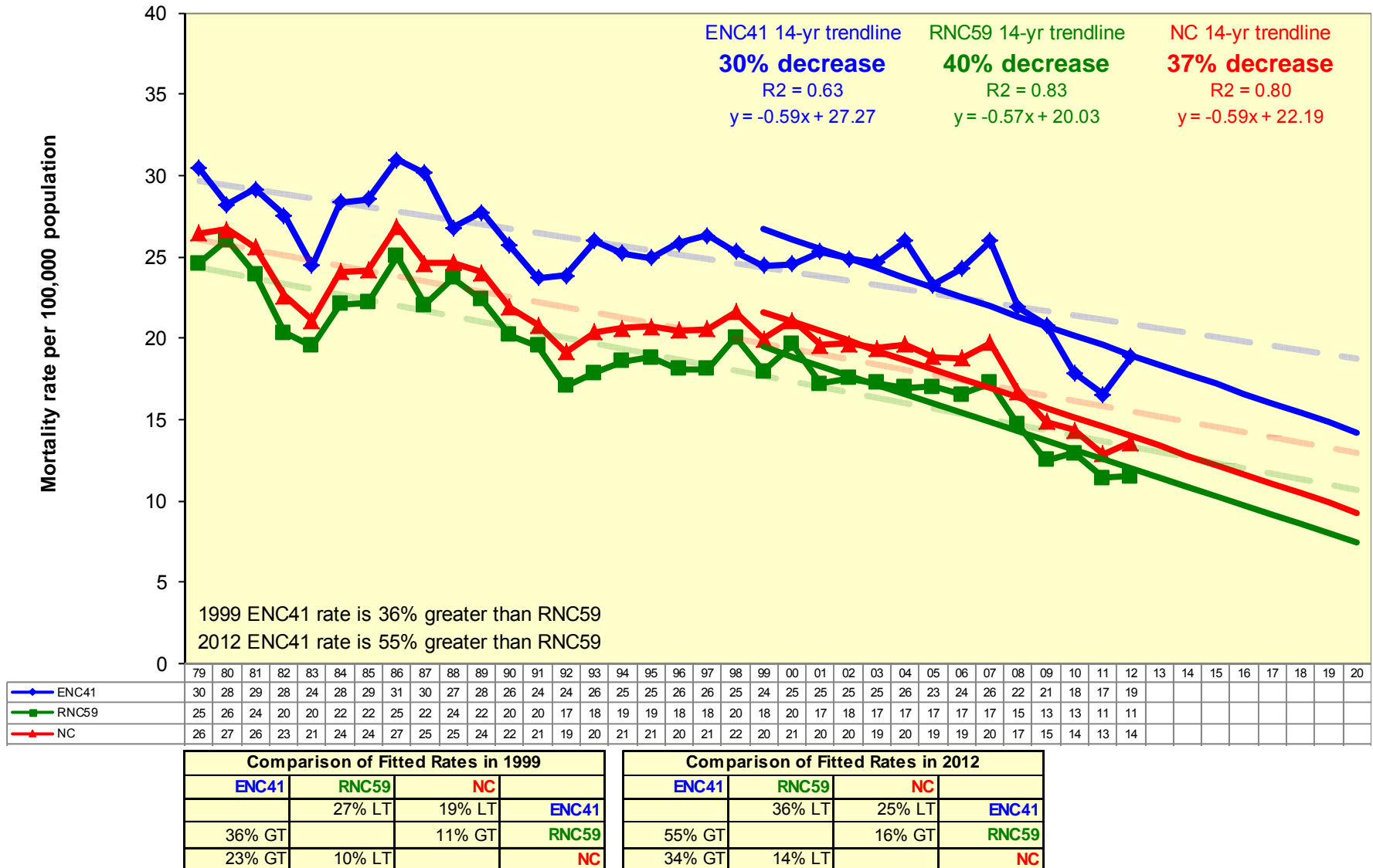




Figure 6.8 ii. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

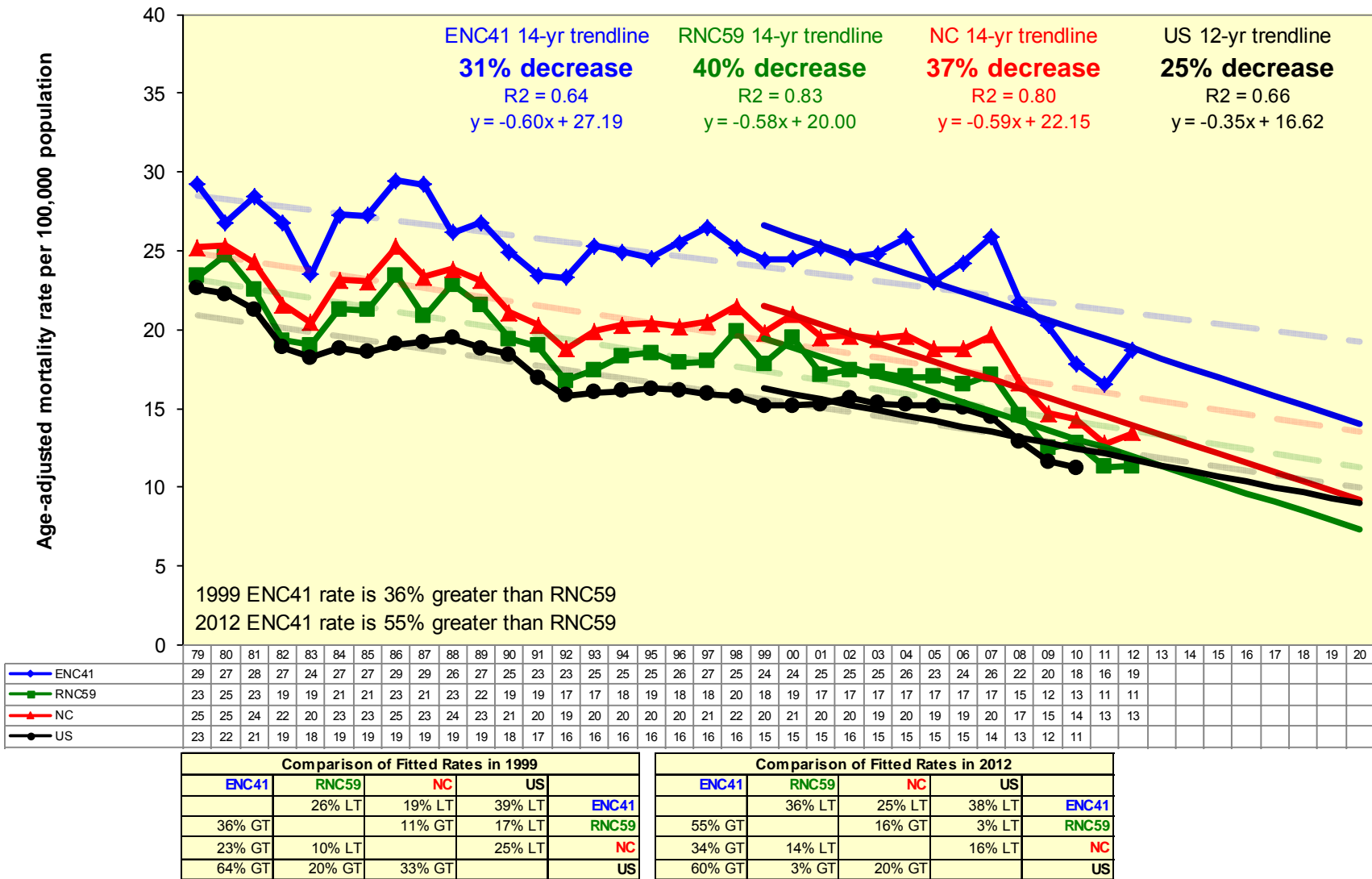


Figure 6.8 iii. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

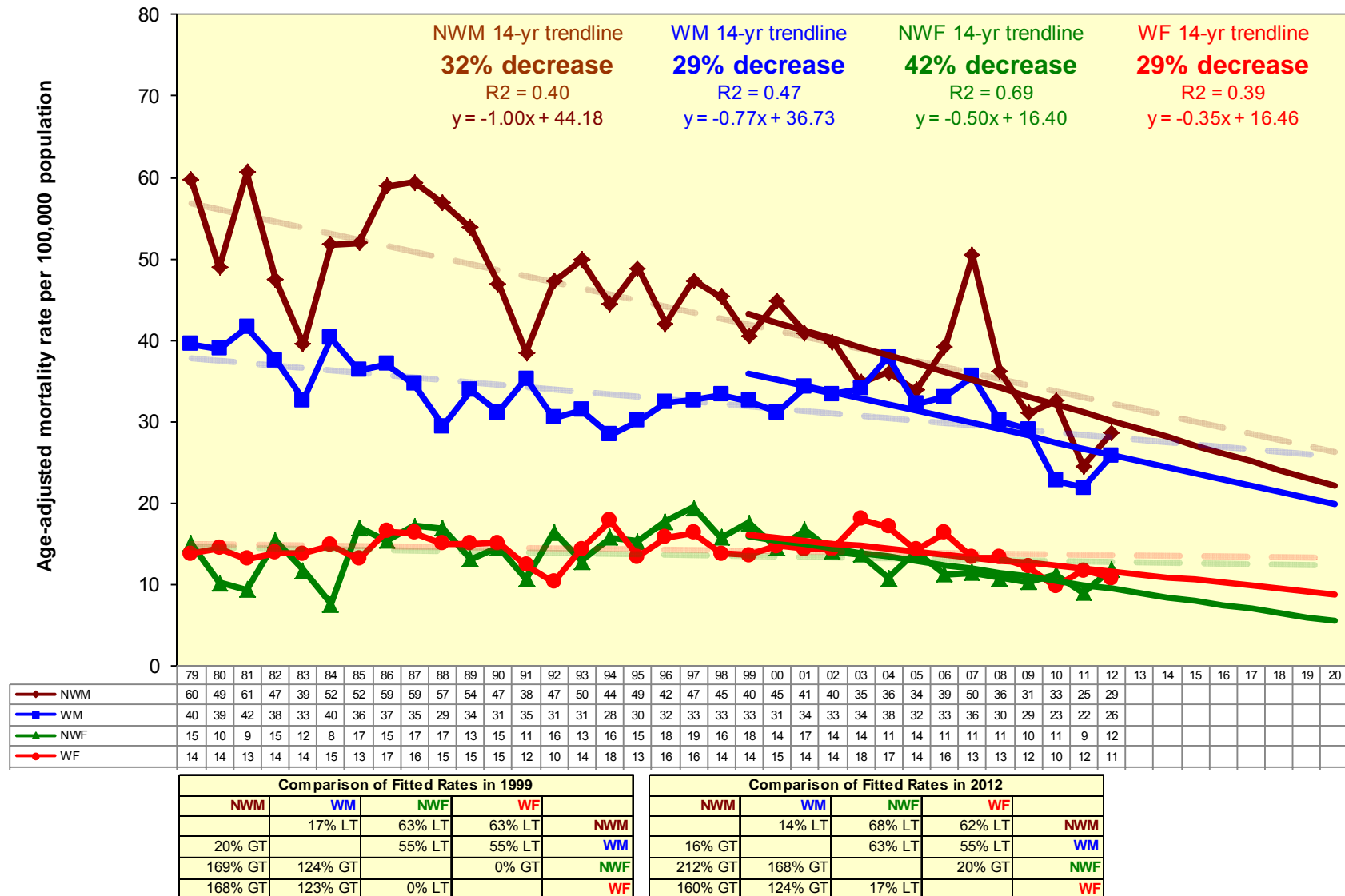


Figure 6.8 iv. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

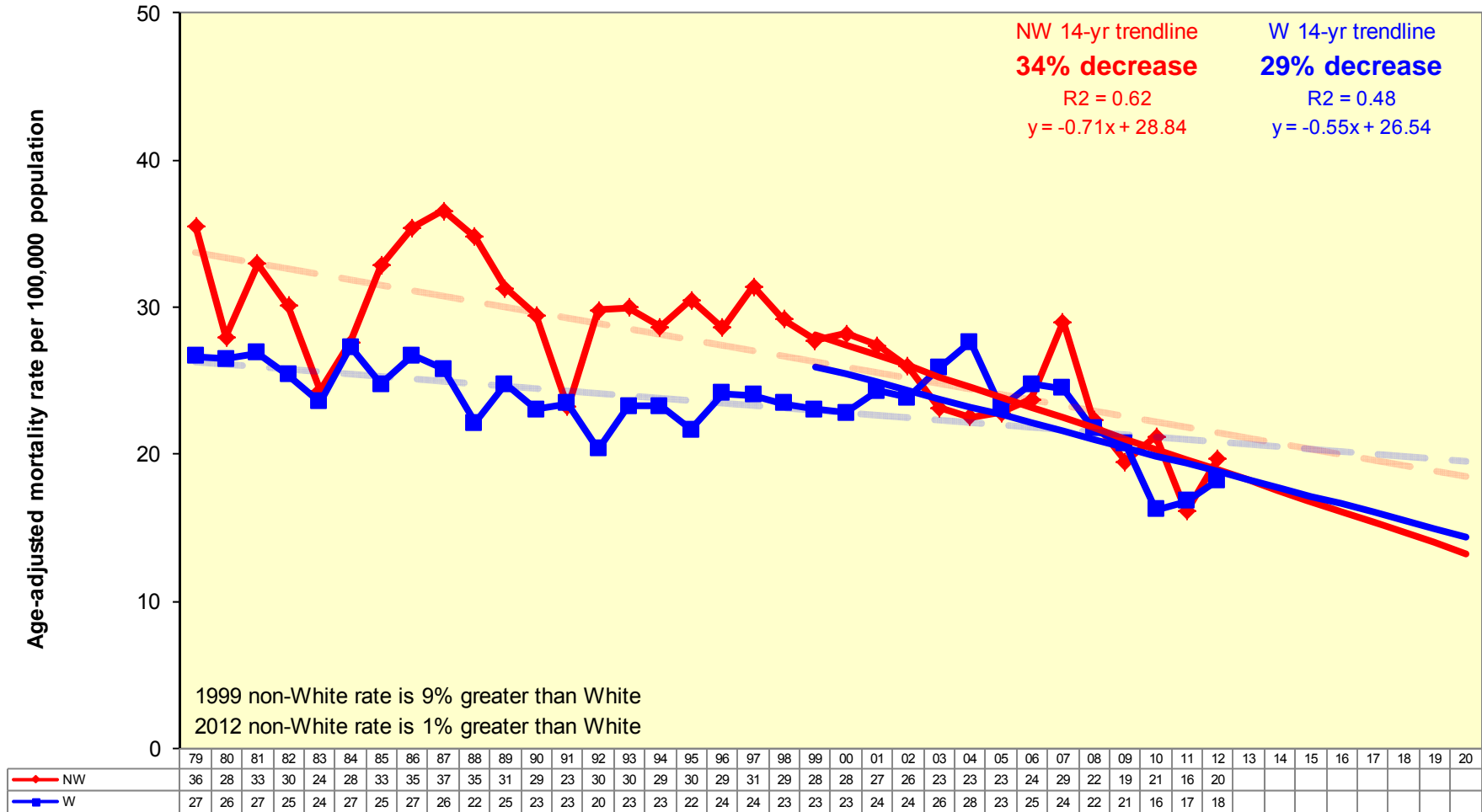
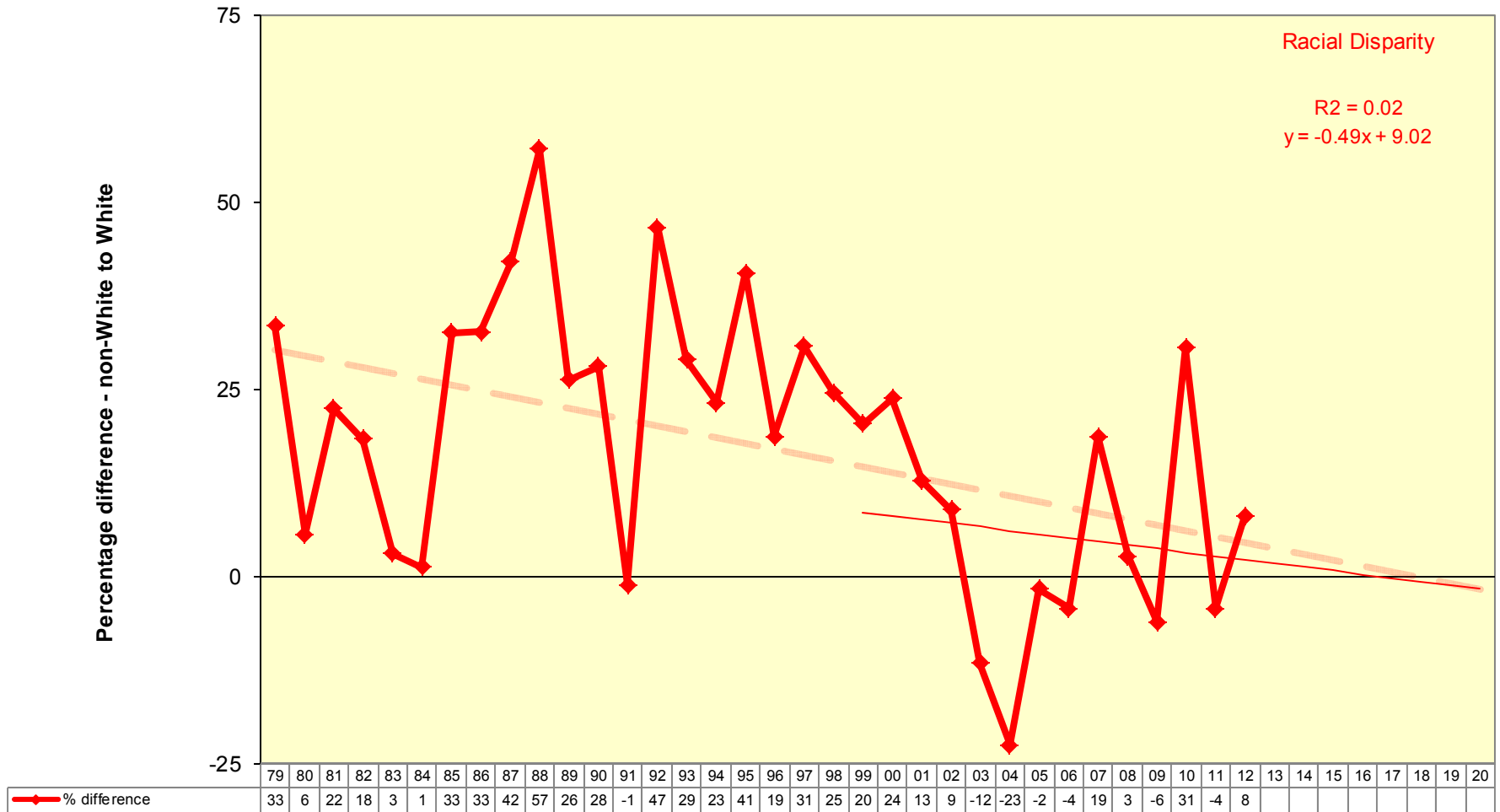


Figure 6.8 v. Unintentional Motor Vehicle Injuries:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020



# Nephritis, Nephrotic Syndrome, and Nephrosis

- Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 26% over 14 years. While other regions have also experienced increases during this time period, ENC rates have increased more, and were 18% greater than RNC in 2012.
- With age-adjustment, ENC has increased by 9% over the 14-year period.
- The 14 year trends for non-White males and females are continually above those for White males and females but are not reliable. The demographic group with the greatest rate of increase is White males, increasing 29% over 14 years.
- In 2012, the non-White rate trend was 125% greater than the White rate, but it is not a reliable trend.
- The trend for racial disparity is moderately reliable and suggests a 19% decrease 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 6.9 i. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

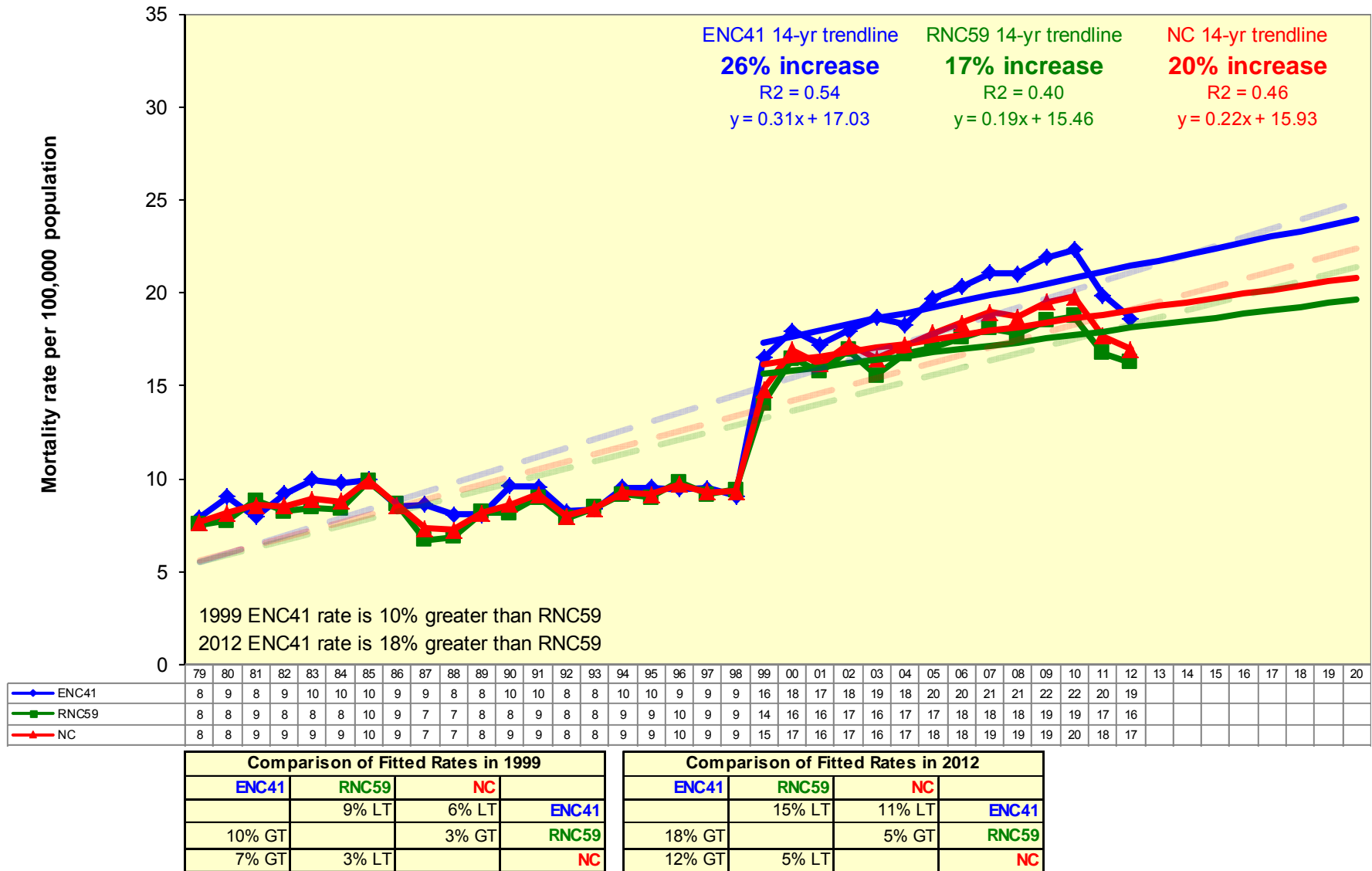


Figure 6.9 ii. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

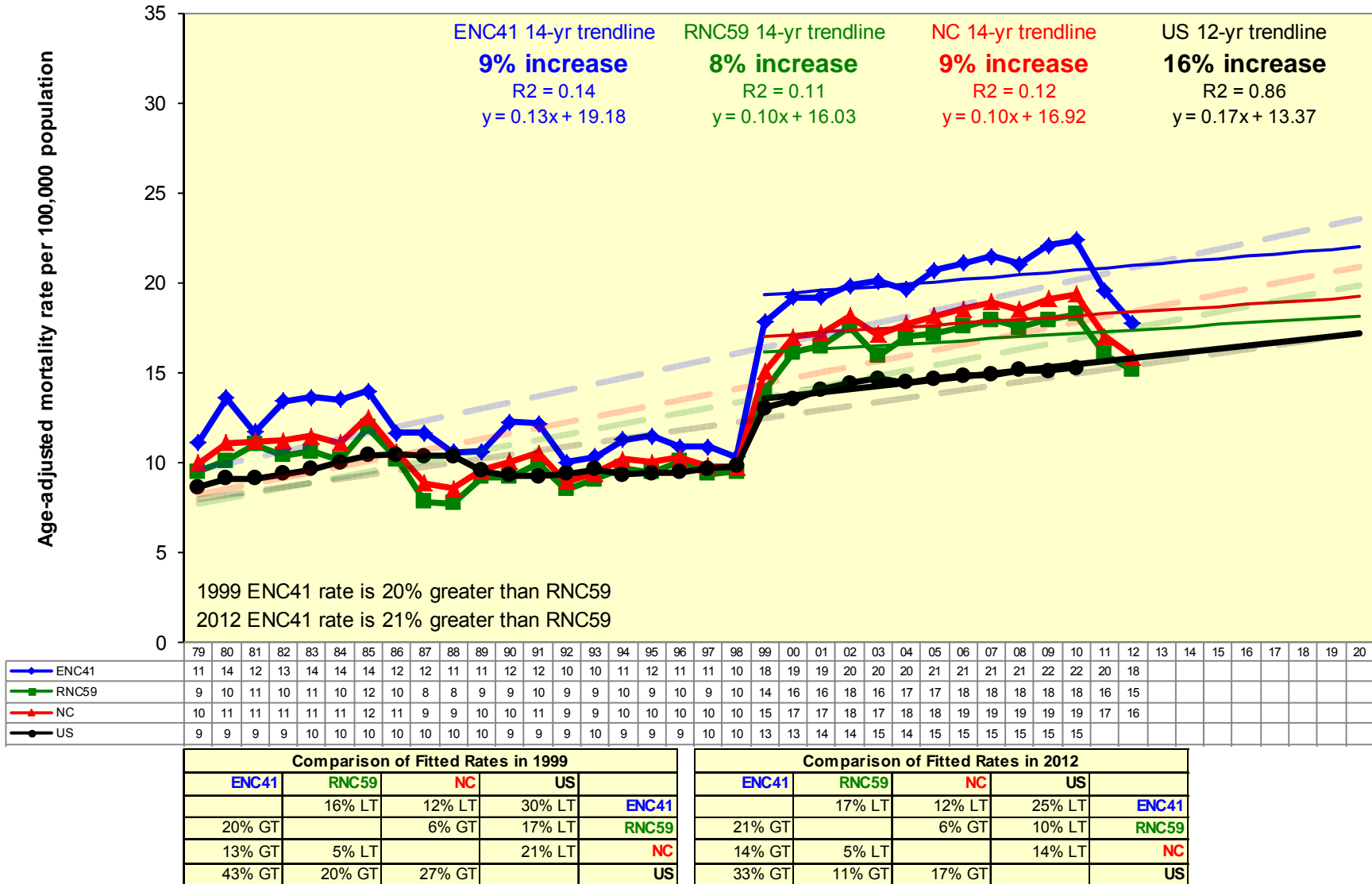
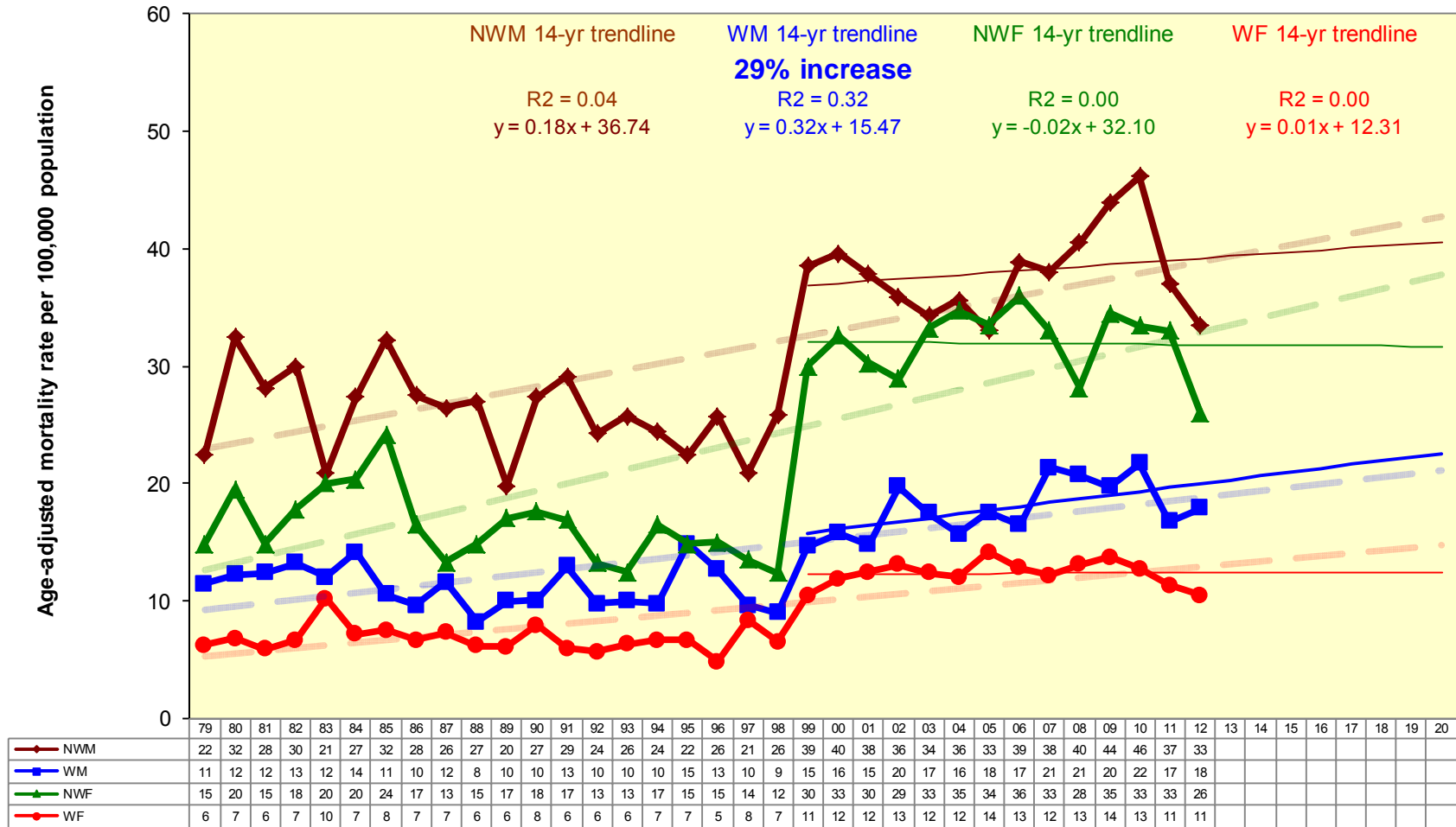


Figure 6.9 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2012 with projections to 2020



**Comparison of Fitted Rates in 1999**

NWM	WM	NWF	WF
	58% LT	13% LT	66% LT
137% GT		108% GT	20% LT
14% GT	52% LT		62% LT
198% GT	26% GT	161% GT	

**Comparison of Fitted Rates in 2012**

NWM	WM	NWF	WF
	50% LT	18% LT	68% LT
98% GT		62% GT	37% LT
23% GT	38% LT		61% LT
214% GT	59% GT	157% GT	



Figure 6.9 iv. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

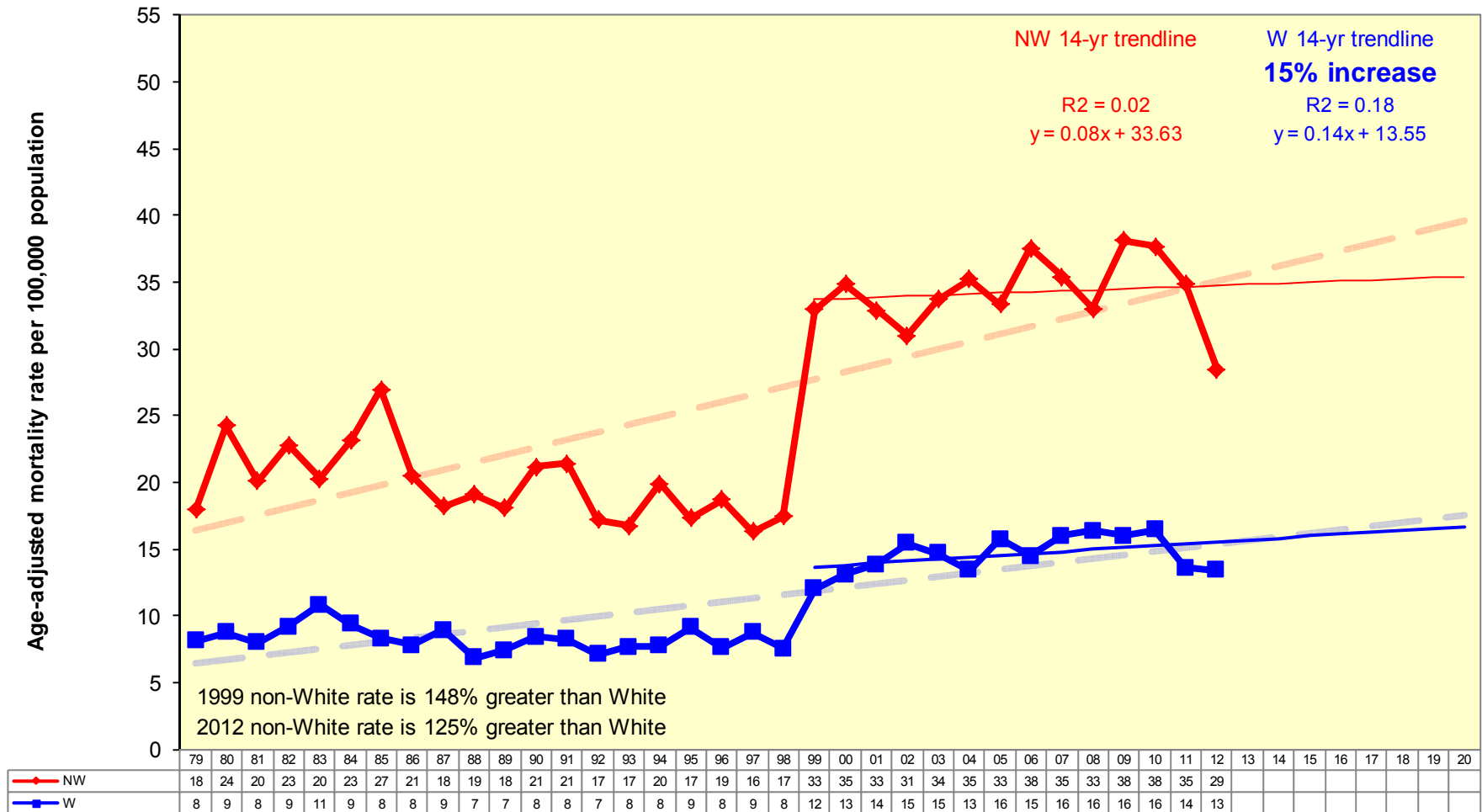
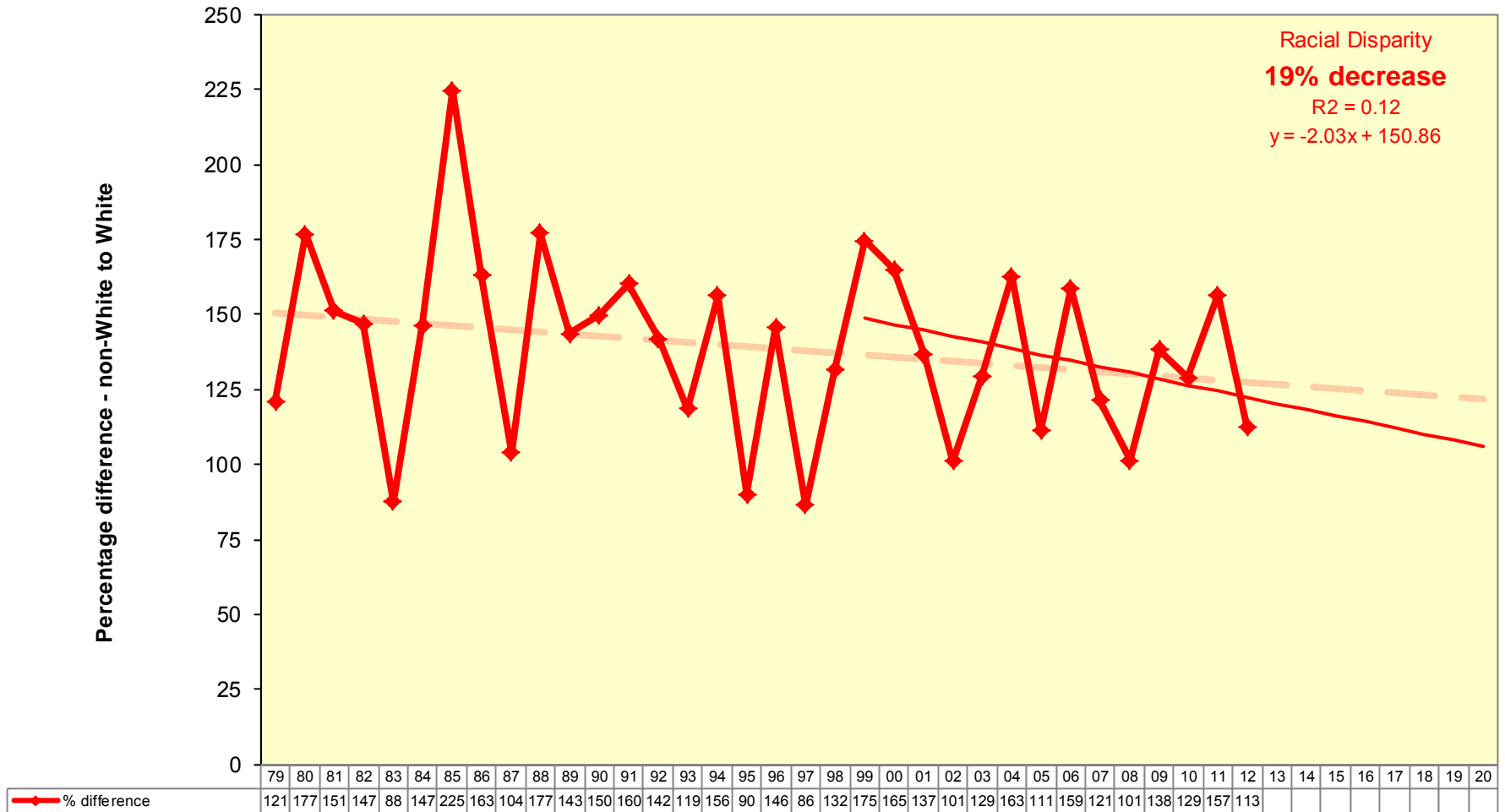


Figure 6.9 v. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Measuring disparity in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020



# Pneumonia and Influenza

- Mortality due to pneumonia and influenza is decreasing (32%) over the 14 year period for ENC, NC, and RNC. The rate trend for ENC is slightly below the rates for the others.
- The age-adjusted mortality rates for ENC, RNC and NC are decreasing. For the 14-year trend line ENC has the largest decrease at 44%.
- The trends for all demographic groups are declining. The decrease for non-White males was highest (52%), which was followed by White males (47%), non-White females (45%), and White females (40%).
- In 1999 the non-White rate trend was 1% greater than the White rate, but by 2012, the non-White rate trend was 8% less than the White rate.
- The trend 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 6.10 i. Pneumonia and Influenza:  
Trends in mortality rates for ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

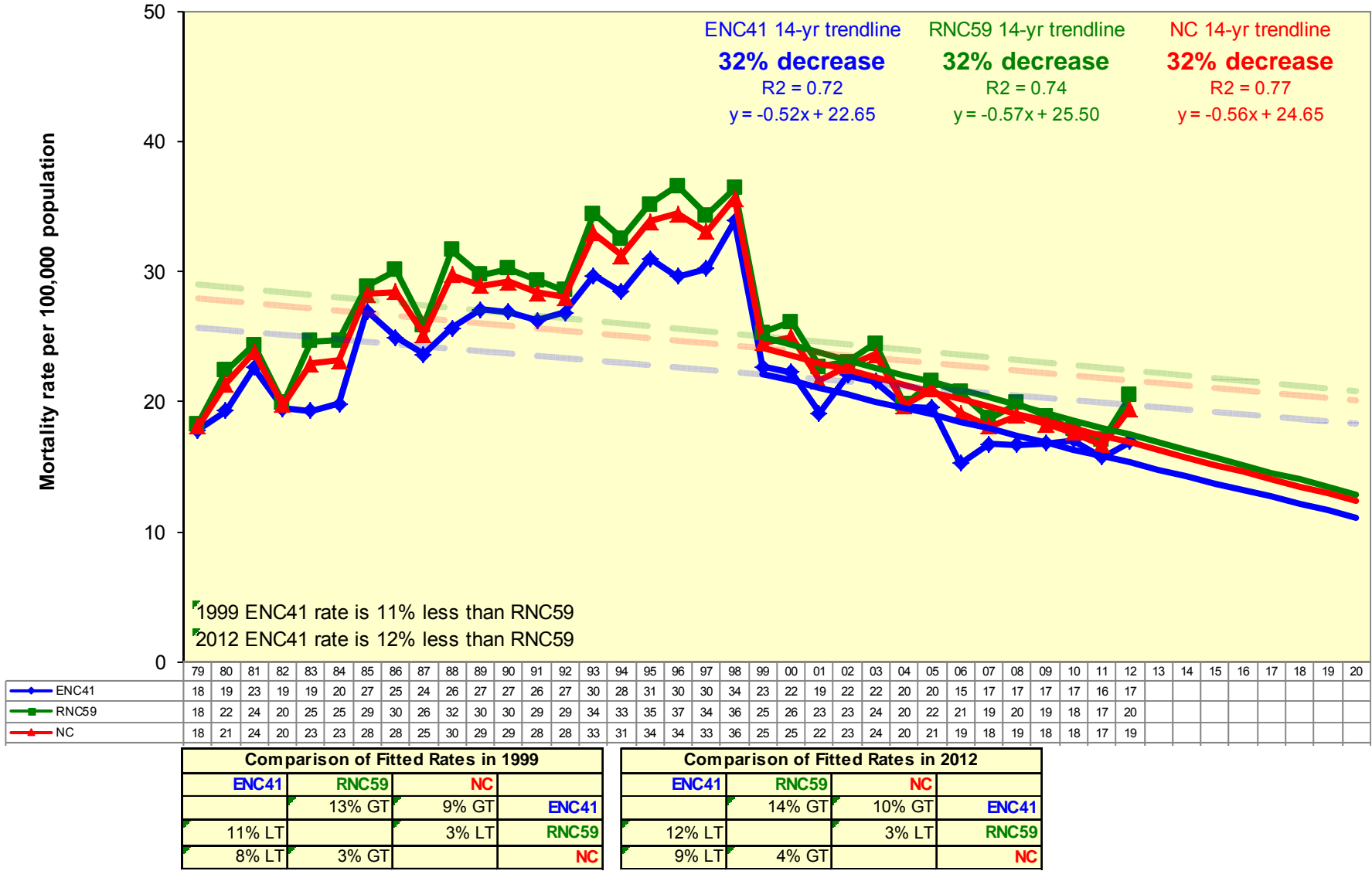


Figure 6.10 ii. Pneumonia and Influenza:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

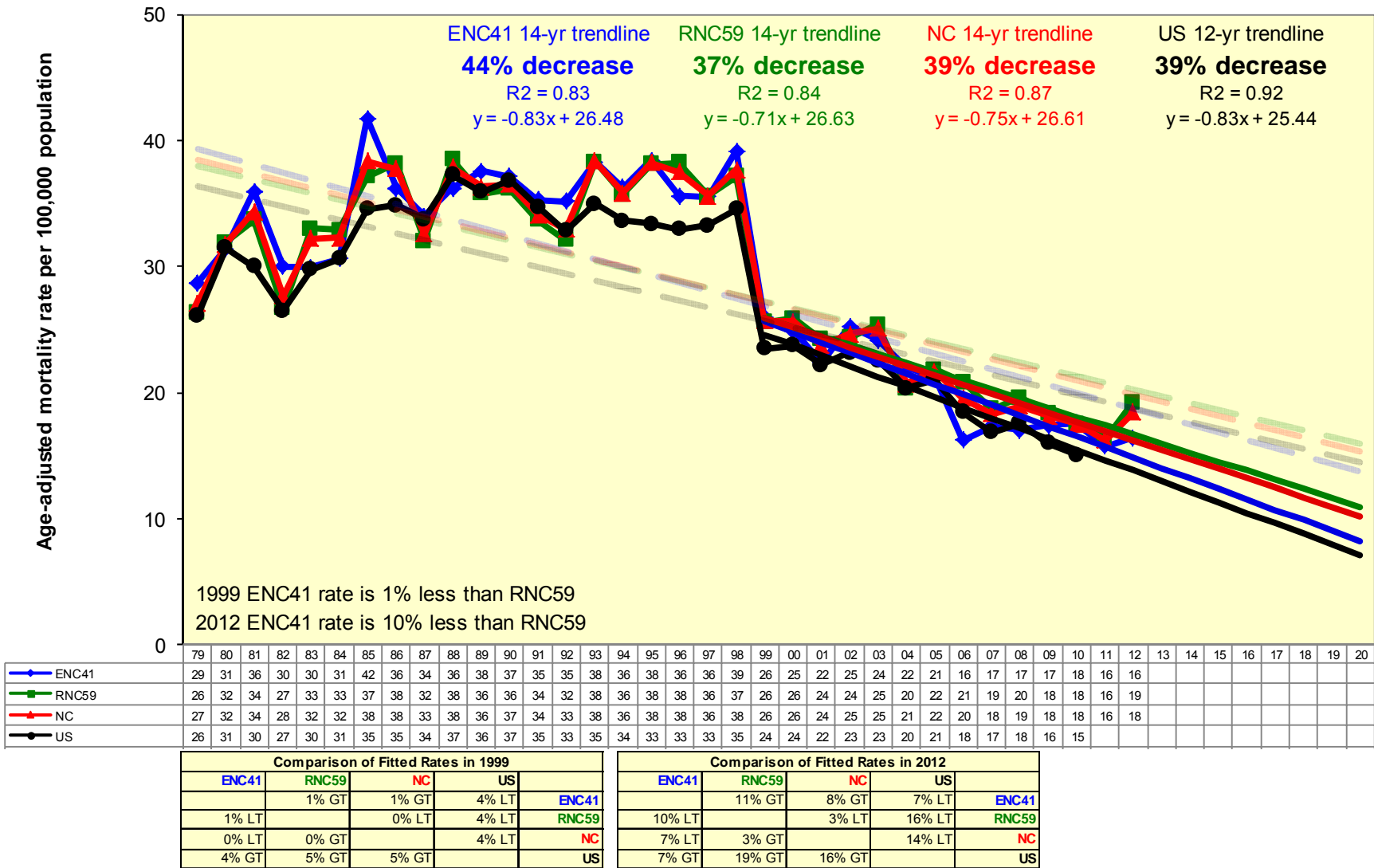


Figure 6.10 iii. Pneumonia and Influenza:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

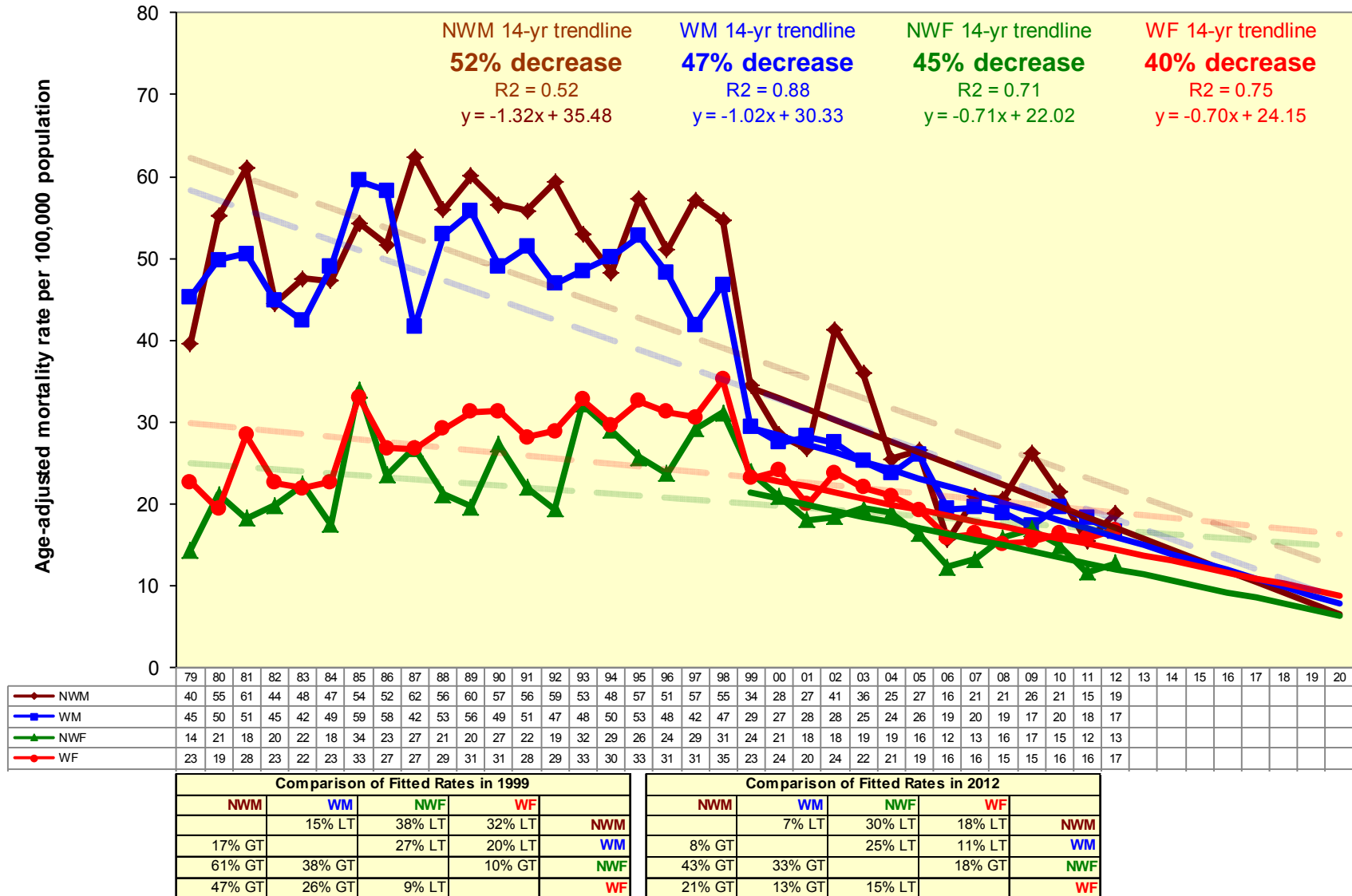


Figure 6.10 iv. Pneumonia and Influenza:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

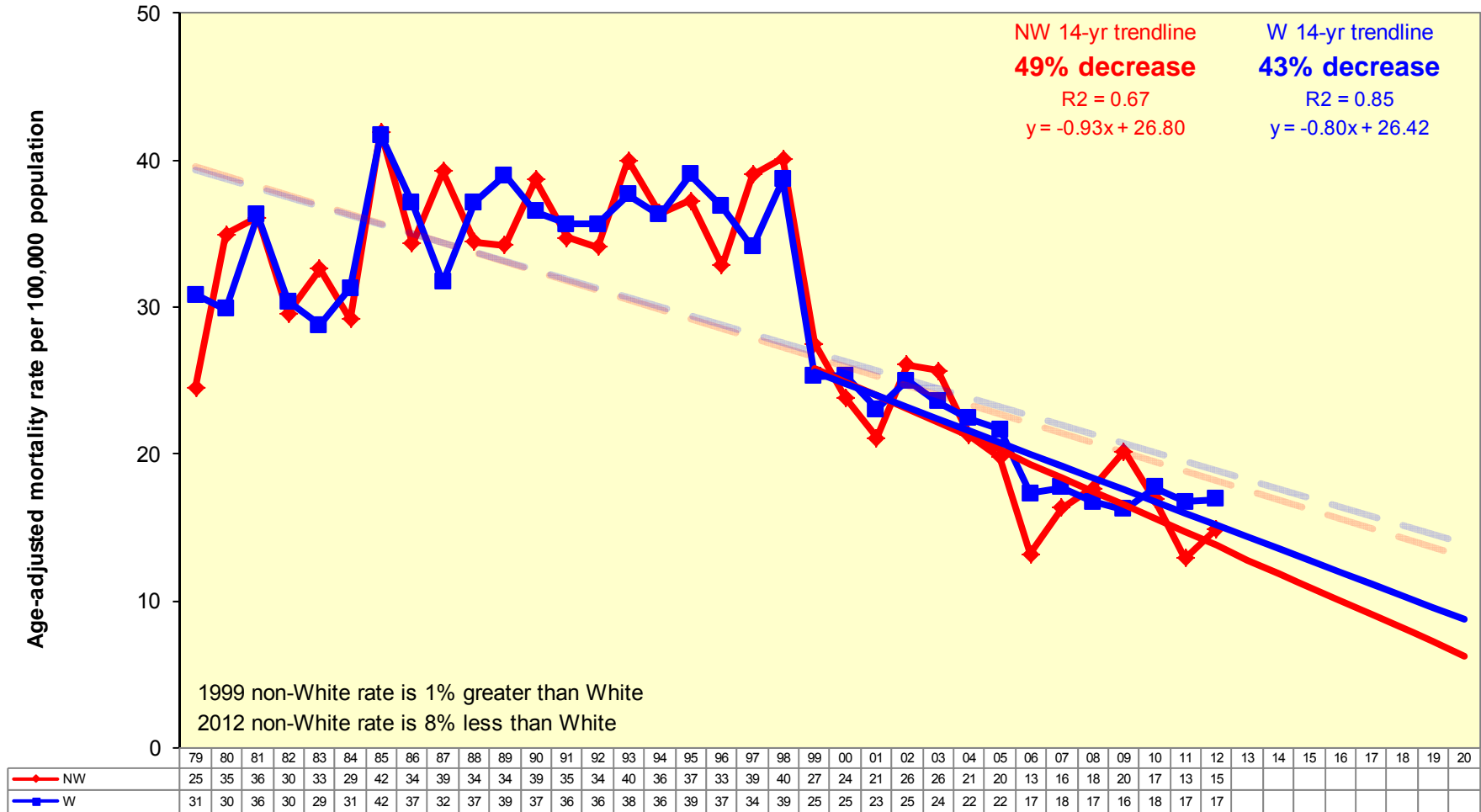
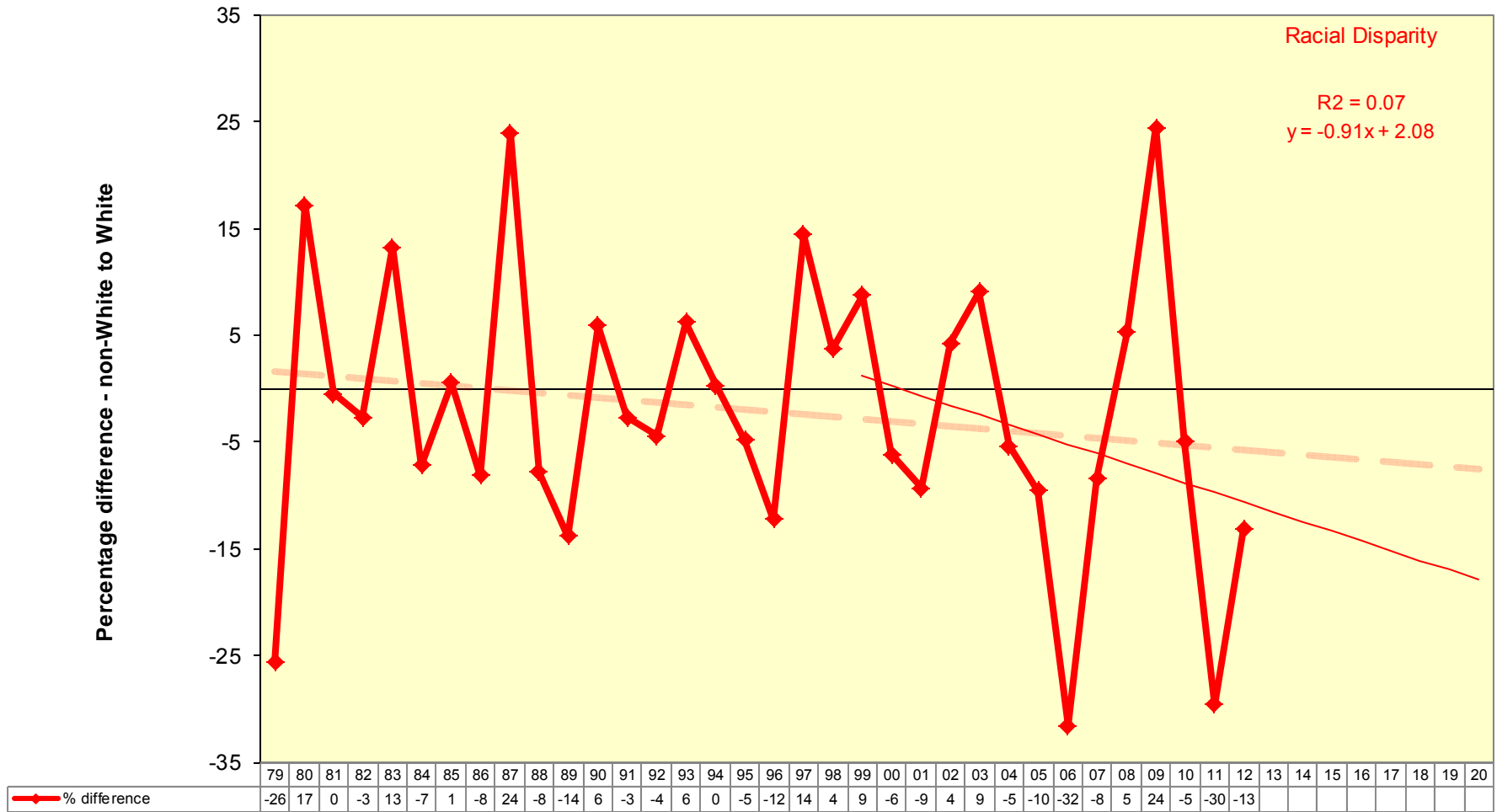


Figure 6.10 v. Pneumonia and Influenza:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020







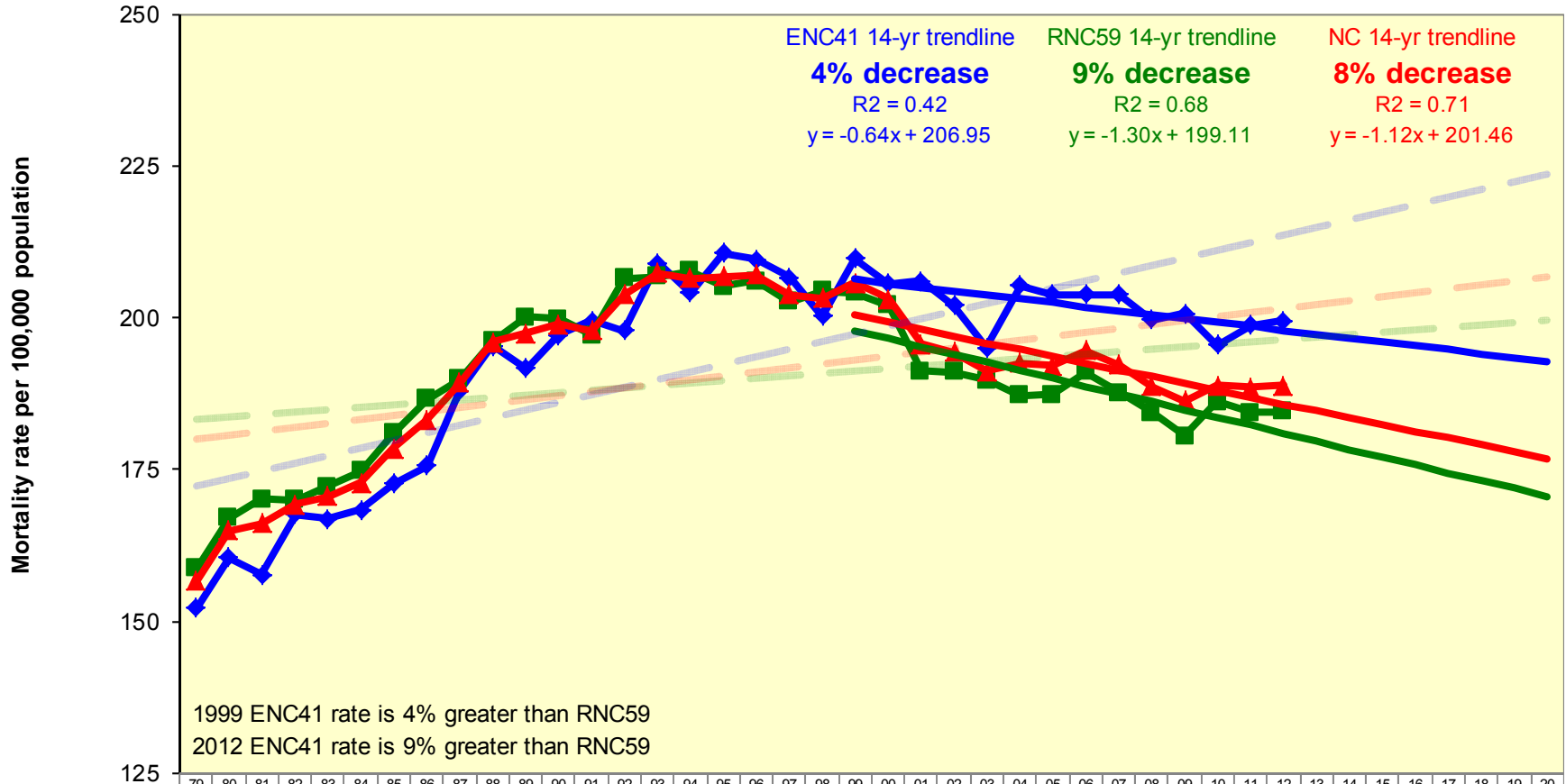
# 7. Trends and Disparities in Mortality in ENC41: Cancer - All Sites and HIV Disease; 1979-2012

## Cancer - All Sites

- The cancer – all sites mortality rates for ENC have decreased slightly (4%) over 14 years. The RNC and NC rates have decreased more than ENC, causing these rates to diverge.
- The age-adjusted cancer – all sites mortality rates for ENC, RNC, NC and the US are all decreasing at about the same pace, although the ENC rate trend is 8% greater than RNC, and 10% greater than the US.
- The rates for non-White males has decreased 31% over 14 years, and is projected to converge with the rate for White males, which show a 21% decrease. The rates for White females and non-White females show a slight decrease and are converging.
- Both White and non-White cancer mortality trends are decreasing over the 14 year period, although the non-White rate remains higher. Non-White rates decreased 24% and White rates decreased 15%, suggesting future convergence.
- The moderately reliable 14-year trend for racial disparity shows a 60% decrease.

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 ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

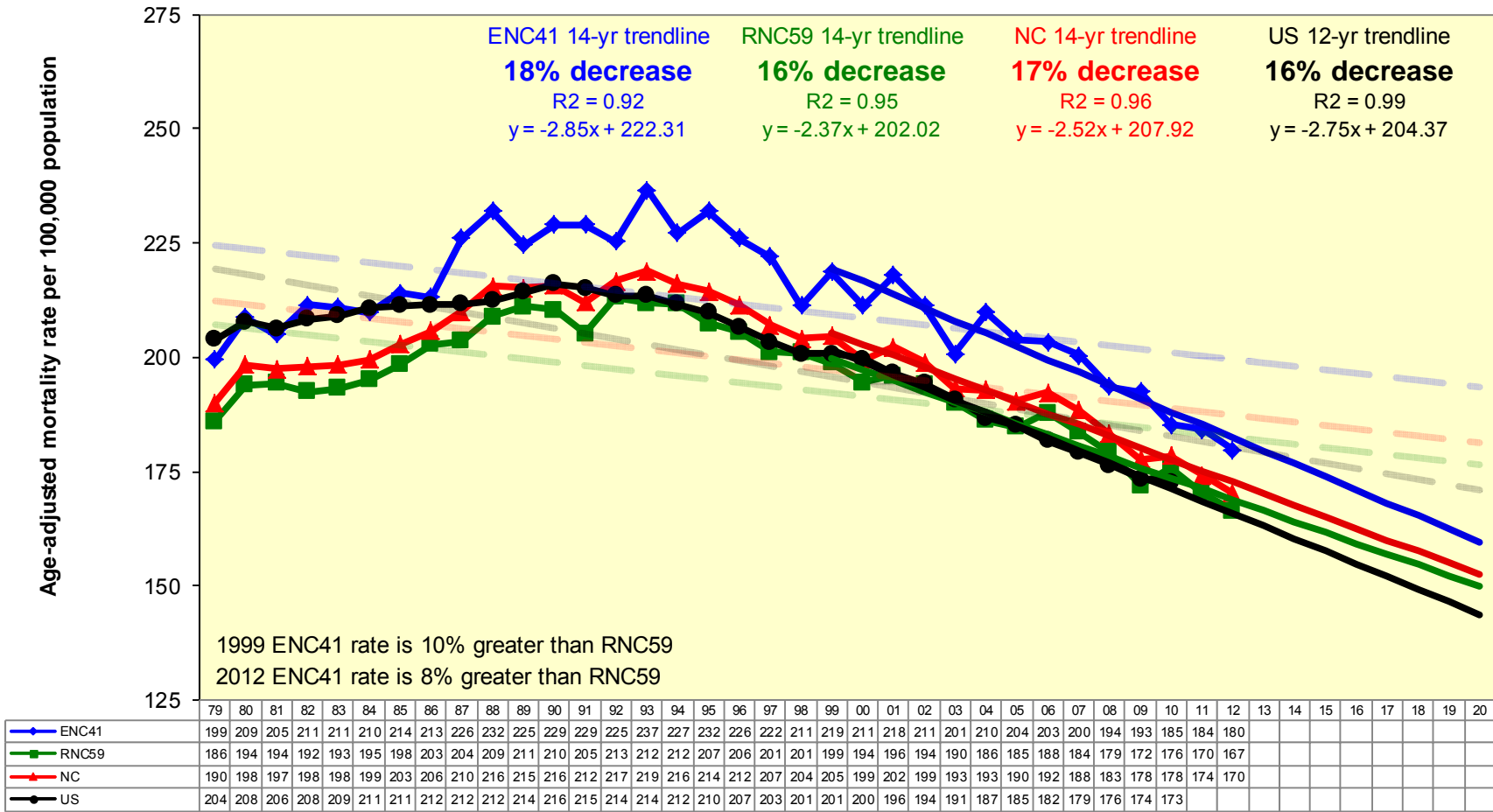


	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20					
ENC41	152	161	158	168	167	168	173	176	188	195	192	197	200	198	209	204	211	210	207	200	210	206	206	202	195	205	204	204	204	200	201	196	199	200													
RNC59	159	167	170	170	172	175	181	187	190	196	200	200	197	206	207	208	205	206	203	204	204	202	191	191	190	187	187	191	188	184	181	186	184	184													
NC	157	165	166	169	171	173	178	183	189	196	197	199	198	204	207	207	207	207	204	203	206	203	196	194	191	192	192	195	192	189	186	189	188	189													

Comparison of Fitted Rates in 1999			
ENC41	RNC59	NC	
	4% LT	3% LT	ENC41
4% GT		1% GT	RNC59
3% GT	1% LT		NC

Comparison of Fitted Rates in 2012			
ENC41	RNC59	NC	
	8% LT	6% LT	ENC41
9% GT		3% GT	RNC59
6% GT	2% LT		NC

Figure 7.1 ii. Cancer - All Sites:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2012 with projections to 2020



Comparison of Fitted Rates in 1999				
ENC41	RNC59	NC	US	
	9% LT	6% LT	8% LT	ENC41
10% GT		3% GT	1% GT	RNC59
7% GT	3% LT		2% LT	NC
9% GT	1% LT	2% GT		US

Comparison of Fitted Rates in 2012				
ENC41	RNC59	NC	US	
	8% LT	5% LT	9% LT	ENC41
8% GT		2% GT	2% LT	RNC59
6% GT	2% LT		4% LT	NC
10% GT	2% GT	4% GT		US

Figure 7.1 iii. Cancer - All Sites:  
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2012 with projections to 2020

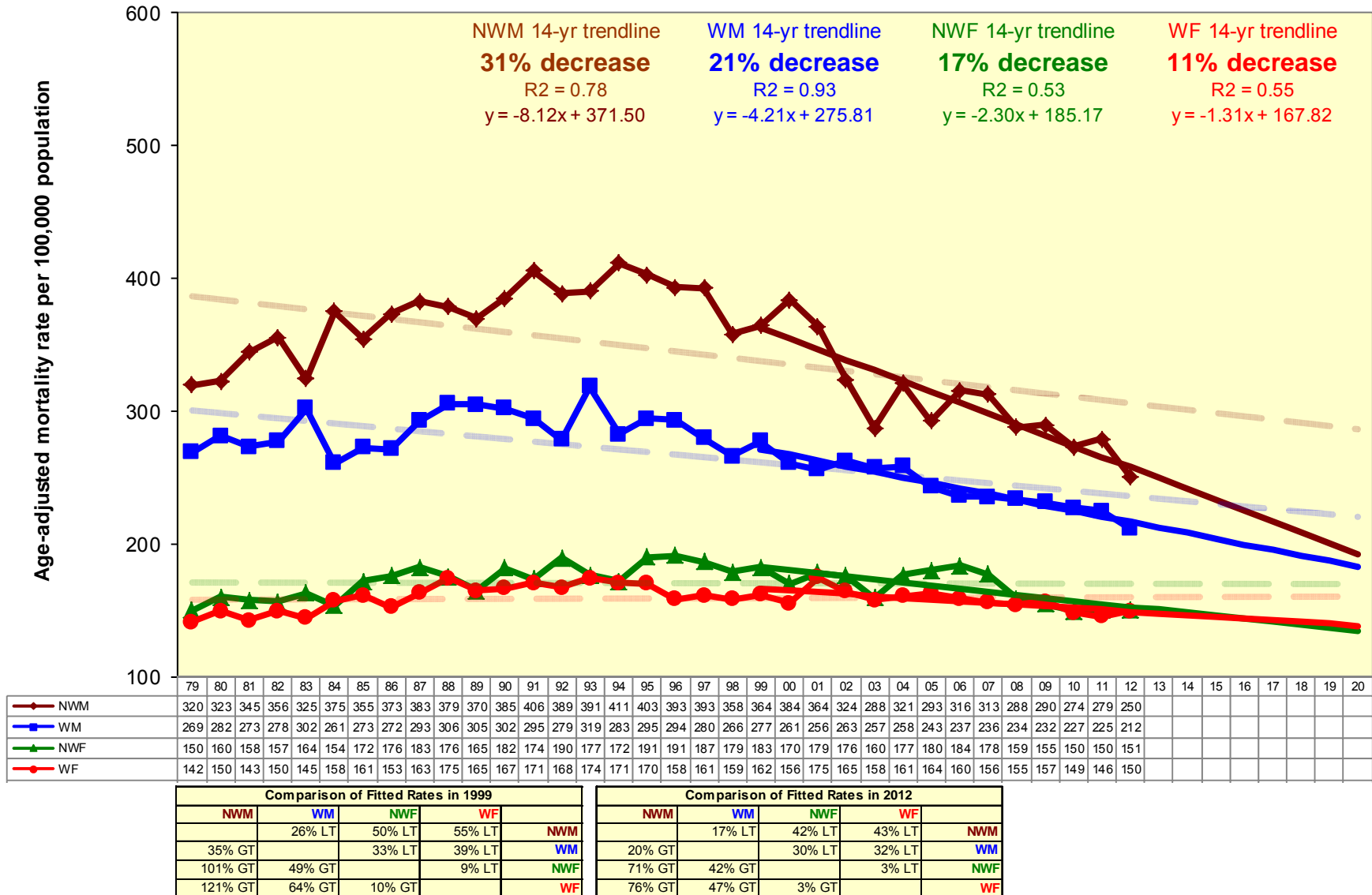


Figure 7.1 iv. Cancer - All Sites:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

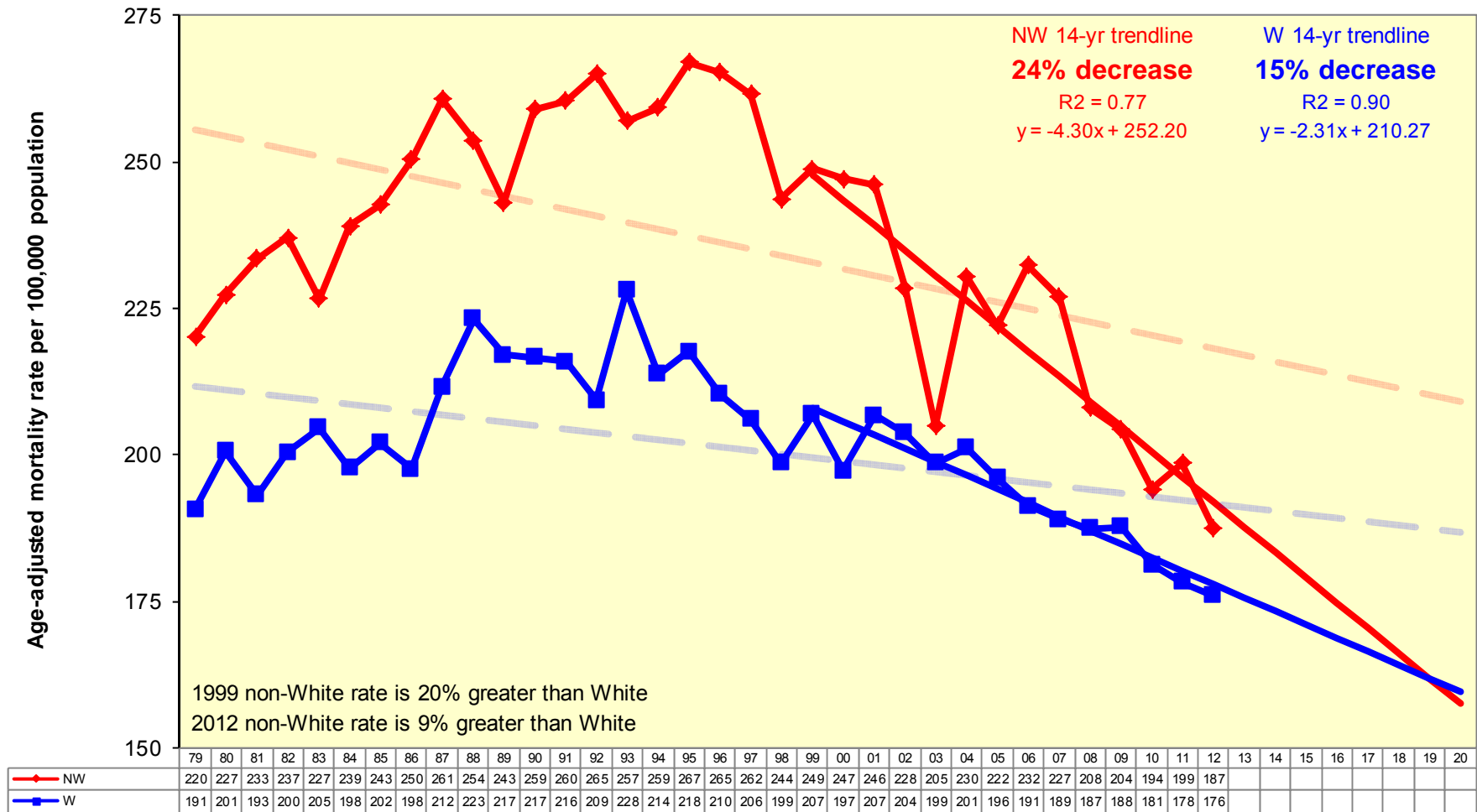
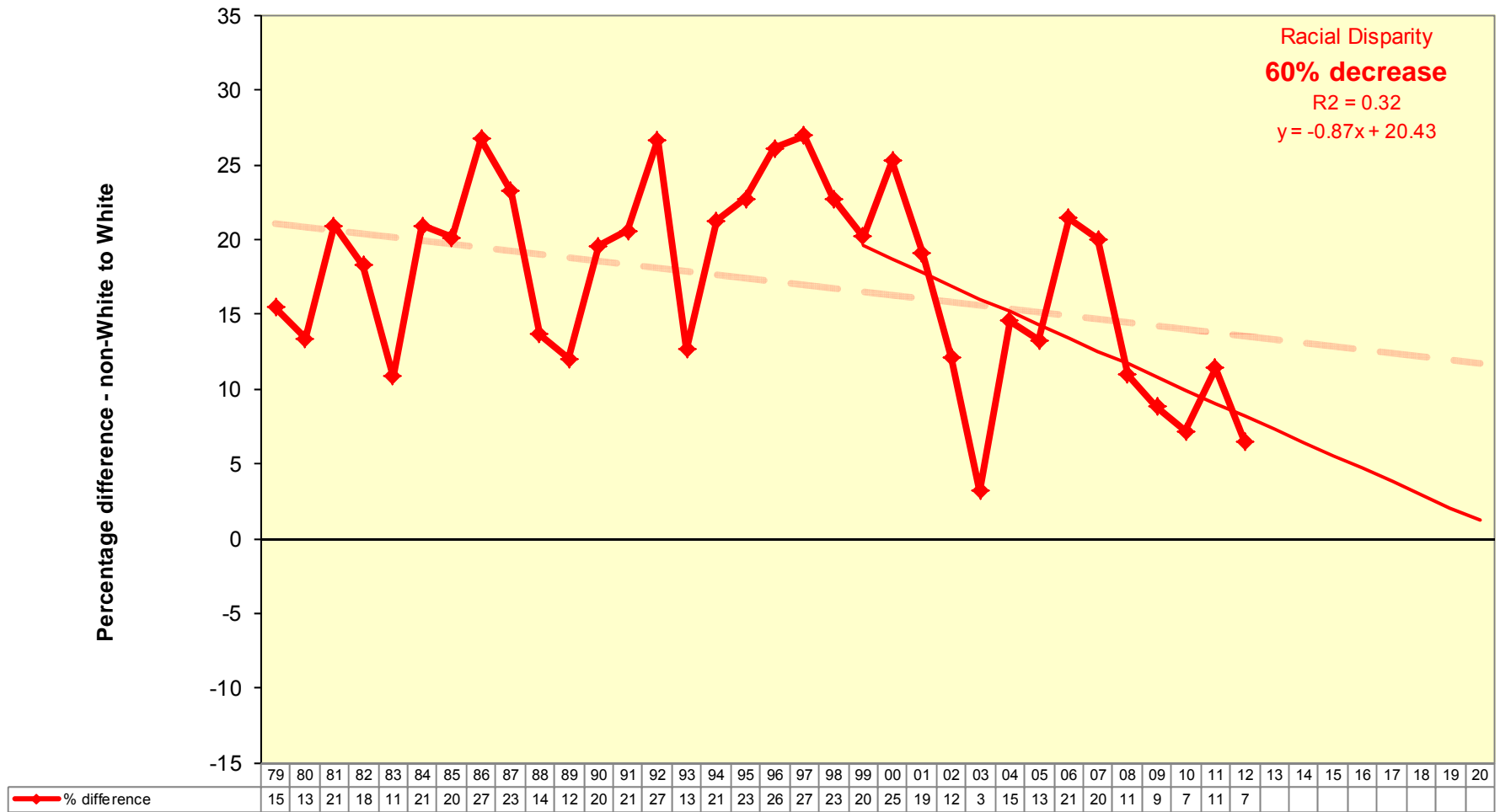


Figure 7.1 v. Cancer - All Sites:  
 Measuring disparity in age-adjusted mortality rates by race for ENC41,  
 1979-2012 with projections to 2020





# HIV Disease

- The fitted HIV mortality rate for ENC has been decreasing over the past 14 years, but was still 67% greater than RNC in 2012.
- The 14 year age-adjusted rate trend for ENC had a 47% decrease. The 2012 ENC rate is 75% greater than RNC.
- Non-White males continue to have the highest rates of age-adjusted mortality, but this rate has also decreased 55% in a 14-year reliable trend. The White male rate decreased 46% during that same period and the rate for non-White females decreased 28%. A convergence of the non-White male rate with other rates is expected in the future.
- The 14-year non-White age-adjusted HIV mortality rate has decreased by 47% in a reliable trend. The age-adjusted mortality rate for Whites decreased by 49%, although the absolute rate for this group is much lower.
- In a moderately reliable trend, the 14-year period shows a 22% 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 ENC41, RNC59, and NC,  
1979-2012 with projections to 2020

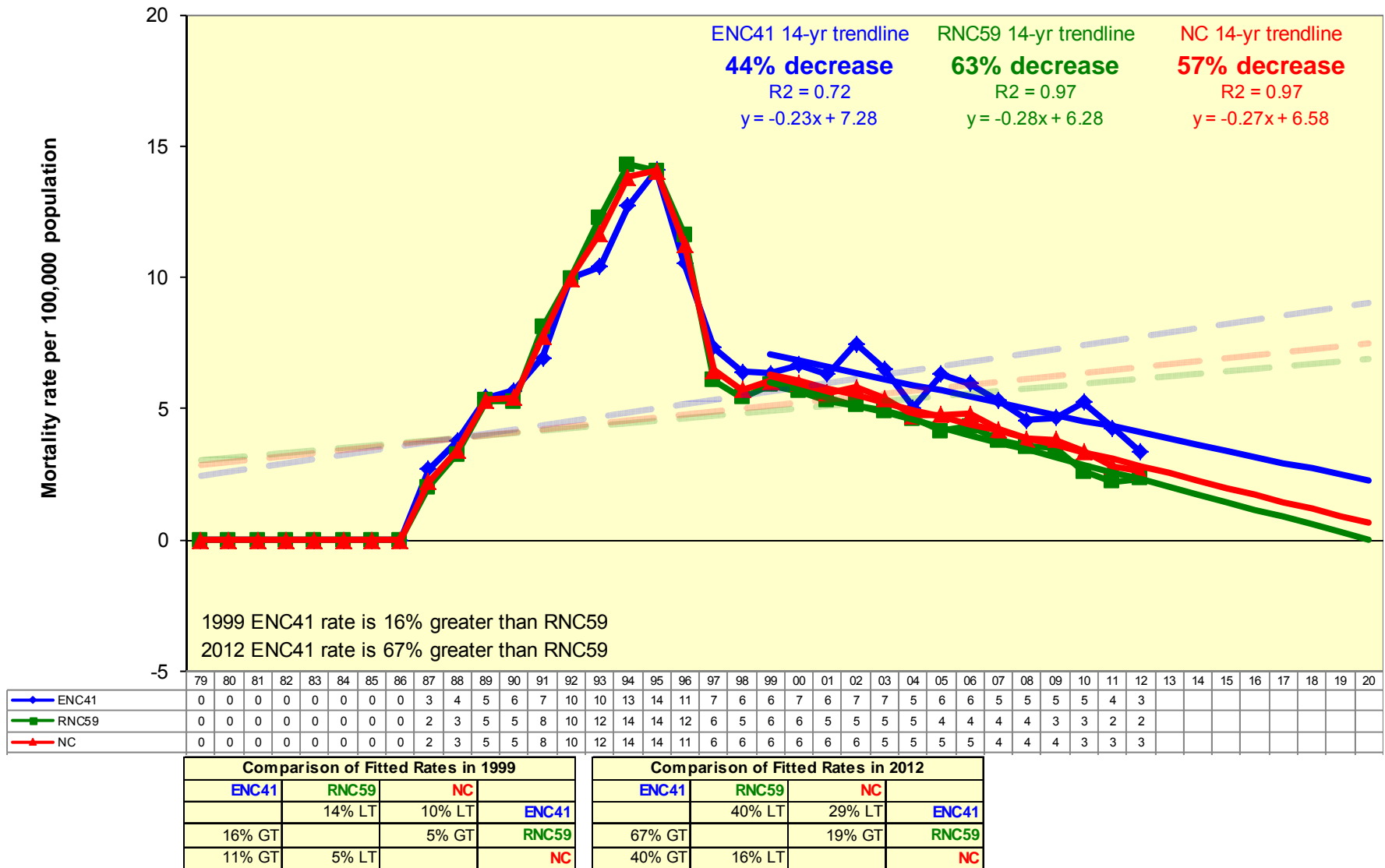


Figure 7.2 ii. HIV Disease:  
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US,  
1979-2012 with projections to 2020

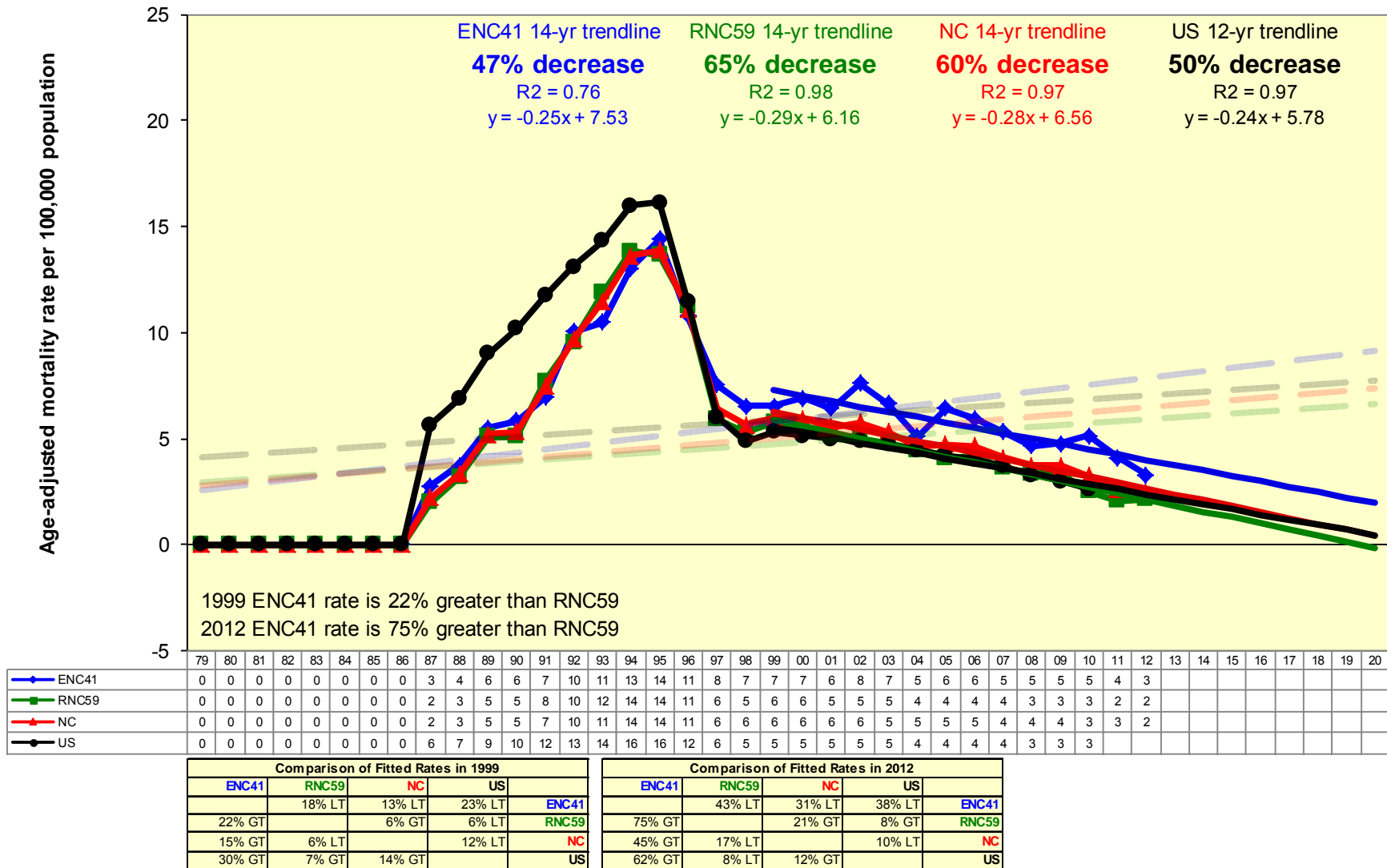


Figure 7.2 iii. HIV Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC41,  
1979-2012 with projections to 2020

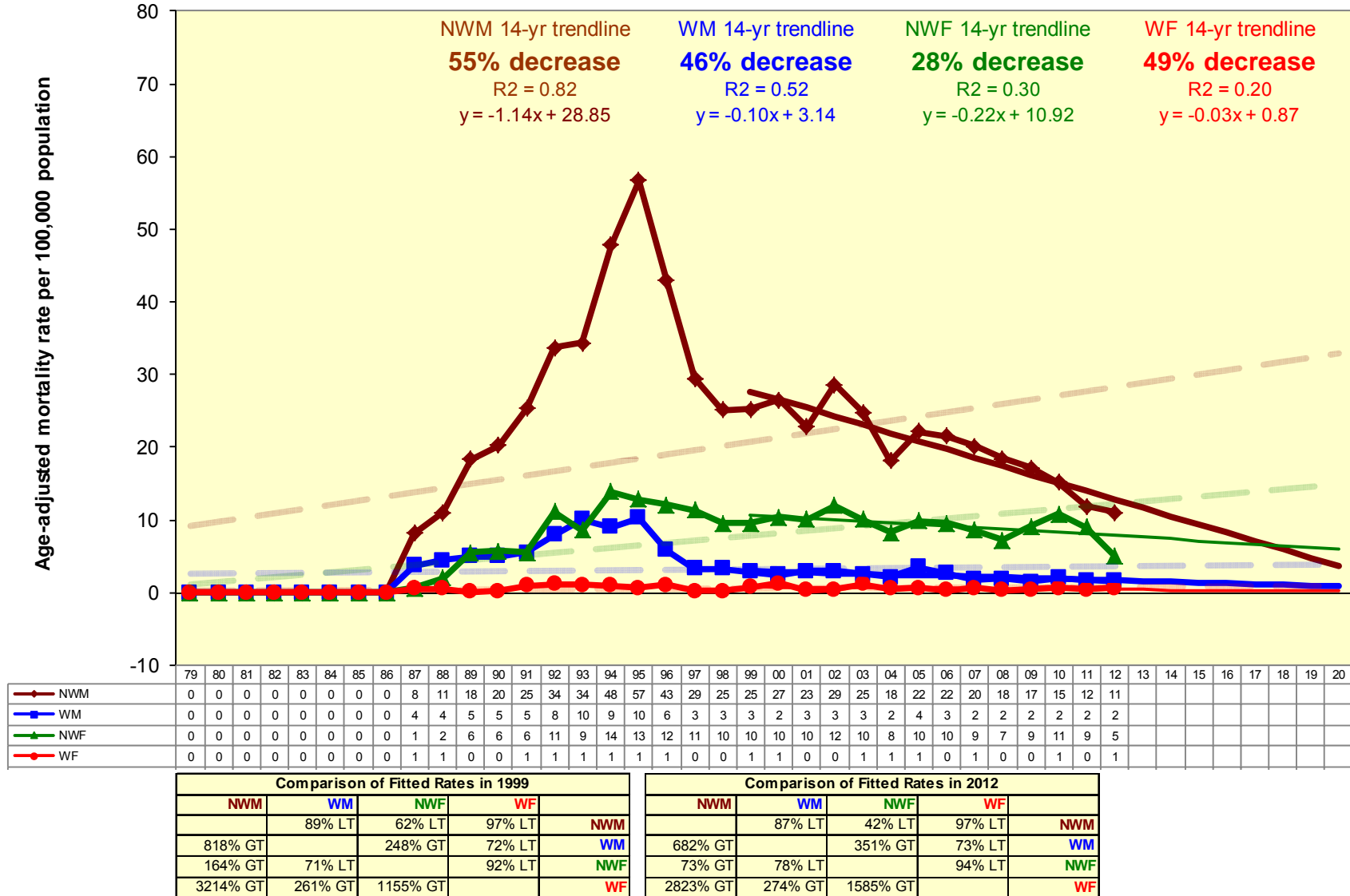


Figure 7.2 iv. HIV Disease:  
Trends in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020

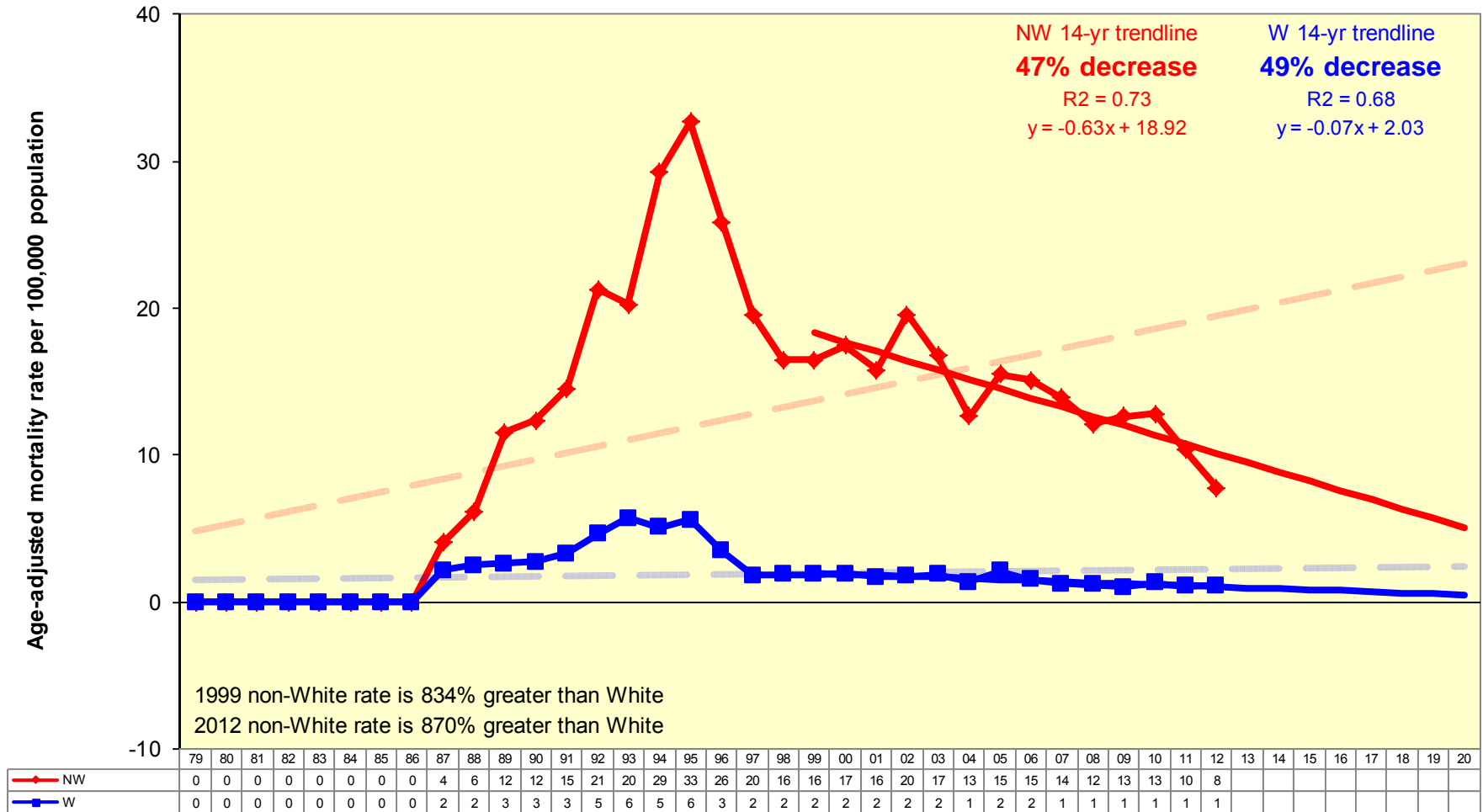
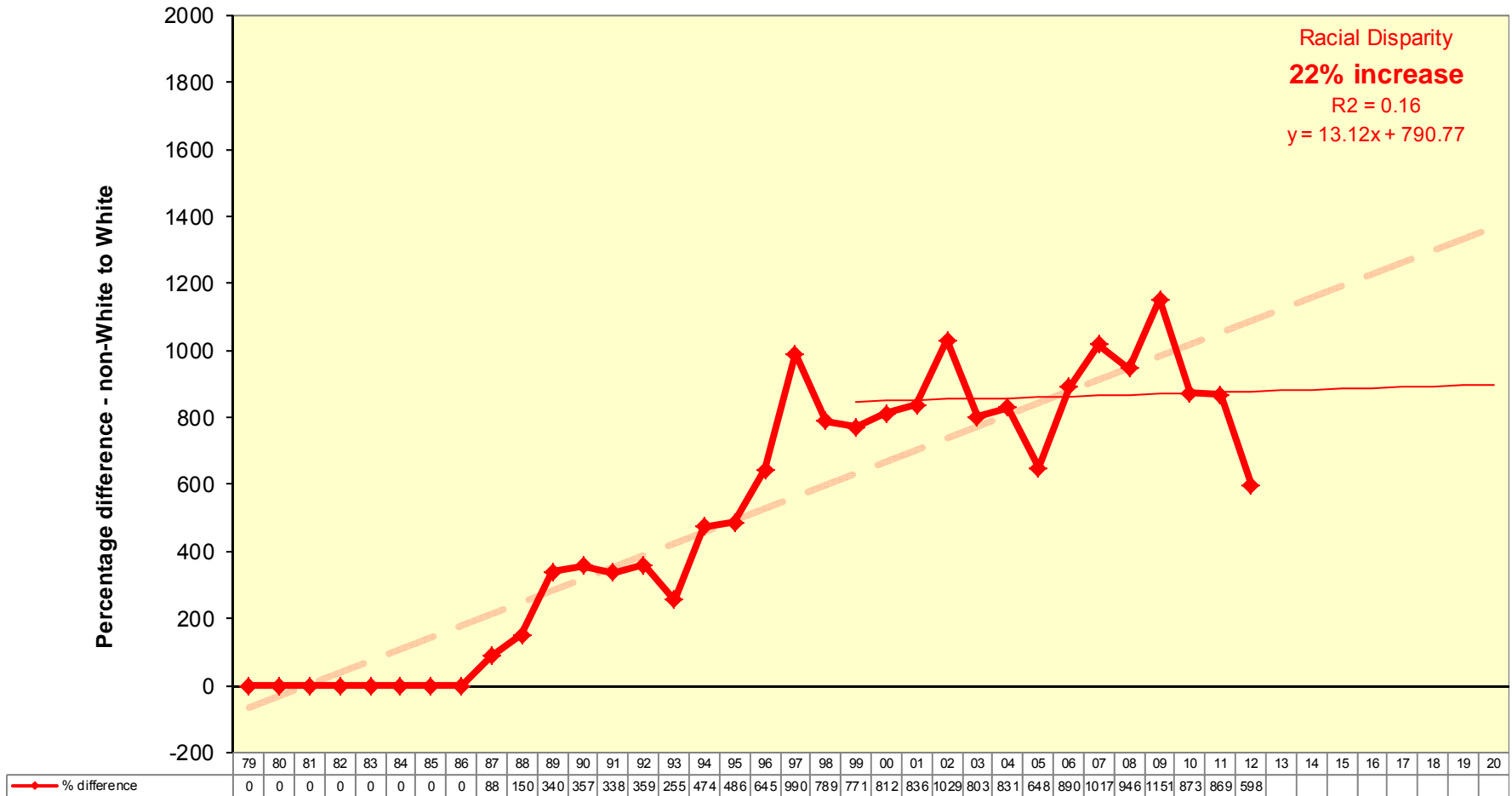


Figure 7.2 v. HIV Disease:  
Measuring disparity in age-adjusted mortality rates by race for ENC41,  
1979-2012 with projections to 2020



### 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