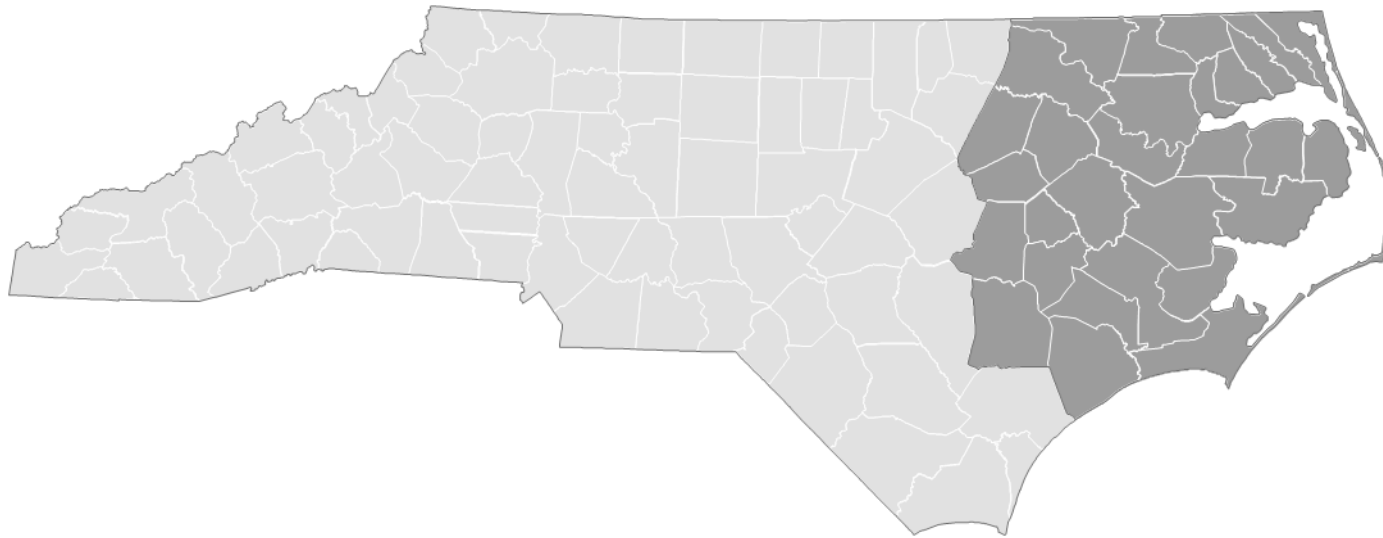


# Trends and Disparities in Mortality in Eastern North Carolina

Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1990-2021



**A Resource for Healthy Communities**

Health Indicator Series - Report #2.201  
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Health Systems Research and Development  
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# 1. Introduction

**Health Indicators Series:  
A Resource for Healthy Communities  
January 2024**

**Report Series #2: Mortality Trends for Eastern North Carolina (1990 to 2021)**

*Health Indicators* is a series of reports describing community health at the state, regional, and county level. 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 overarching goals—to increase the span and quality of life, and to eliminate health disparities. 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 32-year period (1990-2021), as well as the most recent 17 year period (2005 to 2021). 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. The next section charts recent trends and disparities in mortality and provides projections to the year 2030. These charts place Eastern North Carolina's health status in a historical context and provide a glimpse into the future.

\* 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.

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## 2. Data Highlights

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

The following highlights of mortality in the 29 counties of 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 2021, the age-adjusted mortality rate for Eastern North Carolina is 1,074 deaths per 100,000. This rate is 12% higher than the state rate. Within Eastern North Carolina, the non-White rate is 19% higher than the White rate. The non-White male rate is 28% higher than the rate for White males. The non-White female rate is 14% higher than the rate for White females.

All cause mortality and premature mortality both increased in 2021 due to the impact of COVID-19. The marked increase is evident in Figures 5.1 i-v and 5.2 i-v. In 2021 COVID-19 was directly responsible for 1,959 deaths in ENC29, but may have also indirectly led to increased mortality from other causes such as heart disease and cerebrovascular disease due to delayed care because of the pandemic. Because COVID-19 is a new cause of death with no trend data available this report does not include charts for it. For a look at the 2020 impact of COVID-19 in eastern North Carolina readers may refer to the report, *COVID-19 in Eastern North Carolina*, which is available on this web page.

The five general leading causes of mortality in Eastern North Carolina (2021) are:

1. Diseases of Heart
2. Cancer—All Sites
3. COVID-19
4. Cerebrovascular Disease
5. All Other Unintentional Injuries and Adverse Effects

	Race and Gender		
	non-White Males	White Males	non-White Females
1st	Diseases of Heart	Diseases of Heart	Diseases of Heart
2nd	Cancer - All Sites	Cancer - All Sites	Cancer - All Sites
3rd	COVID - 19	COVID - 19	COVID - 19
4th	All Other Unintentional Injuries and Adverse Effects	All Other Unintentional Injuries and Adverse Effects	Cerebrovascular Disease
5th	Diabetes Mellitus	Chronic Lower Respiratory Disease	Diabetes Mellitus

Trends in Mortality from All Causes

- The 32-year and 17-year trend lines show all cause mortality rates increasing for ENC, NC and RNC, with very steep increases in 2020 and 2021, likely due to COVID-19.
- The age-adjusted all cause mortality rate trends for ENC, NC, RNC and the US have been decreasing over the 32-year period, but all show large increases for 2020 and 2021. The 17-year trend lines are not reliable.
- All cause mortality rates for all groups have increased in 2020 and 2021. The 17-year trends are unreliable for all groups.
- Both groups show an increase for 2020 and 2021, but the 17-year trends for both groups are unreliable.
- Over the 17-year trend there is a decrease in racial disparity.

Trends in Premature Mortality from All Causes of Death

- The 17-year trend for premature mortality rates for ENC, RNC and NC are all increasing in a moderately reliable trend. There was a sharp increase in premature mortality rates for all groups in 2020 and 2021, likely due to COVID-19.
- The age-adjusted premature mortality rate trends for ENC, NC, RNC and US are all increasing in moderately reliable trends. All rates showed a sharp increase in 2020 and 2021, likely due to COVID-19.
- The 17-year age-adjusted rate trends for non-White males, and White males are increasing in moderately reliable trends. The rate for non-White females is unreliable. All rates jumped up in 2020 and 2021. The rate for non-White males is the highest.
- The 32-year rate trend for non-Whites is decreasing. The 17-year rate trend is increasing but is unreliable. The 17-year rate trend for Whites shows an increase, in a moderately reliable trend. Both rates increased sharply in 2020 and 2021.
- The 17-year trend for racial disparity is unreliable.

Diseases of the Heart

- ENC's 17-year heart disease mortality rate is 30% greater than the RNC rate and is increasing in a moderately reliable trend.
- While ENC's age-adjusted mortality rate trend is decreasing at a pace similar to RNC, NC and the US, the ENC rate remains 21% greater than the RNC rate in 2021.
- The non-White male rate trend remains higher than the White male trend; both are declining. The non-White female trend is 5% greater than the White female trend but is projected to drop below the White female trend.
- The non-White rate trend remains 8% greater than for Whites, but the 17-year trends for both are decreasing and convergence is suggested in the future.
- The 17-year trend line for racial disparity is decreasing in a moderately reliable trend.

Cerebrovascular Disease

- ENC's cerebrovascular disease mortality rate has turned up in recent years and is 34% greater than RNC. The rate trend has increased 23% over the 17-year period. The trends for RNC and NC are unreliable.
- The ENC age-adjusted cerebrovascular disease mortality rate trend has decreased 9% over the 17-year period. It remains 23% greater than the RNC rate trend.
- The rate for non-White females has decreased 16% over the 17-year period. The trends for non-White males, White males and White females are unreliable.
-

## *Trends and Disparities in Mortality in Eastern North Carolina-29 Counties*

- The cerebrovascular disease mortality rate trend for non-Whites is decreasing but is still 42% greater than Whites in 2021. The White rate is unreliable.
- The 17-year trend for racial disparity is unreliable.

### All Other Unintentional Injuries and Adverse Effects

- The mortality rate trend for unintentional injuries and adverse effects shows a sharp increase in ENC (201% over 17 years). The trends for RNC and NC are also up sharply.
- The age-adjusted mortality rate trends for ENC, RNC, NC, and the US are all increasing. During the last 17 years the ENC rate has increased 200% and it is now 10% greater than RNC.
- The trends are increasing for all groups, but the White male rate is the highest and shows the greatest increase (222% over 17 years).
- The White rate trend has increased 201% over the 17-year period. The non-White rate is 32% less than the White rate and increased 203% over the period.
- Over the 17-year period the racial disparity trend line is flat and is unreliable.

### Cancer—Tracheal, Bronchus, Lung

- The 17-year trend line for cancer-TBL for ENC has decreased 15% over the period. The ENC rate for 2021 is 23% greater than the rate for RNC.
- In 2021 the age-adjusted rate for ENC is 15% higher than RNC. The 17-year trend for ENC has decreased 38%.
- The mortality rate trends for White and non-White males are decreasing and have converged. The rate for non-White females is 32% less than the rate for White females.
- The non-White mortality rate trend for this cancer is consistently lower than the White rate (17% less than Whites). Both trends are decreasing over the 17-year period, but non-White is decreasing more quickly.
- The trend for racial disparity is not reliable.

### Chronic Lower Respiratory Diseases

- The 32-year ENC trend for CLRD is increasing, as is the 17-year trend. In 2021 the ENC rate is 9% greater than the RNC rate.
- The ENC age-adjusted rate trend is converging with the RNC and NC trends. All three are higher than the US rate trend.
- The rate trend for White males is the highest but is decreasing. The rate for non-White males has decreased 28% over the 17-year period in a moderately reliable trend and is now below the rate for White females, which is unreliable. The rate for non-White females is the lowest and is increasing in a moderately reliable trend.
- The 17-year trend for Whites is higher than the non-White rate, but both rates are relatively flat. The non-White rate is unreliable.
- The disparity trend between White and non-White is unreliable.

### Diabetes Mellitus

- The 17-year rate trend for ENC has increased 52% over the period and is 43% greater than the RNC rate.
- In 2021, the ENC 17-year rate trend for age-adjusted diabetes mellitus is 36% greater than RNC, and is increasing in a moderately reliable trend.
- The non-White male 17-year rate has increased by 31%. The non-White female trend is unreliable. The White male and White female trends are lower. The trend for white females is also unreliable.

## *Trends and Disparities in Mortality in Eastern North Carolina-29 Counties*

- In 2021 the non-White mortality 17-year rate trend is 124% greater than the White, but both are flat. The non-White trend is unreliable.
- The 17-year trend for racial disparity is not reliable.

### Alzheimer's Disease

- The Alzheimer's mortality rate trend for ENC shows a steep increase over the 17-year period (186%). ENC's rate of increase was larger than RNC and NC, and looks set to overtake the others.
- In 2021, the age-adjusted rate for ENC is 11% less than the rate for RNC. The ENC rate trend has increased 98% over the 17-year period and is 9% greater than the US rate.
- Rate trends are increasing for all groups, but non-White males and non-White females have the greatest rate of increase (123% and 151% over 17 years, respectively). The trends for White females and non-White females are the highest.
- The White and non-White rate trends have converged. Both trends are increasing over the 17-year period.
- The 17-year trend shows an 106% increase in racial disparity in a moderately reliable trend.

### Nephritis, Nephrotic Syndrome, and Nephrosis

- In 2021 ENC's rate trend for nephritis, nephrotic syndrome and nephrosis is 14% greater than RNC, but the trend is not reliable.
- With age-adjustment, the ENC rate trend has decreased 20% over the 17-year period. It is 5% greater than the RNC rate and 4% greater than the NC rate. They are projected to converge soon.
- The 17-year trends for non-White males and non-White females are the highest but have decreased 22% and 32% over the 17-year period. The non-White male trend in 2021 is 104% greater than the White male trend and 224% greater than the White female trend. All trends are decreasing except for White males, which is flat and unreliable.
- The non-White rate in 2021 is 114% greater than the White rate. It has decreased 27% over the 17-year period. The White rate has decreased 17%.
- The trend for racial disparity is not reliable.

### Chronic Liver Disease and Cirrhosis

- The mortality rate trend for chronic liver disease and cirrhosis is increasing for ENC and RNC. The rate for ENC is the highest and has increased 112% over the 17-year period.
- The age-adjusted rate trend for ENC is 22% greater than RNC and has increased 74% over the 17-year period.
- The age-adjusted rate trend for White males is the highest and has increased 70% over the 17-year period. The rate for non-White males is unreliable. The rate for White females increased 153% over 17 years. The rate for non-White females is the lowest.
- The non-White rate trend is 41% less than White in 2021. The White trend has increased 97% over the 17-year period.
- The 17-year trend for racial disparity has decreased 211% over the 17-year period.

### Unintentional Motor Vehicle Injuries

- The mortality rate trend for unintentional motor vehicle injuries in ENC has decreased by 15% over the 17-year period but has recently ticked up. In 2021 ENC's rate trend is 21% greater than RNC.
- With age-adjustment, the ENC rate trend has decreased 16% over the 17-year period but has recently gone up. It is 22% greater than the RNC rate and 19% greater than the NC rate.
- The 17-year trends for non-White males and White males are the highest, but the White male trend line has experienced a 35% decrease

over the 17-year period. The rate for non-White males has increased 29%. Non-White females and White females are lower, with White females decreasing by 39% over the 17-year period. The trend for non-White females is unreliable.

- The non-White rate in 2021 is 64% greater than the White rate and has increased 30% over the 17-year period. The White rate is decreasing, 37% over 17 years.
- The 17-year trend shows a 397% increase in disparity that favors Whites and is projected to further increase in the future.

#### Cancer – All Sites

- The cancer-all sites mortality rate trends for ENC, RNC, and NC are flat and are not reliable.
- The age-adjusted cancer-all sites mortality rate trends for ENC, RNC, NC and US are all decreasing. The ENC rate is 10% greater than the RNC rate.
- The rate trend is decreasing for all groups. The rate for non-White males has decreased by 41% in the 17-year period and is set to converge with the rate for White males. White and non-White females are decreasing at similar rates.
- Both the White and non-White cancer mortality trends are decreasing over the 17-year period. The non-White rate decreased by 32% and the White rate decreased 20%. The non-White rate remains 5% greater than the White rate in 2021, but they are projected to converge.
- The 17-year trend for racial disparity shows a 78% decrease.

#### HIV Disease

- The HIV mortality rates for ENC have been decreasing over the past 17 years but are still 36% greater than RNC in 2021.
- The age-adjusted rate trend for ENC, RNC, and the US are all decreasing and set to converge. The ENC rate is 48% greater than RNC in 2021.
- Non-White males continue to have the highest rate of age-adjusted mortality, but the rate has decreased 81% in the 17-year period. Non-White females have the second highest rate, but it has also declined. All demographics are projected to converge in the future.
- The 17-year age-adjusted HIV mortality rates have decreased for both Whites and non-Whites by 81% and 76% respectively. The non-White rate is still 802% greater than the White rate.
- The 17-year trend for racial disparity is unreliable.



### 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 National Center for Health Statistics population estimates. For the US, data were obtained from the CDC Multiple Cause of Death public use data file.

#### 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).

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 2021. Smaller areas like counties will usually be aggregated into 5-year intervals (e.g., 2017 to 2021). 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 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 32-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 32 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 2030 from known historical values (2005 to 2021) 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 6.2 ii the year 2013 is the 9th year in the series, so 9 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 cerebrovascular diseases (2005 to 2021), the 2013 *expected* or *fitted* age-adjusted rate is calculated to be 51.25 deaths per 100,000 people. The *observed* age-adjusted rate for 2013 is 46 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 2013 is 5.25—the model (the equation of the line) *overestimates* the observed value by 5.25 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 trend lines are for those where  $R^2$  is less than 0.10 and should be considered not reliable. The thickest 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 sixteen year period (2005-2021). 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 2005 and 2021 tables compare the fitted rates calculated for the beginning and end of the observed time series in terms of percent difference. Returning to figure 6.2 ii, ENC29's age-adjusted fitted rate for cerebrovascular diseases in 2005 is 8% greater than (GT) RNC's fitted rate. In 2021, ENC29's fitted rate is 23% greater than (GT) 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 2030: A Path Toward Health*.

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

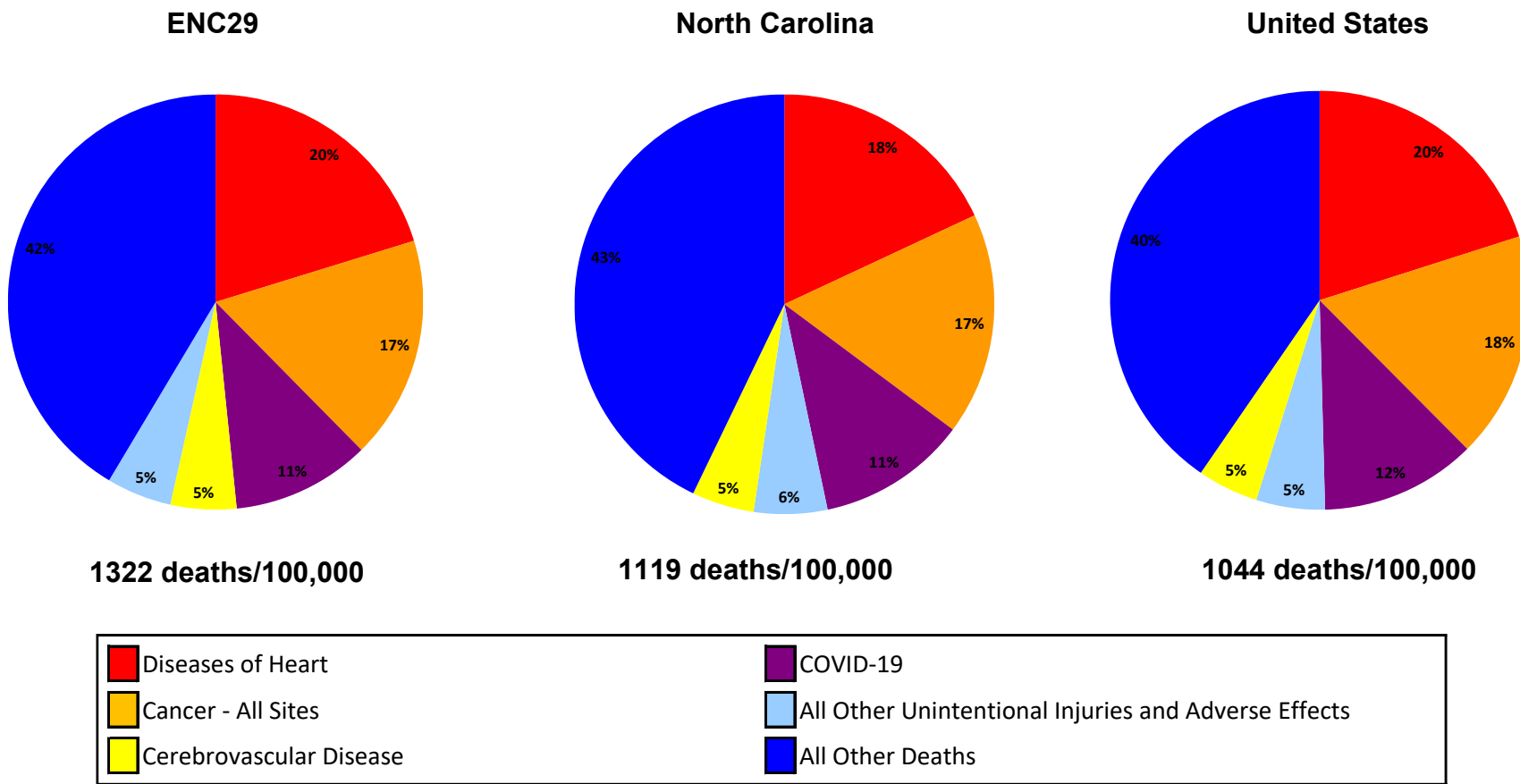
### **Cited References**

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

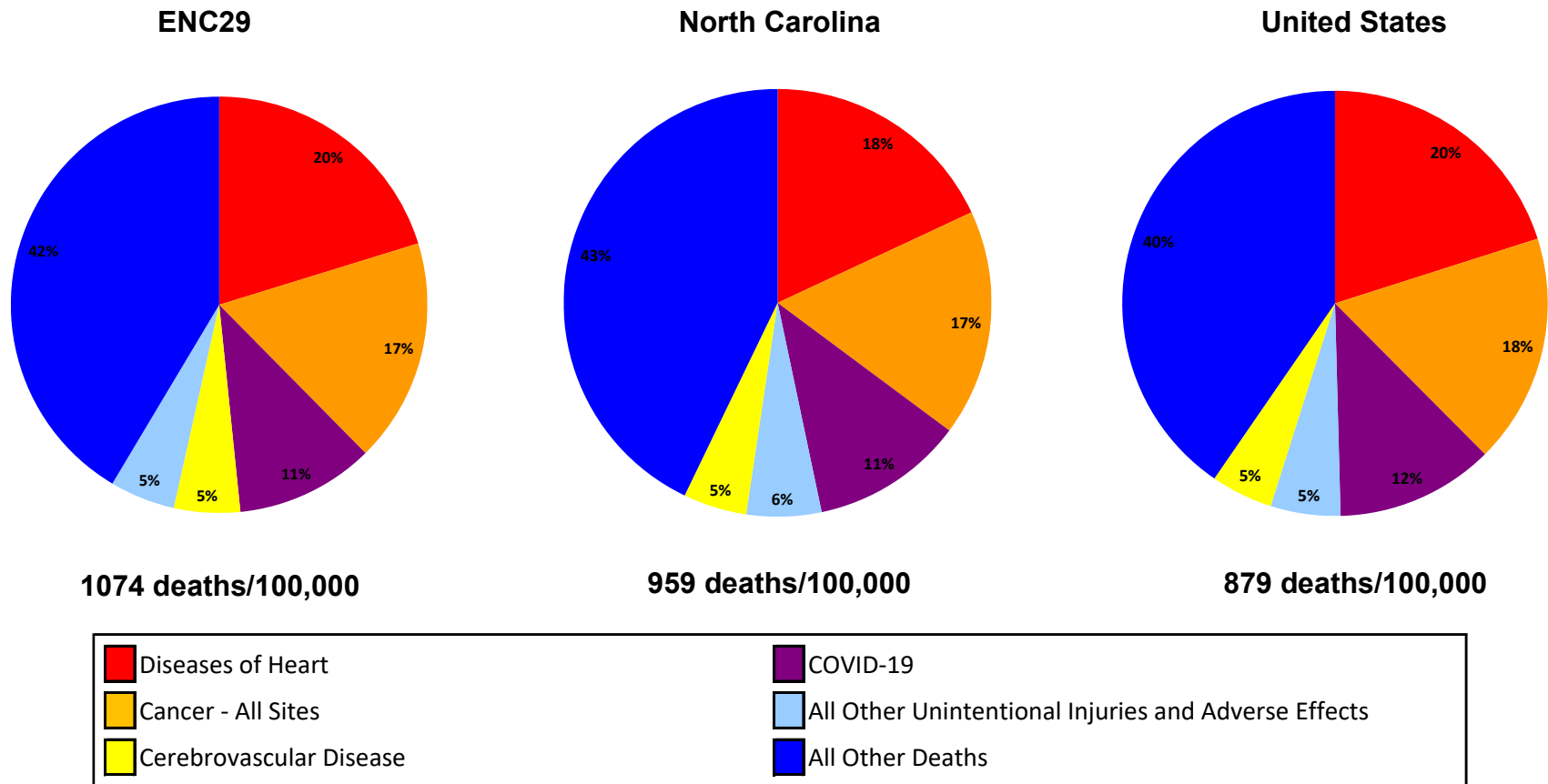
Figure 4.1 i. General leading causes of death for ENC29 (2021), NC (2021), and US (2021). Mortality rate per 100,000 population.



2021 NC rate is 7% higher than 2021 US rate

Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.1 ii. General leading causes of death for ENC29 (2021), NC (2021), and US (2021). Age-adjusted mortality rate per 100,000 population.



2021 NC age-adjusted rate is 9% higher than 2021 US age-adjusted rate

Slices without percentages constitute less than 5% of the deaths within that chart.



Figure 4.2 i. General leading causes of death for ENC29 (2021) by race and gender.  
Mortality rate per 100,000 population.

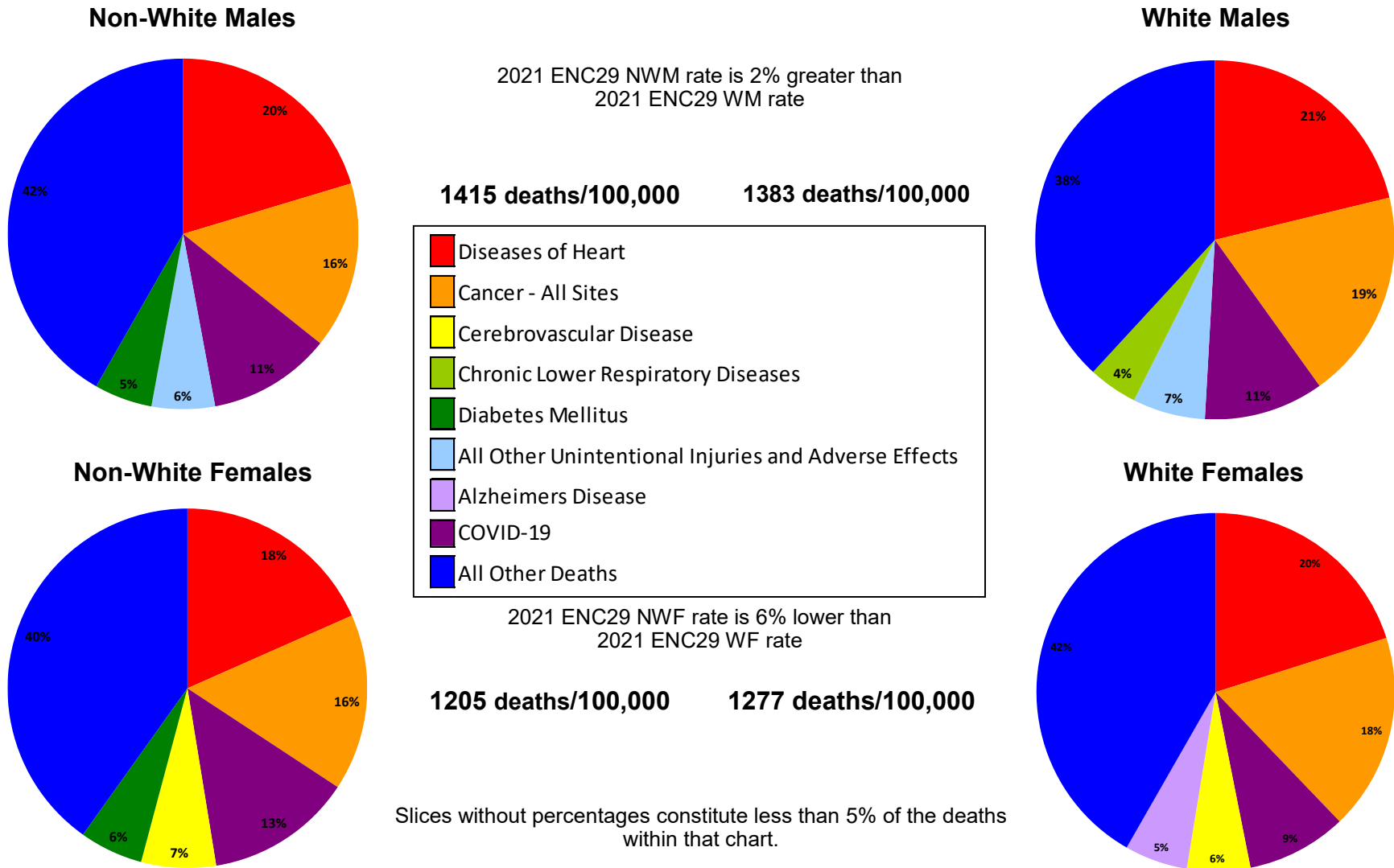


Figure 4.2 ii. General leading causes of death for ENC29 (2021) by race and gender. Age-adjusted mortality rate per 100,000 population.

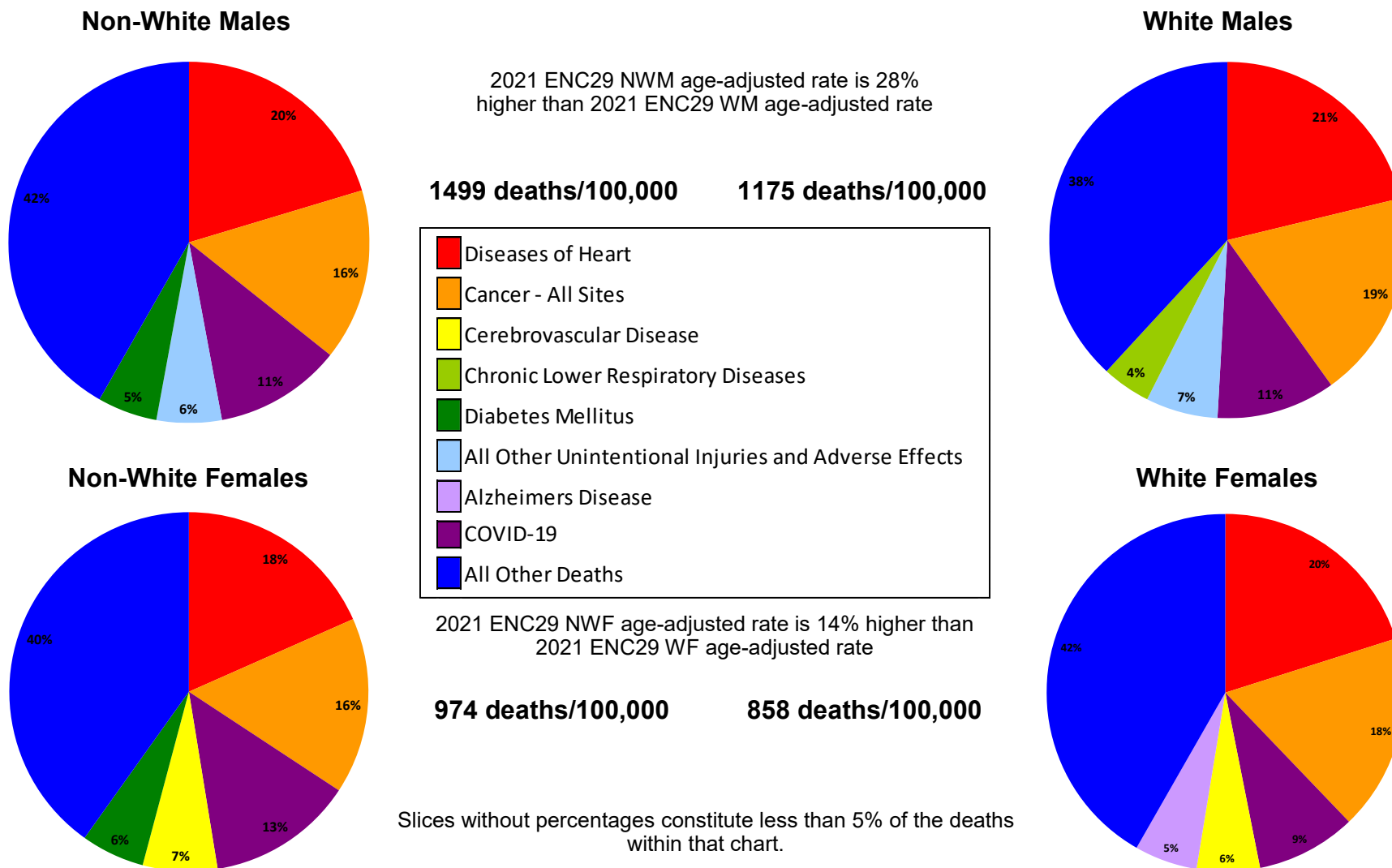
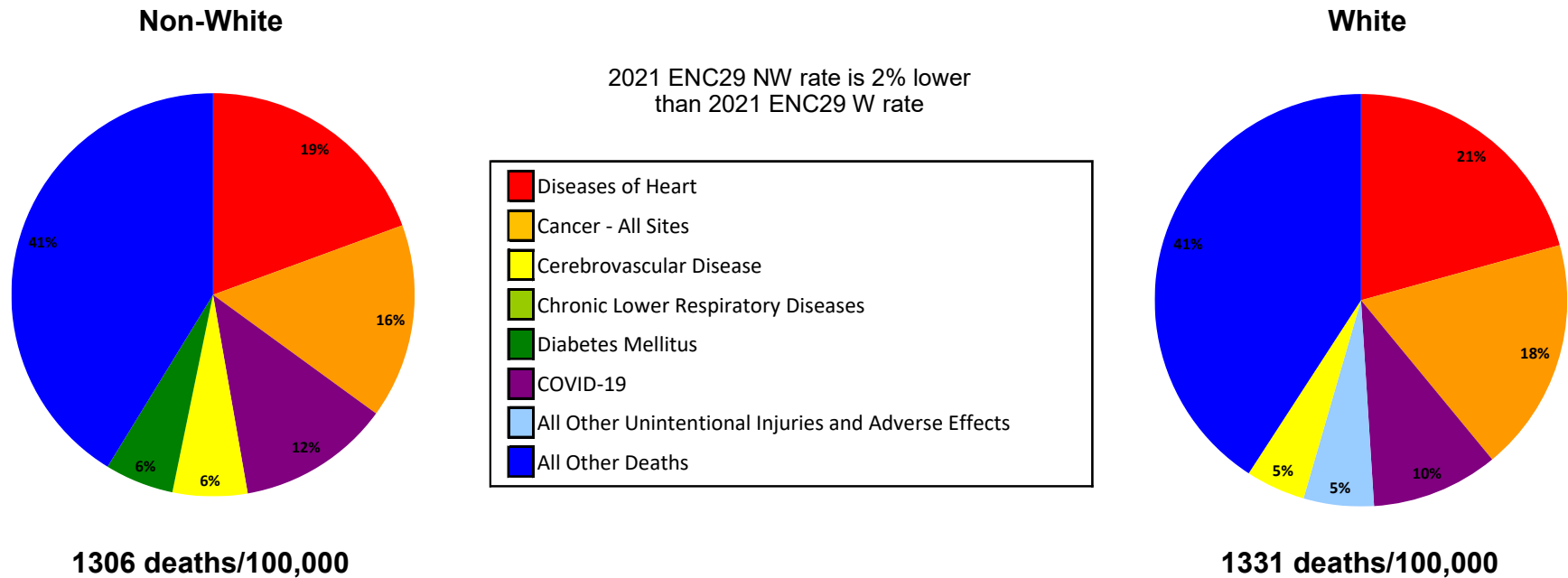
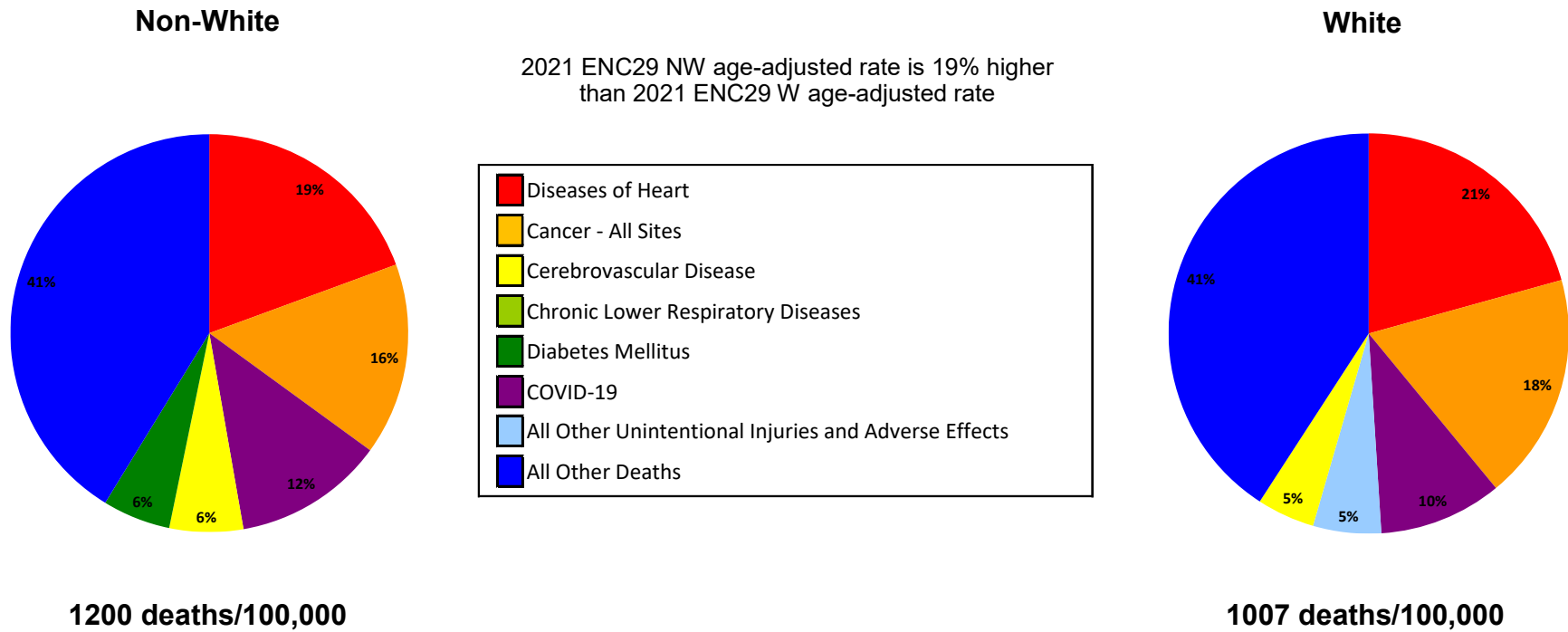


Figure 4.3 i. General leading causes of death for ENC29 (2021) by race.  
Mortality rate per 100,000 population.



Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.3 ii. General leading causes of death for ENC29 (2021) by race. Age-adjusted mortality rate per 100,000 population.



Slices without percentages constitute less than 5% of the deaths within that chart.



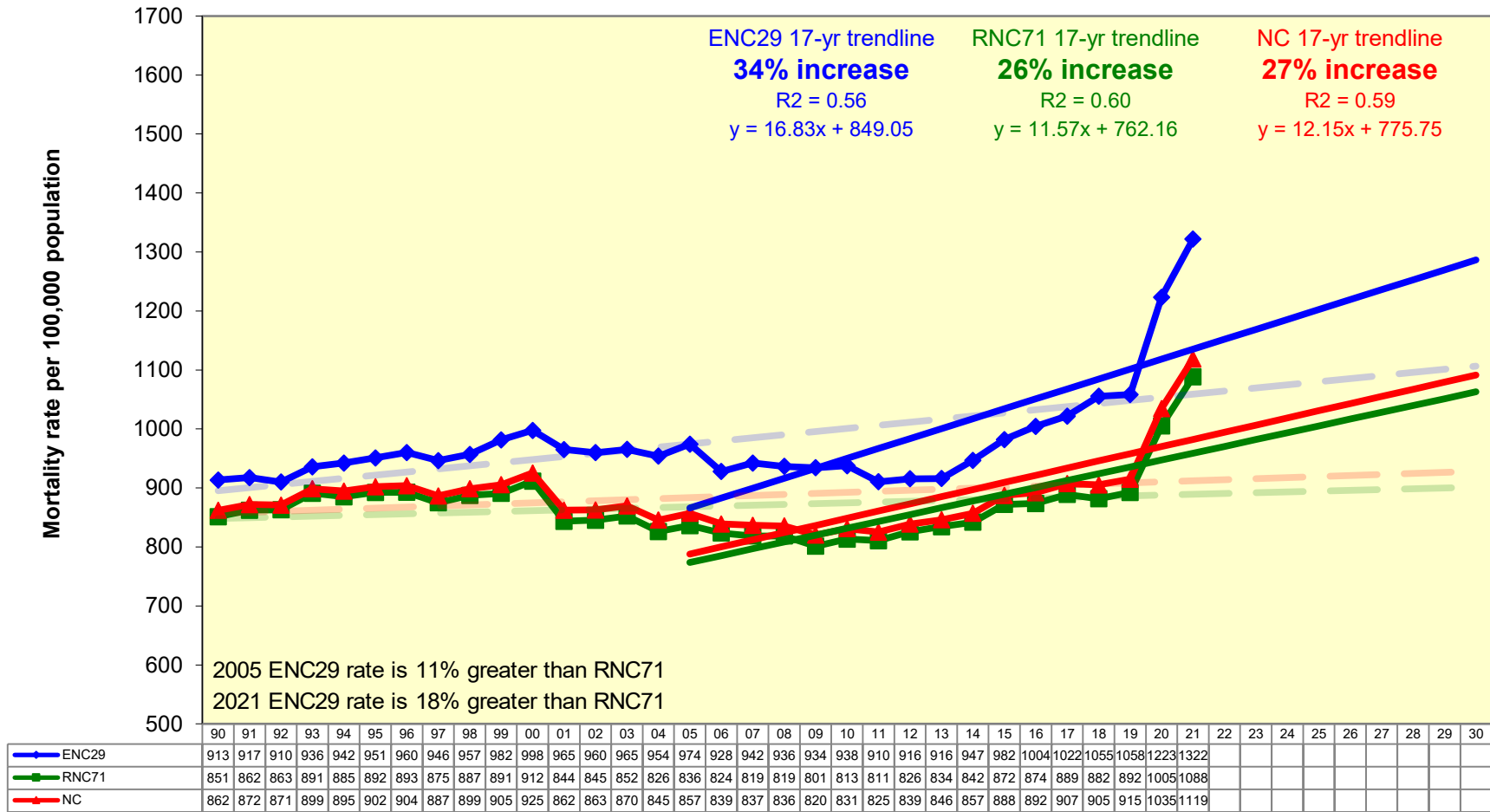
# 5. Trends and Disparities in Mortality in ENC29: All Causes of Death and All Causes of Premature Mortality; 1990-2021

# All Causes of Death

- The 32-year and 17-year trend lines show all cause mortality rates increasing for ENC, NC and RNC, with very steep increases in 2020 and 2021, likely due to COVID-19.
- The age-adjusted all cause mortality rate trends for ENC, NC, RNC and the US have been decreasing over the 32-year period, but all show large increases for 2020 and 2021. The 17-year trend lines are not reliable.
- All cause mortality rates for all groups have increased in 2020 and 2021. The 17-year trends are unreliable for all groups.
- Both White and non-White show an increase for 2020 and 2021, but the 17-year trends for both groups are unreliable.
- Over the 17-year trend there is a 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 5.1 i. All Causes of Death:  
Trends in mortality rates for ENC29, RNC71, and NC  
1990-2021 with projections to 2030

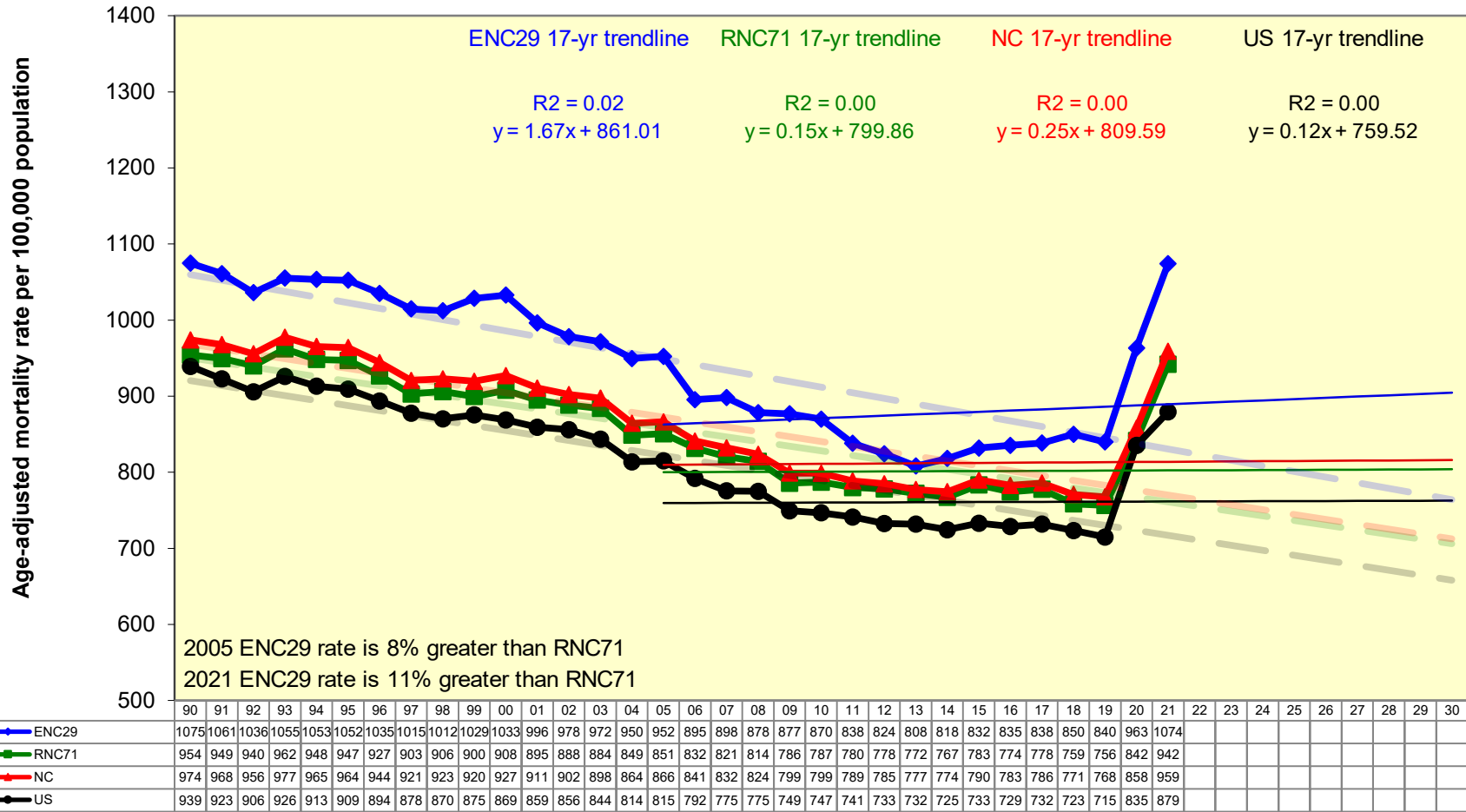


Comparison of Fitted Rates in 2005			
ENC29	RNC71	NC	
	10% LT	9% LT	ENC29
11% GT		2% GT	RNC71
9% GT	2% LT		NC

Comparison of Fitted Rates in 2021			
ENC29	RNC71	NC	
	15% LT	13% LT	ENC29
18% GT		2% GT	RNC71
15% GT	2% LT		NC



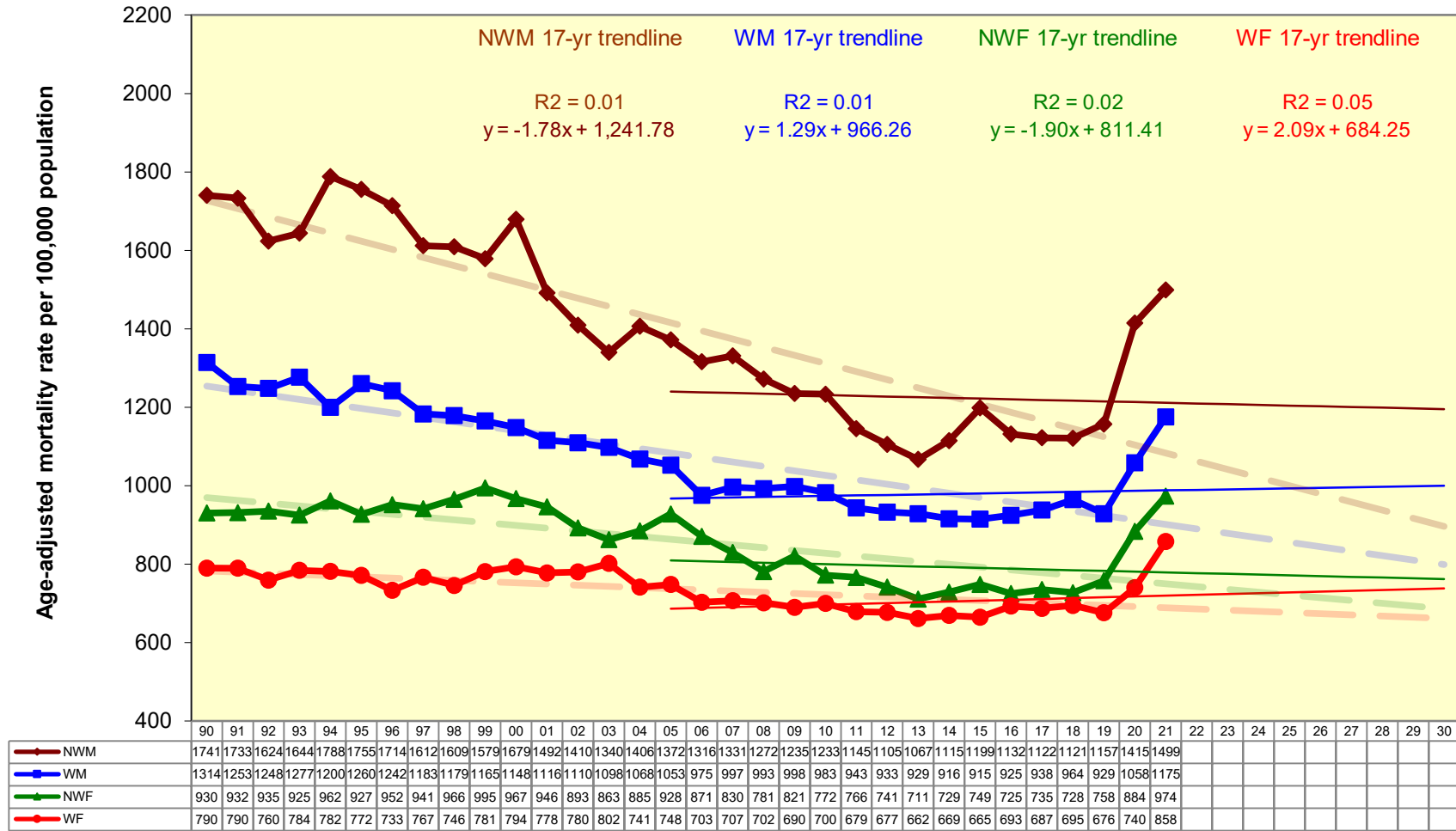
Figure 5.1 ii. All Causes of Death:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1990-2021 with projections to 2030



Comparison of Fitted Rates in 2005				
ENC29	RNC71	NC	US	
	7% LT	6% LT	12% LT	ENC29
8% GT		1% GT	5% LT	RNC71
6% GT	1% LT		6% LT	NC
13% GT	5% GT	7% GT		US

Comparison of Fitted Rates in 2021				
ENC29	RNC71	NC	US	
	10% LT	8% LT	14% LT	ENC29
11% GT		1% GT	5% LT	RNC71
9% GT	1% LT		6% LT	NC
17% GT	5% GT	7% GT		US

Figure 5.1 iii. All Causes of Death:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030



Comparison of Fitted Rates in 2005				
NWM	WM	NWF	WF	
	22% LT	35% LT	45% LT	NWM
29% GT		16% LT	29% LT	WM
53% GT	19% GT		16% LT	NWF
81% GT	41% GT	19% GT		WF

Comparison of Fitted Rates in 2021				
NWM	WM	NWF	WF	
	19% LT	36% LT	41% LT	NWM
23% GT		21% LT	27% LT	WM
55% GT	26% GT		8% LT	NWF
69% GT	38% GT	9% GT		WF

Figure 5.1 iv. All Causes of Death:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

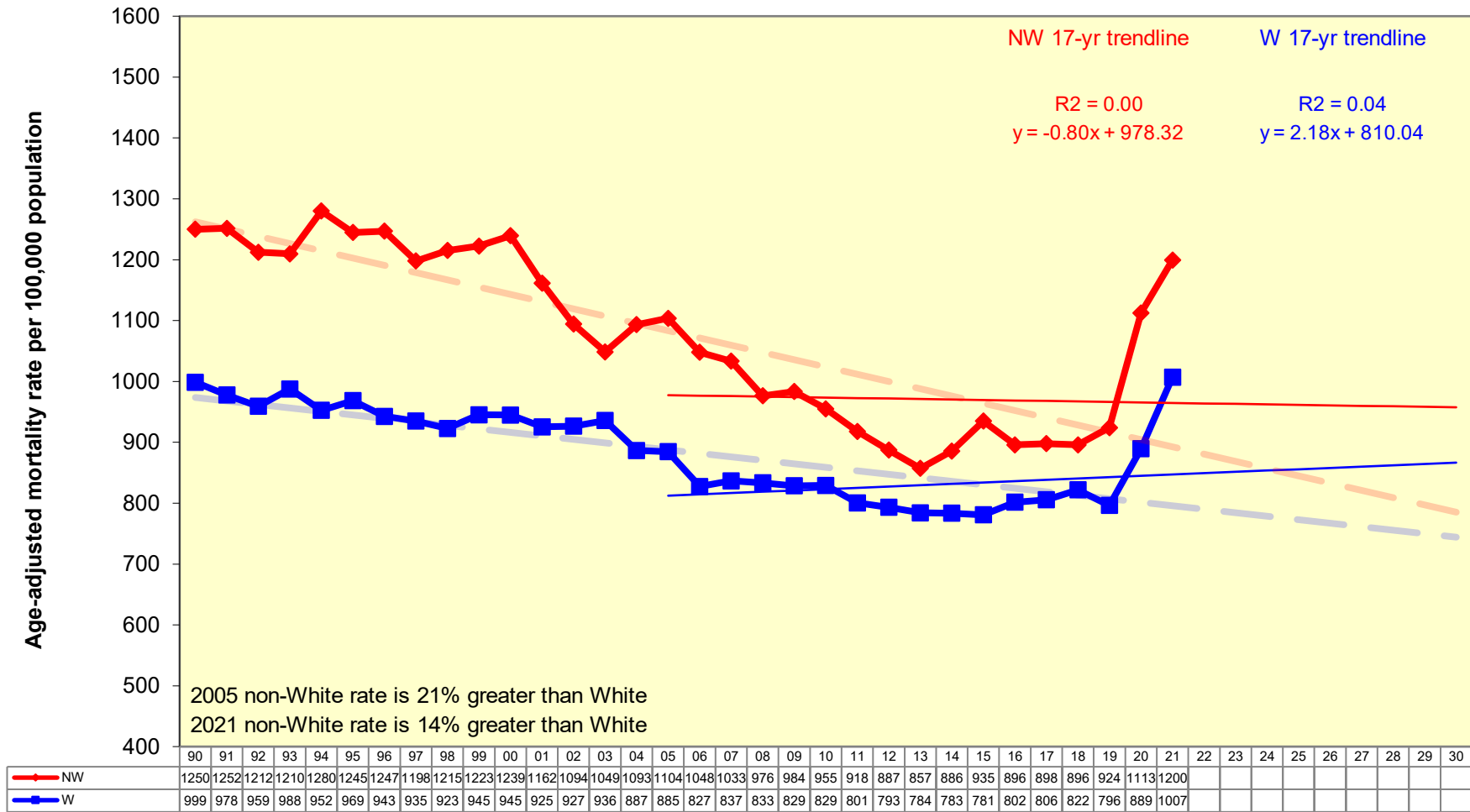
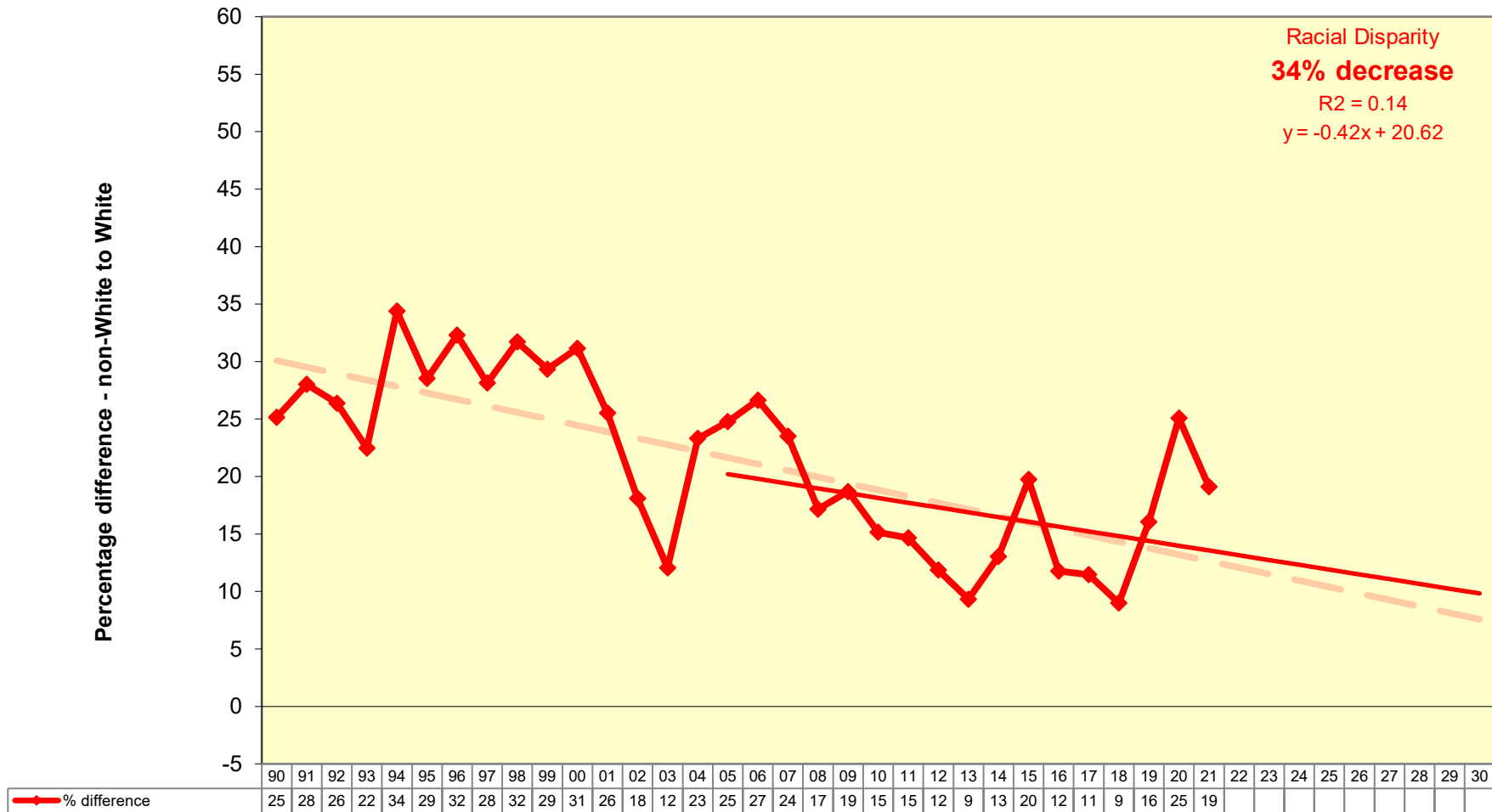


Figure 5.1 v. All Causes of Death:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030



# All Causes of Premature Mortality

- The 17-year trend for premature mortality rates for ENC, RNC and NC are all increasing in a moderately reliable trend. There was a sharp increase in premature mortality rates for all groups in 2020 and 2021, likely due to COVID-19.
- The age-adjusted premature mortality rate trends for ENC, NC, RNC and US are all increasing in moderately reliable trends. All rates showed a sharp increase in 2020 and 2021, likely due to COVID-19.
- The 17-year age-adjusted rate trends for non-White males, and White males are increasing in moderately reliable trends. The rate for non-White females is unreliable. All rates jumped up in 2020 and 2021. The rate for non-White males is the highest.
- The 32-year rate trend for non-Whites is decreasing. The 17-year rate trend is increasing but is unreliable. The 17-year rate trend for Whites shows an increase, in a moderately reliable trend. Both rates increased sharply in 2020 and 2021.
- The 17-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 5.2 i. All Causes of Premature Mortality:  
Trends in premature mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

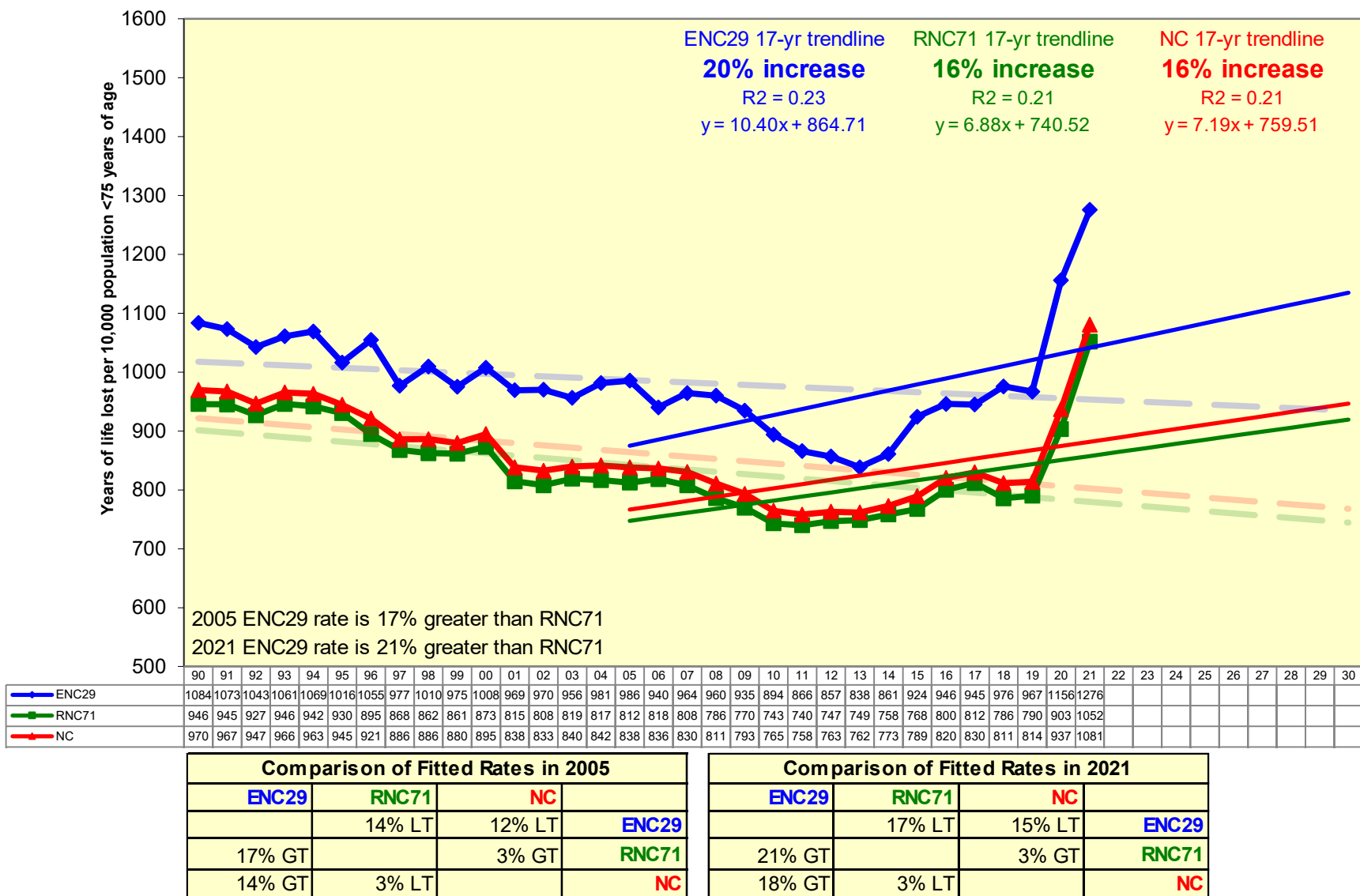
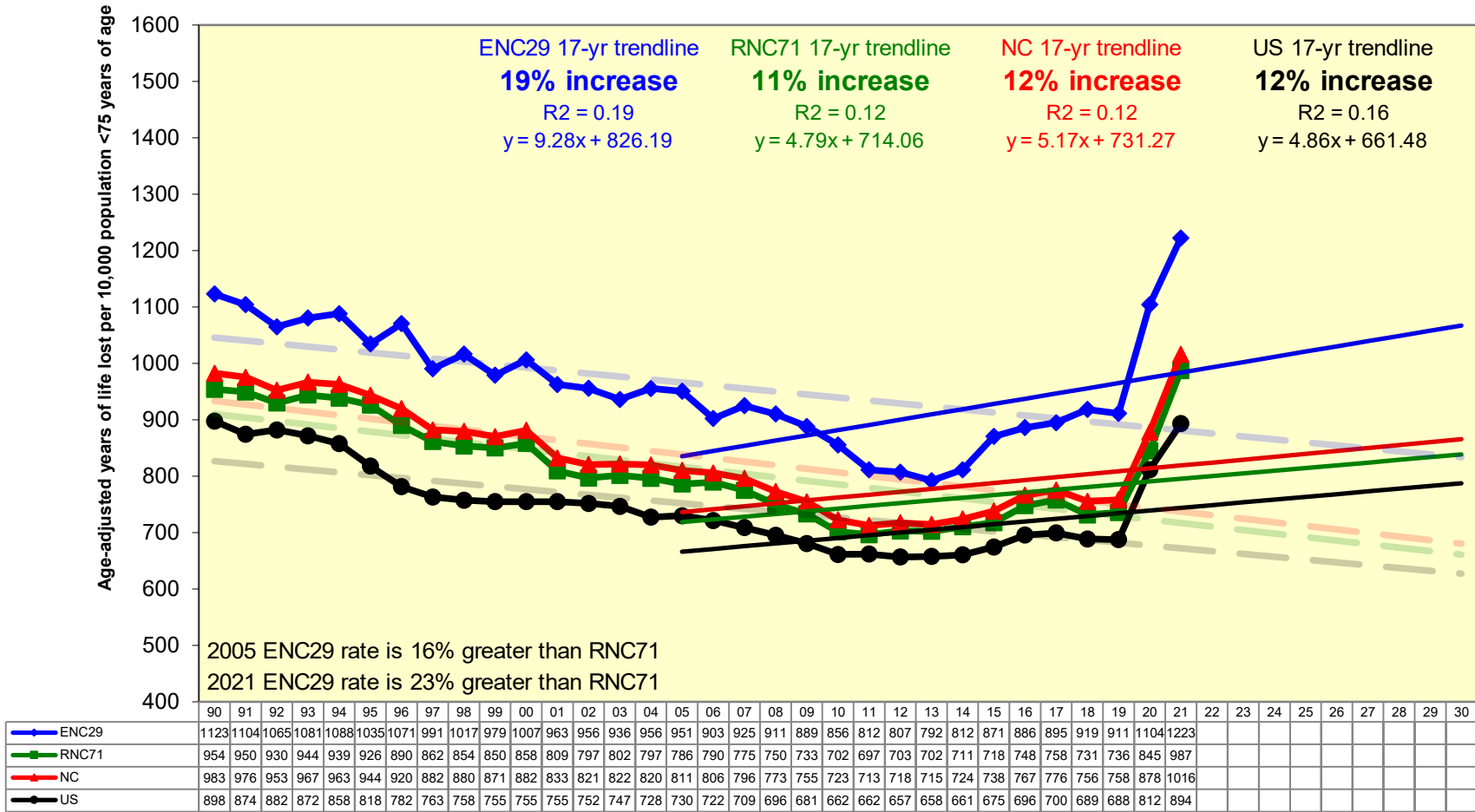


Figure 5.2 ii. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates for ENC29, RNC71, NC, and US, 1990-2021 with projections to 2030



Comparison of Fitted Rates in 2005				
ENC29	RNC71	NC	US	
	14% LT	11% LT	20% LT	ENC29
16% GT		2% GT	7% LT	RNC71
13% GT	2% LT		10% LT	NC
25% GT	8% GT	11% GT		US

Comparison of Fitted Rates in 2021				
ENC29	RNC71	NC	US	
	19% LT	16% LT	24% LT	ENC29
23% GT		3% GT	7% LT	RNC71
20% GT	3% LT		9% LT	NC
32% GT	7% GT	10% GT		US

Figure 5.2 iii. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

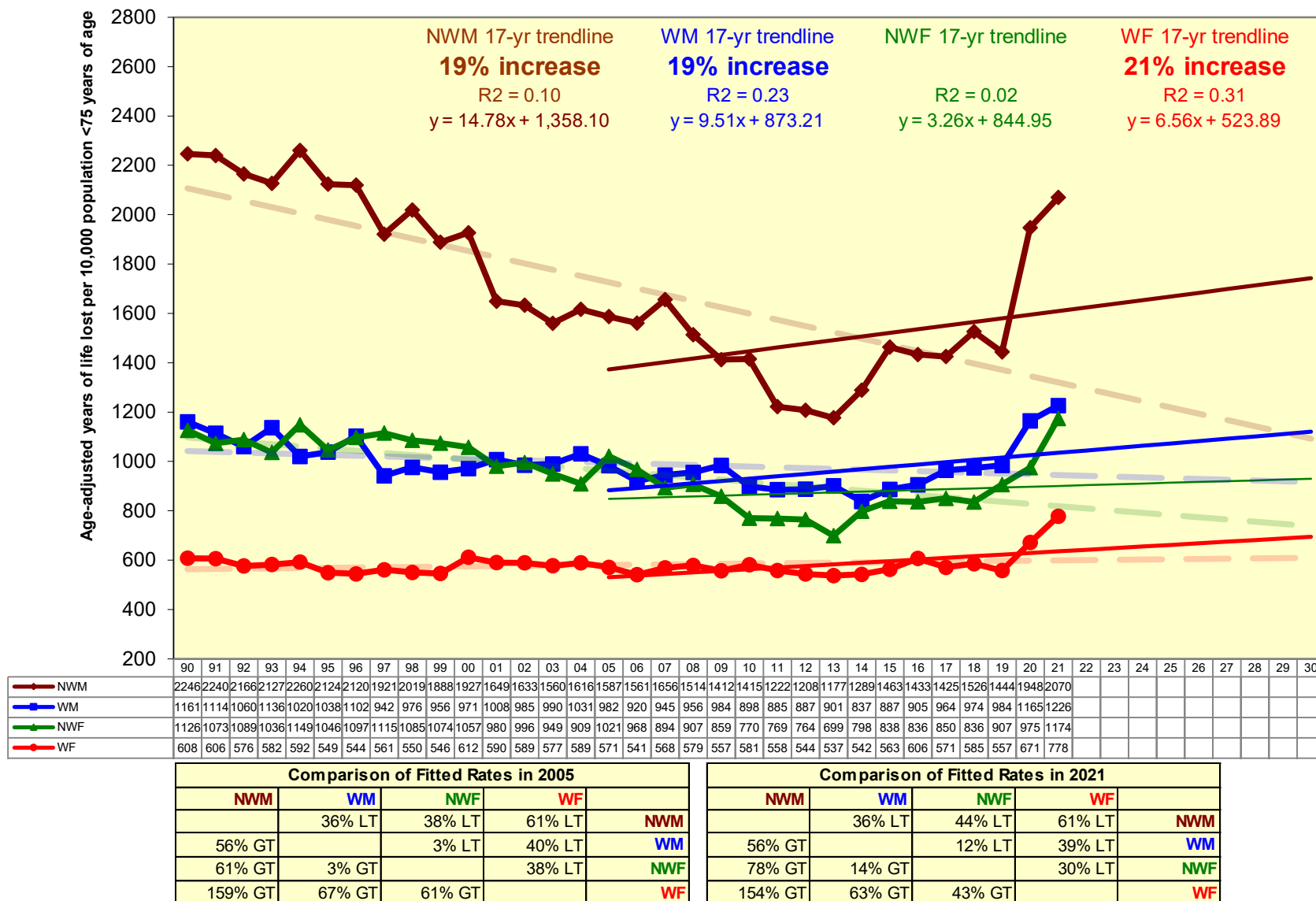




Figure 5.2 iv. All Causes of Premature Mortality:  
Trends in age-adjusted premature mortality rates by race for ENC29,  
1990-2021 with projections to 2030

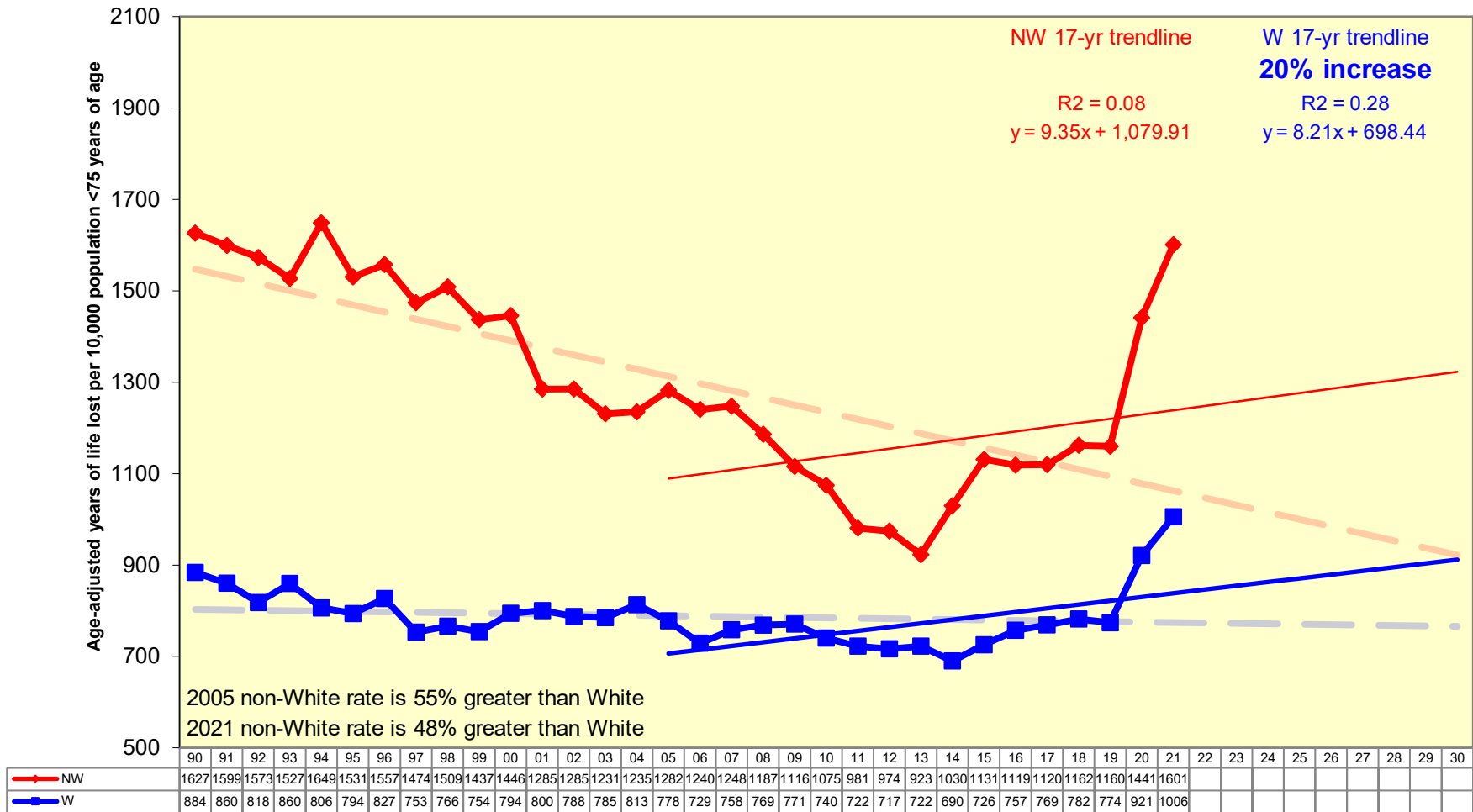
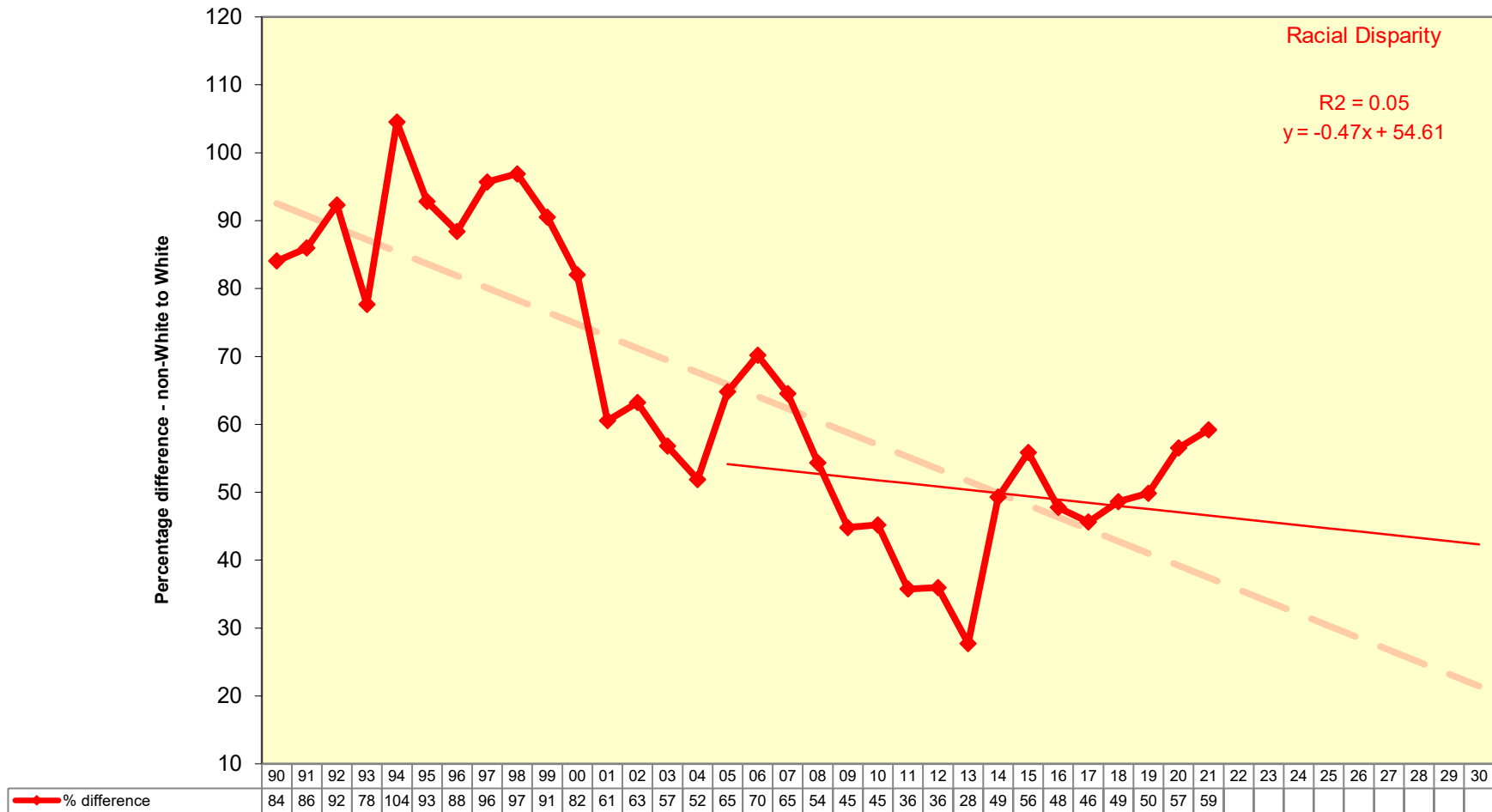


Figure 5.2 v. All Causes of Premature Mortality:  
 Measuring disparity in age-adjusted premature mortality rates by race for ENC29,  
 1990-2021 with projections to 2030





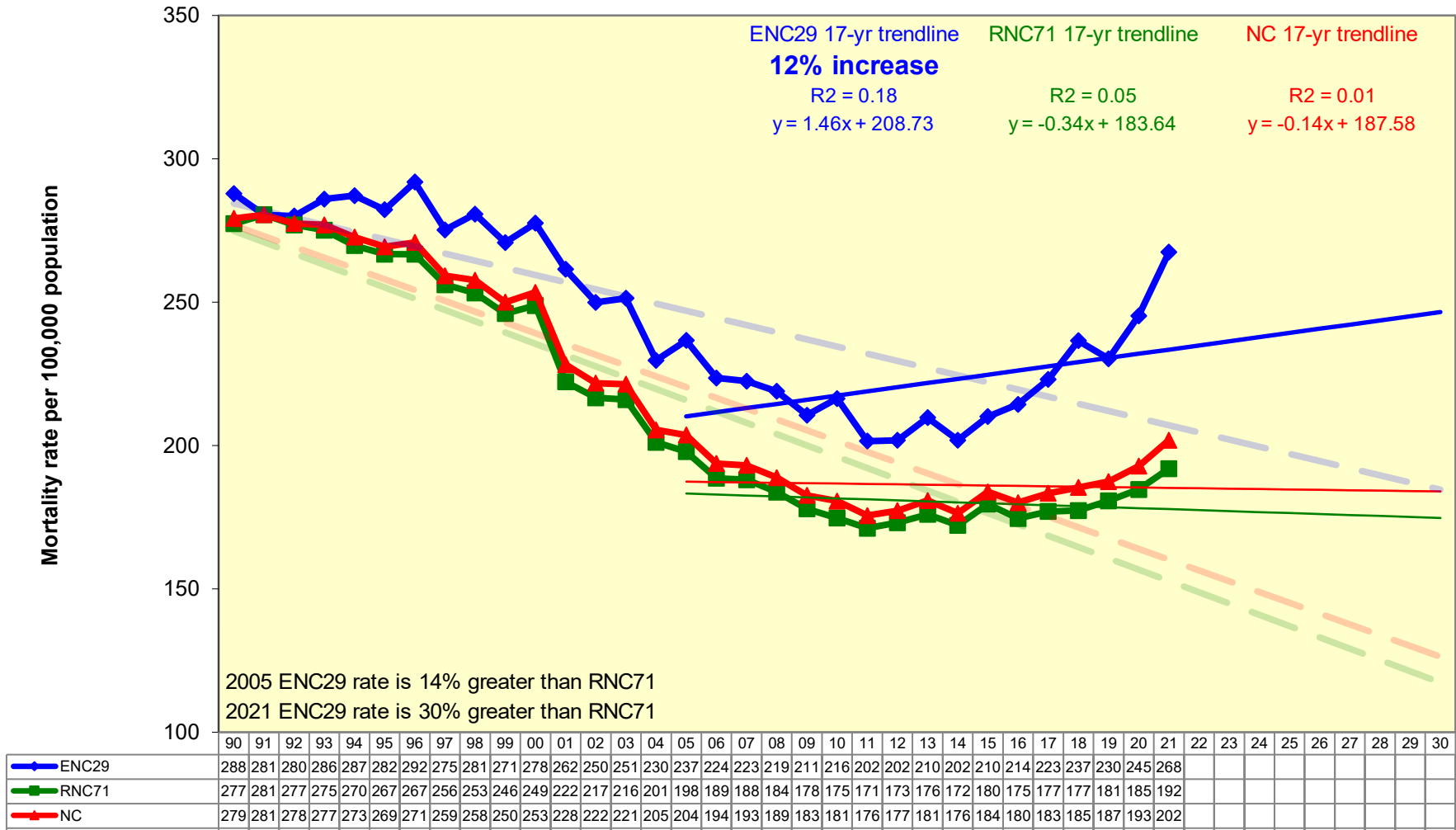
## 6. Trends and Disparities in Mortality in ENC29: Ten Specific Leading Causes of Death, 1990-2021

# Diseases of Heart

- ENC's 17-year heart disease mortality rate is 30% greater than the RNC rate and is increasing in a moderately reliable trend.
- While ENC's age-adjusted mortality rate trend is decreasing at a pace similar to RNC, NC and the US, the ENC rate remains 21% greater than the RNC rate in 2021.
- The non-White male rate trend remains higher than the White male trend; both are declining. The non-White female trend is 5% greater than the White female trend but is projected to drop below the White female trend.
- The non-White rate trend remains 8% greater than for Whites, but the 17-year trends for both are decreasing and convergence is suggested in the future.
- The 17-year trend line for racial disparity is decreasing 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 6.1 i. Diseases of Heart:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030



Comparison of Fitted Rates in 2005			
ENC29	RNC71	NC	
	12% LT	10% LT	ENC29
14% GT		2% GT	RNC71
11% GT	2% LT		NC

Comparison of Fitted Rates in 2021			
ENC29	RNC71	NC	
	23% LT	20% LT	ENC29
30% GT		4% GT	RNC71
25% GT	4% LT		NC

Figure 6.1 ii. Diseases of Heart:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

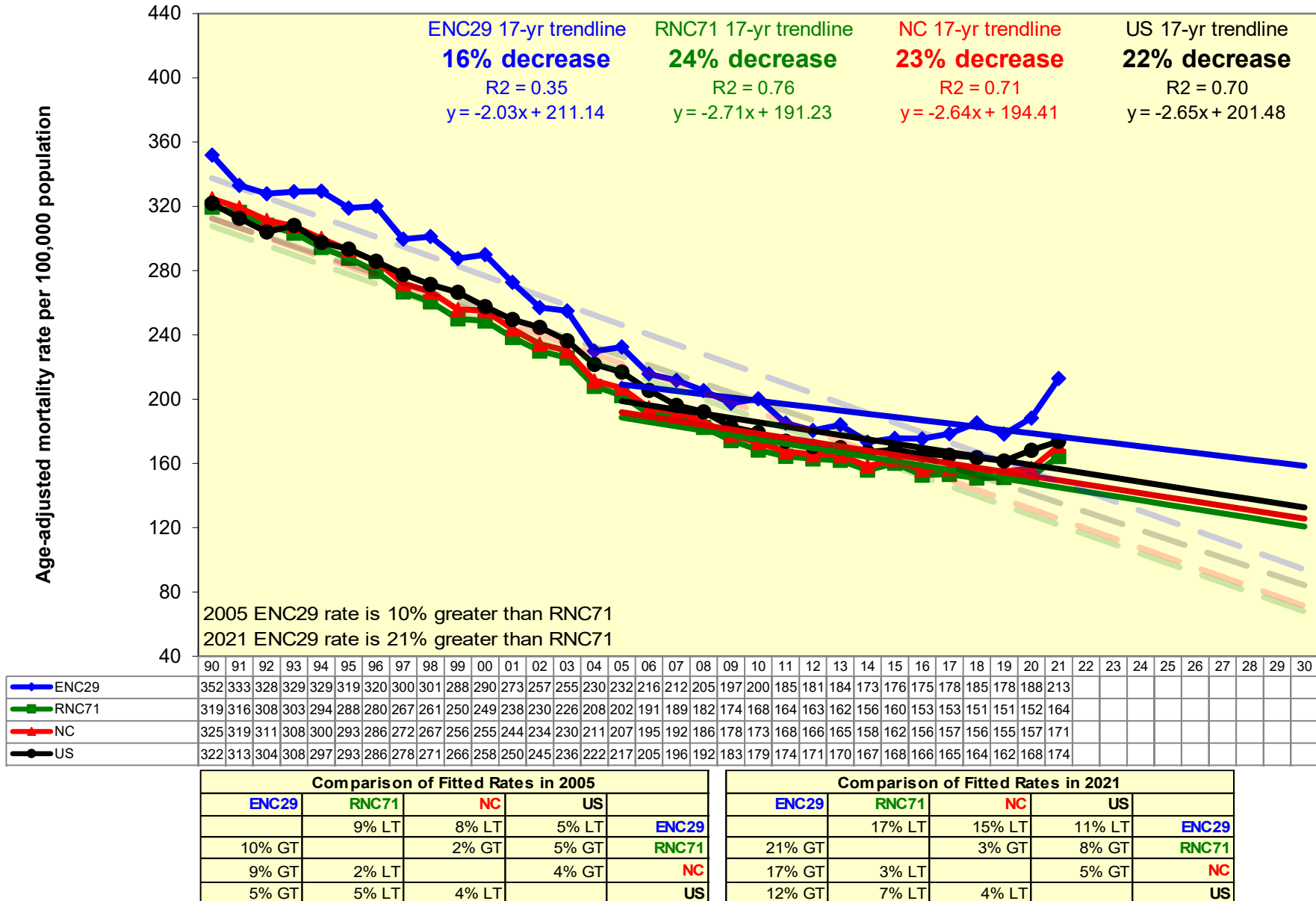


Figure 6.1 iii. Diseases of Heart:  
Trends in age-adjusted mortality rates by race and gender for ENC29, 1990-2021 with projections to 2030

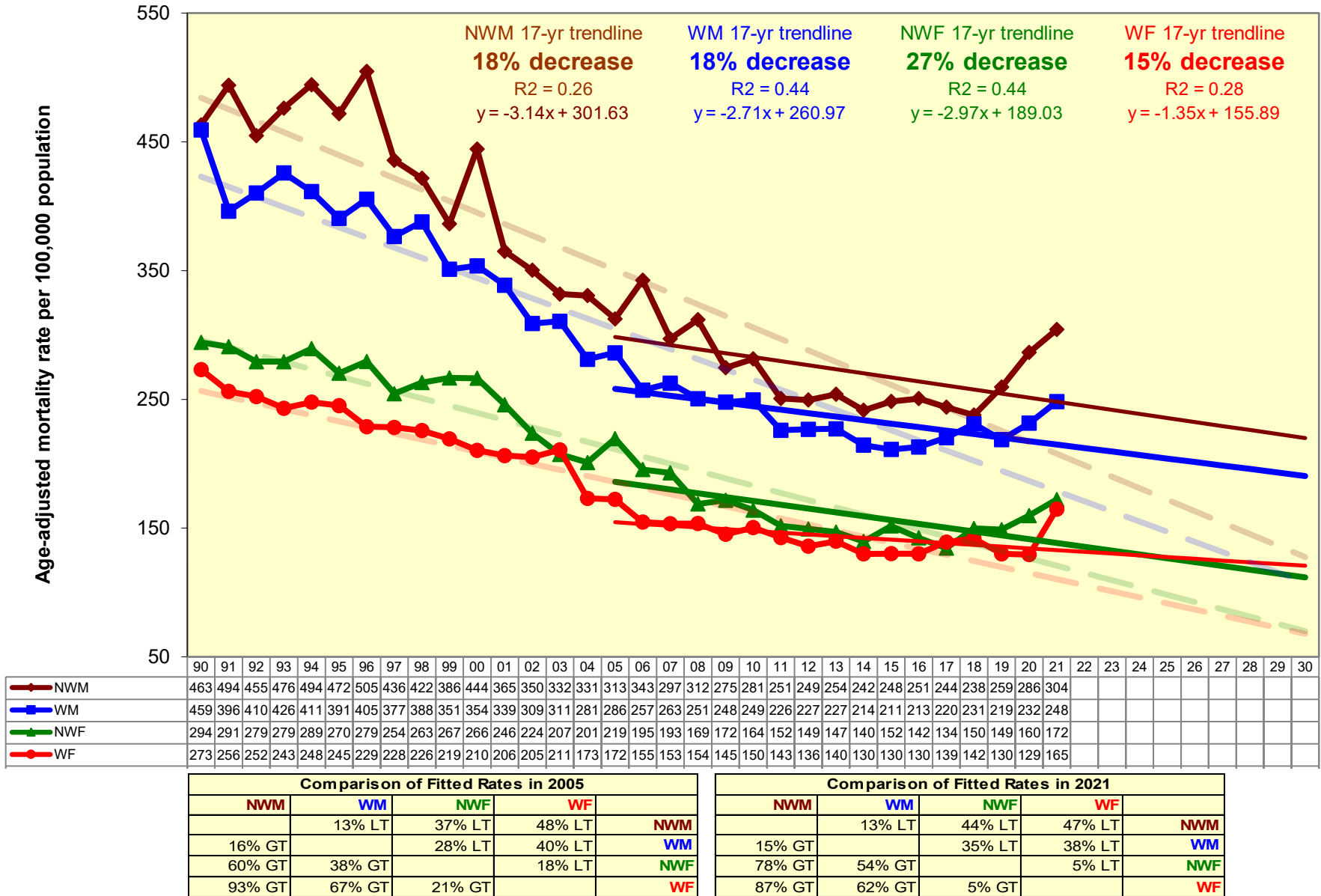




Figure 6.1 iv. Diseases of Heart:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

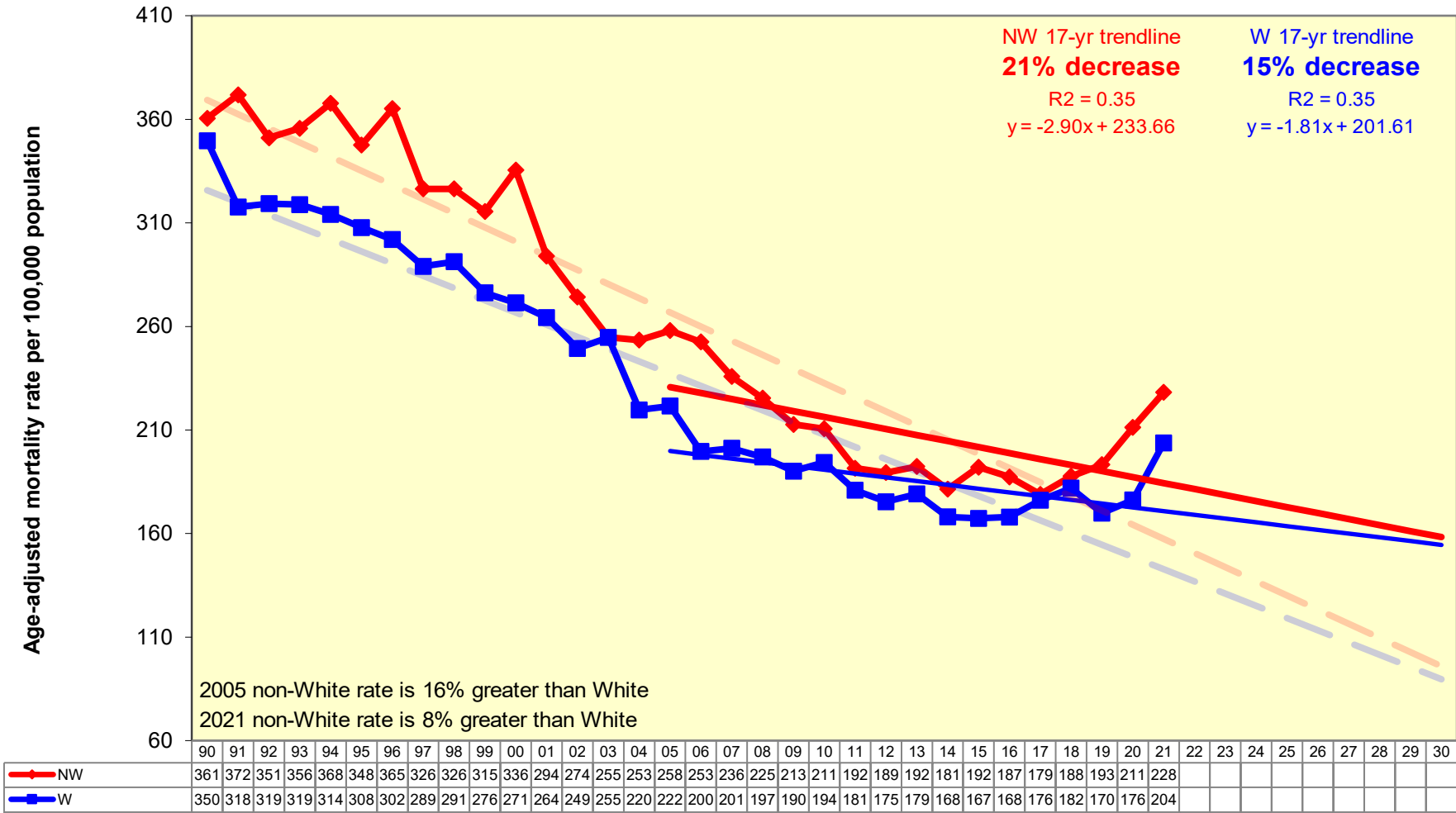
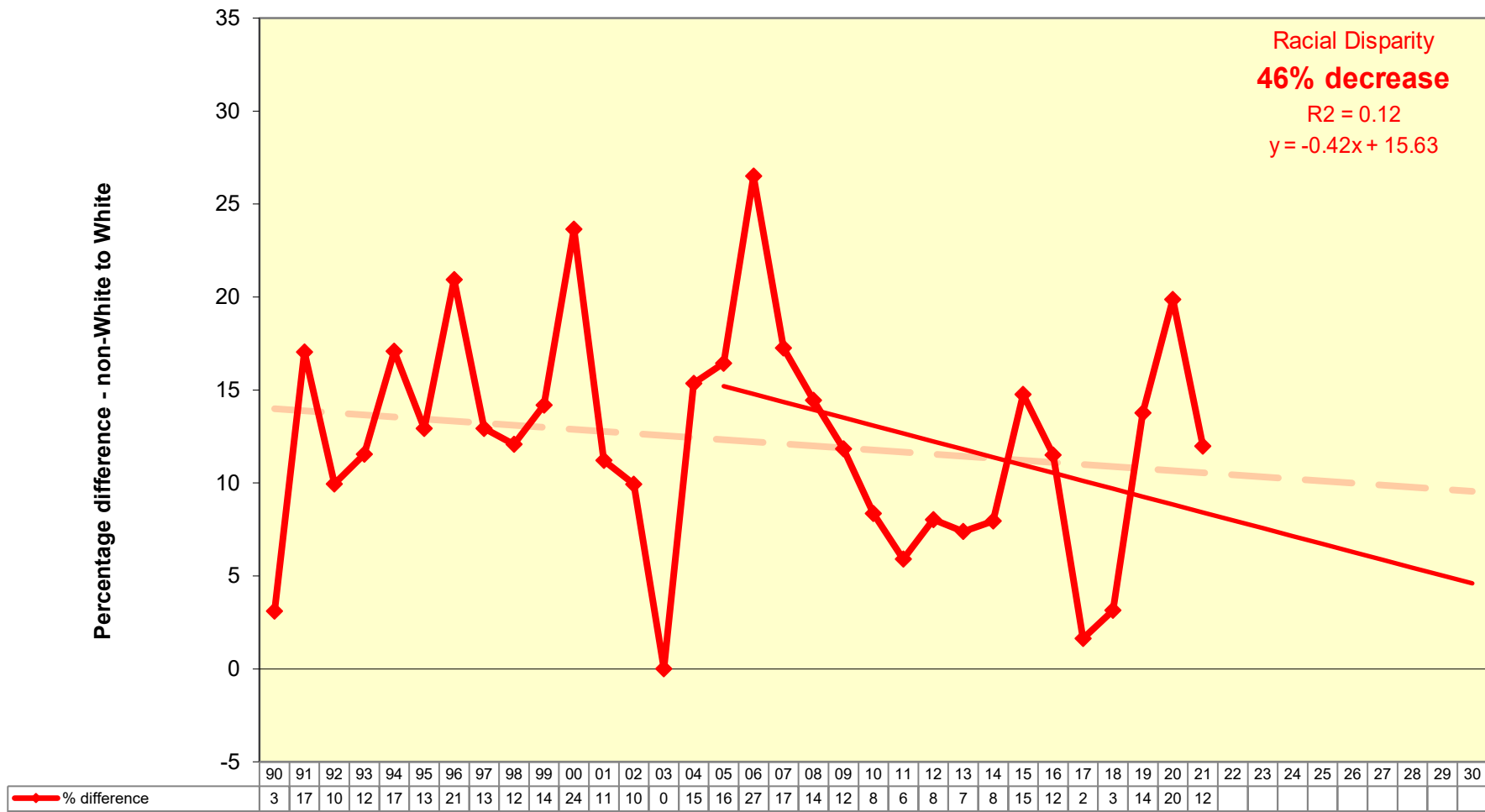


Figure 6.1 v. Diseases of Heart:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030



# Cerebrovascular Disease

- ENC's cerebrovascular disease mortality rate has turned up in recent years and is 34% greater than RNC. The rate trend has increased 23% over the 17-year period. The trends for RNC and NC are unreliable.
- The ENC age-adjusted cerebrovascular disease mortality rate trend has decreased 9% over the 17-year period. It remains 23% greater than the RNC rate trend.
- The rate for non-White females has decreased 16% over the 17-year period. The trends for non-White males, White males and White females are unreliable.
- The cerebrovascular disease mortality rate trend for non-Whites is decreasing but is still 42% greater than Whites in 2021. The White rate is unreliable.
- The 17-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 6.2 i. Cerebrovascular Disease:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

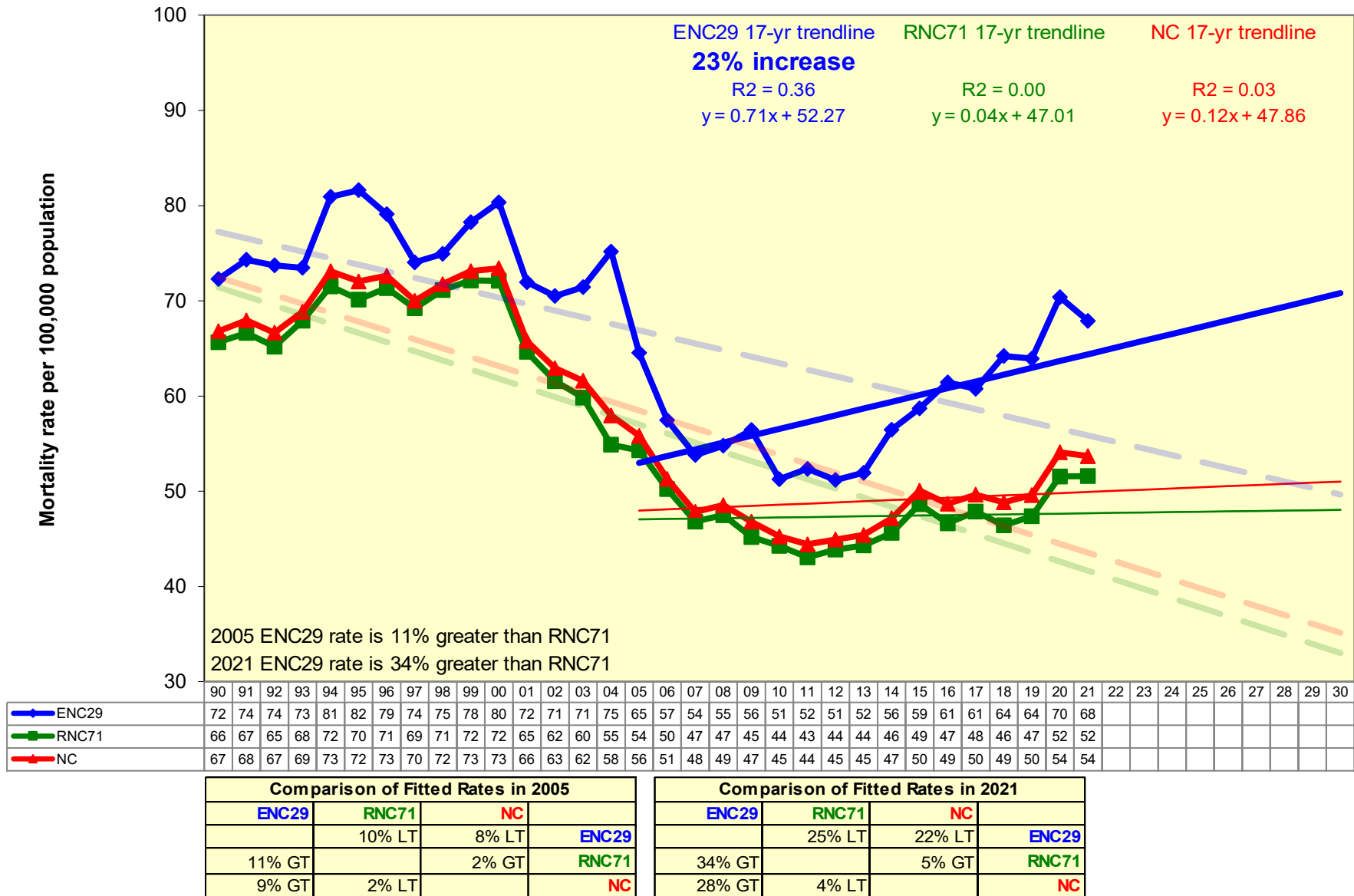


Figure 6.2 ii. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

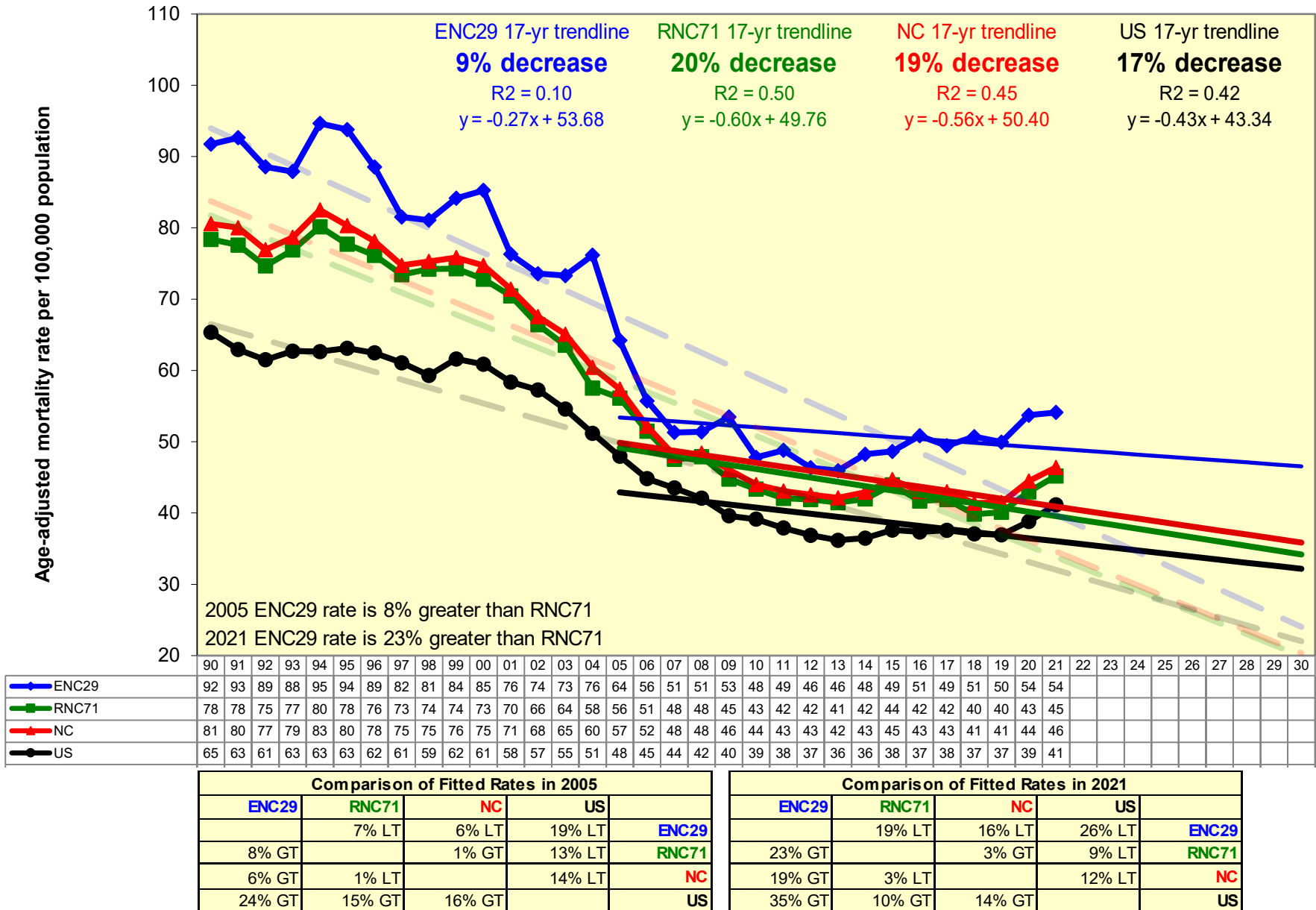


Figure 6.2 iii. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

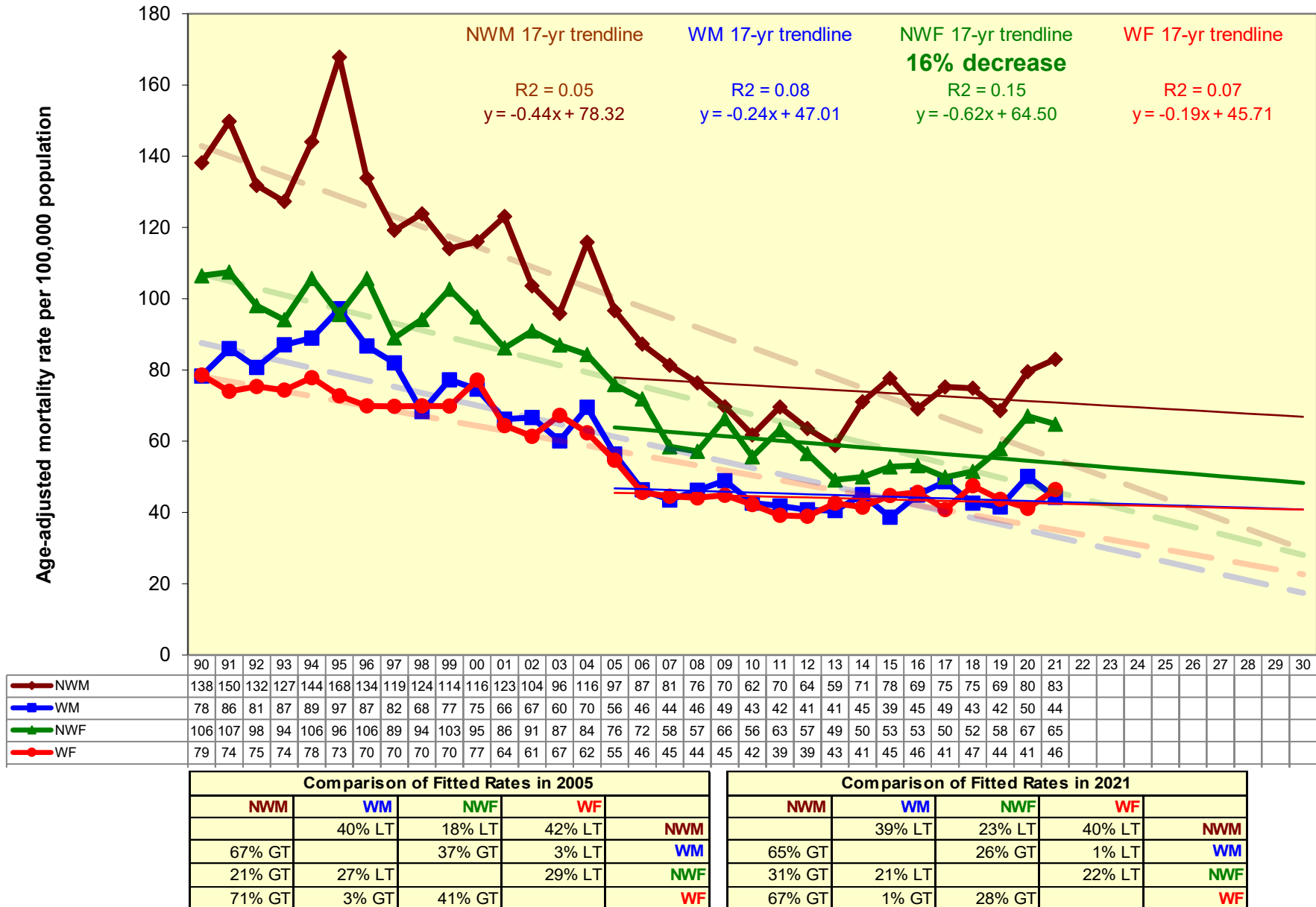


Figure 6.2 iv. Cerebrovascular Disease:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

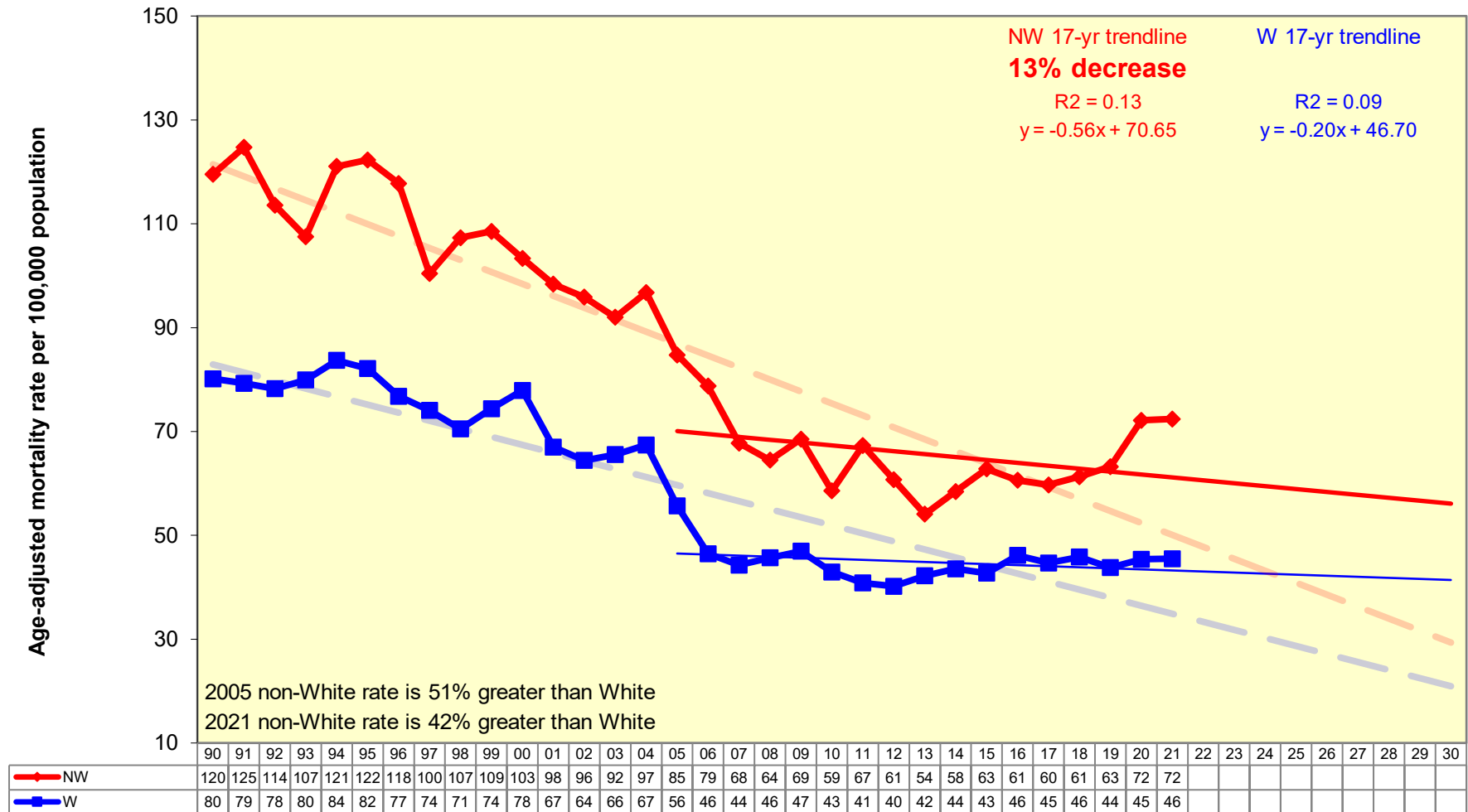
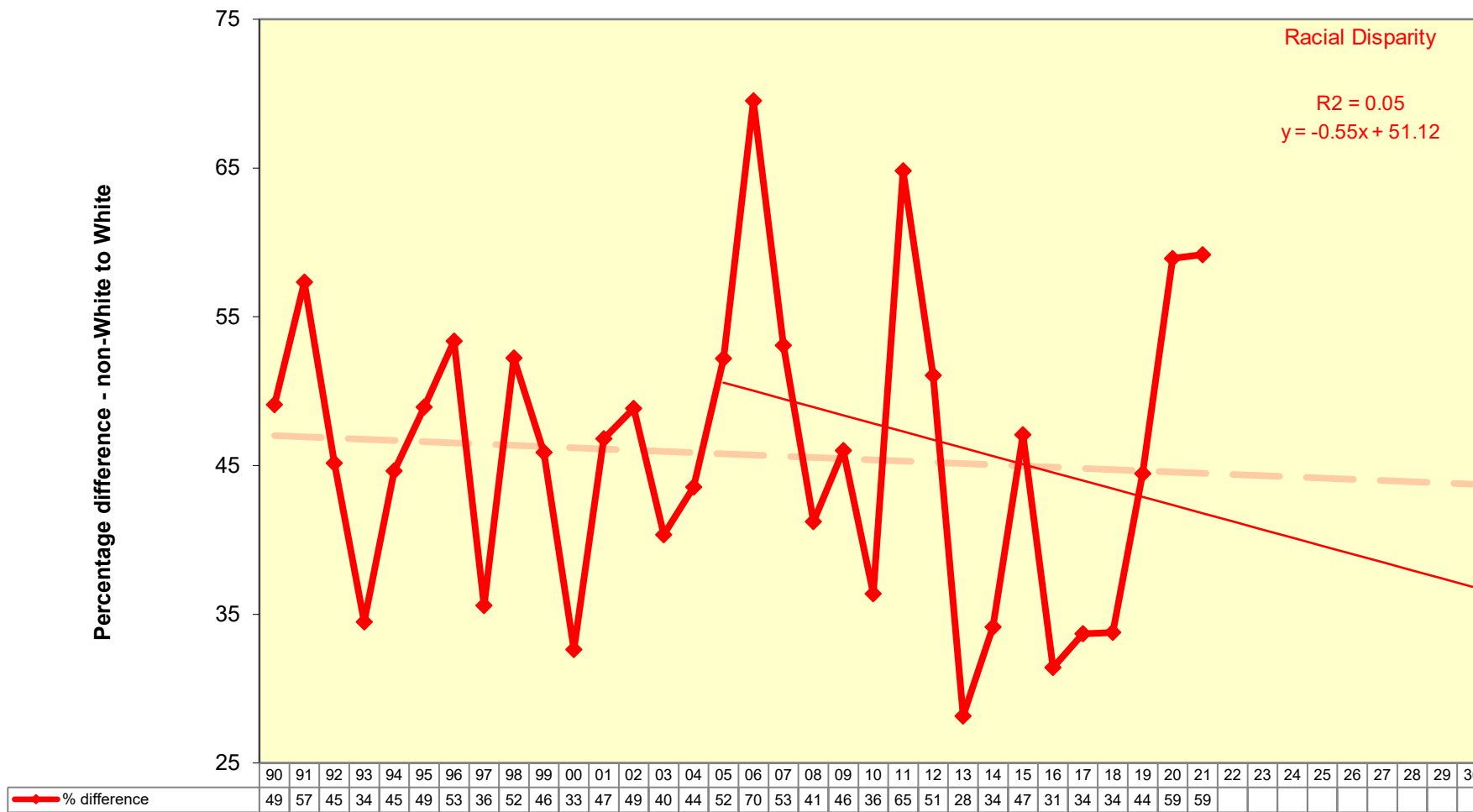


Figure 6.2 v. Cerebrovascular Disease:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030





# All Other Unintentional Injuries and Adverse Effects

- The mortality rate trend for unintentional injuries and adverse effects shows a sharp increase in ENC (201% over 17 years). The trends for RNC and NC are also up sharply.
- The age-adjusted mortality rate trends for ENC, RNC, NC, and the US are all increasing. During the last 17 years the ENC rate has increased 200% and it is now 10% greater than RNC.
- The trends are increasing for all groups, but the White male rate is the highest and shows the greatest increase (222% over 17 years).
- The White rate trend has increased 201% over the 17-year period. The non-White rate is 32% less than the White rate and increased 203% over the period.
- Over the 17-year period the racial disparity trend line is flat and 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 6.3 iii. All Other Unintentional Injuries and Adverse Effects:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

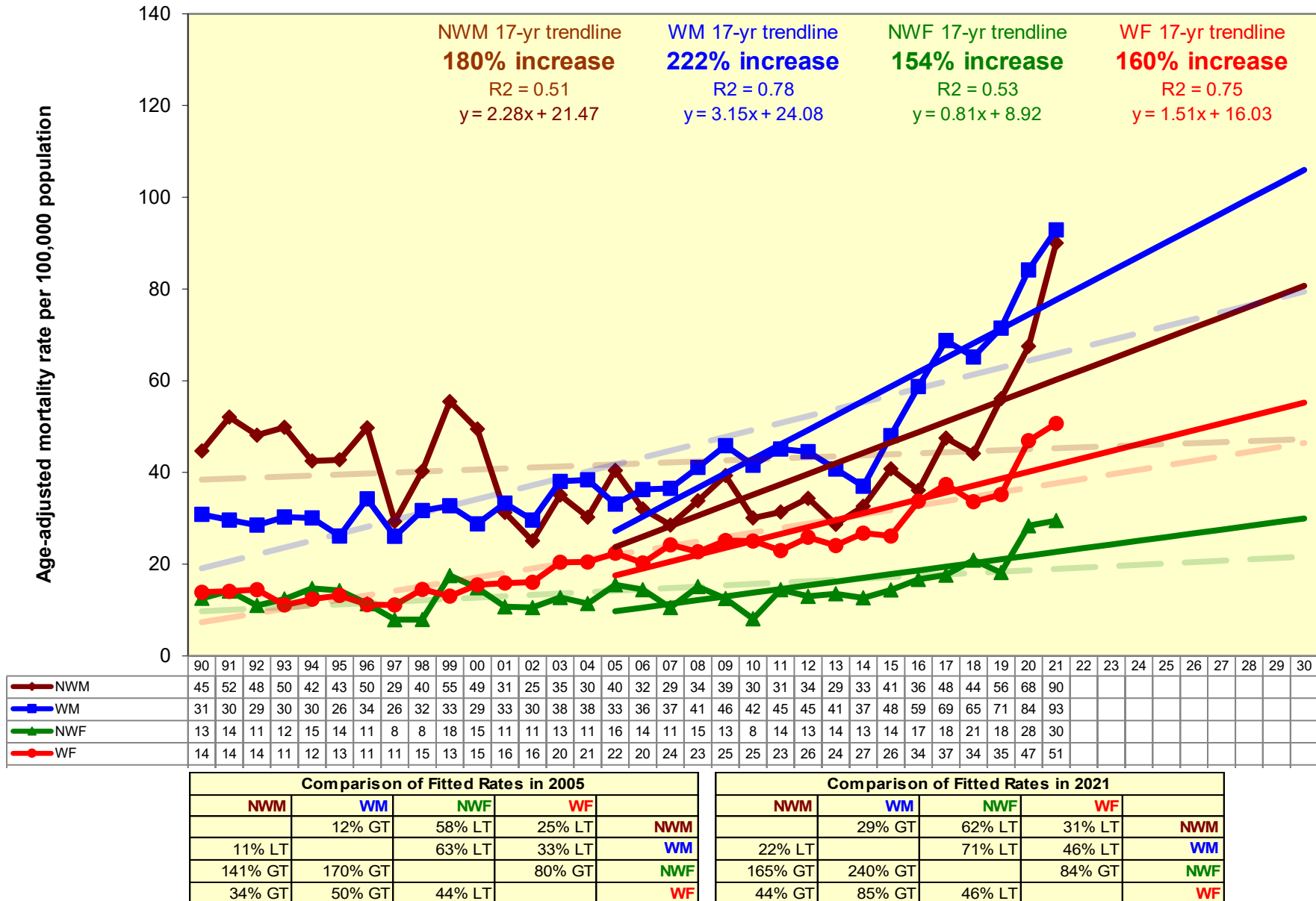


Figure 6.3 iv. All Other Unintentional Injuries and Adverse Effects:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

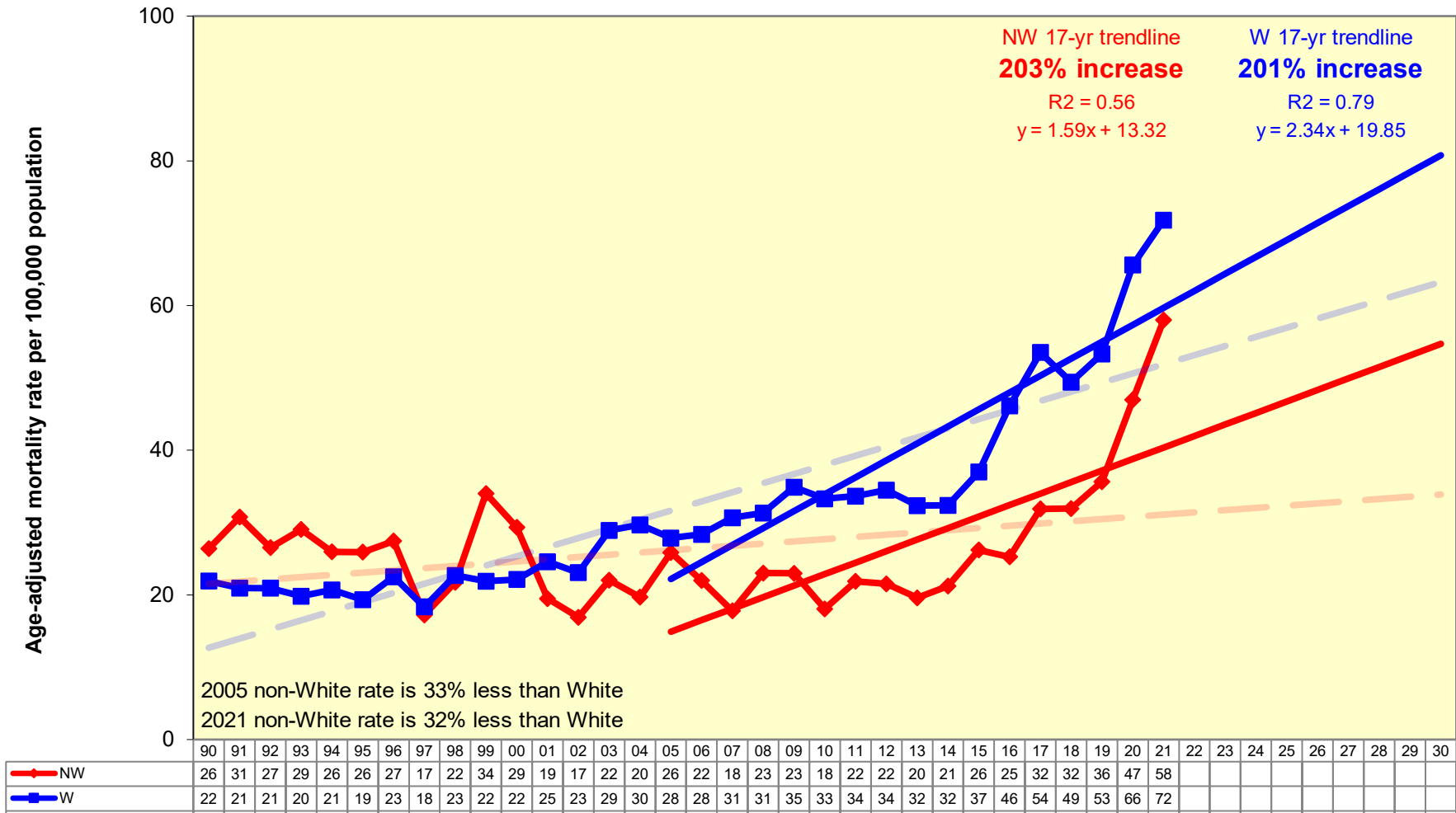
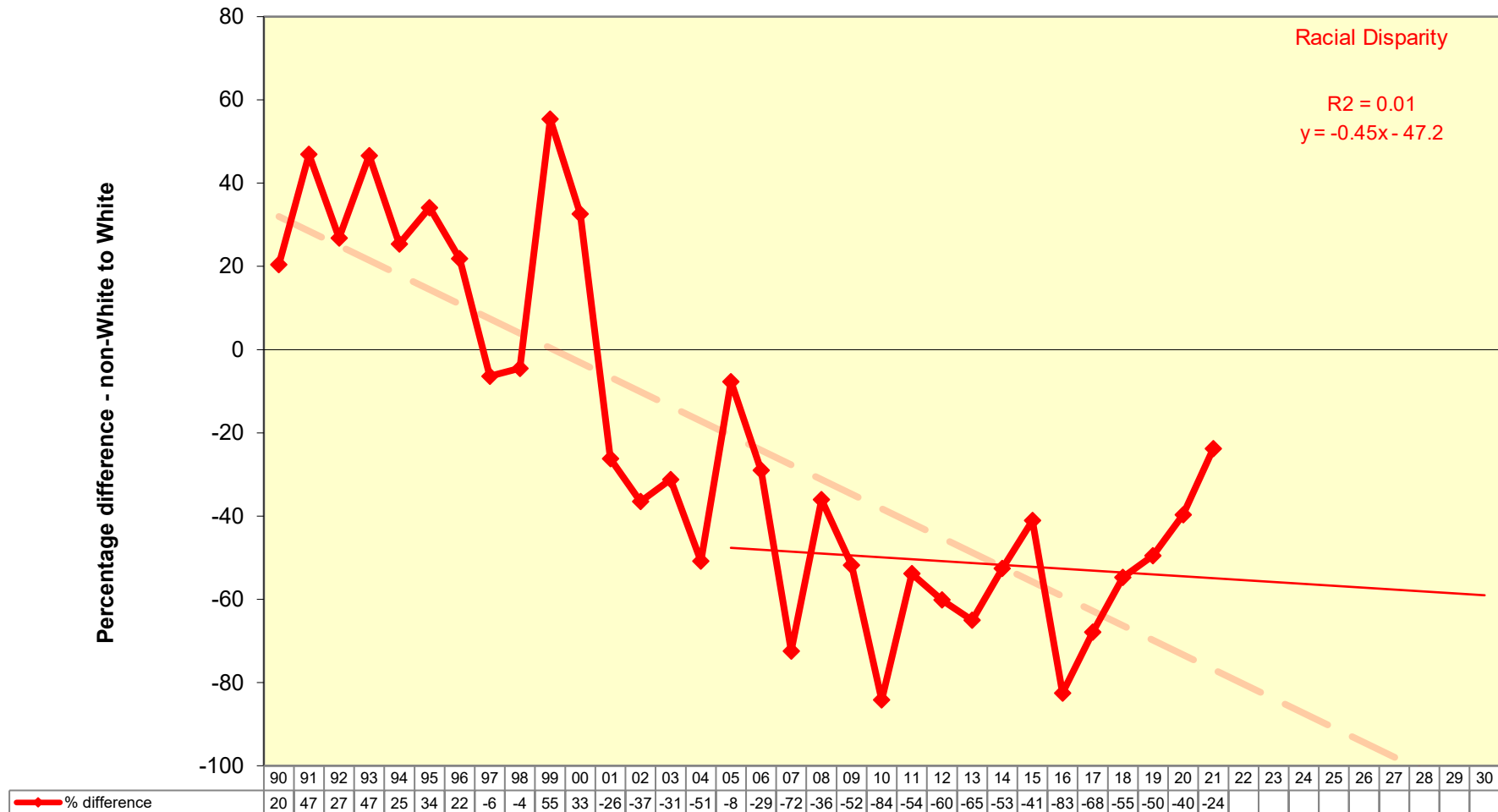


Figure 6.3 v. All Other Unintentional Injuries and Adverse Effects:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030



# Cancer—Trachea, Bronchus, Lung

- The 17-year trend line for cancer-TBL for ENC has decreased 15% over the period. The ENC rate for 2021 is 23% greater than the rate for RNC.
- In 2021 the age-adjusted rate for ENC is 15% higher than RNC. The 17-year trend for ENC has decreased 38%.
- The mortality rate trends for White and non-White males are decreasing and have converged. The rate for non-White females is 32% less than the rate for White females.
- The non-White mortality rate trend for this cancer is consistently lower than the White rate (17% less than Whites). Both trends are decreasing over the 17-year period, but non-White is decreasing more quickly.
- 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. Cancer - Trachea, Bronchus, Lung:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

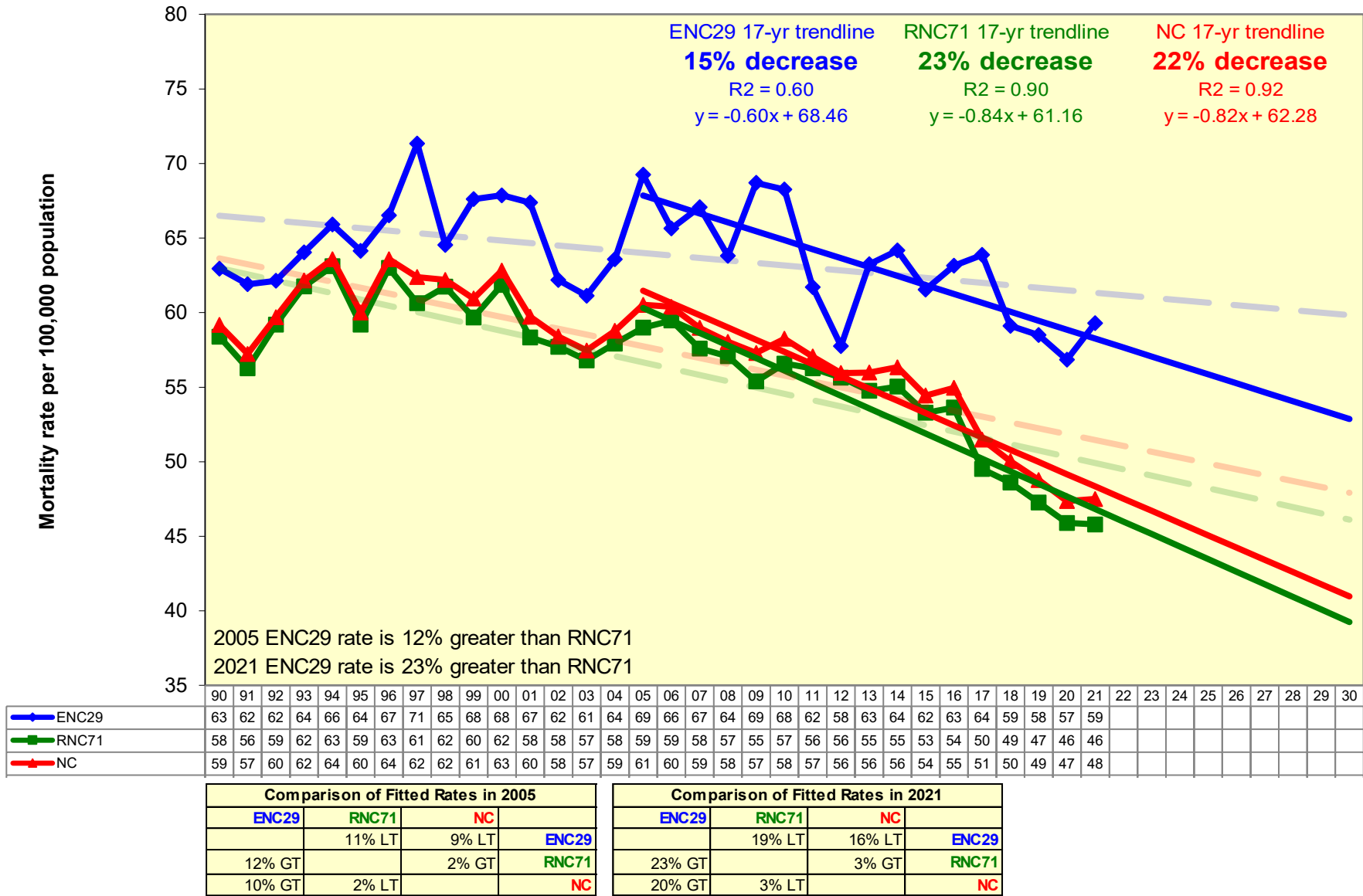




Figure 6.4 ii. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1990-2021 with projections to 2030

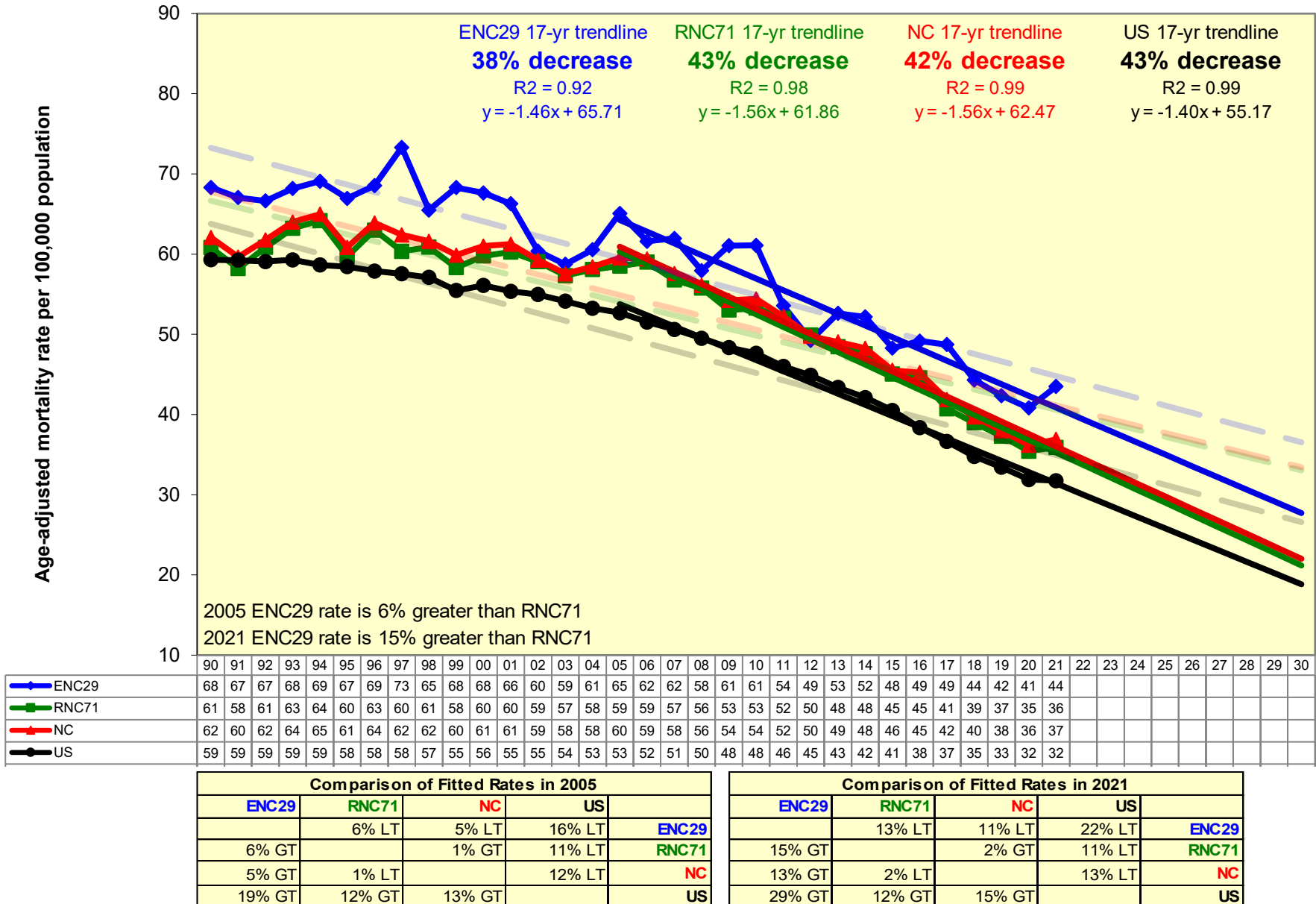


Figure 6.4 iii. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

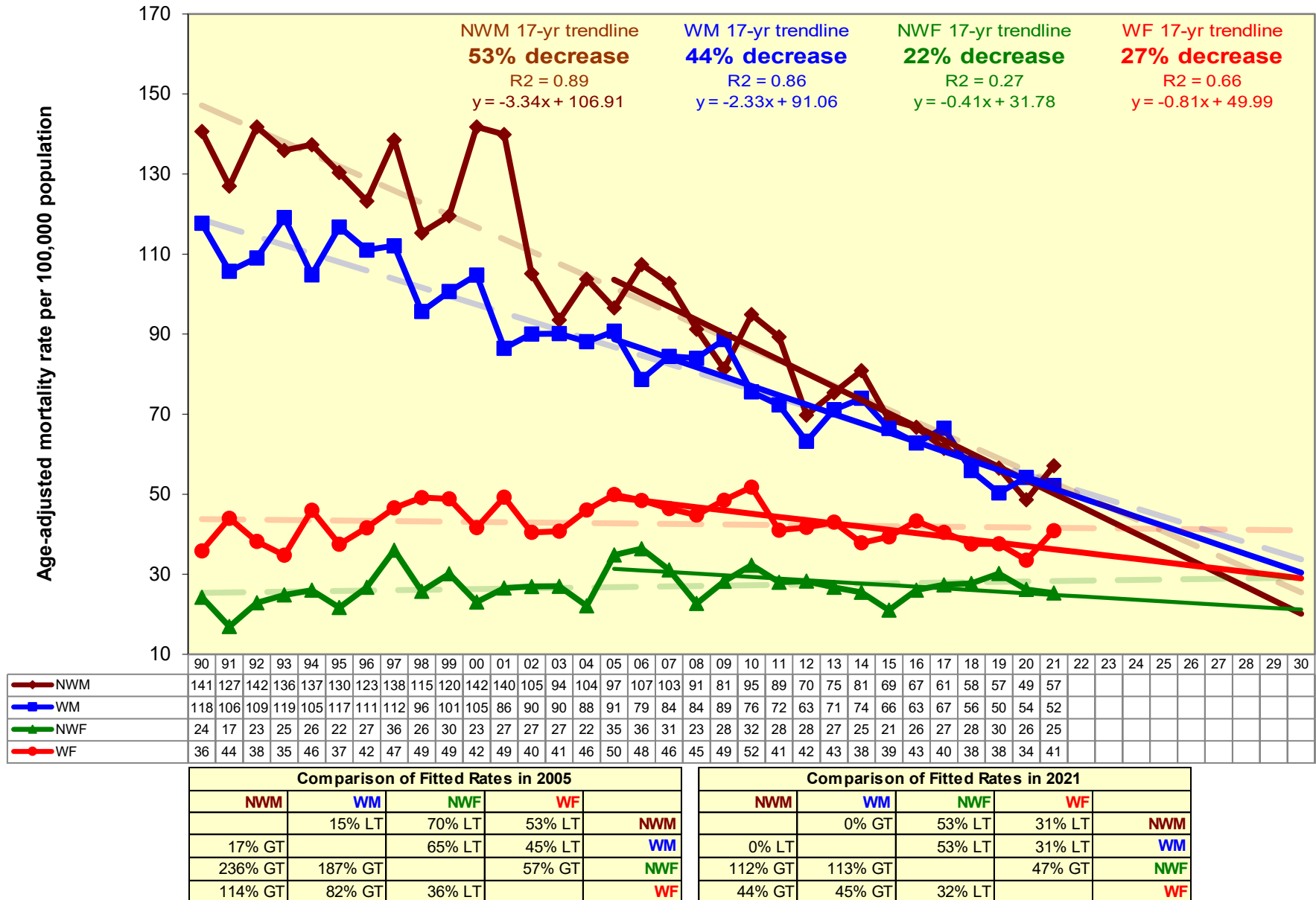


Figure 6.4 iv. Cancer - Trachea, Bronchus, Lung:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

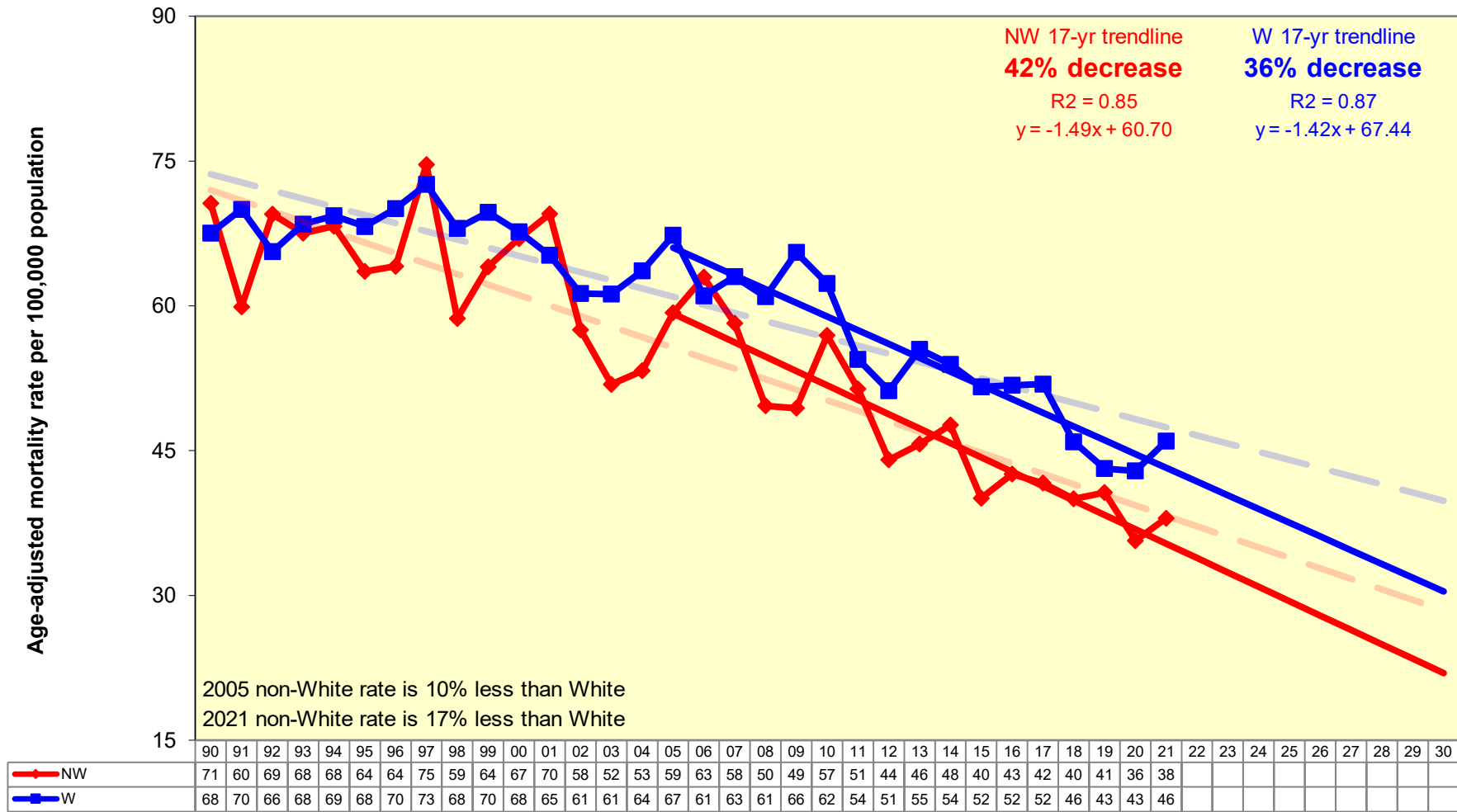
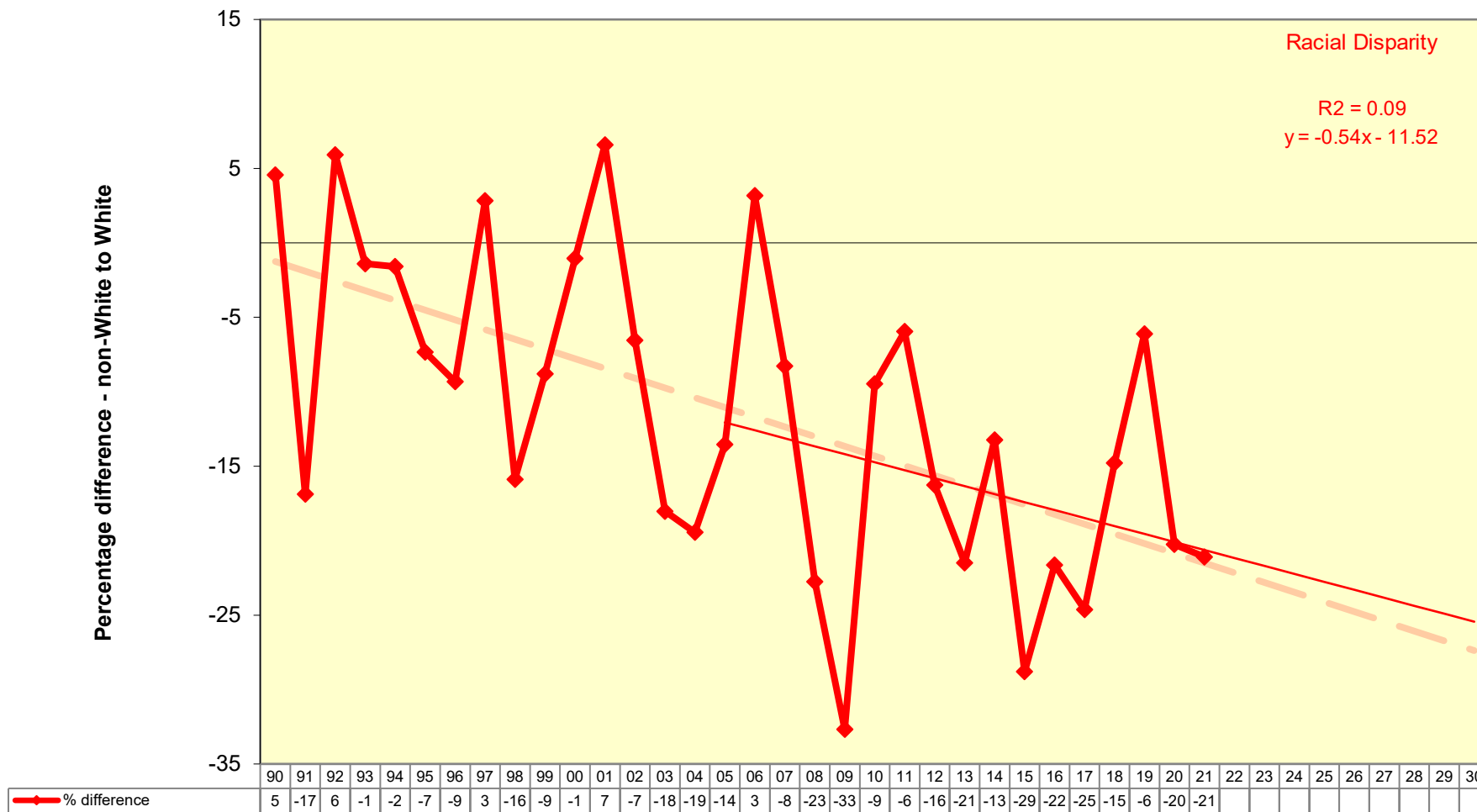


Figure 6.4 v. Cancer - Trachea, Bronchus, Lung:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030



# Chronic Lower Respiratory Diseases

- The 32-year ENC trend for CLRD is increasing, as is the 17-year trend. In 2021 the ENC rate is 9% greater than the RNC rate.
- The ENC age-adjusted rate trend is converging with the RNC and NC trends. All three are higher than the US rate trend.
- The rate trend for White males is the highest but is decreasing. The rate for non-White males has decreased 28% over the 17-year period in a moderately reliable trend and is now below the rate for White females, which is unreliable. The rate for non-White females is the lowest and is increasing in a moderately reliable trend.
- The 17-year trend for Whites is higher than the non-White rate, but both rates are relatively flat. The non-White rate is unreliable.
- The disparity trend between White and non-White 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. Chronic Lower Respiratory Diseases:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

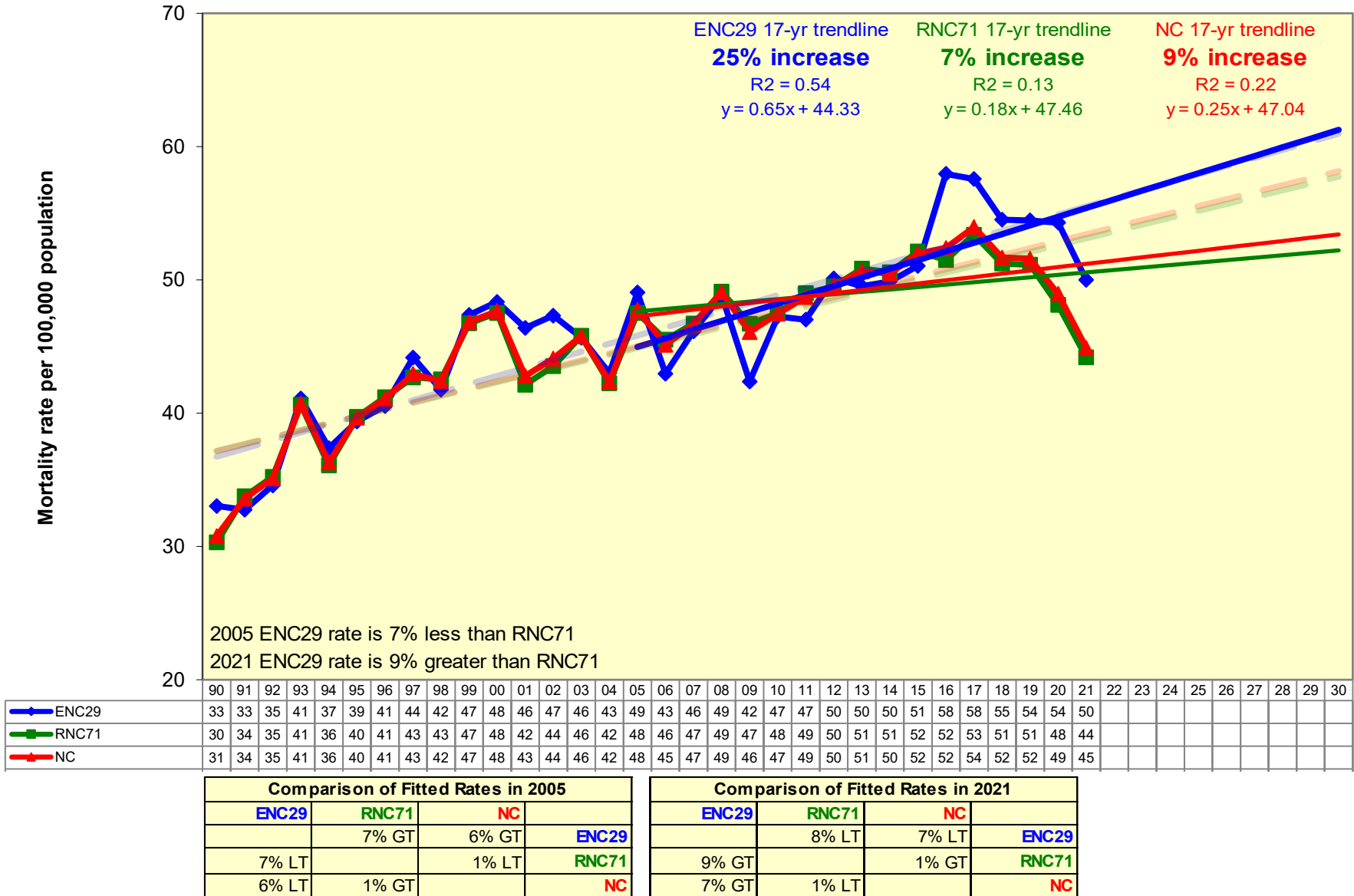


Figure 6.5 ii. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

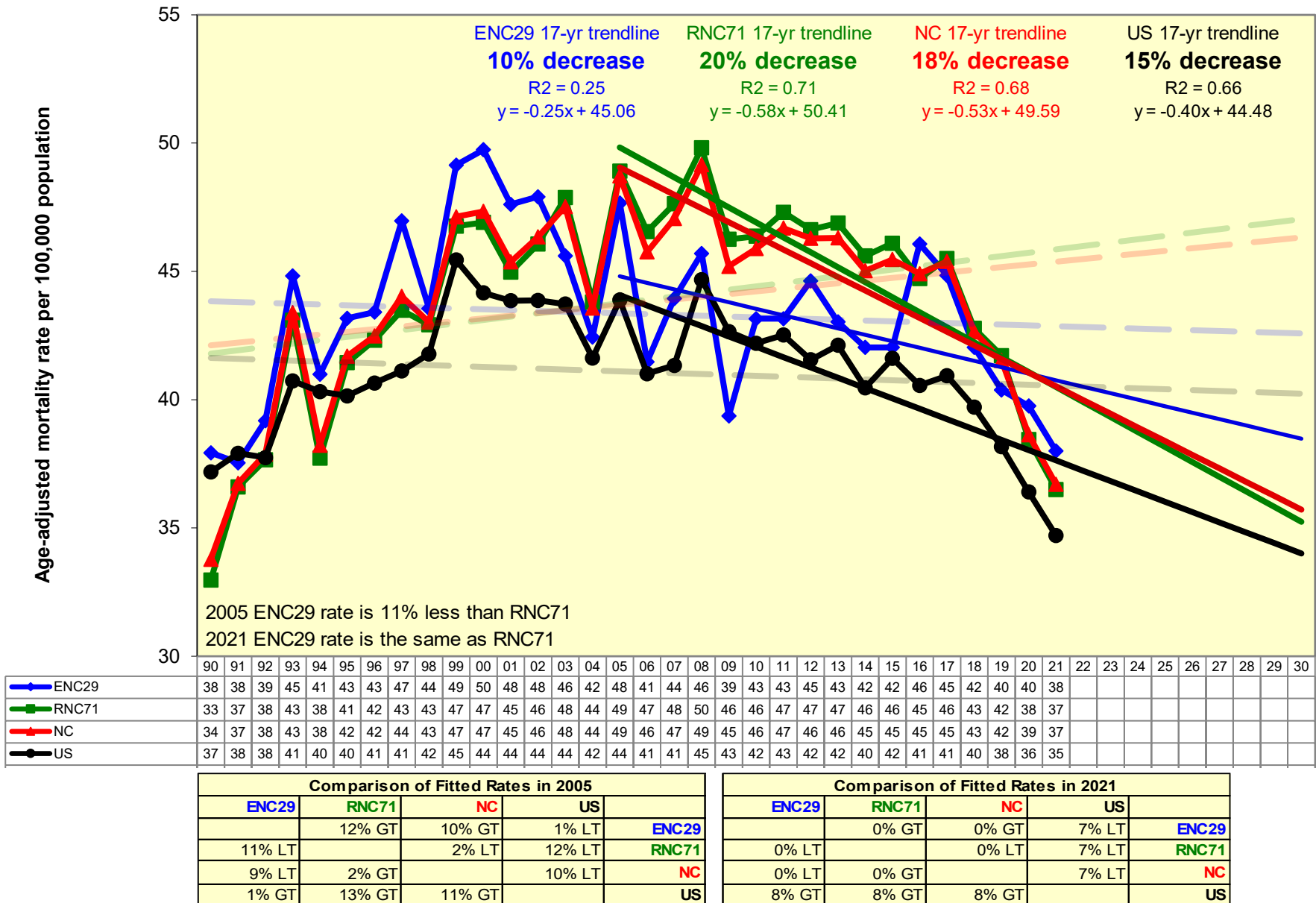


Figure 6.5 iii. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

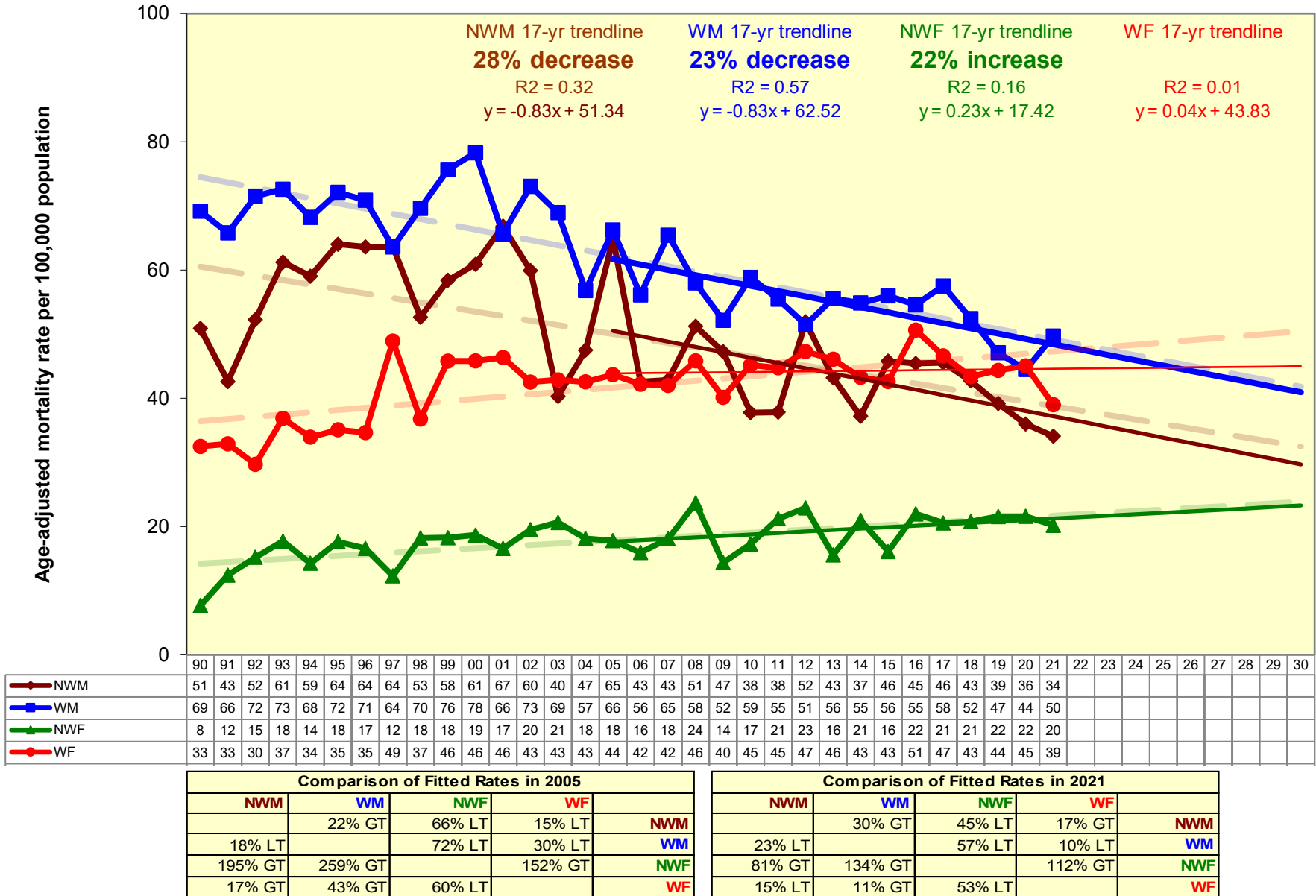




Figure 6.5 iv. Chronic Lower Respiratory Diseases:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

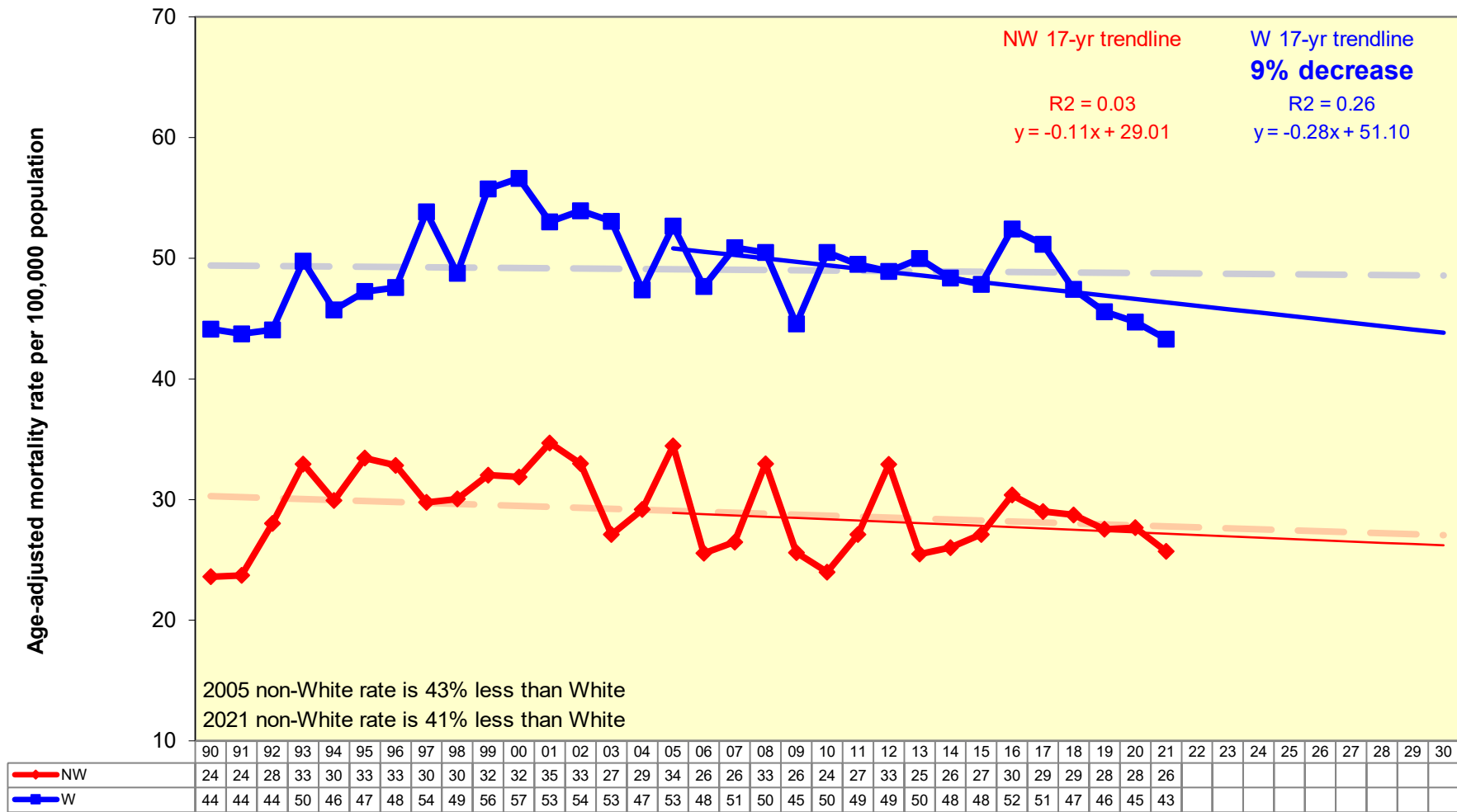
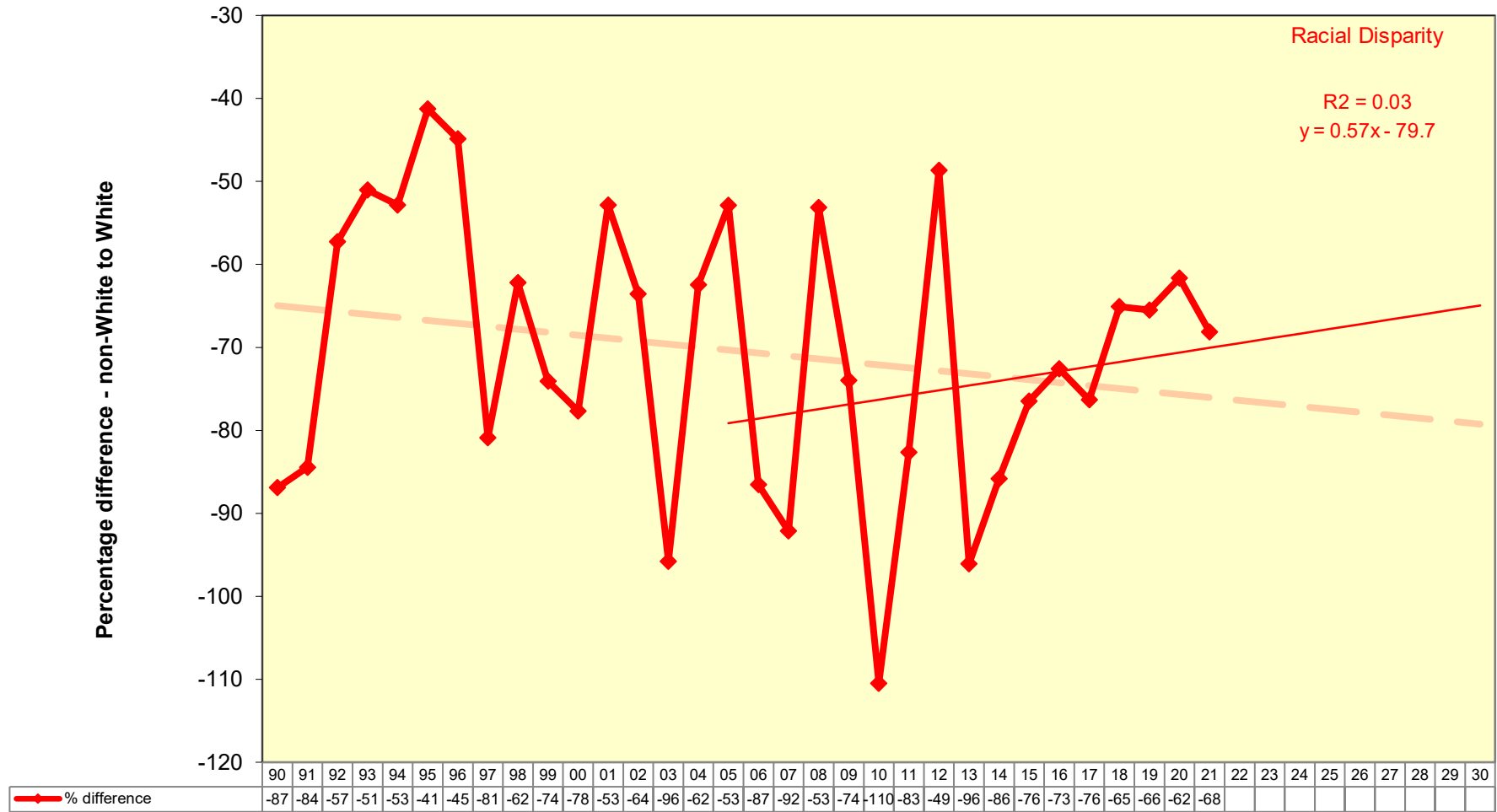


Figure 6.5 v. Chronic Lower Respiratory Diseases:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030



# Diabetes Mellitus

- The 17-year rate trend for ENC has increased 52% over the period and is 43% greater than the RNC rate.
- In 2021, the ENC 17-year rate trend for age-adjusted diabetes mellitus is 36% greater than RNC, and is increasing in a moderately reliable trend.
- The non-White male 17-year rate has increased by 31%. The non-White female trend is unreliable. The White male and White female trends are lower. The trend for white females is also unreliable.
- In 2021 the non-White mortality 17-year rate trend is 124% greater than the White, but both are flat. The non-White trend is unreliable.
- The 17-year 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 6.6 i. Diabetes Mellitus:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

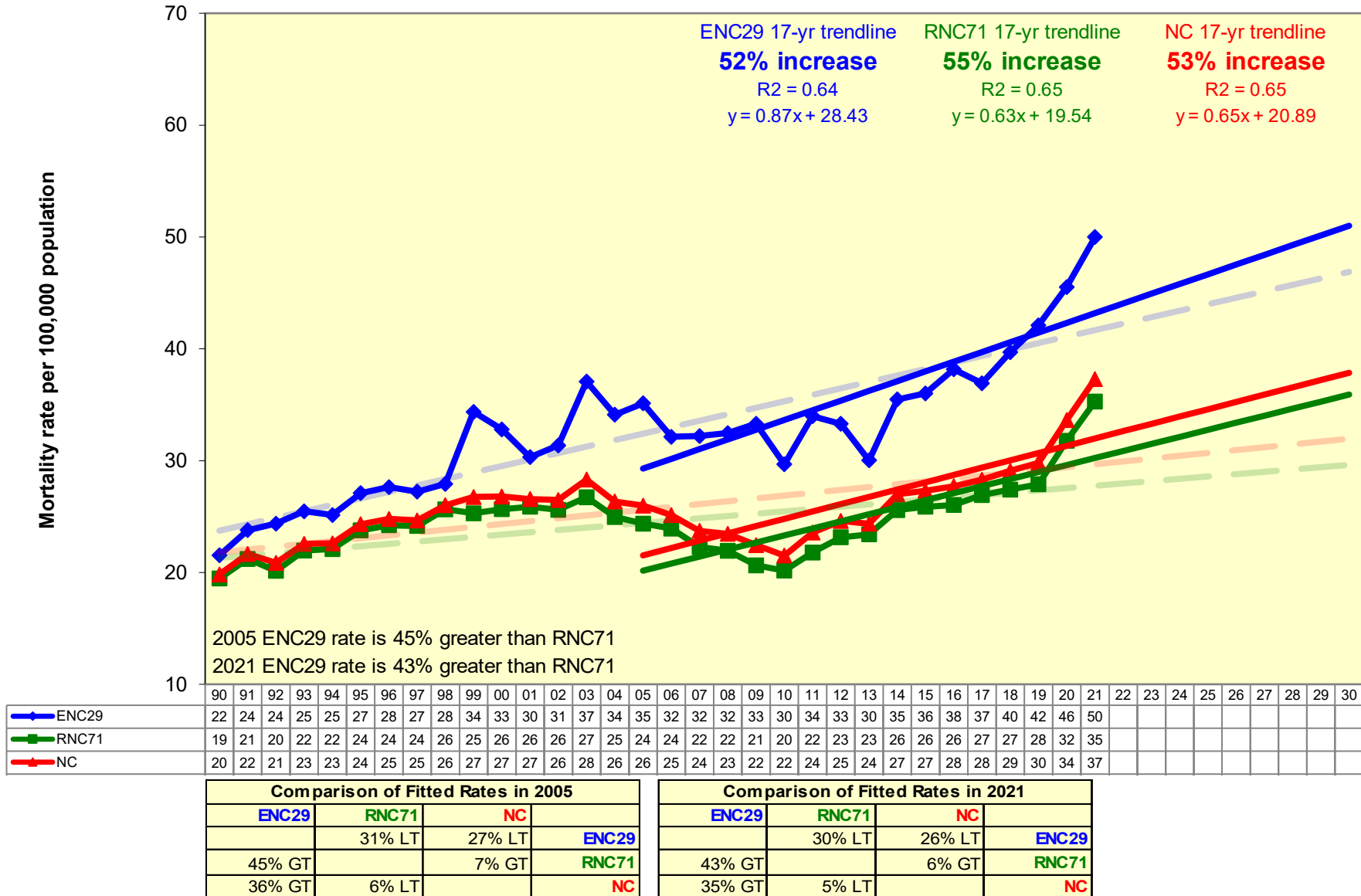


Figure 6.6 ii. Diabetes Mellitus:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

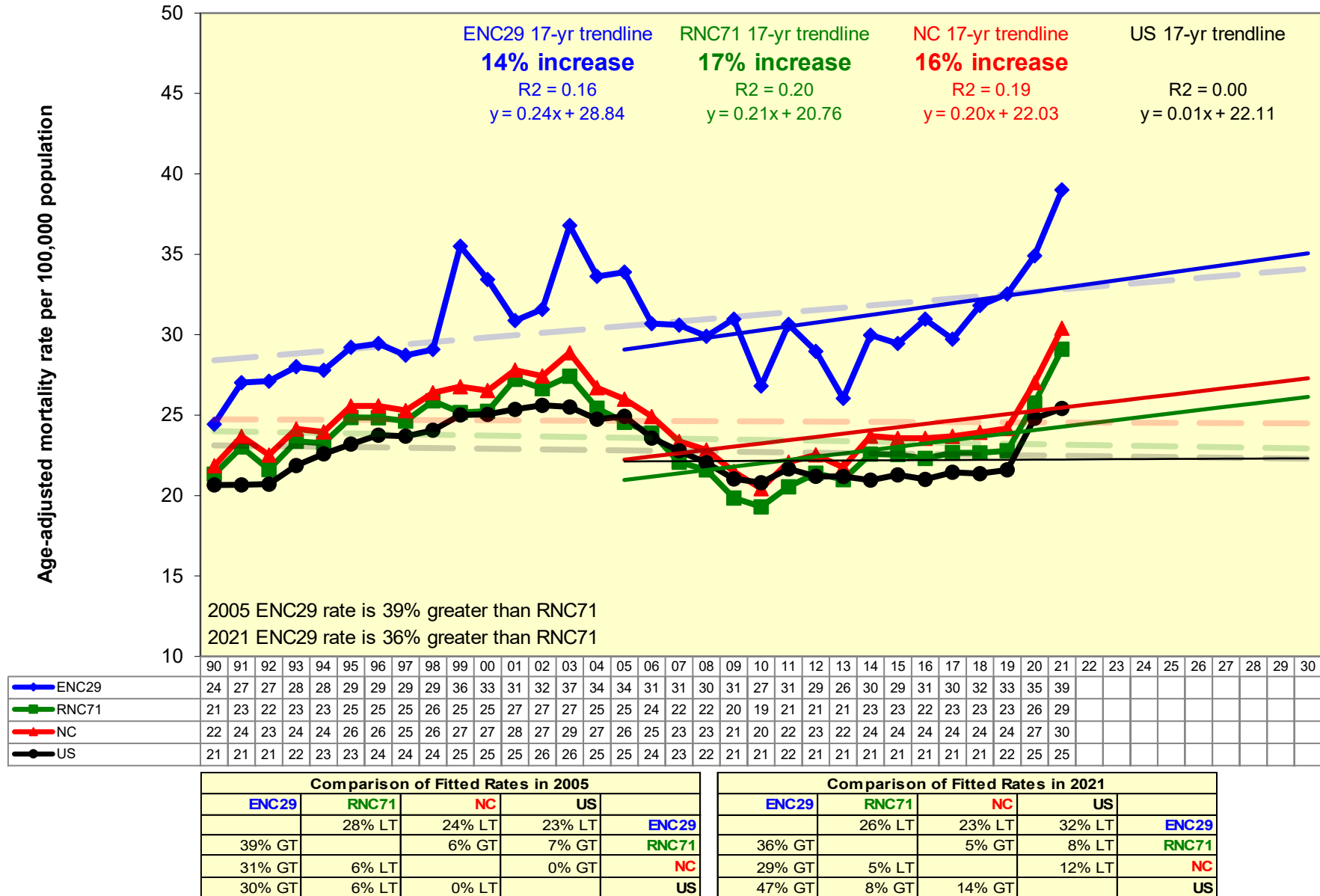


Figure 6.6 iii. Diabetes Mellitus:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

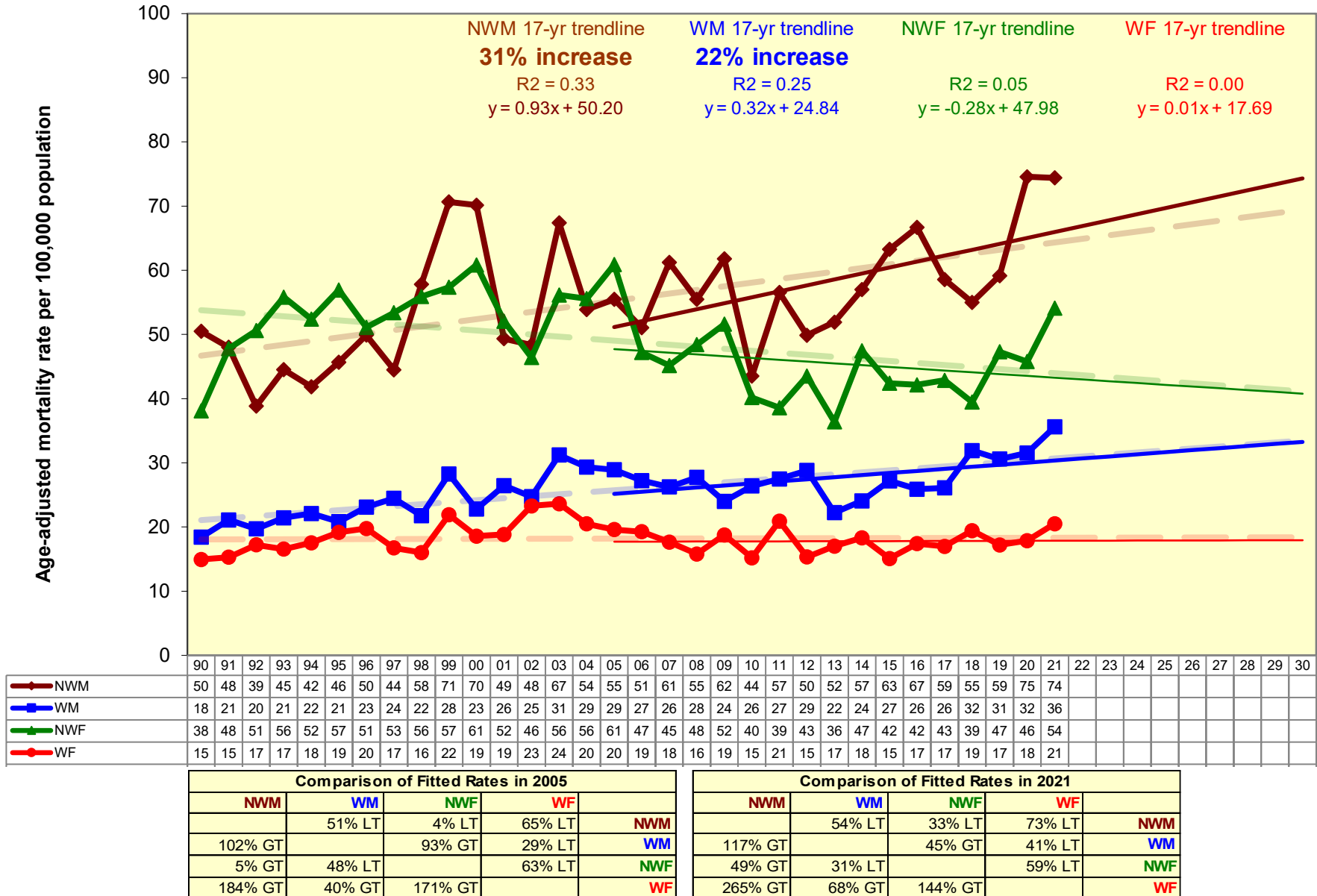


Figure 6.6 iv. Diabetes Mellitus:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

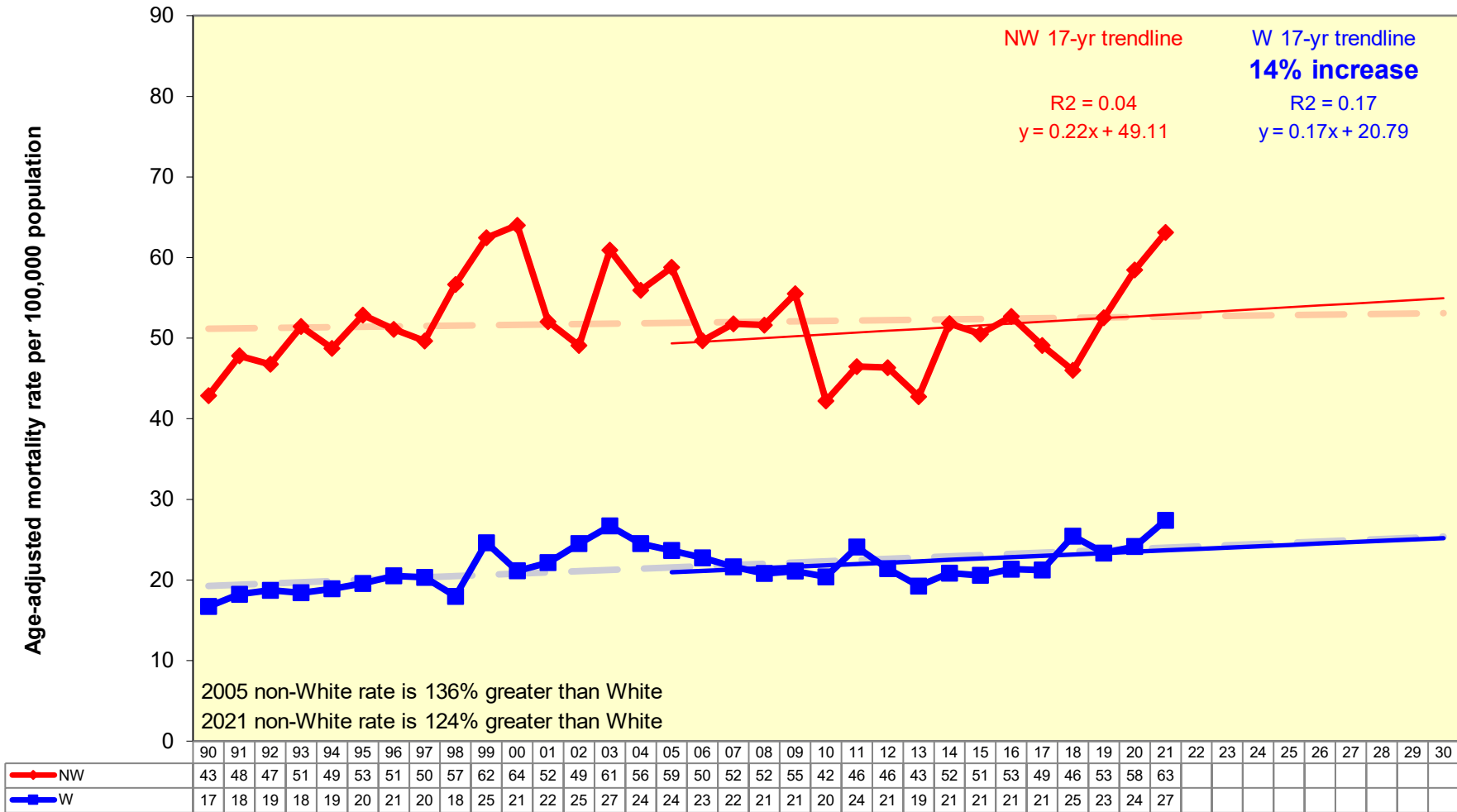
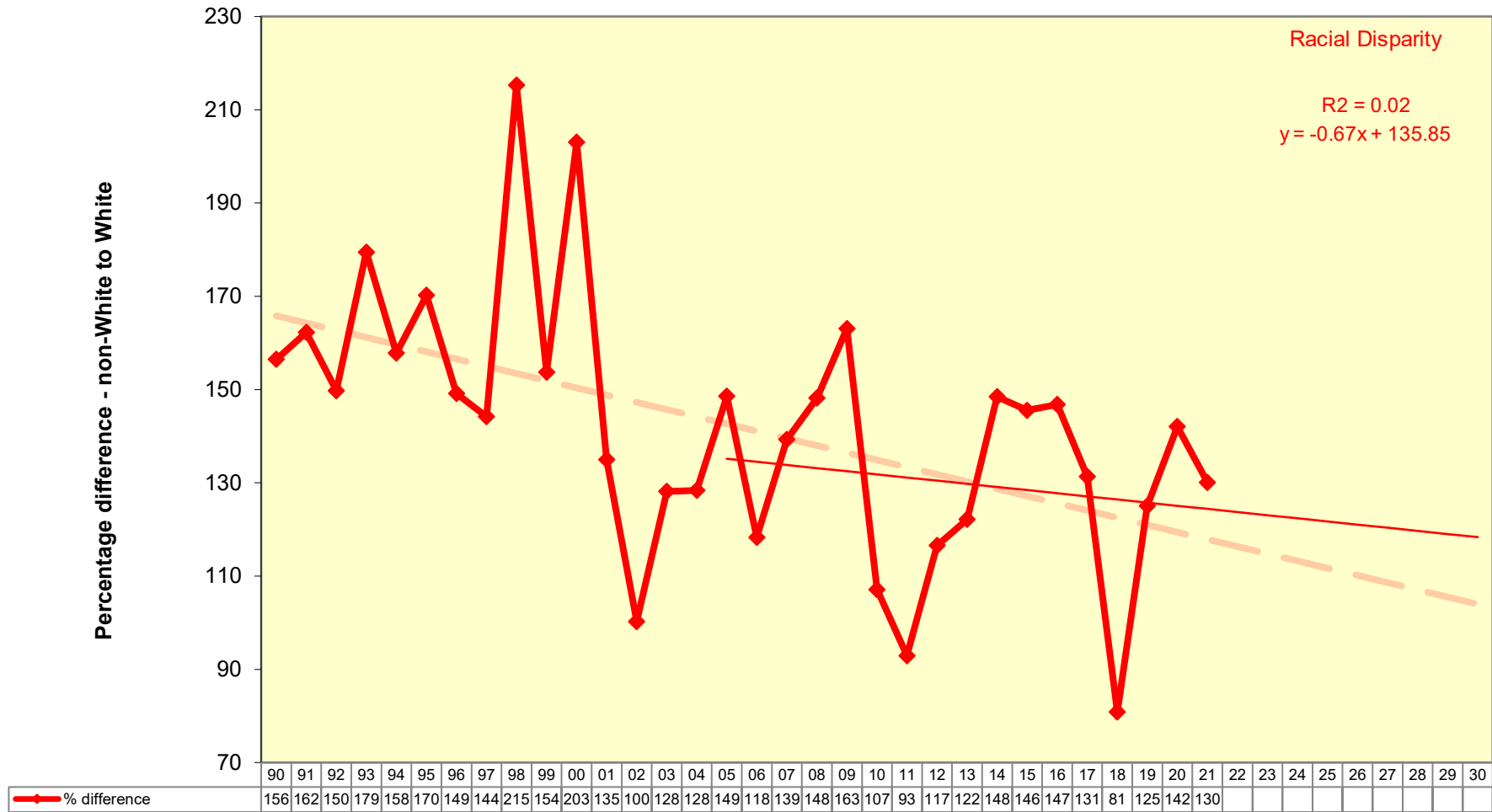


Figure 6.6 v. Diabetes Mellitus:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030





# Alzheimer's Disease

- The Alzheimer's mortality rate trend for ENC shows a steep increase over the 17-year period (186%). ENC's rate of increase was larger than RNC and NC, and looks set to overtake the others.
- In 2021, the age-adjusted rate for ENC is 11% less than the rate for RNC. The ENC rate trend has increased 98% over the 17-year period and is 9% greater than the US rate.
- Rate trends are increasing for all groups, but non-White males and non-White females have the greatest rate of increase (123% and 151% over 17 years, respectively). The trends for White females and non-White females are the highest.
- The White and non-White rate trends have converged. Both trends are increasing over the 17-year period.
- The 17-year trend shows an 106% increase in racial disparity 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. Alzheimer's Disease:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

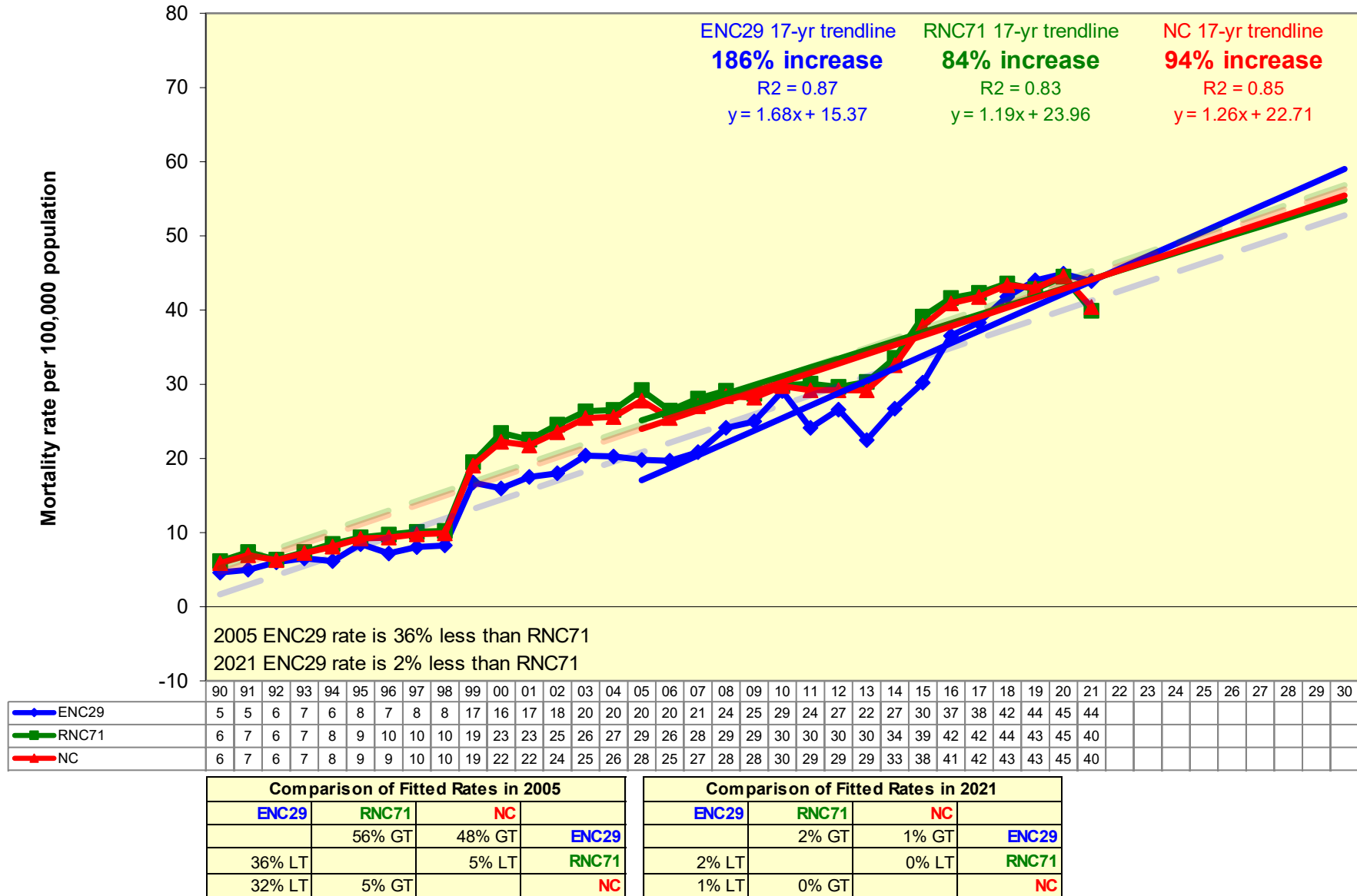


Figure 6.7 ii. Alzheimer's Disease:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

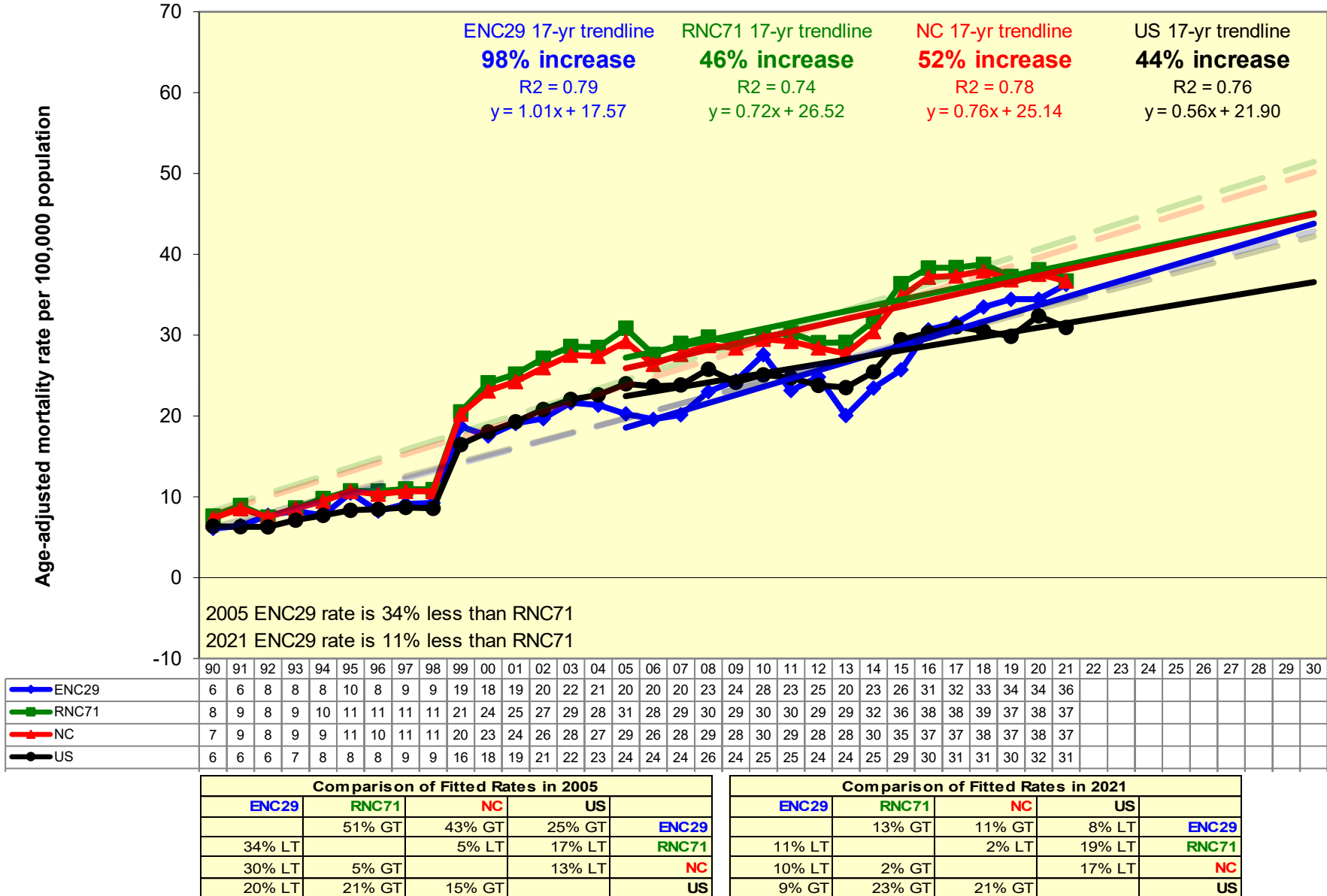


Figure 6.7 iii. Alzheimer's Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

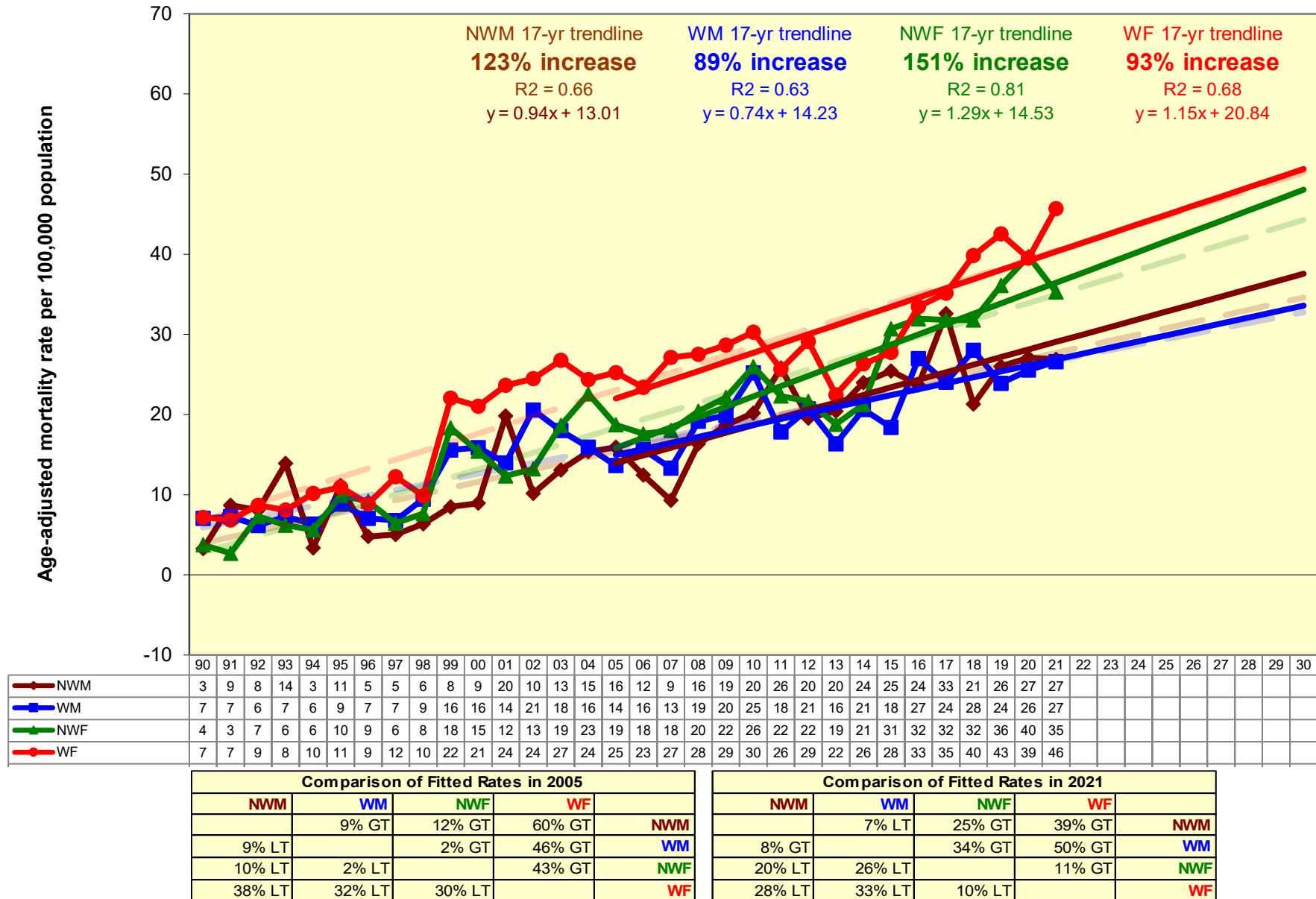


Figure 6.7 iv. Alzheimer's Disease:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

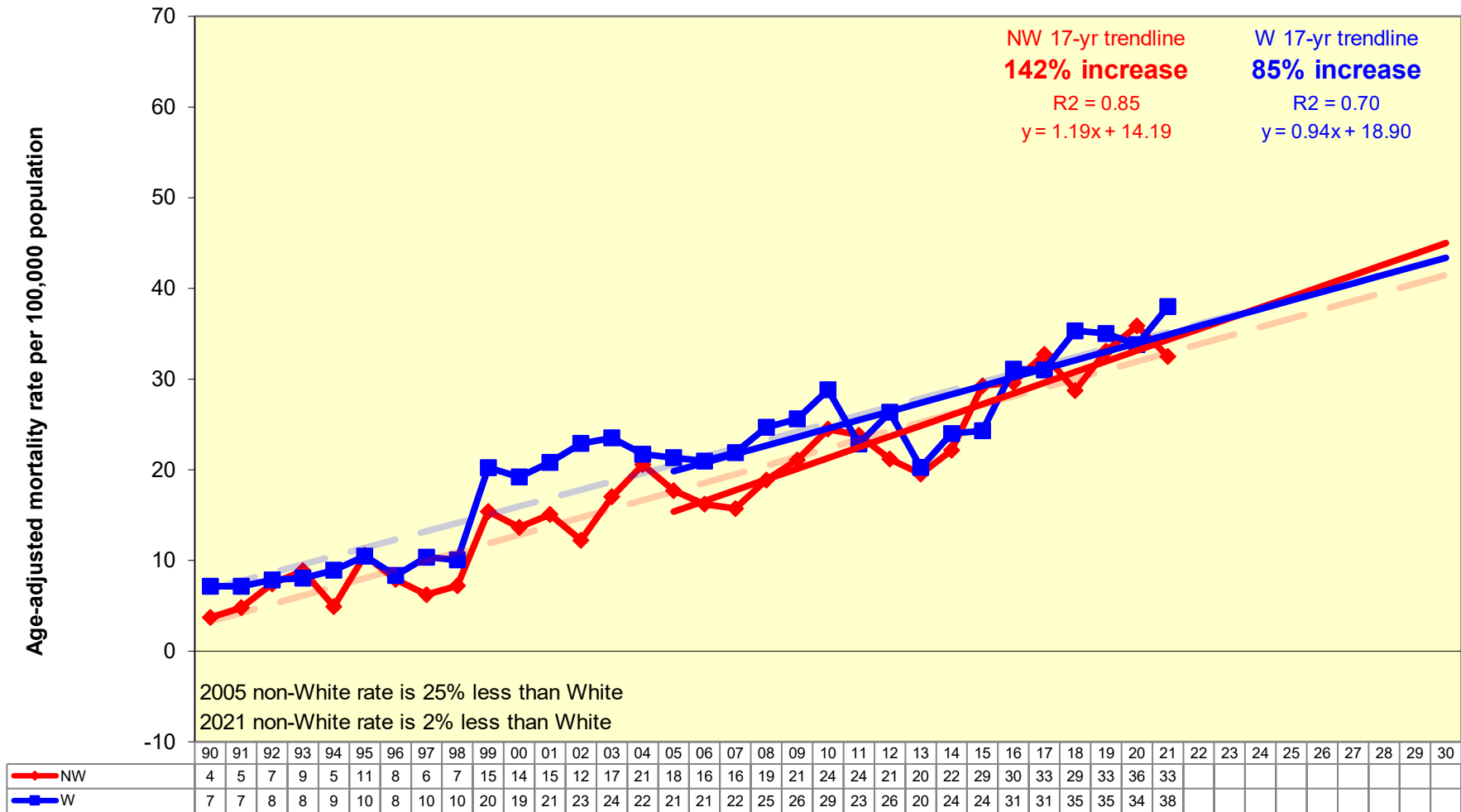
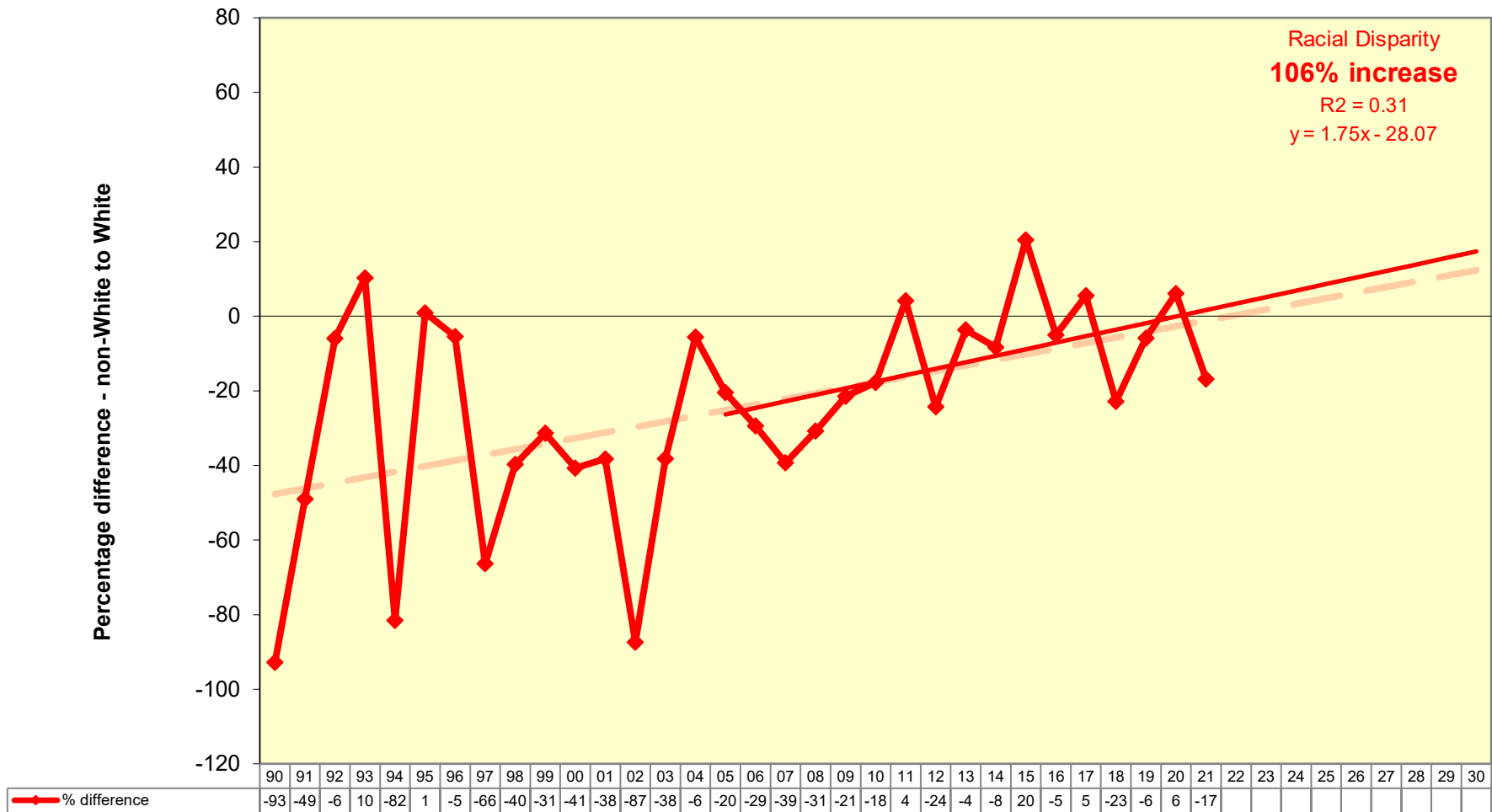


Figure 6.7 v. Alzheimer's Disease:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030



# Nephritis, Nephrotic Syndrome, and Nephrosis

- In 2021 ENC's rate trend for nephritis, nephrotic syndrome and nephrosis is 14% greater than RNC, but the trend is not reliable.
- With age-adjustment, the ENC rate trend has decreased 20% over the 17-year period. It is 5% greater than the RNC rate and 4% greater than the NC rate. They are projected to converge soon.
- The 17-year trends for non-White males and non-White females are the highest but have decreased 22% and 32% over the 17-year period. The non-White male trend in 2021 is 104% greater than the White male trend and 224% greater than the White female trend. All trends are decreasing except for White males, which is flat and unreliable.
- The non-White rate in 2021 is 114% greater than the White rate. It has decreased 27% over the 17-year period. The White rate has decreased 17%.
- 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. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

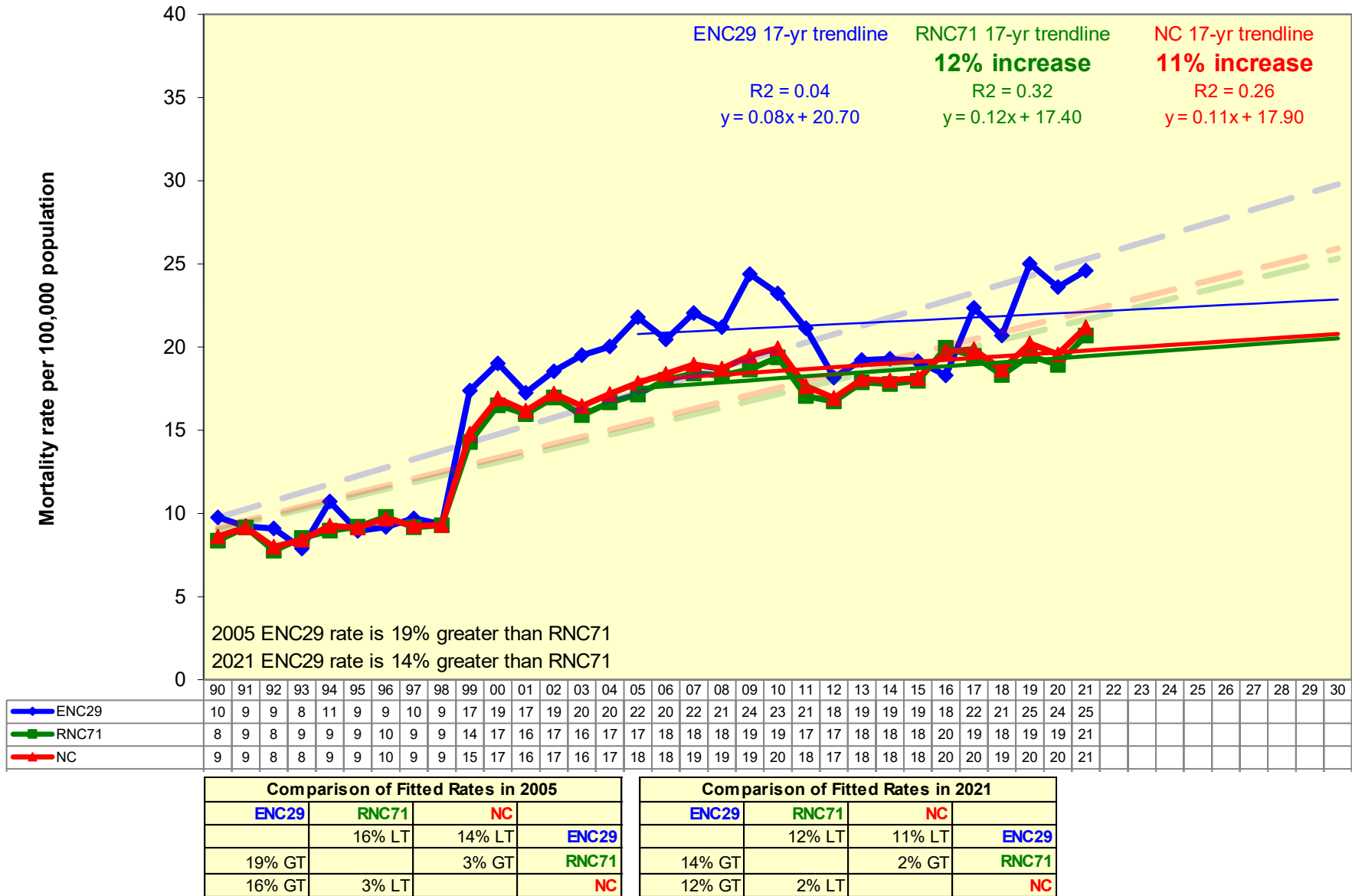




Figure 6.8 ii. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

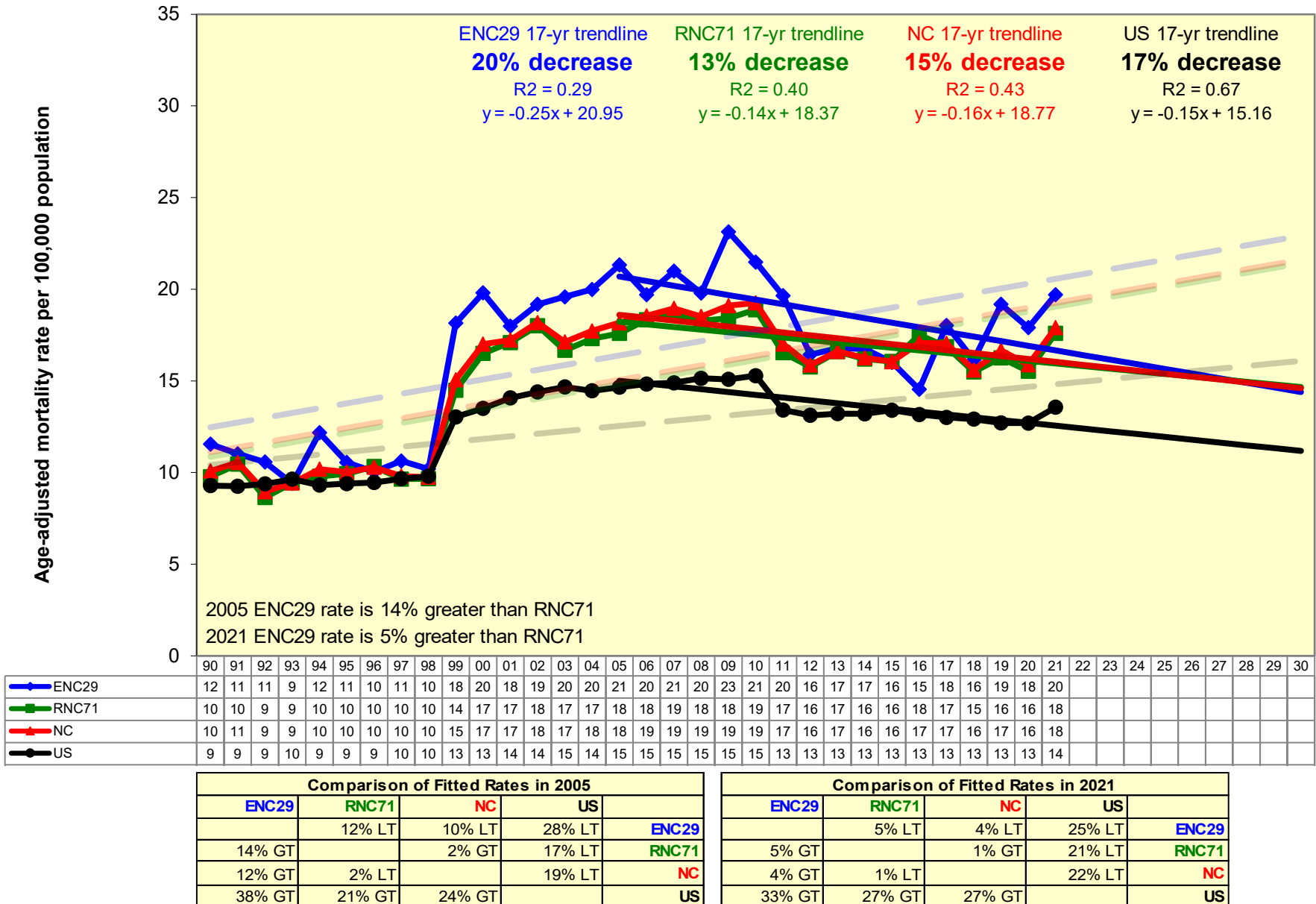


Figure 6.8 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1990-2021 with projections to 2030

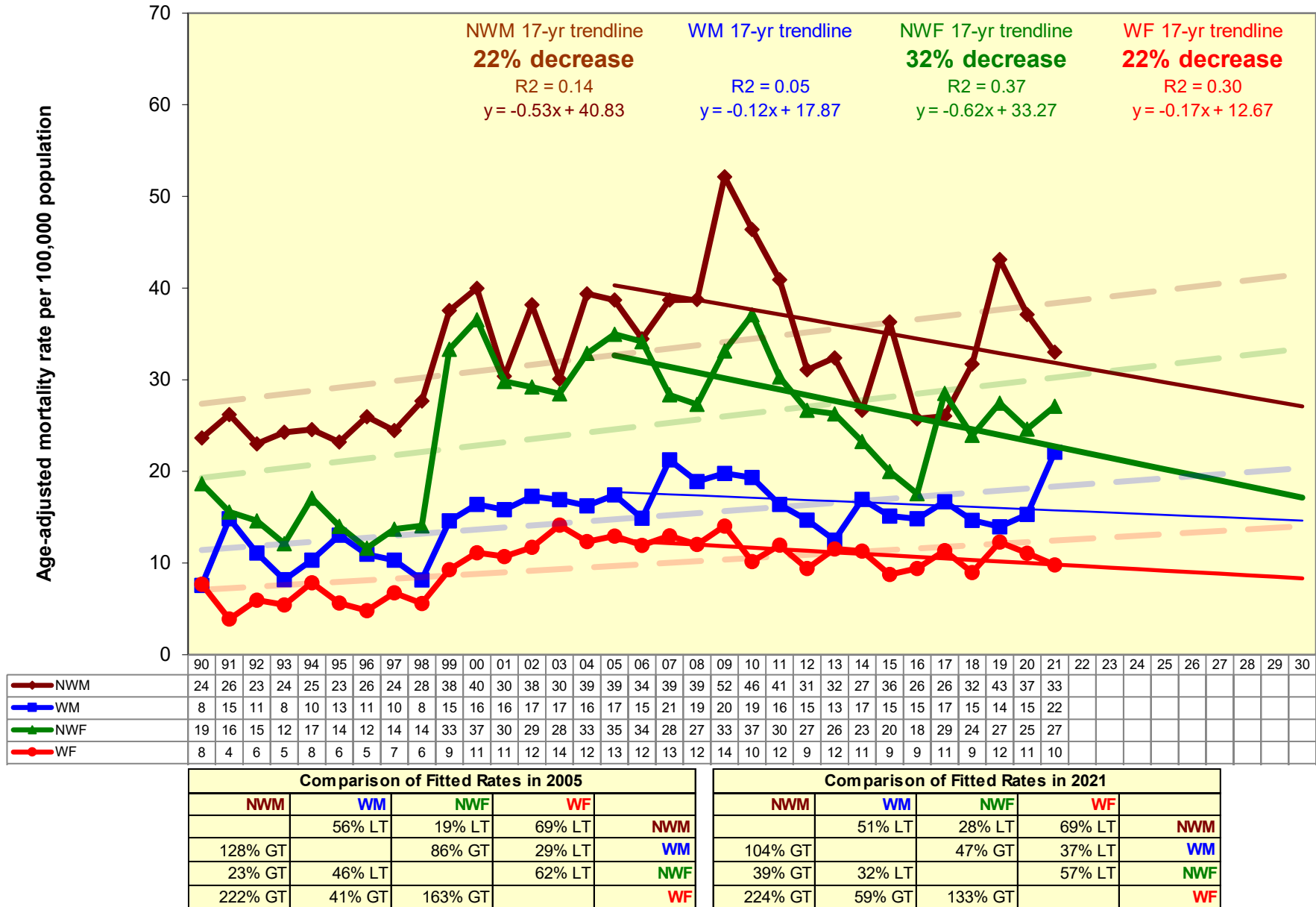
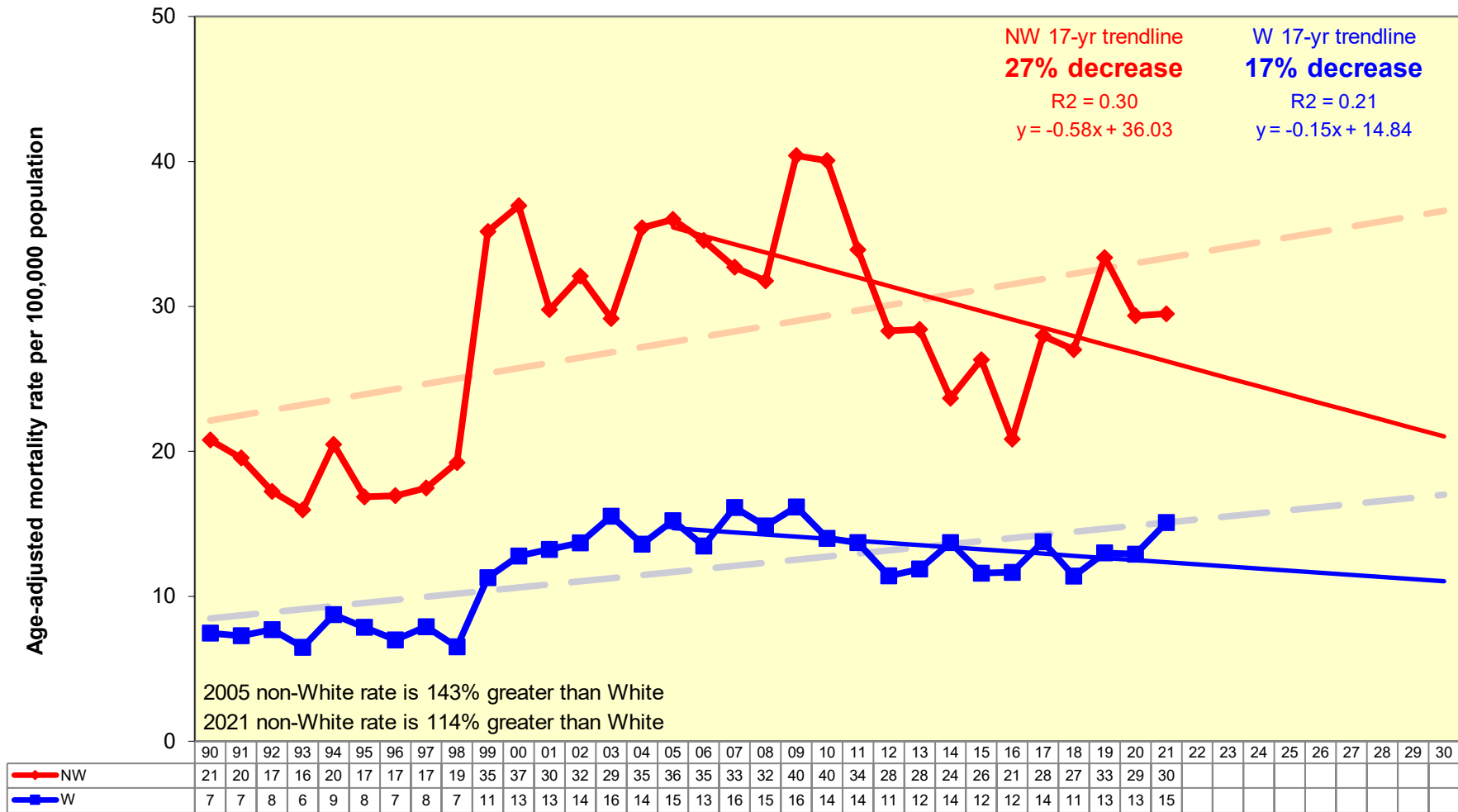


Figure 6.8 iv. Nephritis, Nephrotic Syndrome, and Nephrosis:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030





# Chronic Liver Disease and Cirrhosis

- The mortality rate trend for chronic liver disease and cirrhosis is increasing for ENC and RNC. The rate for ENC is the highest and has increased 112% over the 17-year period.
- The age-adjusted rate trend for ENC is 22% greater than RNC and has increased 74% over the 17-year period.
- The age-adjusted rate trend for White males is the highest and has increased 70% over the 17-year period. The rate for non-White males is unreliable. The rate for White females increased 153% over 17 years. The rate for non-White females is the lowest.
- The non-White rate trend is 41% less than White in 2021. The White trend has increased 97% over the 17-year period.
- The 17-year trend for racial disparity has decreased 211% over the 17-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 6.9 ii. Chronic Liver Disease and Cirrhosis:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

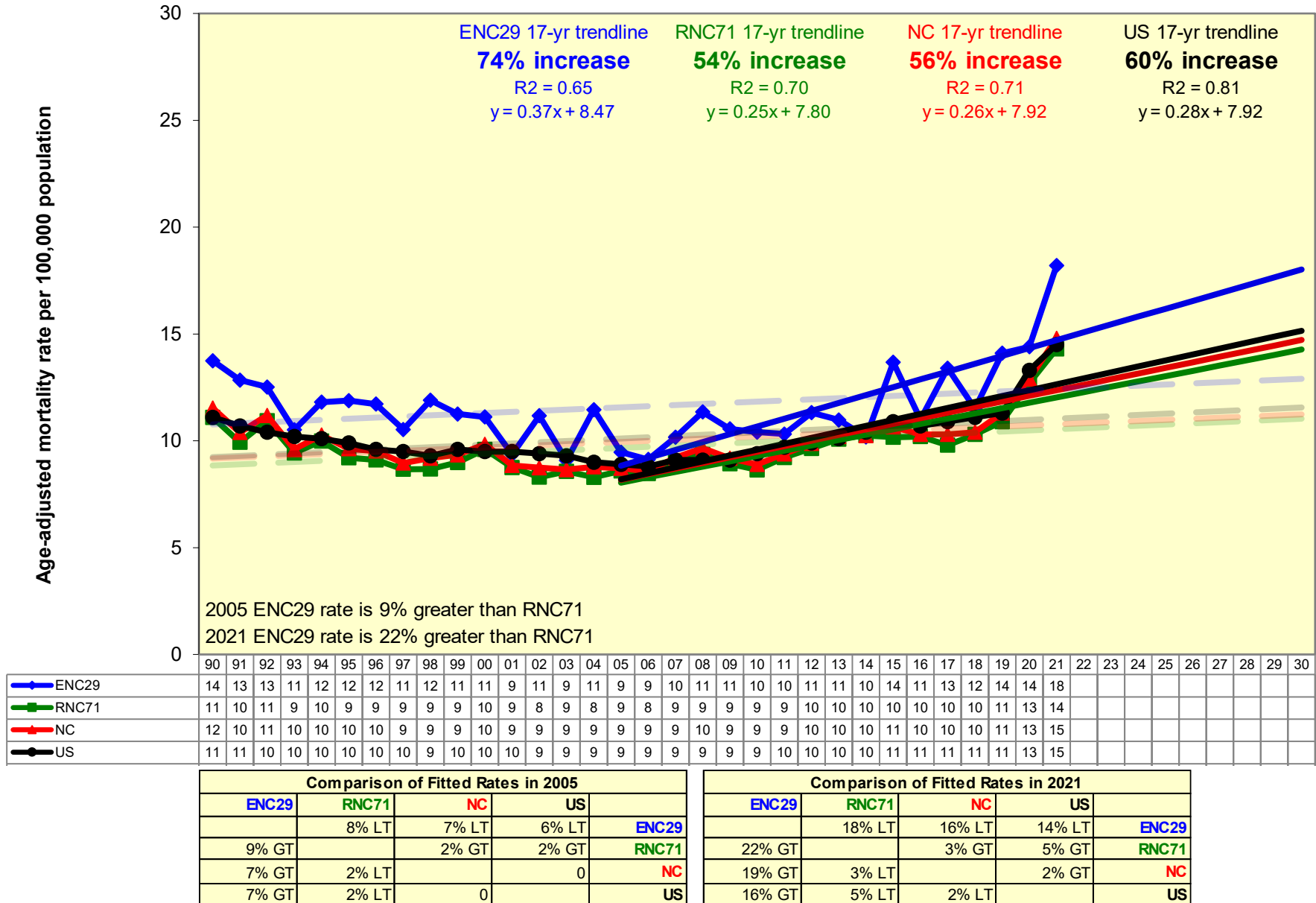


Figure 6.9 iii. Chronic Liver Disease and Cirrhosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1990-2021 with projections to 2030

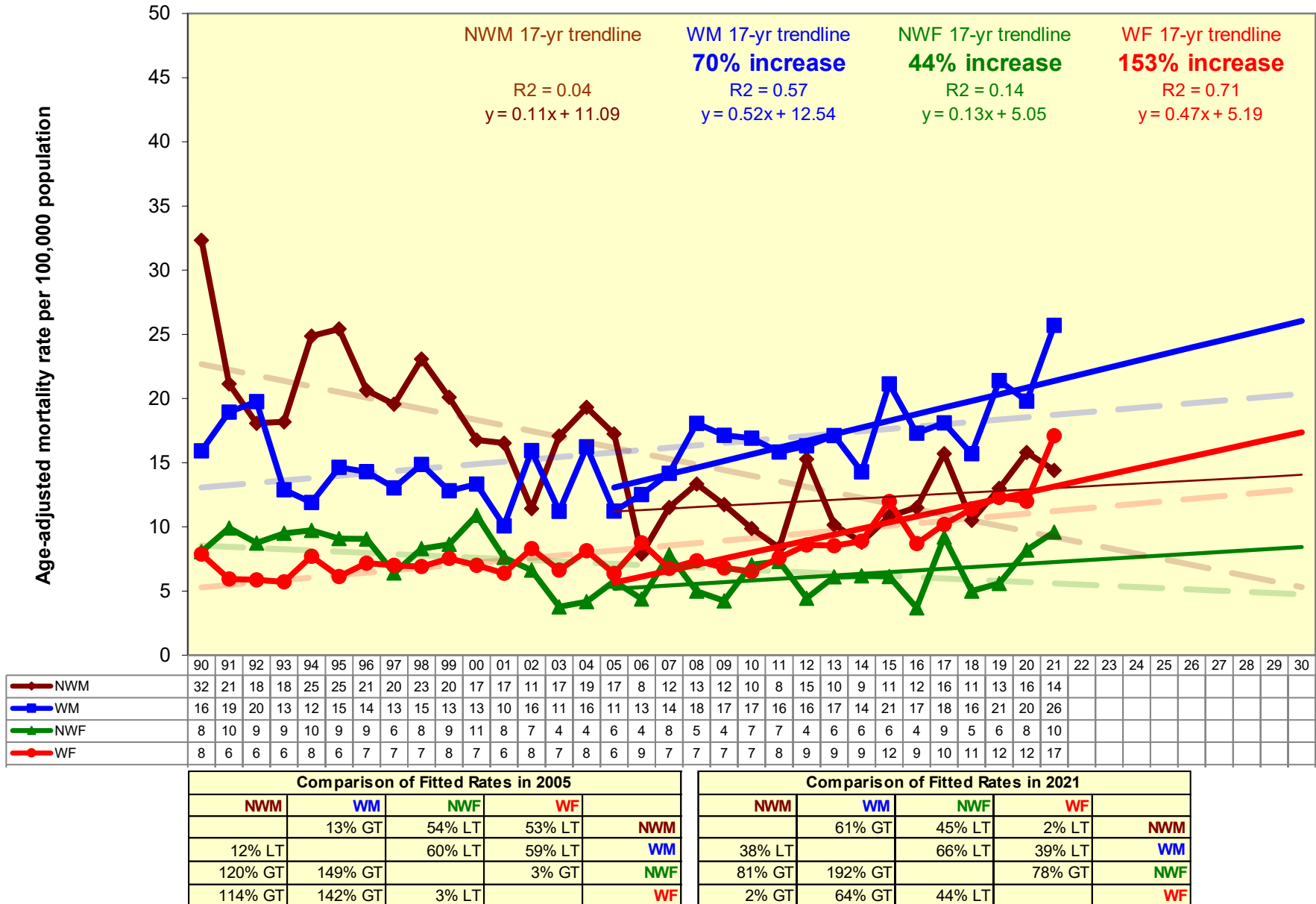




Figure 6.9 iv. Chronic Liver Disease and Cirrhosis:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

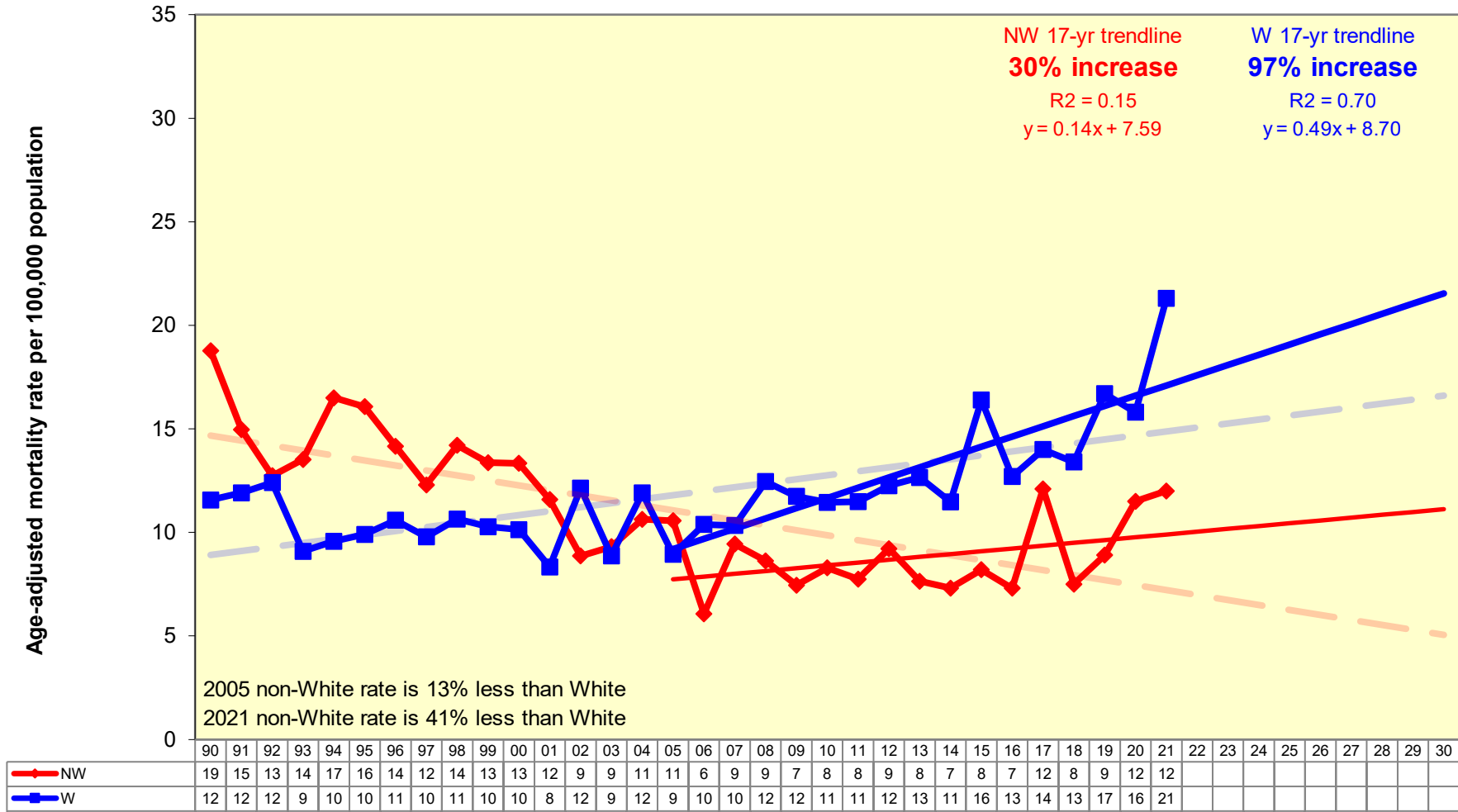
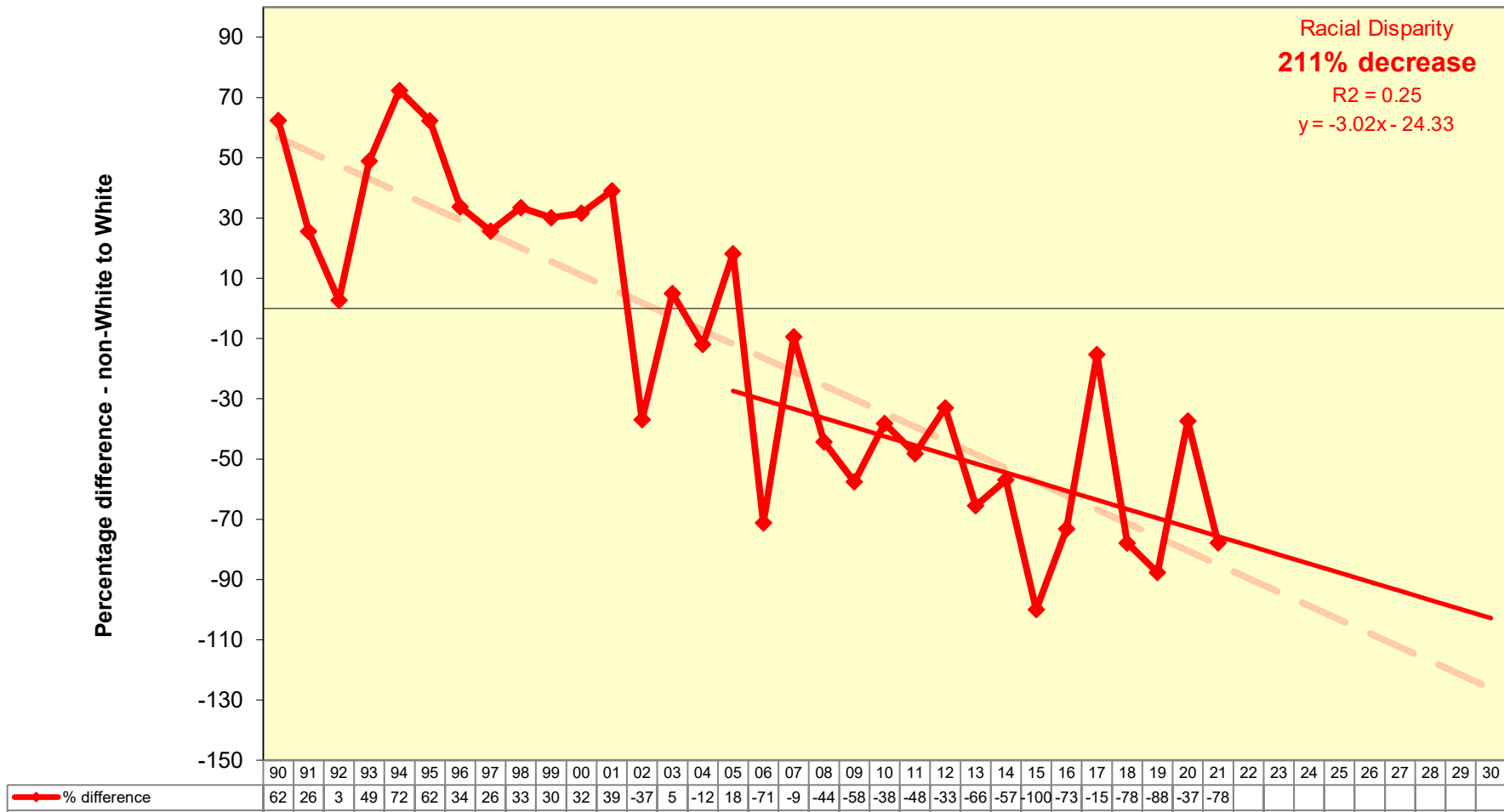


Figure 6.9 v. Chronic Liver Disease and Cirrhosis:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030



# Unintentional Motor Vehicle Injuries

- The mortality rate trend for unintentional motor vehicle injuries in ENC has decreased by 15% over the 17-year period but has recently ticked up. In 2021 ENC's rate trend is 21% greater than RNC.
- With age-adjustment, the ENC rate trend has decreased 16% over the 17-year period but has recently gone up. It is 22% greater than the RNC rate and 19% greater than the NC rate.
- The 17-year trends for non-White males and White males are the highest, but the White male trend line has experienced a 35% decrease over the 17-year period. The rate for non-White males has increased 29%. Non-White females and White females are lower, with White females decreasing by 39% over the 17-year period. The trend for non-White females is unreliable.
- The non-White rate in 2021 is 64% greater than the White rate and has increased 30% over the 17-year period. The White rate is decreasing, 37% over 17 years.
- The 17-year trend shows a 397% increase in disparity that favors Whites and is projected to further increase in the future.

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,  
1990-2021 with projections to 2030

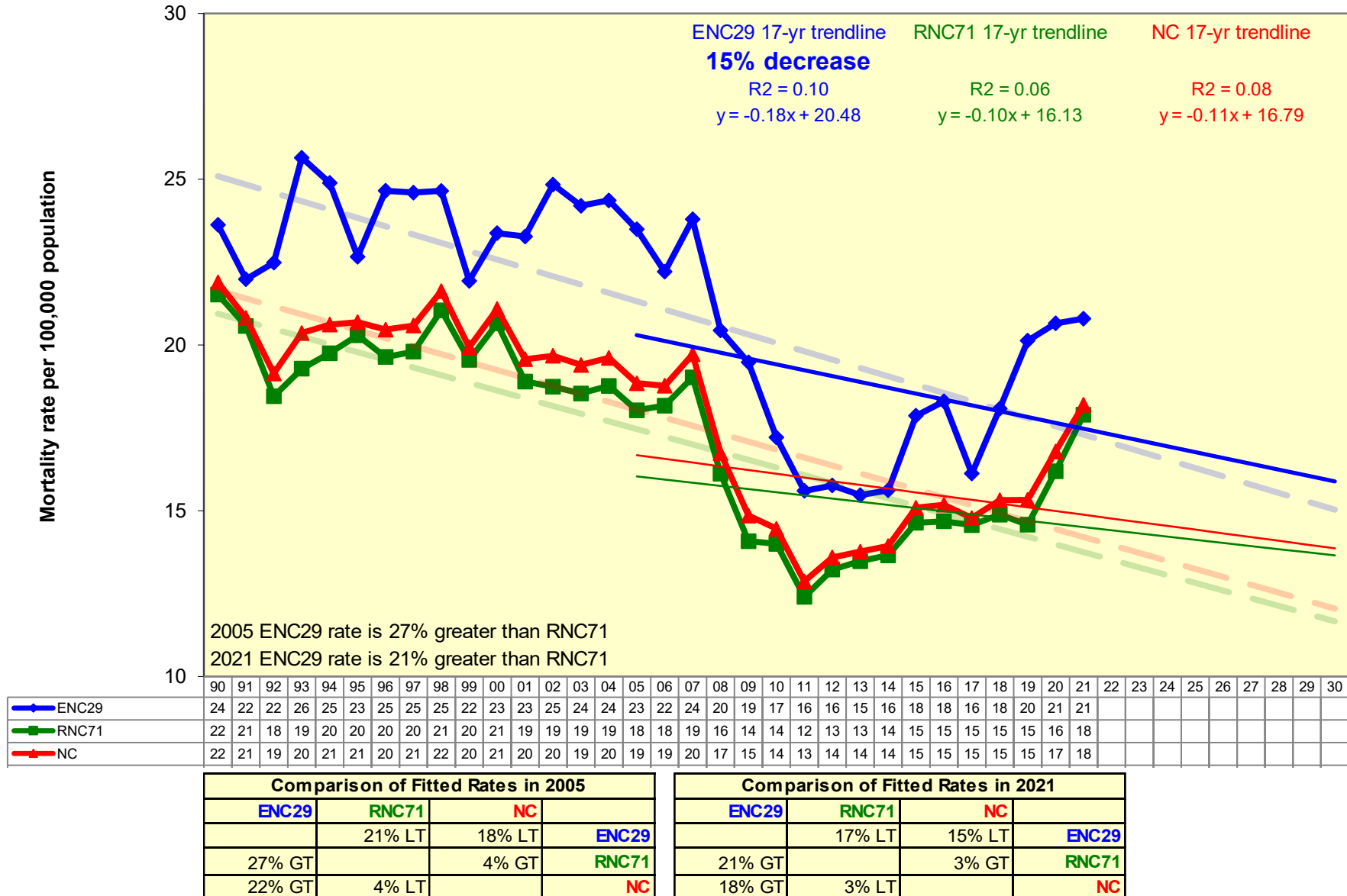


Figure 6.10 ii. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,  
1990-2021 with projections to 2030

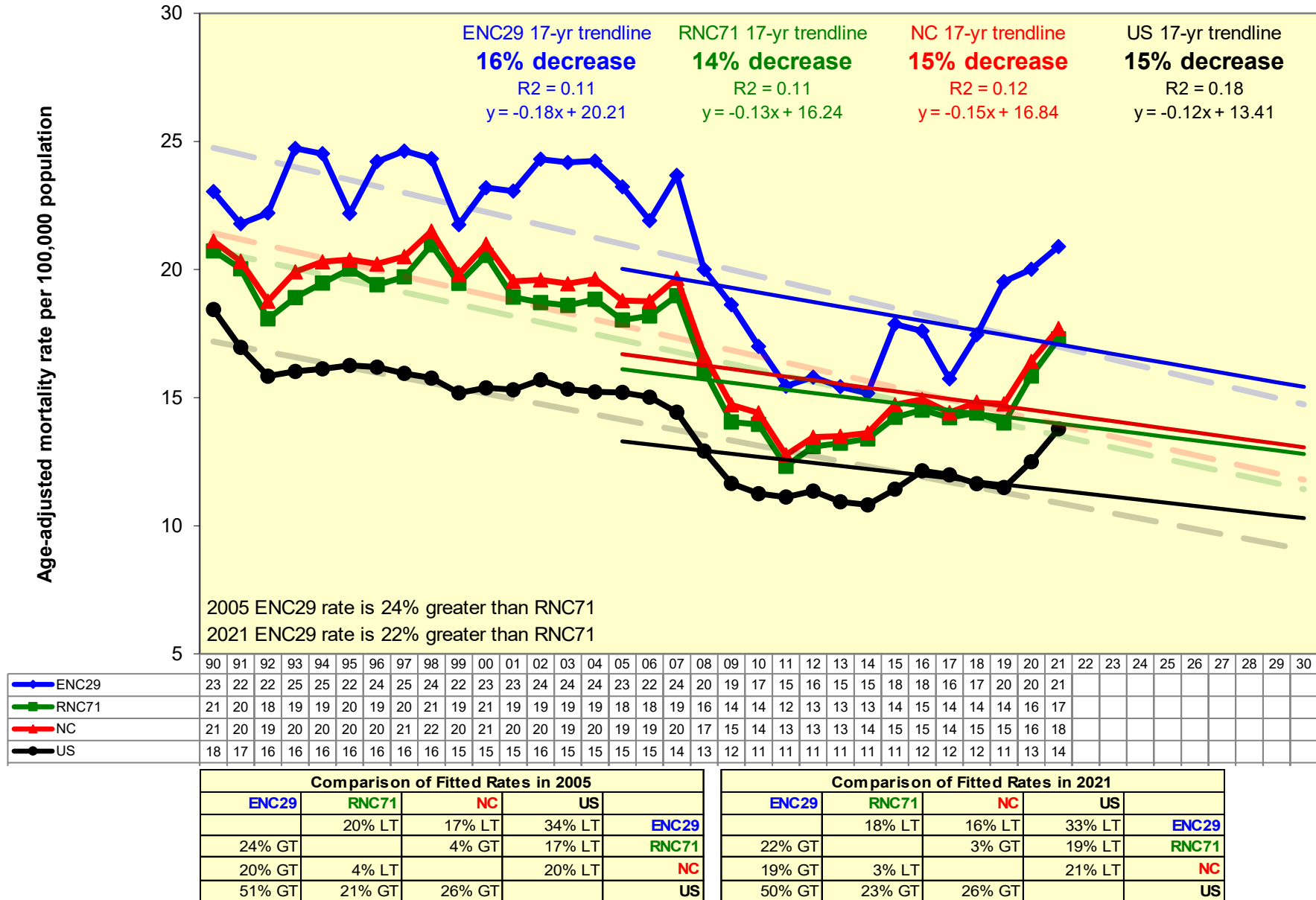


Figure 6.10 iii. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

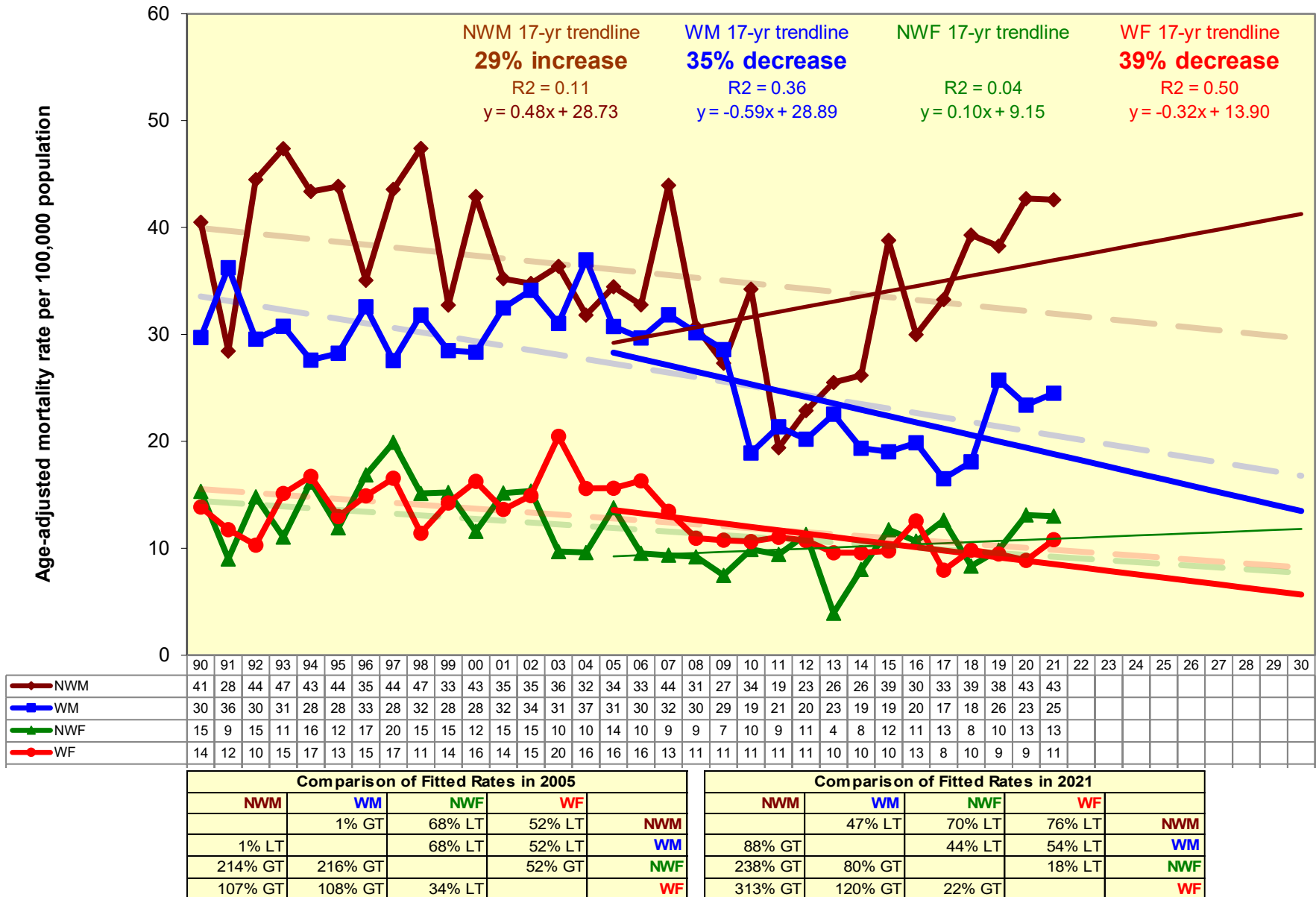


Figure 6.10 iv. Unintentional Motor Vehicle Injuries:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

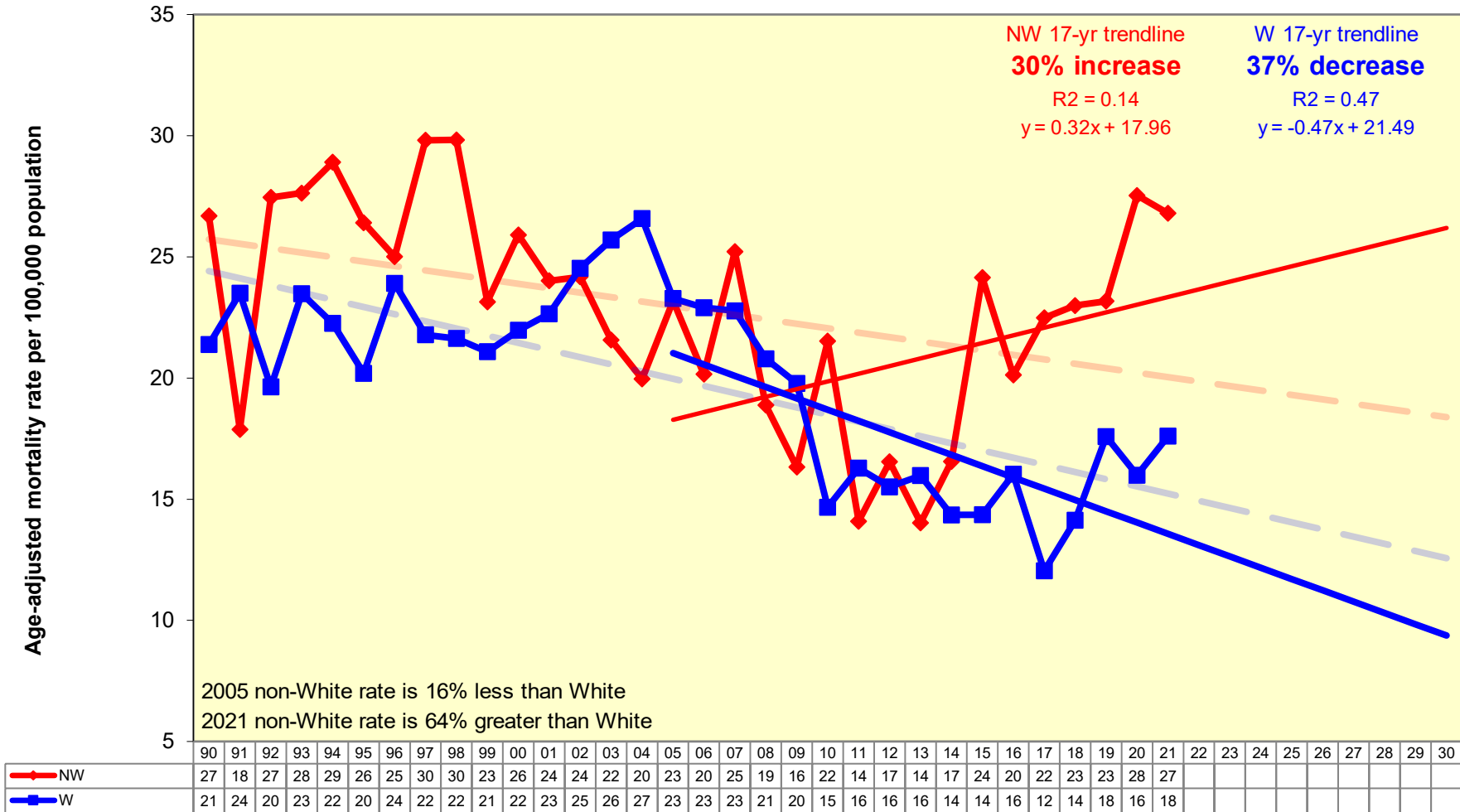
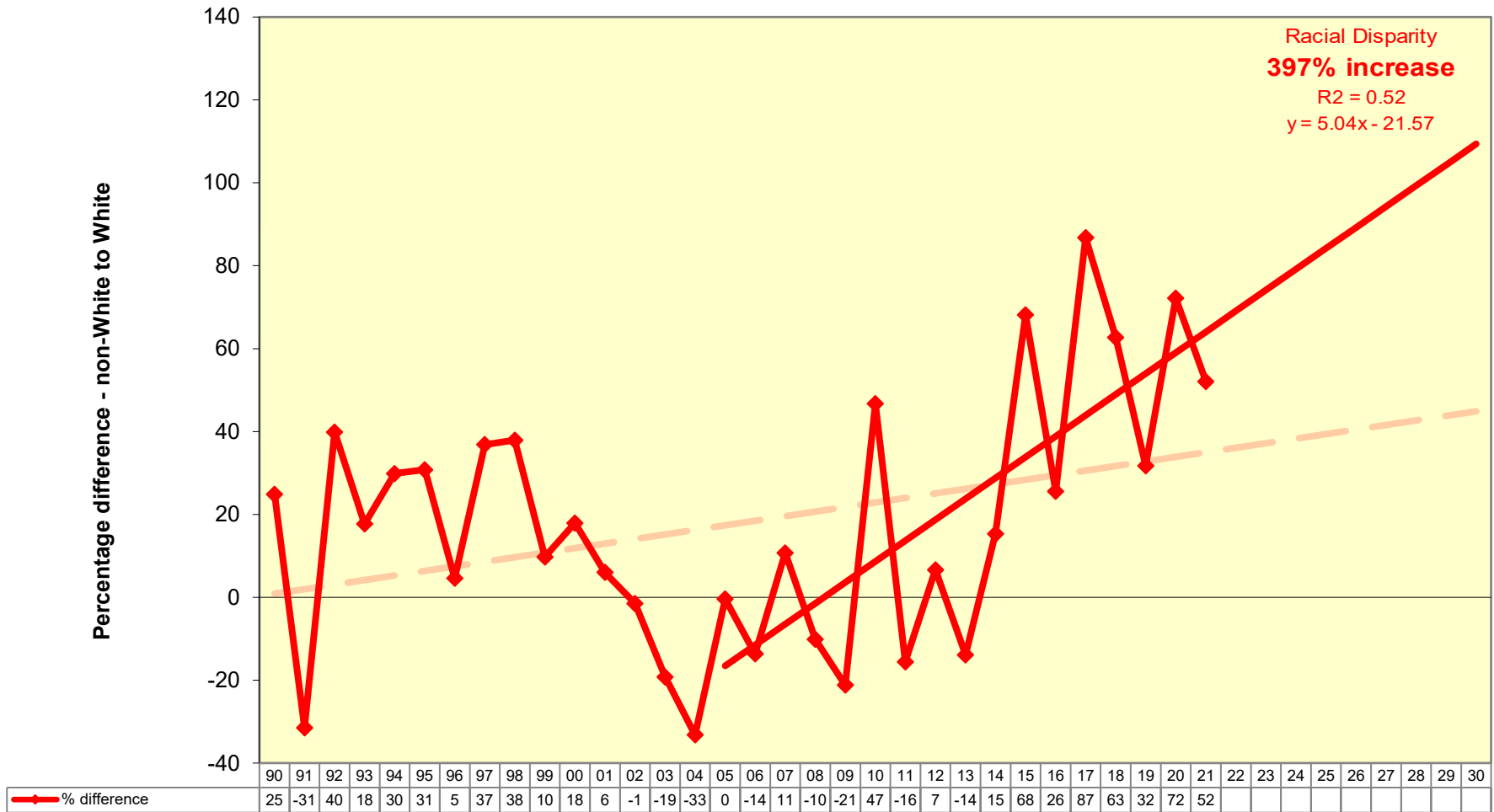


Figure 6.10 v. Unintentional Motor Vehicle Injuries:  
Measuring disparity in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030







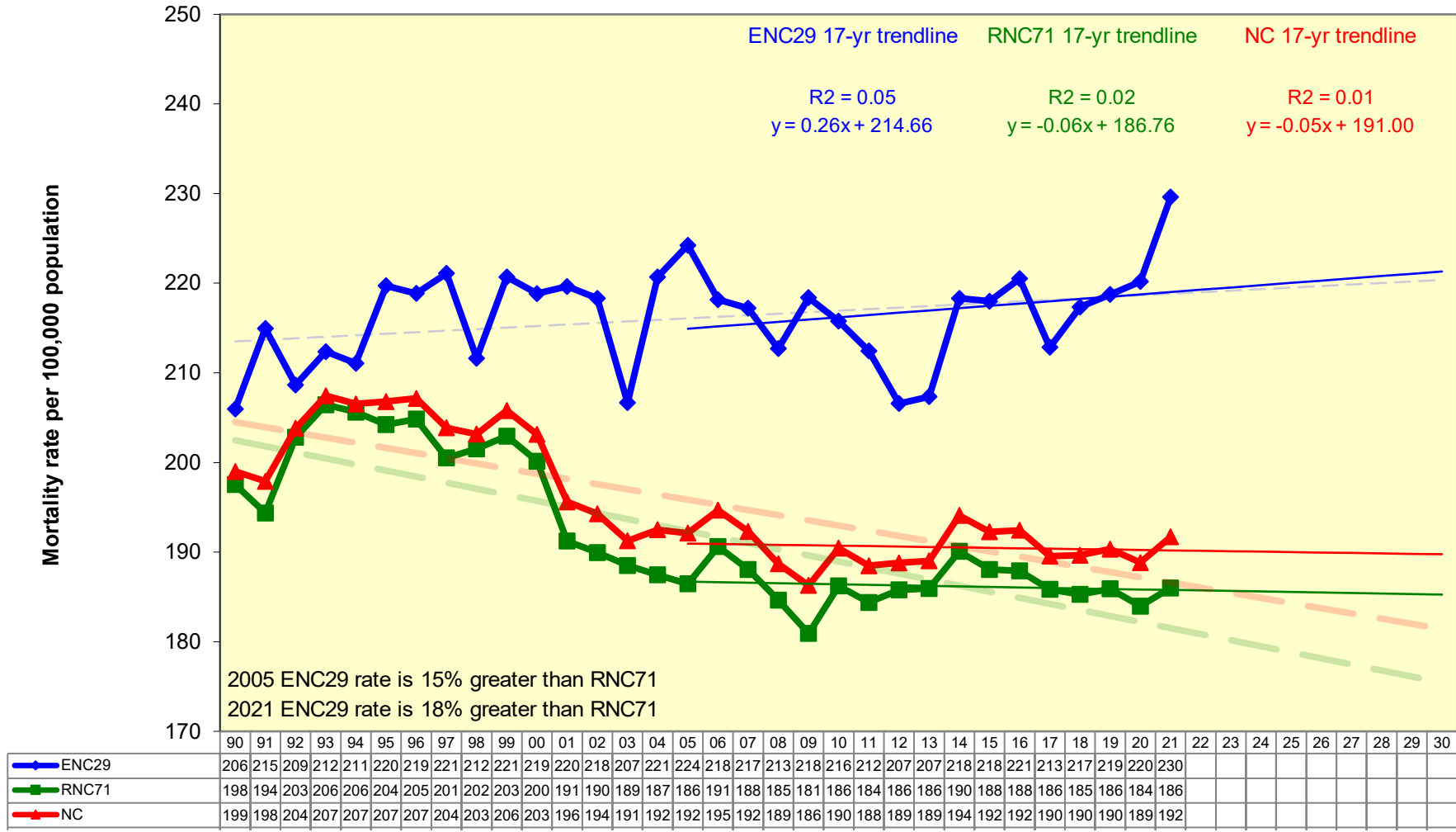
# 7. Trends and Disparities in Mortality in ENC29: Cancer - All Sites and HIV Disease; 1990-2021

# Cancer - All Sites

- The cancer-all sites mortality rate trends for ENC, RNC, and NC are flat and are not reliable.
- The age-adjusted cancer-all sites mortality rate trends for ENC, RNC, NC and US are all decreasing. The ENC rate is 10% greater than the RNC rate.
- The rate trend is decreasing for all groups. The rate for non-White males has decreased by 41% in the 17-year period and is set to converge with the rate for White males. White and non-White females are decreasing at similar rates.
- Both the White and non-White cancer mortality trends are decreasing over the 17-year period. The non-White rate decreased by 32% and the White rate decreased 20%. The non-White rate remains 5% greater than the White rate in 2021, but they are projected to converge.
- The 17-year trend for racial disparity shows a 78% 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 ENC29, RNC71, and NC,  
1990-2021 with projections to 2030



Comparison of Fitted Rates in 2005			
ENC29	RNC71	NC	
	13% LT	11% LT	ENC29
15% GT		2% GT	RNC71
12% GT	2% LT		NC

Comparison of Fitted Rates in 2021			
ENC29	RNC71	NC	
	15% LT	13% LT	ENC29
18% GT		2% GT	RNC71
15% GT	2% LT		NC

Figure 7.1 ii. Cancer - All Sites:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1990-2021 with projections to 2030

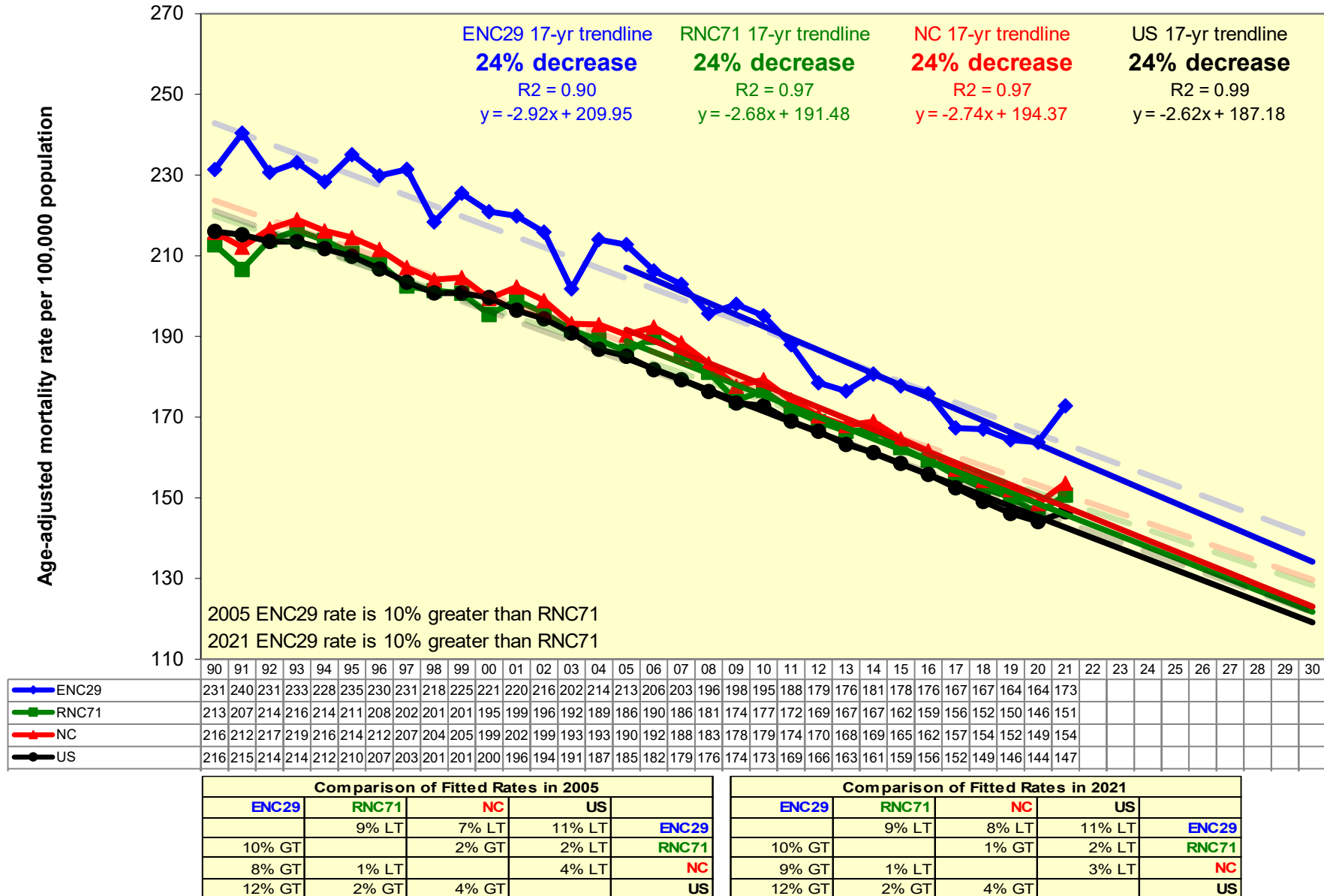


Figure 7.1 iii. Cancer - All Sites:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

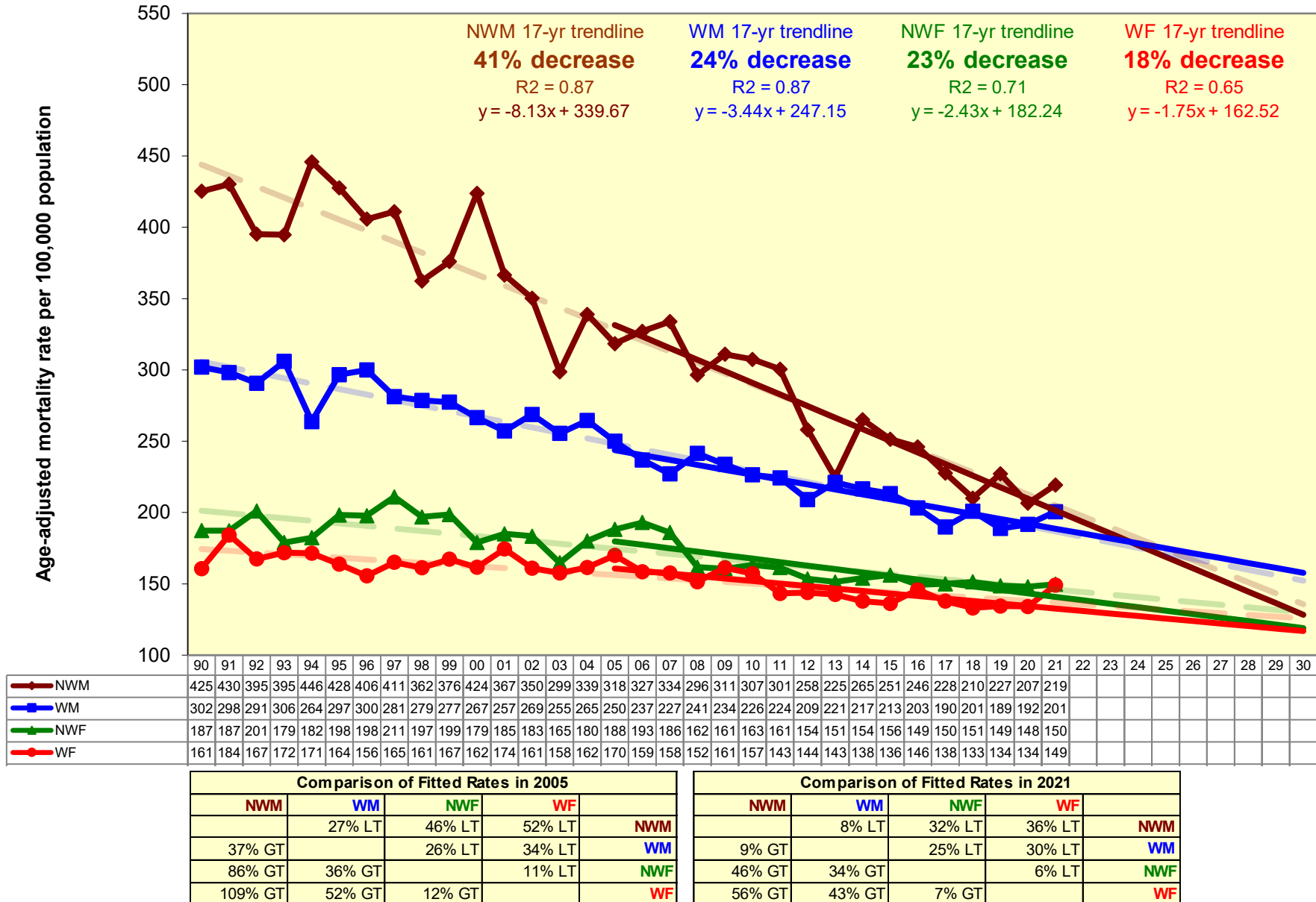


Figure 7.1 iv. Cancer - All Sites:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

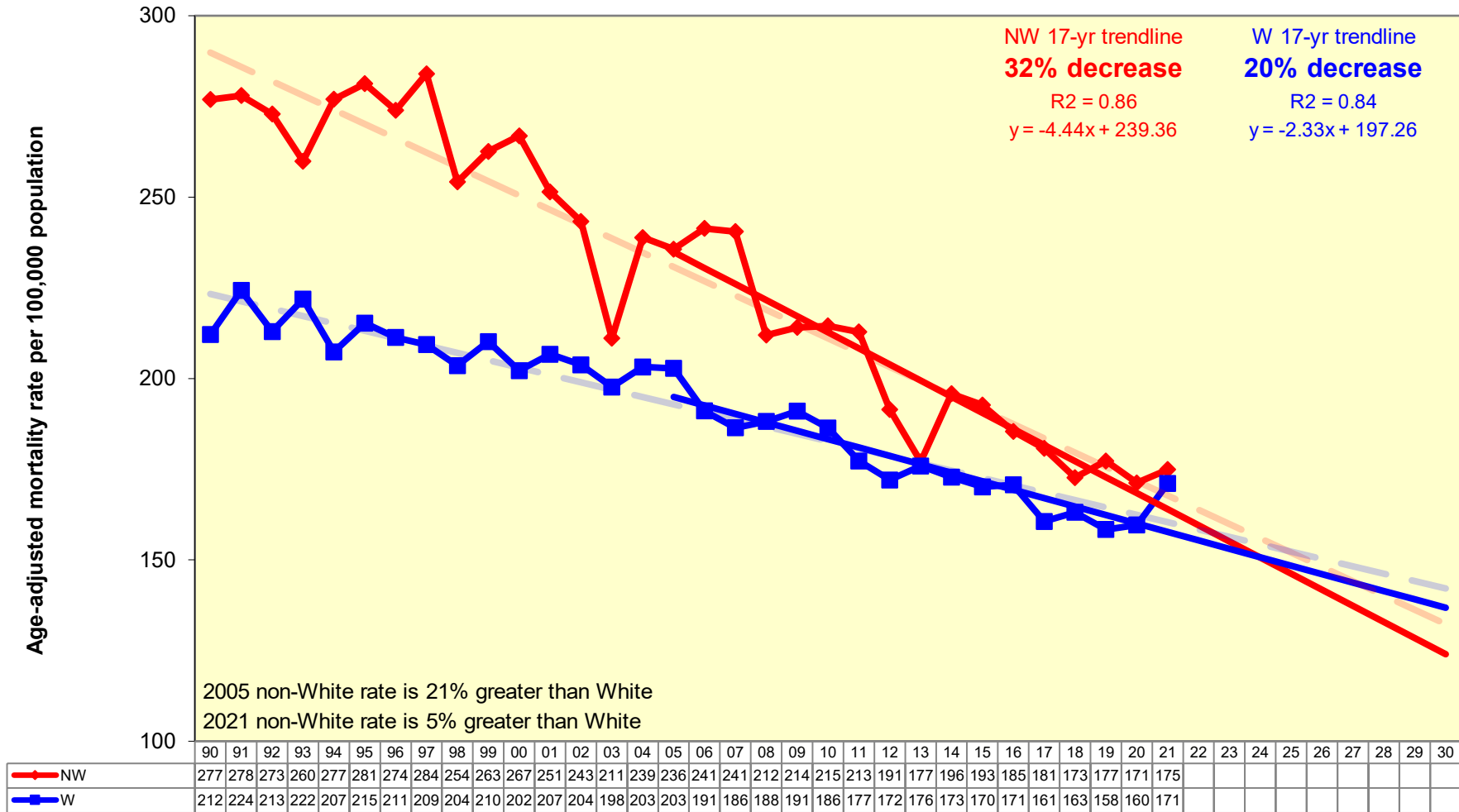
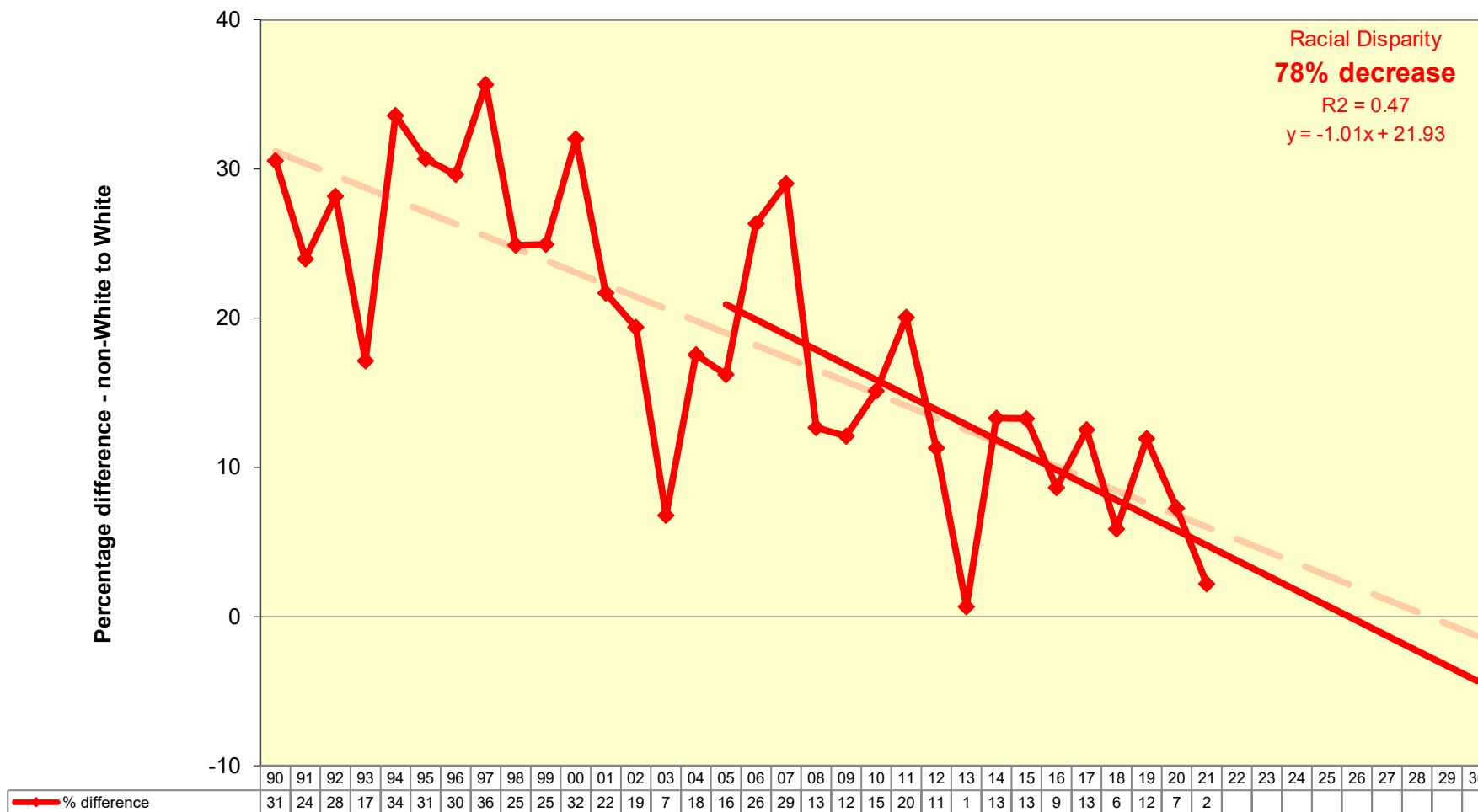


Figure 7.1 v. Cancer - All Sites:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030





# HIV Disease

- The HIV mortality rates for ENC have been decreasing over the past 17 years but are still 36% greater than RNC in 2021.
- The age-adjusted rate trend for ENC, RNC, and the US are all decreasing and set to converge. The ENC rate is 48% greater than RNC in 2021.
- Non-White males continue to have the highest rate of age-adjusted mortality, but the rate has decreased 81% in the 17-year period. Non-White females have the second highest rate, but it has also declined. All demographics are projected to converge in the future.
- The 17-year age-adjusted HIV mortality rates have decreased for both Whites and non-Whites by 81% and 76% respectively. The non-White rate is still 802% greater than the White rate.
- The 17-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 7.2 i. HIV Disease:  
Trends in mortality rates for ENC29, RNC71, and NC,  
1990-2021 with projections to 2030

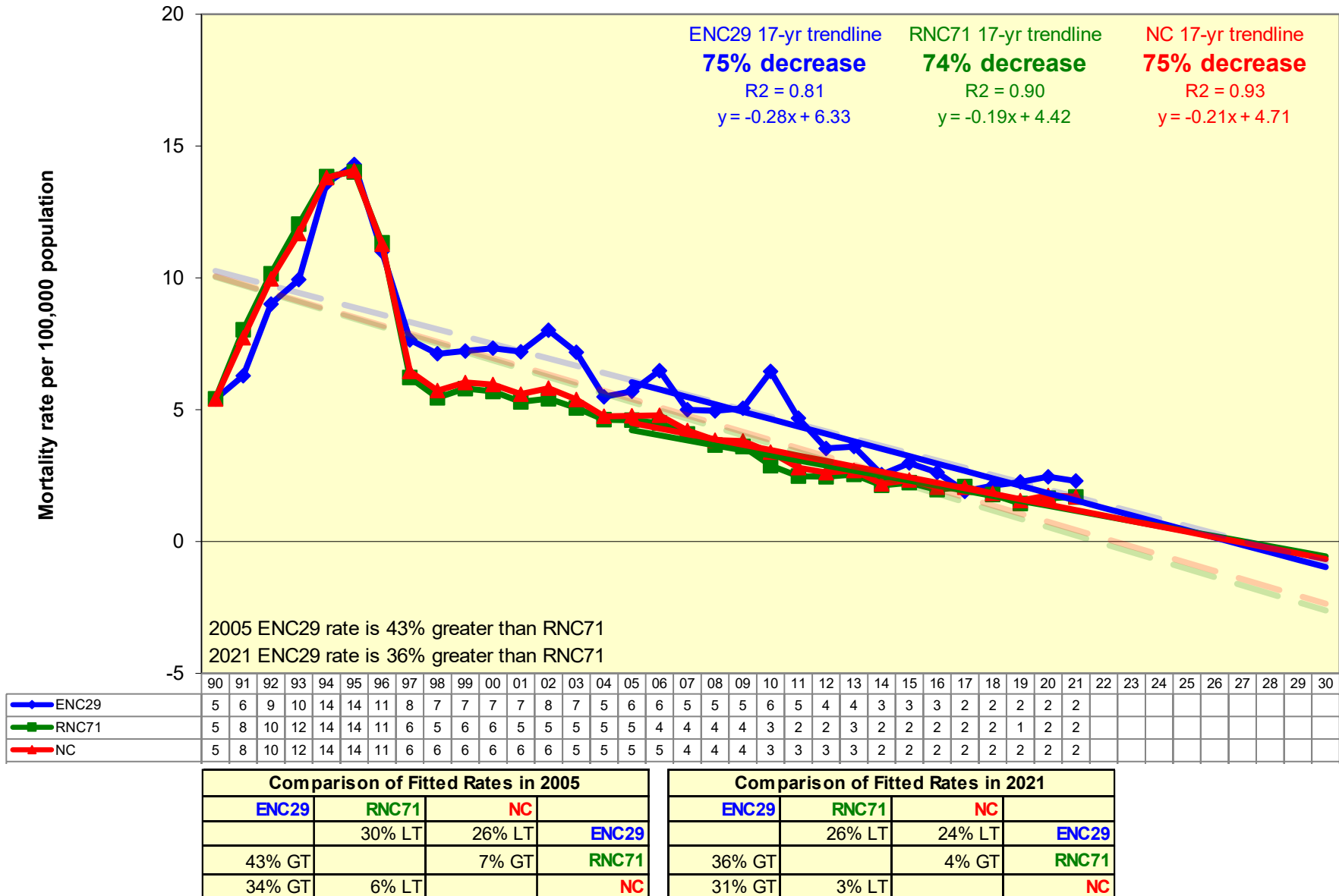


Figure 7.2 ii. HIV Disease:  
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1990-2021 with projections to 2030

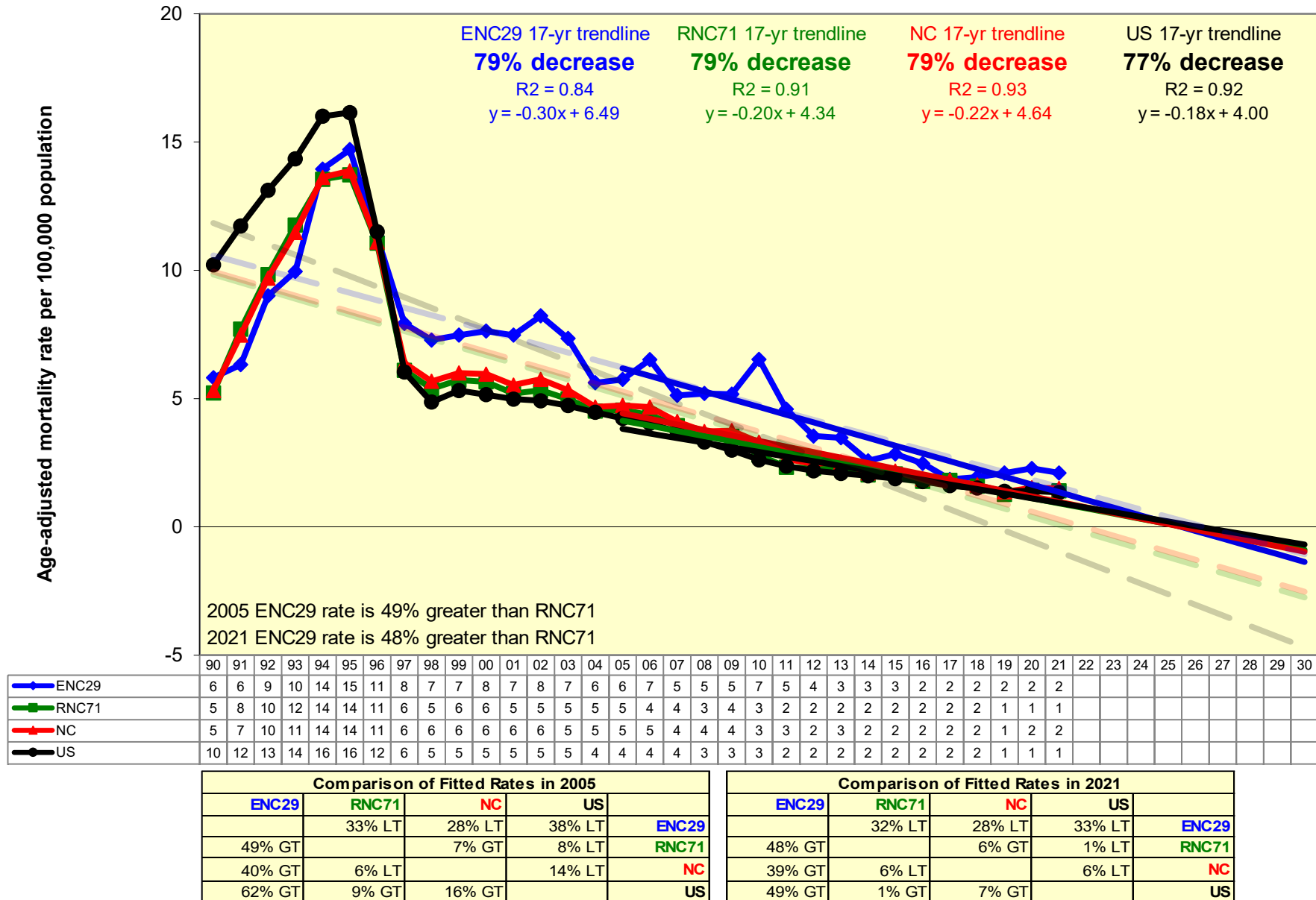


Figure 7.2 iii. HIV Disease:  
Trends in age-adjusted mortality rates by race and gender for ENC29,  
1990-2021 with projections to 2030

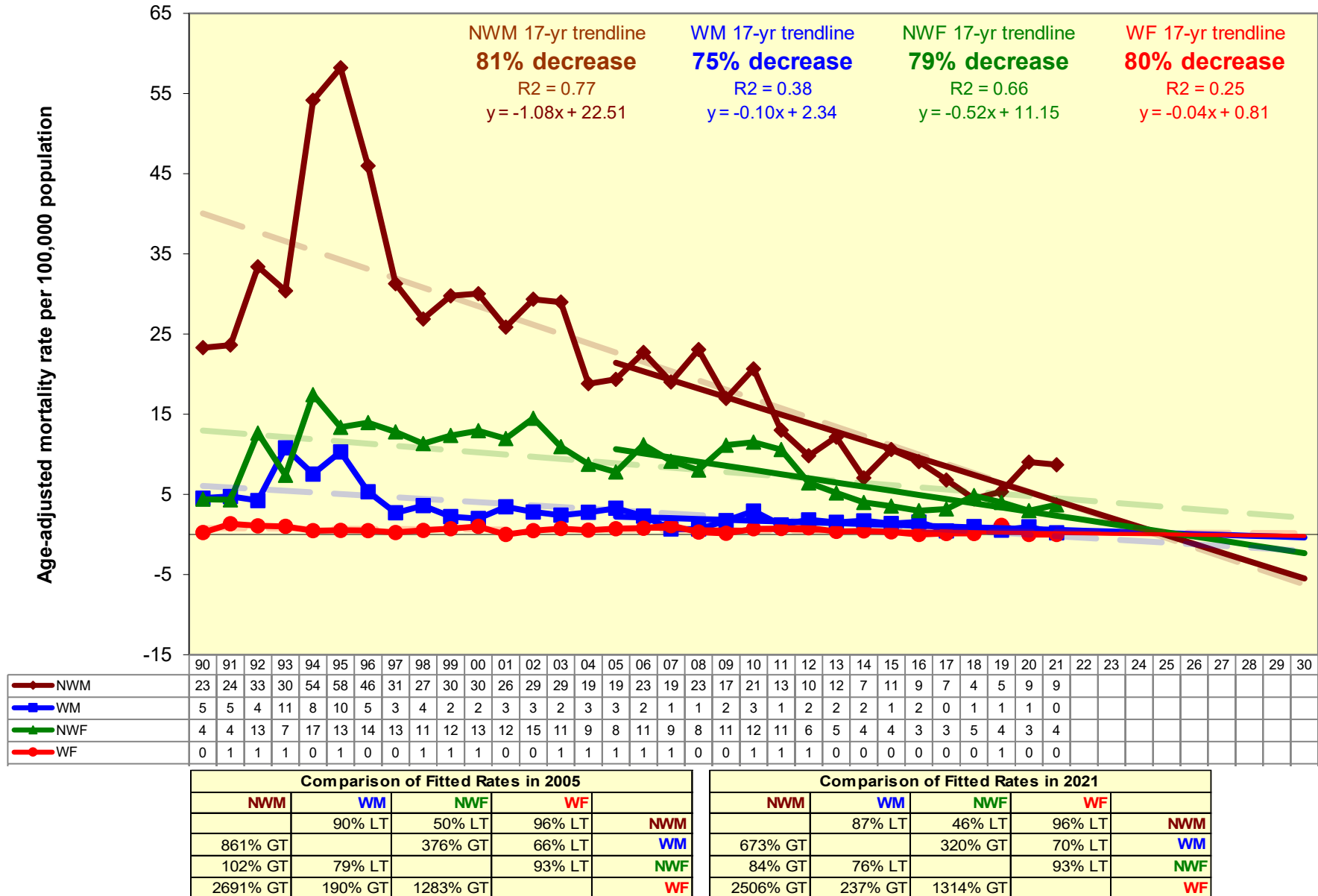


Figure 7.2 iv. HIV Disease:  
Trends in age-adjusted mortality rates by race for ENC29,  
1990-2021 with projections to 2030

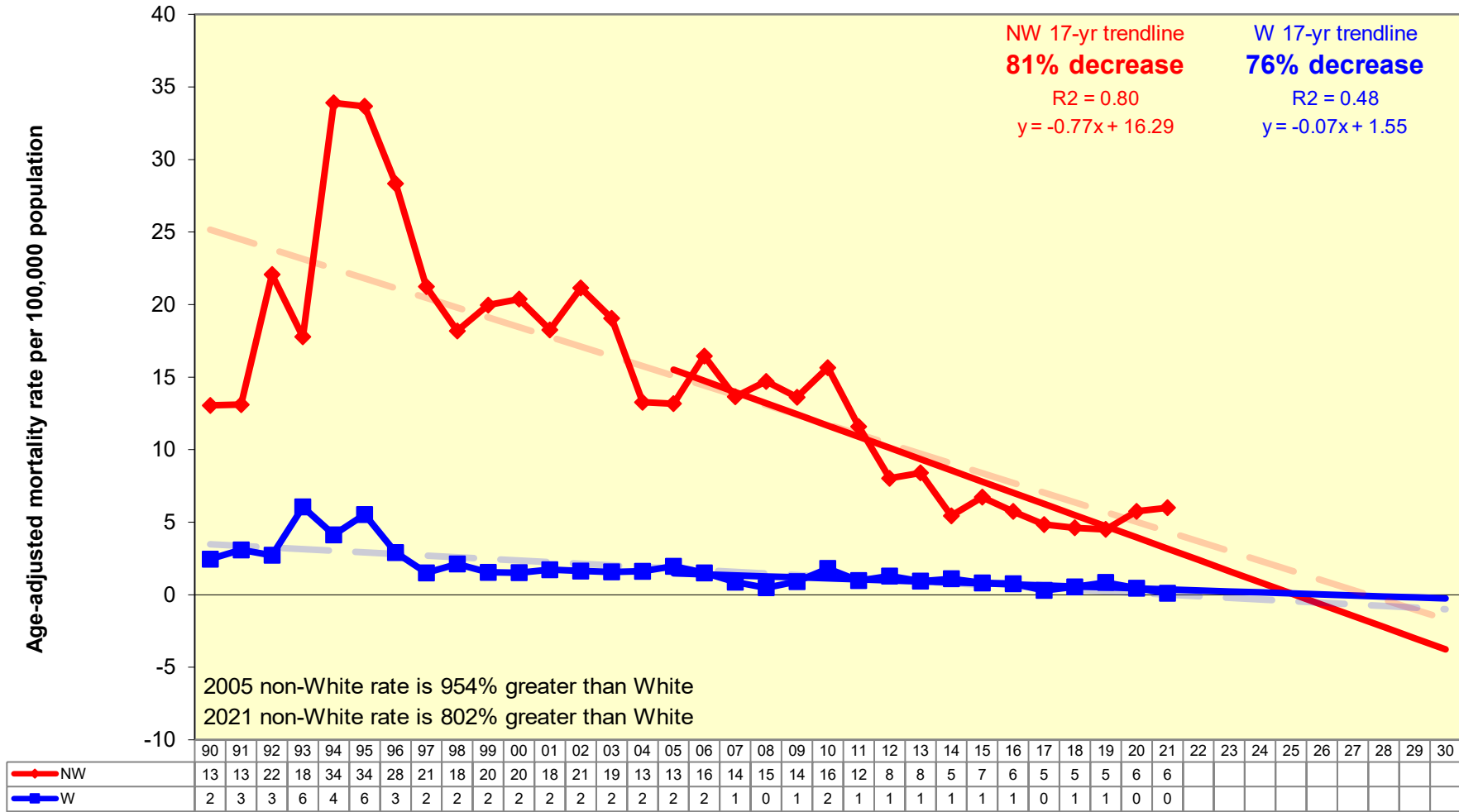
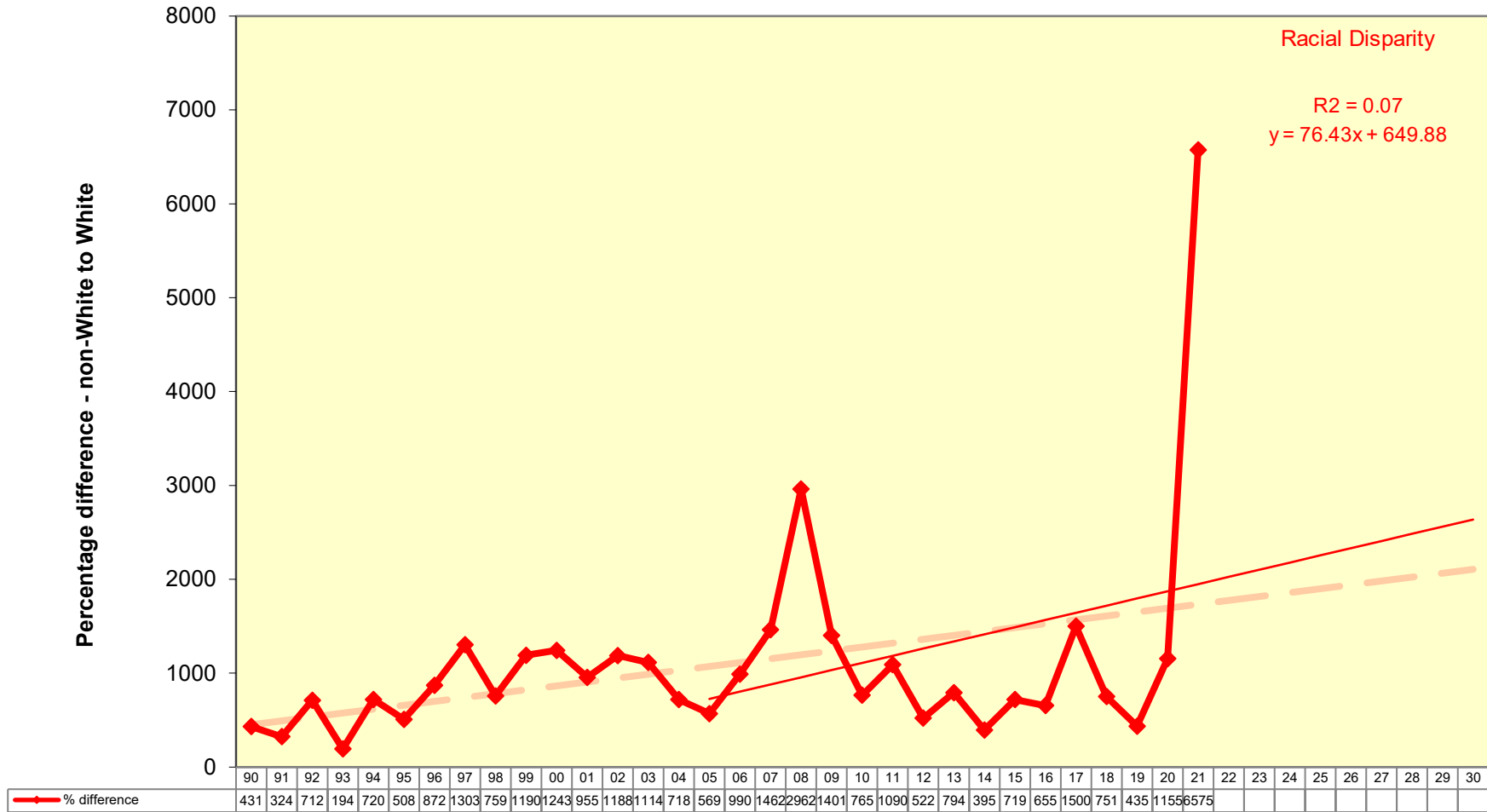


Figure 7.2 v. HIV Disease:  
 Measuring disparity in age-adjusted mortality rates by race for ENC29,  
 1990-2021 with projections to 2030



## 8. Appendix

Diseases of Heart	ICD10 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, Pharynx	C00-C14	140-149
Cancer - Stomach	C16	151
Cancer - Colon, Rectum, Anus	C18-C21	153-154
Cancer - Liver	C22	155
Cancer - Pancreas	C25	157
Cancer - Larynx	C32	161
Cancer - Trachea, Bronchus, 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-Hodgkins Lymphoma	C82-C85	200202
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-V99.9, 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, X87.0	E950-E959
Homicide	X85-Y09, Y87.1	E960-E969
Legal Intervention	Y35, Y89.0	E970-E978
Alzheimers Disease	G30	331.0
COVID-19	U07.1	