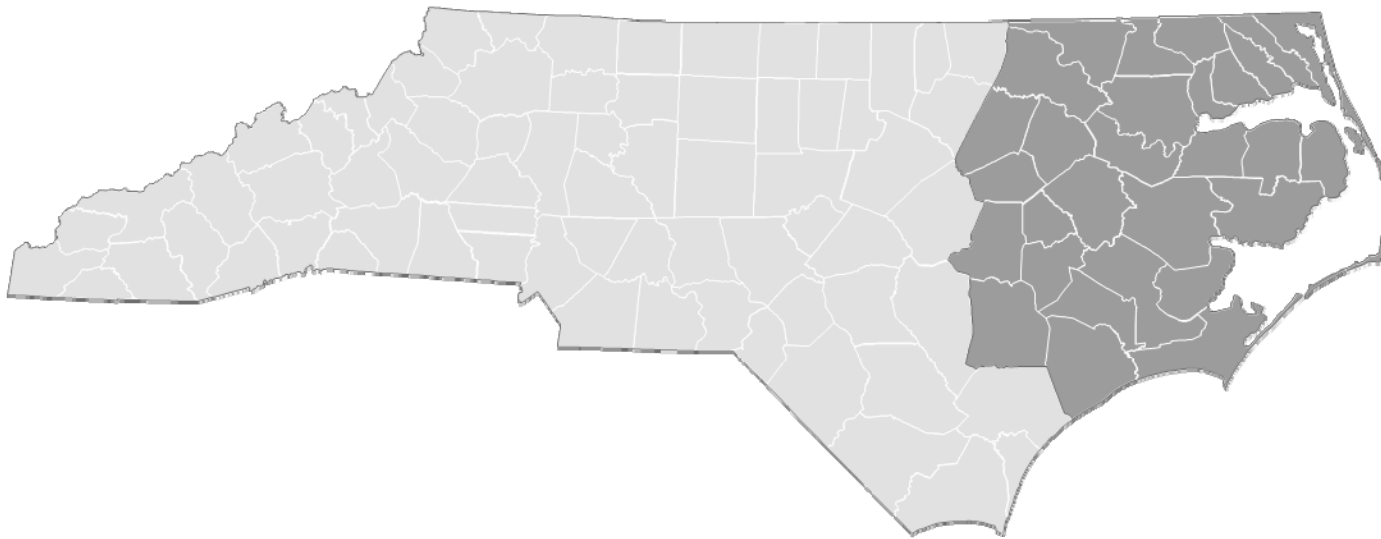


Trends and Disparities in Mortality in Eastern North Carolina

Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1979-2011



A Resource for Healthy Communities

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1. Introduction

Health Indicators Series: A Resource for Healthy Communities June 2013

Report Series #2: Mortality Trends for Eastern North Carolina (1979 to 2011)

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

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

This report describes the leading contributors to mortality, provides a geographic context, and examines trends and inequalities over a 32-year period (1979-2011), as well as the most recent 13 year period (1999 to 2011). 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.

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

2. Data Highlights

Trends and Disparities in Mortality in Eastern North Carolina

The following highlights of mortality in 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 2011, age-adjusted mortality rate for Eastern North Carolina is 838 deaths per 100,000. This rate is 6% higher than the state rate. Within Eastern North Carolina, the non-White rate is 15% 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 13% higher than the rate for White females.

The five general leading causes of mortality in Eastern North Carolina (2011) are:

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

The five general leading causes of mortality in Eastern North Carolina by race and gender (2011) are:

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

Trends in Mortality from All Causes

- The 32 year ENC trend line shows all cause mortality rates are increasing. The 13 year trend line shows ENC's rate is decreasing but is still higher than NC and RNC.
- The age-adjusted, all-cause mortality rate trend for ENC has decreasing over the 30 year period. The 13-year trend shows greater decrease and suggests the ENC rate will converge with the RNC and NC rates. ENC's rate remains 10% greater than the rate for RNC.

- The non-White male mortality rate trend remains higher than other demographic groups but has had the greatest rate of decrease (27%) in the 13-year trend. Convergence of non-White males with White males and non-White females with White females is suggested in the future.
- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 16% greater than the White rate, but the recent 13-year trend suggests they will converge in the future.
- Over the recent 13-year period there is a drop in racial disparity, in a moderately reliable trend.

Trends in Premature Mortality from All Causes of Death

- ENC's premature mortality rate trend has decreased by 11% over the 13 year period since 1999. This decline is similar to RNC and NC, but ENC remains about 20% higher.
- The age-adjusted premature mortality rate trend for ENC is also decreasing, but remains 19% higher than the RNC rate in 2011.
- The non-White male rate trend is significantly higher than any other demographic group, but also has the highest rate of decrease (31% over 13 years). White females have the lowest rate and also the lowest rate of decrease (6% over 13 years).
- A recent decrease in the premature mortality rate for non-Whites and leveling of rates for Whites suggests a reduction in racial disparity.
- The 13 year trend for racial disparity shows a 50% decrease, in a reliable trend.

Diseases of the Heart

- ENC's 13-year mortality rate trend is decreasing at about the same rate as RNC and NC, although ENC remains well above the others.
- While ENC's age-adjusted mortality rate trend is decreasing at a pace equal to RNC, the ENC rate remains 13% greater than RNC in 2011.
- The non-White male rate trend remains slightly higher than the White female trend but is decreasing at a quicker rate and is suggested to fall below White females in the future.
- The non-White rate trend remains 11% greater than for Whites, but the 13-year trends for both are decreasing, and convergence is suggested in the future.
- The 13-year trend line for racial disparity is unreliable.

Cancer – Trachea, Bronchus, Lung

- The 13-year trend line for Cancer—TBL for ENC is 15% greater than RNC but is unreliable.
- In 2011, the age-adjusted rate trend for ENC is 6% above the RNC rate and 19% above the US rate. The 13-year trend lines suggest that the ENC rate is decreasing more quickly, suggesting convergence with RNC and NC in the future.
- The mortality rate trends for males are decreasing. Non-White males continue to have the highest rate, however the 13-year trend line suggests White males will have a higher rate than non-White males in the near future. The trends for White and non-White females are not reliable.
- The non-White mortality rate trend for this cancer is consistently lower than the White rate. Both trends are decreasing over the 13-year period, but non-White is decreasing more quickly.
- The moderately reliable 10-year trend for racial disparity shows a 469% decrease.

Cerebrovascular Disease

- ENC's cerebrovascular disease mortality trend line is decreasing but is 21% greater than RNC in 2011.

- The ENC age-adjusted cerebrovascular disease mortality rate trend is decreasing and converging with the RNC and NC rates. It remains 12% greater than the RNC trend. In 2011 there were 49 deaths per 100,000, which is almost at the *Healthy People 2010* goal of less than 48 deaths per 100,000.
- Non-Whites have the highest mortality rate for cerebrovascular disease but the rate trend continues to decrease and converge with the other demographic groups. Over the 13-year period the trend has decreased by about 50% for all demographic groups.
- The cerebrovascular disease mortality rate trend for non-Whites is decreasing and converging with that of whites but is still 52% greater than Whites in 2011.
- The 13-year trend for racial disparity is unreliable.

Chronic Lower Respiratory Diseases

- The 32 year ENC trend for CLRD mortality is increasing. The 13-year trend for ENC is unreliable.
- The 13-year CLRD age-adjusted rate trend for ENC is decreasing and converging with the US rate. The rate for ENC is lower than the rates for RNC and NC.
- Fitted rates for non-White males and White males have decreased over 13 years by 39% and 30%, respectively. White male rates remain the highest. The 13-year trend for White females is flat. The 13-year trend for non-White females is unreliable.
- The 13-year White mortality rate trend is higher than the non-White trend, although both are declining evenly. The non-White rate is 45% less than the White rate in 2011.
- There is a 36% decrease in the disparity between the White and non-White rate in a moderately reliable trend.

Diabetes Mellitus

- The 13-year trend for diabetes mellitus mortality is decreasing for RNC and NC. The trend for ENC is higher and is also decreasing, but it is not reliable.
- The 13-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 18% for ENC. In 2011, the ENC age-adjusted rate trend remains 43% greater than RNC and 38% greater than the US.
- The non-White male and non-White female 13-year trends are decreasing more quickly than their White counterparts. The White male rate is flat and the White female rate is decreasing slightly.
- The non-White mortality rate trend decreased 25% over 13 years but remains 118% greater than the White rate.
- The 27% decrease in racial disparity for the last 13 years is moderately reliable.

All Other Unintentional Injuries and Adverse Effects

- The mortality rate trend for unintentional injuries and adverse effects is increasing in ENC (39% over 13 years). The trends for RNC and NC are also increasing.
- The age-adjusted mortality rate trends for ENC, RNC, NC, and the US are all increasing. During the last 13 years, ENC has increased 29%, although it is 4% below RNC in 2011.
- The trends for White males and White females are both increasing (52% and 86% respectively over the 13-year period). The mortality rate trend for non-White males decreased 33% over 13 years. The trend for non-White females is not reliable.
- The White rate trend has increased 64% over the 13-year period. The non-White rate trend has dropped below the White and is decreasing in a moderately reliable trend.

- Over the last 13 years, racial disparity has decreased by 420% in a reliable trend, eliminating the unfavorable disparity in relation to Whites and favoring non-whites.

Alzheimer's Disease

- The Alzheimer's mortality rate trend for ENC shows a 73% increase over the 13 year period. ENC's rate of increase was larger than RNC and NC but the rate for ENC still remains 17% less than RNC.
- In 2011, the age-adjusted rate trend for ENC is 5% below the US rate, but has increased 43% over the 13-year period. The ENC rate is 22% less than RNC.
- The 13-year mortality rate trends for White and non-White females are greater than White males and non-White males. Rate trends for all demographic groups are increasing but non-White males are increasing the most.
- The non-White mortality rate for Alzheimer's remains 14% less than the White mortality rate in 2011 but the 13-year trend is increasing for both and suggests convergence in the near future.
- The 13-year moderately-reliable trend suggests an increase in disparity that favors whites.

Nephritis, Nephrotic Syndrome, and Nephrosis

- The mortality rate trend for nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 33% over 13 years. The rate trends for RNC and NC have also increased, but not as much. In 2011 ENC's rate is 22% greater than RNC.
- With age-adjustment, the rate of increase is the same for RNC and NC, but ENC is 15% greater than RNC, and 40% greater than the US rate trend.
- The 13 year trend for non-White males is the highest and increasing the most rapidly. The trends for White males and White females are increasing but more slowly. The trend for non-White females is not reliable.
- In 2011, the non-White rate was 136% greater than the White rate. Both the White rate and the non-White rate are increasing.
- The racial disparity trend is decreasing but is unreliable.

Cancer - Colon, Rectum, Anus

- The 13-year rate trends for colon cancer for ENC, RNC and NC have all declined over the period. In 2011 ENC's rate was 29% greater than RNC.
- The age-adjusted mortality rate trend for colon cancer for ENC has declined 32% over the 13-year period. The ENC rate is the highest (14% greater than RNC) but is projected to converge with the NC and RNC trends.
- The non-White male mortality rate trend is the highest of the demographic groups and is decreasing the most slowly. White males and non-White females are about 40% less than non-White males. White females have the lowest rate trend.
- The non-White rate in 2011 is 47% greater than the White rate. Both are declining but the White rate is declining more quickly.
- The trend for racial disparity is unreliable.

Pneumonia and Influenza

- The mortality rate trend for pneumonia and influenza for ENC, RNC and NC have all declined over the 13 year period. The ENC rate in 2011 is 11% higher than the RNC rate.
- The age-adjusted mortality rate trends for all NC regions are similar and are decreasing at about the same pace. The ENC rate is 20% higher than the US rate.

- The age-adjusted mortality rate trend for all four demographics are decreasing. The trends for non-White males and White males are the highest. Trend lines predict convergence of all four groups in the future.
- The Non-White mortality rate is 11% less than the White rate in 2011. Both are decreasing.
- The 13-year decreasing trend for racial disparity is unreliable.

Cancer – All Sites

- The cancer – all sites mortality rates for ENC have decreased slightly (4%) over 13 years. The RNC and NC rates are lower, and have decreased more than ENC, causing these rates to diverge.
- The age-adjusted cancer – all sites mortality rates for ENC, NC and RNC are all decreasing at about the same level, although the ENC rate is 9% greater than the RNC rate.
- The rate trend is decreasing for all regions. The rate for non-White males is the highest but is decreasing the most. White and non-White females show slight decreases.
- Both White and non-White cancer mortality trends are decreasing over the 13 year period. The Non-White rate decreased 22% and the White rate decreased 15%. The non-White rate remains 16% greater than the White rate in 2011.
- The moderately reliable 13-year trend for racial disparity shows a 38% decrease.

HIV Disease

- The fitted HIV mortality rates for ENC have been decreasing over the past 13 years, but are still 62% greater than RNC in 2011.
- The age-adjusted rate trend for ENC, RNC and the US are all decreasing. The ENC rate is 68% greater than RNC in 2011.
- Non-White males continue to have the highest rates of age-adjusted mortality, but these rates have also decreased 15% in a 13-year reliable trend. Non-White females have the second highest rate, but it has also declined over the 13-year period. The rate for White males is lower but has also decreased. The White female rate is not reliable.
- The 13-year age-adjusted HIV mortality rates have decreased by 43% in a reliable trend for both Whites and non-Whites. The non-White rate is still 1068% greater than the White rate.
- The 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 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 2011. 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 2011--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 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 2020 from known historical values (1979 to 2011) to provide a *general* idea about where mortality trends are heading.

The equation of the line allows the user to calculate an expected or fitted rate for any given year, x . For example, in figure 6.4 ii the year 2005 is the 7th year in the series, so 7 would be substituted for x in the equation of the line derived from ENC29’s age-adjusted mortality rate series for a selected cause of death. For chronic lower respiratory diseases (1979 to 2011), the 2005 *expected* or *fitted* age-adjusted rate is calculated to be a little less than 45 deaths per 100,000 people. The *observed* age-adjusted rate for 2005 is 48 deaths per 100,000 people. (The observed rates are the values found in the table that runs along the x -axis of the time series chart.) The numeric difference between the expected and observed rates for 2005 is 2.9—the model (the equation of the line) *underestimates* the observed value by 2.9 deaths. Each previous and subsequent year’s difference between the expected and observed rates will vary to a greater or lesser degree depending on the size of the population under study (see below). This variation can be measured to determine how well the line fits or models the observed data.

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

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

is low, R^2 approaches 1.0. A low R^2 implies low reliability and a larger R^2 indicates that a greater degree of confidence can be placed in the trend line. The trend lines are generally unreliable when R^2 is less than 0.10, moderately reliable when R^2 is between 0.10 and 0.35, and most reliable when R^2 is equal to or greater than 0.35. Graphically, data points, data lines and trend lines are weighted according to their reliability and significance. The thinnest, dashed trend lines are for those where R^2 is less than 0.10 and should be considered not reliable. The thickest 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 (1999-2011). 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 2011 tables compare the fitted rates calculated for the beginning and end of the observed time series in terms of percent difference. Returning to figure 6.4 ii, ENC29's age-adjusted fitted rate for chronic lower respiratory diseases in 1999 is 8% greater than (GT) RNC's fitted rate. In 2011, ENC29's fitted rate is 12% 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*.

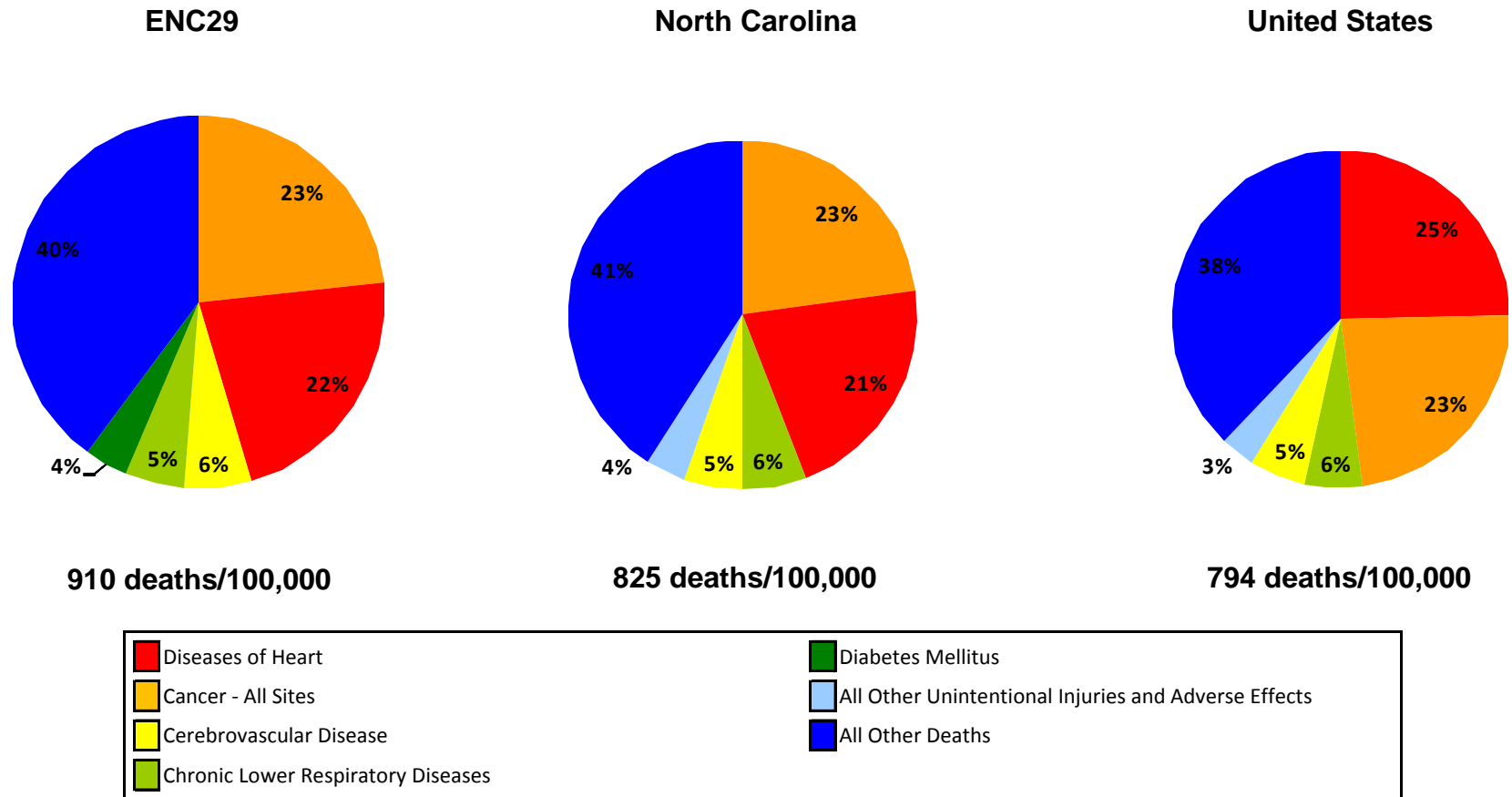
United States Department of Health and Human Services. *Healthy People 2020*. www.healthypeople.gov.

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

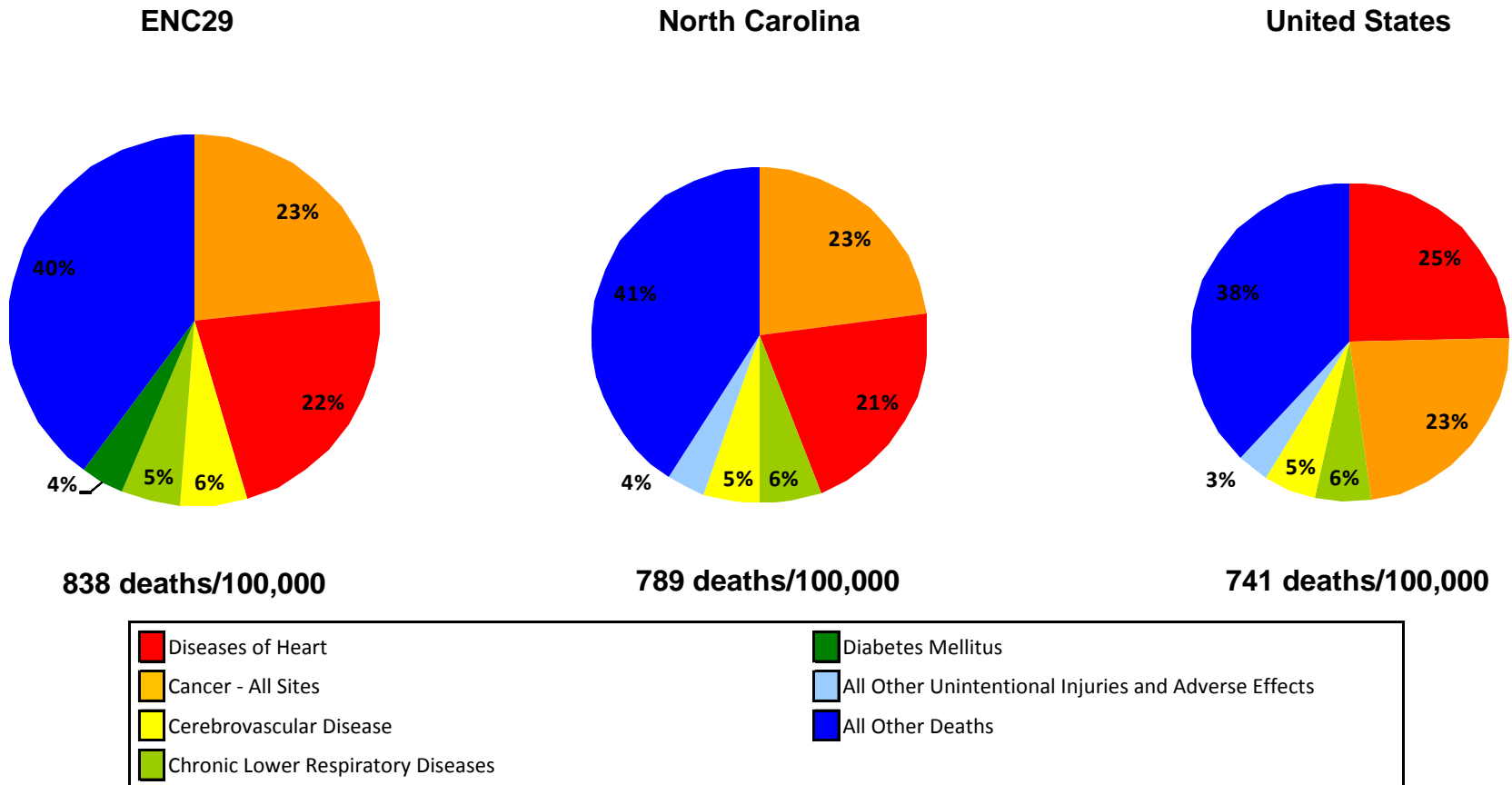
Figure 4.1 i. General leading causes of death for ENC29 (2011), NC (2011), and US (2009). Mortality rate per 100,000 population.



2011 NC rate is 4% higher than 2009 US rate

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.1 ii. General leading causes of death for ENC29 (2011), NC (2011), and US (2009). Age-adjusted mortality rate per 100,000 population.



2011 NC age-adjusted rate is 6% higher than 2009 US age-adjusted rate

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.2 i. General leading causes of death for ENC29 (2011) by race and gender. Mortality rate per 100,000 population.

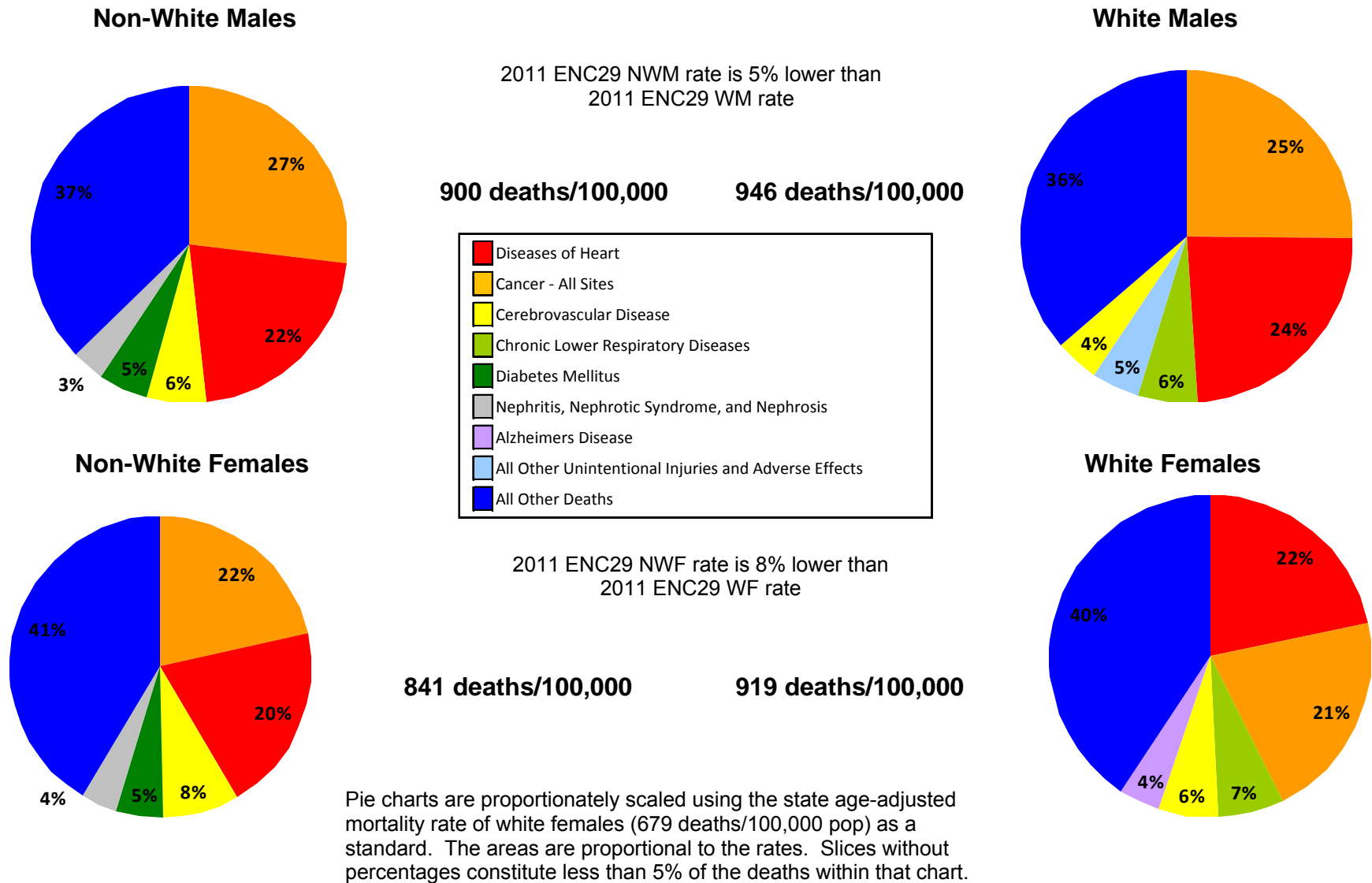


Figure 4.2 ii. General leading causes of death for ENC29 (2011) by race and gender. Age-adjusted mortality rate per 100,000 population.

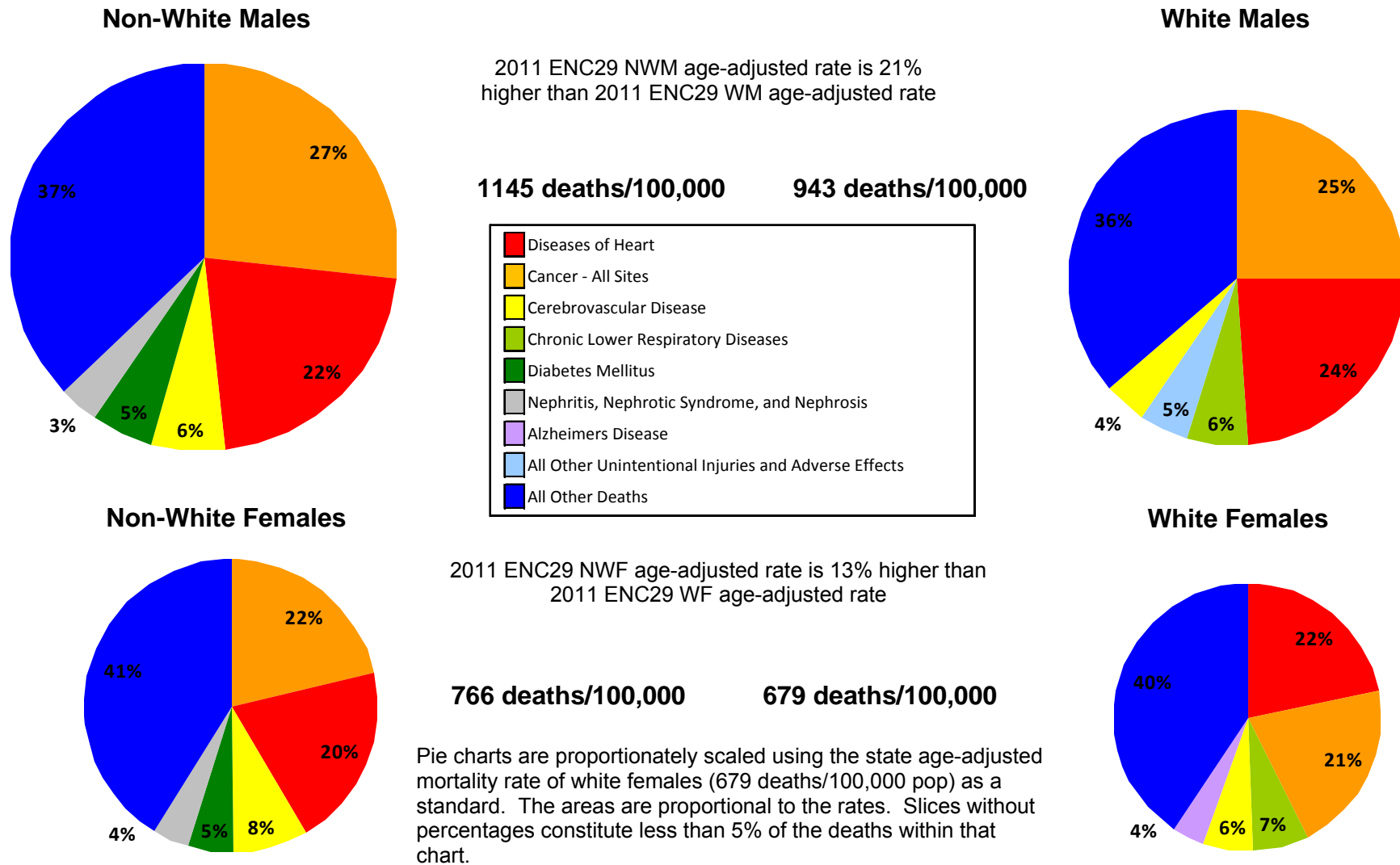
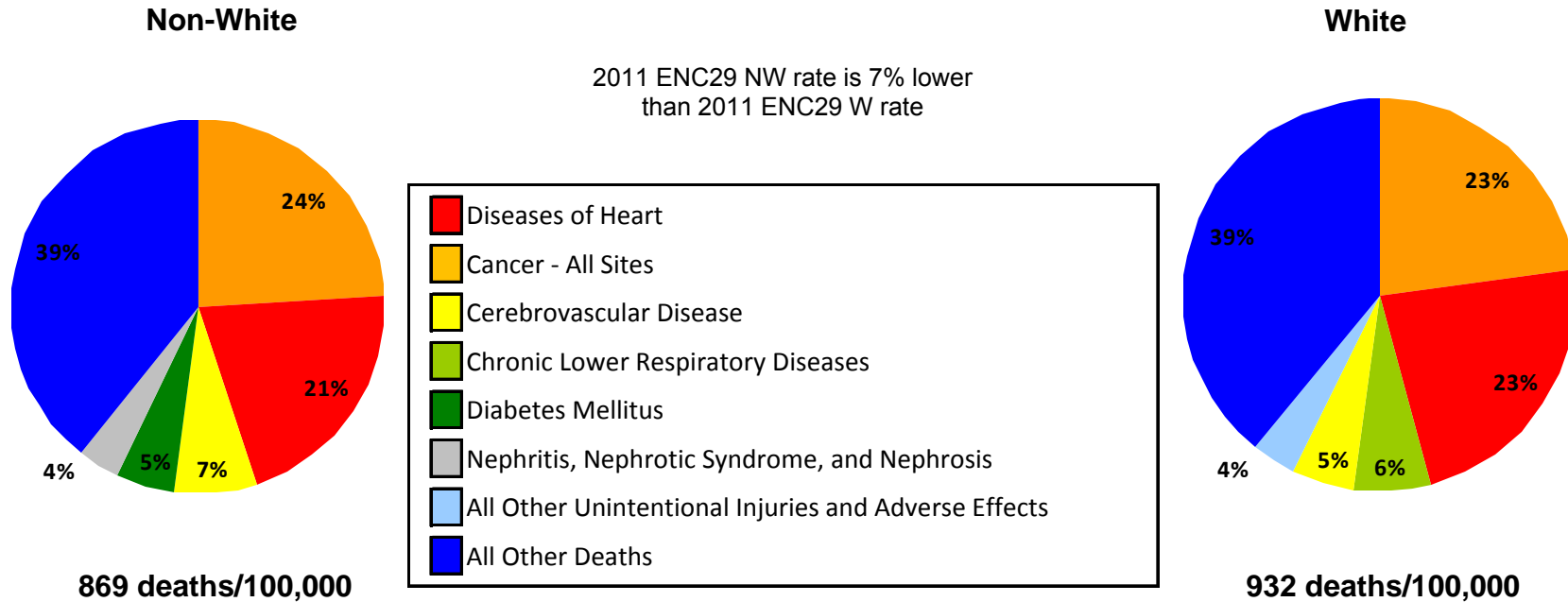
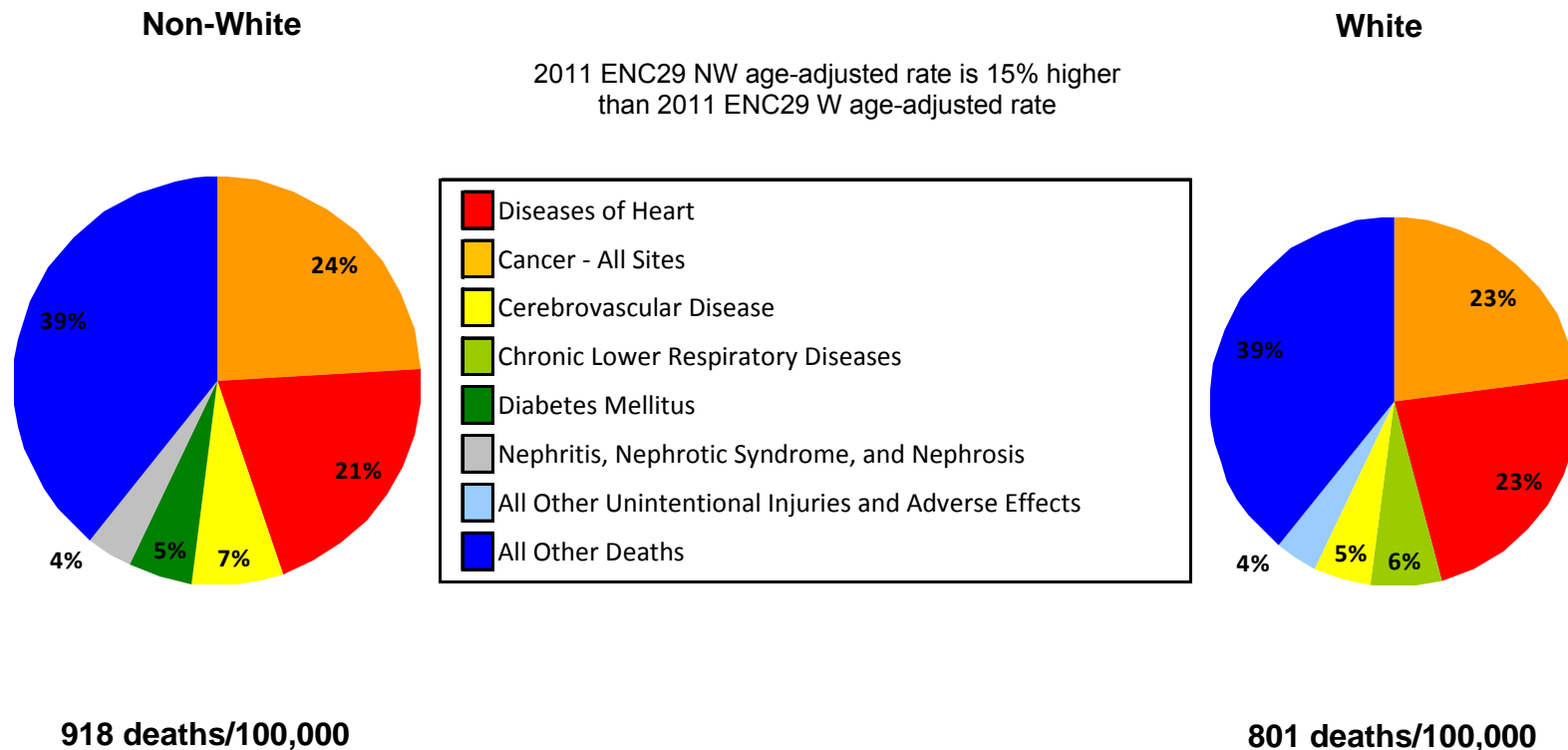


Figure 4.3 i. General leading causes of death for ENC29 (2011) by race.
Mortality rate per 100,000 population.



Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

Figure 4.3 ii. General leading causes of death for ENC29 (2011) 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 (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

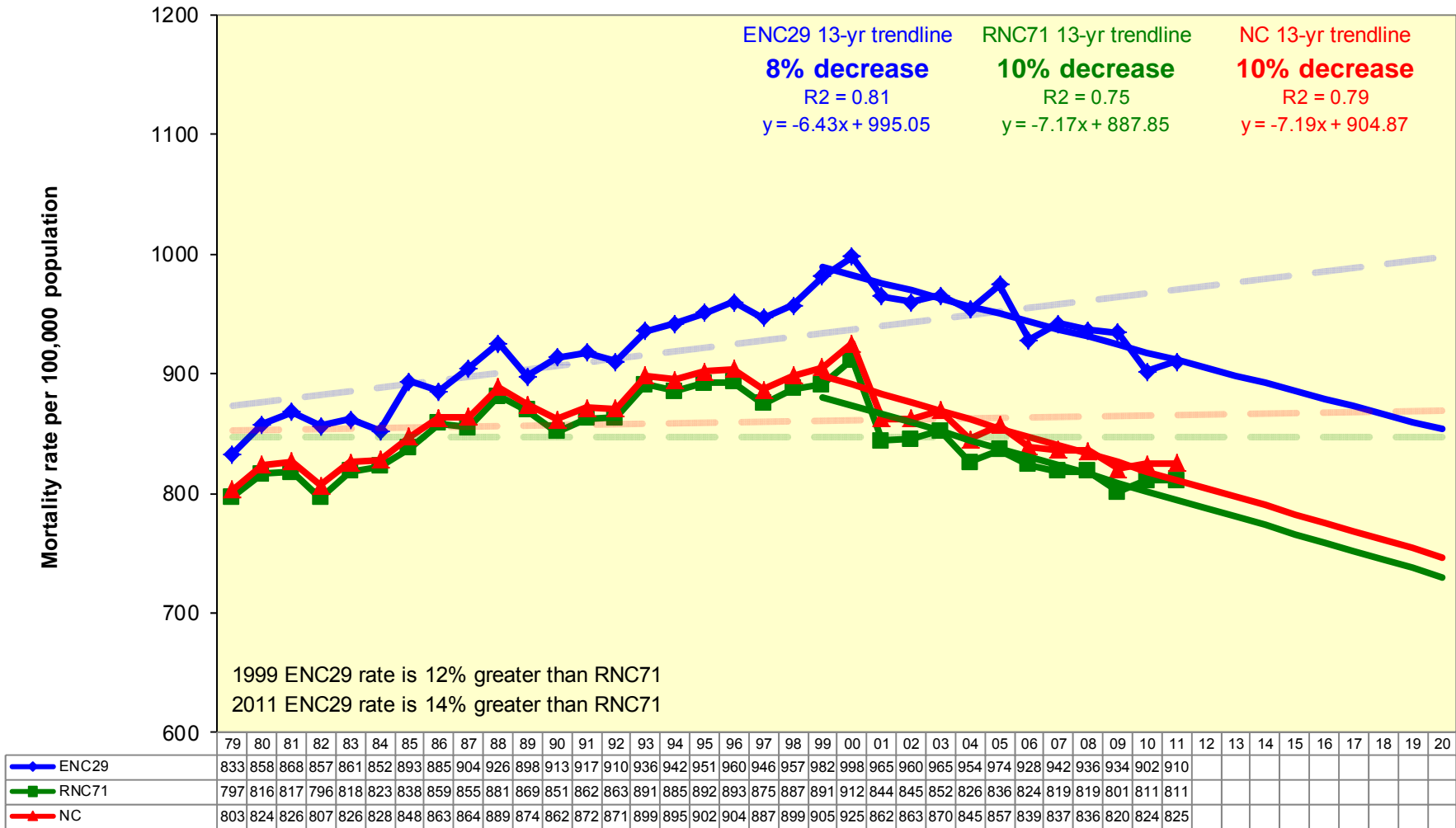
5. Trends and Disparities in Mortality
in ENC29:
All Causes of Death and
All Causes of Premature Mortality;
1979-2011

All Causes of Death

- The 32 year ENC trend line shows all cause mortality rates are increasing. The 13 year trend line shows ENC's rate is decreasing but is still higher than NC and RNC.
- The age-adjusted, all-cause mortality rate trend for ENC has decreasing over the 30 year period. The 13-year trend shows greater decrease and suggests the ENC rate will converge with the RNC and NC rates. ENC's rate remains 10% greater than the rate for RNC.
- The non-White male mortality rate trend remains higher than other demographic groups but has had the greatest rate of decrease (27%) in the 13-year trend. Convergence of non-White males with White males and non-White females with White females is suggested in the future.
- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 16% greater than the White rate, but the recent 13-year trend suggests they will converge in the future.
- Over the recent 13-year period there is a drop 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 $R^2 < 0.10$.

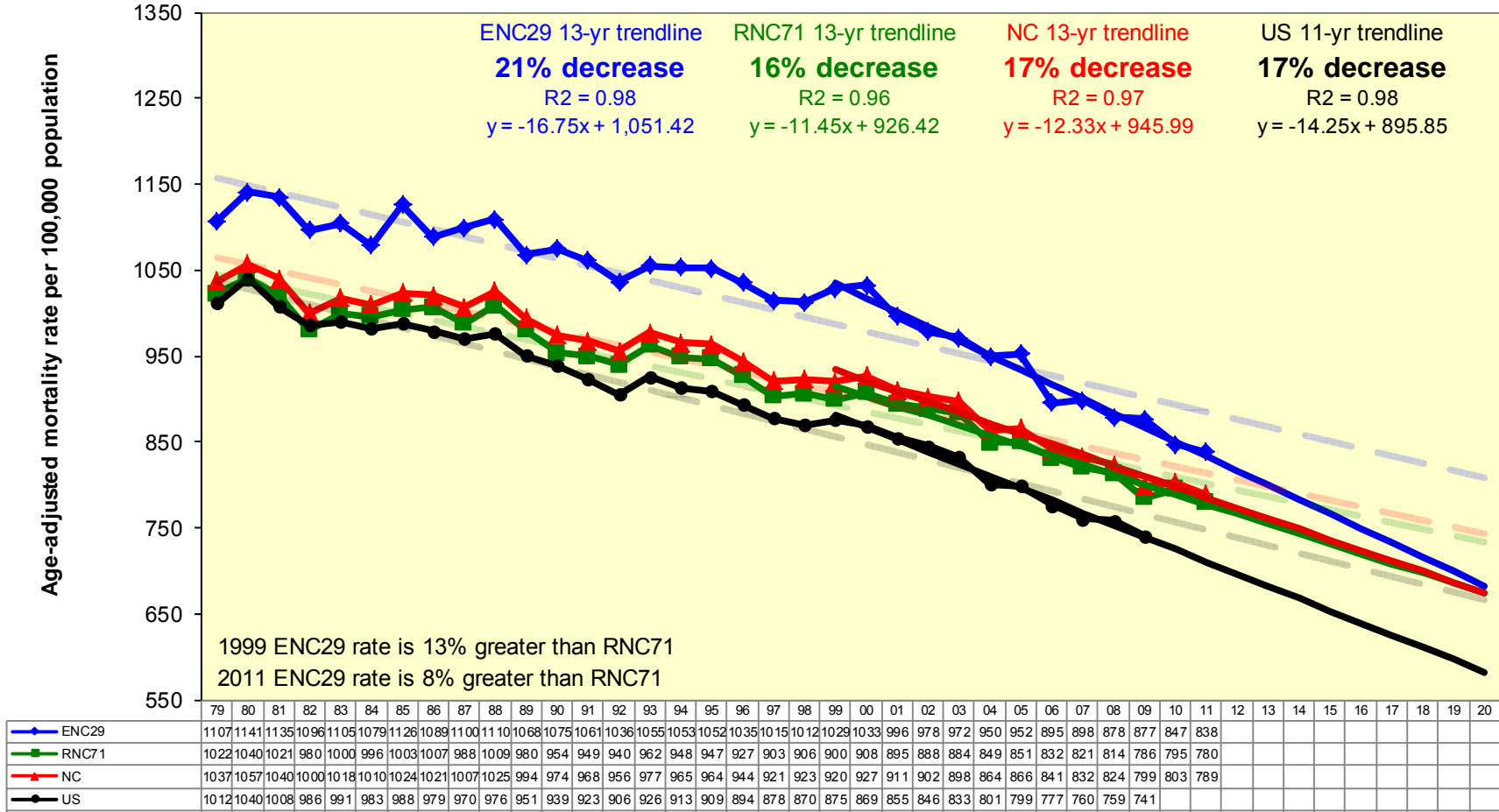
Figure 5.1 i. All Causes of Death:
Trends in mortality rates for ENC29, RNC71, and NC
1979-2011 with projections to 2020



Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	
	11% LT	9% LT	ENC29
12% GT		2% GT	RNC71
10% GT	2% LT		NC

Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	
	13% LT	11% LT	ENC29
14% GT		2% GT	RNC71
12% GT	2% LT		NC

Figure 5.1 ii. All Causes of Death:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020



Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	US
	12% LT	10% LT	15% LT
13% GT		2% GT	3% LT
11% GT	2% LT		5% LT
17% GT	3% GT	6% GT	

Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	US
	7% LT	6% LT	15% LT
8% GT		1% GT	8% LT
7% GT	1% LT		9% LT
17% GT	9% GT	10% GT	

Figure 5.1 iii. All Causes of Death:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

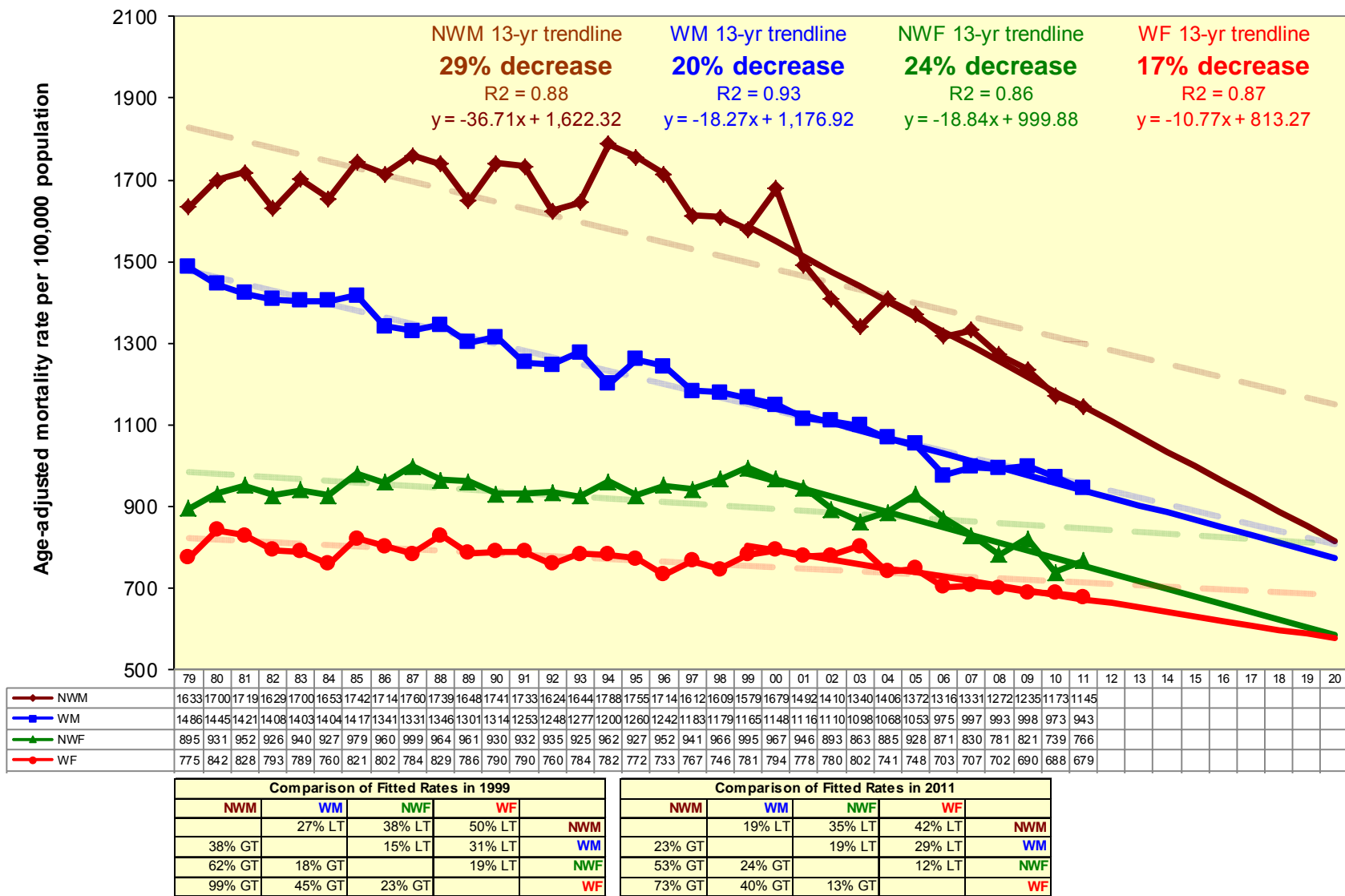


Figure 5.1 iv. All Causes of Death:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

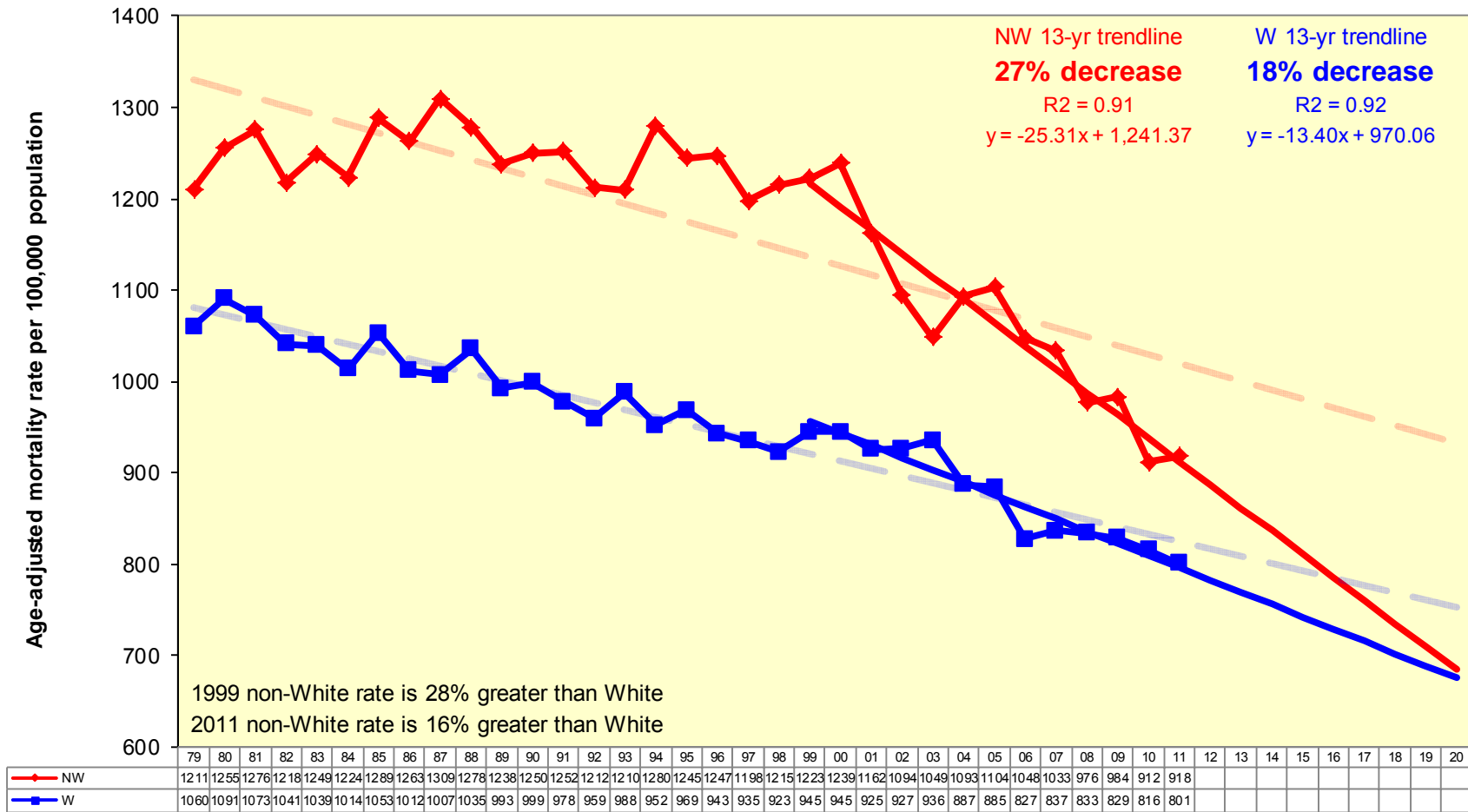
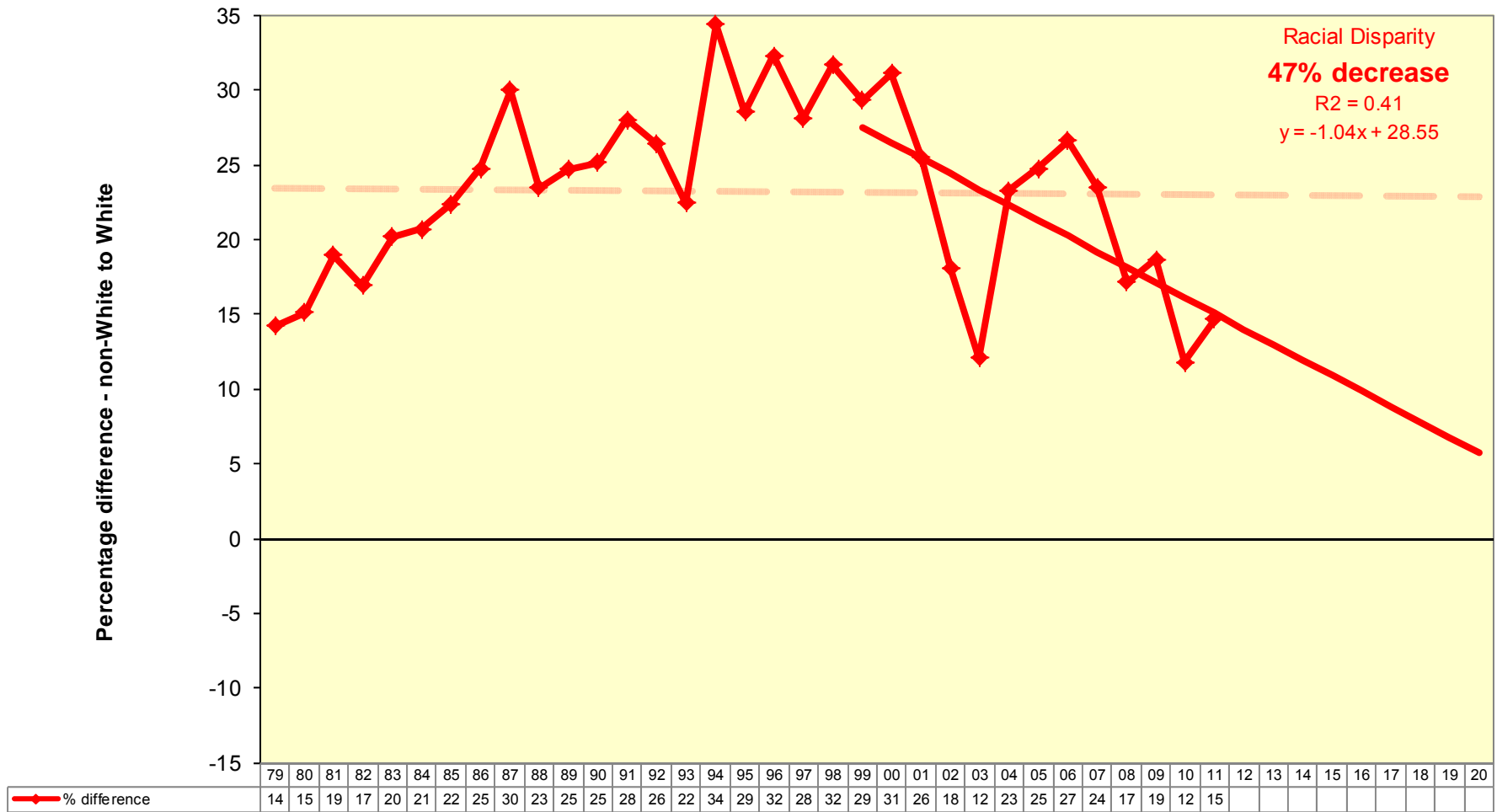


Figure 5.1 v. All Causes of Death:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020

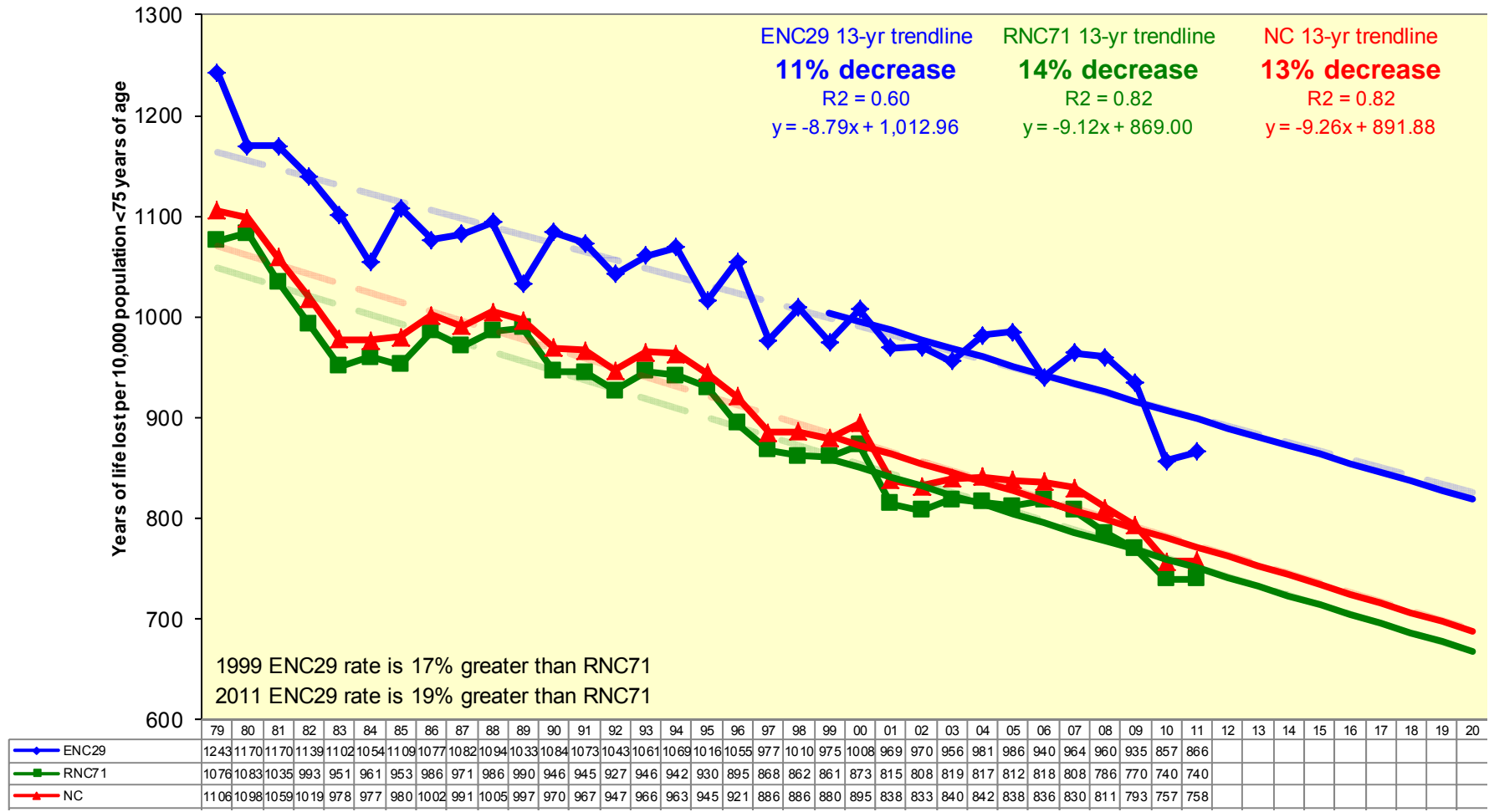


All Causes of Premature Mortality

- ENC's premature mortality rate trend has decreased by 11% over the 13 year period since 1999. This decline is similar to RNC and NC, but ENC remains about 20% higher.
- The age-adjusted premature mortality rate trend for ENC is also decreasing, but remains 19% higher than the RNC rate in 2011.
- The non-White male rate trend is significantly higher than any other demographic group, but also has the highest rate of decrease (31% over 13 years). White females have the lowest rate and also the lowest rate of decrease (6% over 13 years).
- A recent decrease in the premature mortality rate for non-Whites and leveling of rates for Whites suggests a reduction in racial disparity.
- The 13 year trend for racial disparity shows a 50% decrease, in a reliable trend.

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

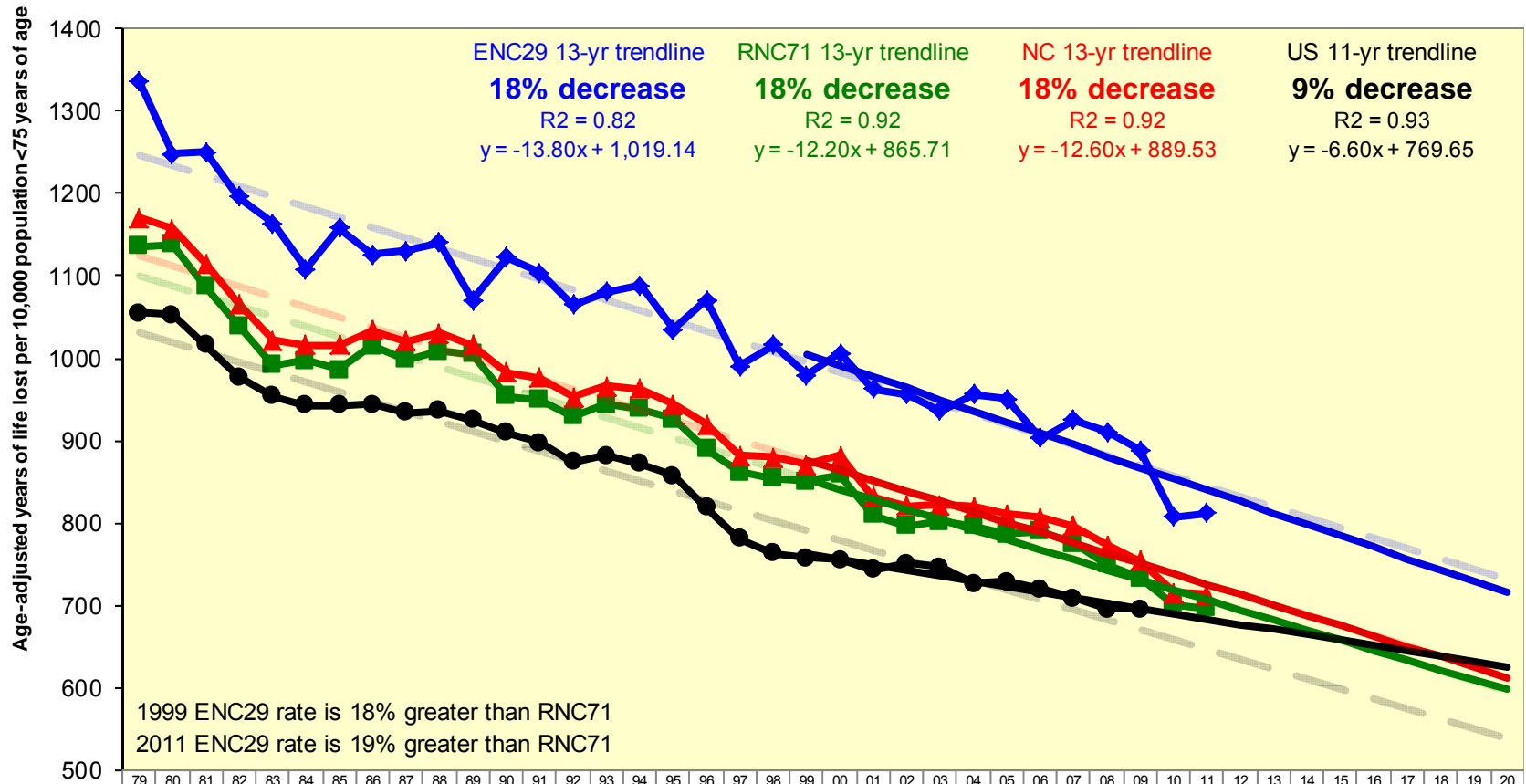
Figure 5.2 i. All Causes of Premature Mortality:
Trends in premature mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020



Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	
	14% LT	12% LT	ENC29
17% GT		3% GT	RNC71
14% GT	3% LT		NC

Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	
	16% LT	14% LT	ENC29
19% GT		3% GT	RNC71
16% GT	3% LT		NC

Figure 5.2 ii. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020



	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20				
ENC29	1336	1248	1251	1196	1163	1108	1158	1126	1130	1140	1071	1123	1104	1065	1081	1088	1035	1071	991	1017	979	1007	963	956	936	956	951	903	925	911	889	807	812													
RNC71	1135	1138	1087	1039	992	997	986	1015	998	1009	1005	954	950	930	944	939	926	890	862	854	850	858	809	797	802	797	786	790	775	750	733	700	697													
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													
US	1055	1053	1016	977	954	943	943	944	935	936	925	910	898	874	882	872	858	818	782	763	758	755	743	751	746	727	729	720	709	696																

Comparison of Fitted Rates in 1999				Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	US	ENC29	RNC71	NC	US
	15% LT	13% LT	24% LT		16% LT	14% LT	19% LT
18% GT		3% GT	11% LT	19% GT		3% GT	4% LT
15% GT	3% LT		13% LT	16% GT	3% LT		6% LT
32% GT	12% GT	16% GT		24% GT	4% GT	7% GT	

Figure 5.2 iii. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

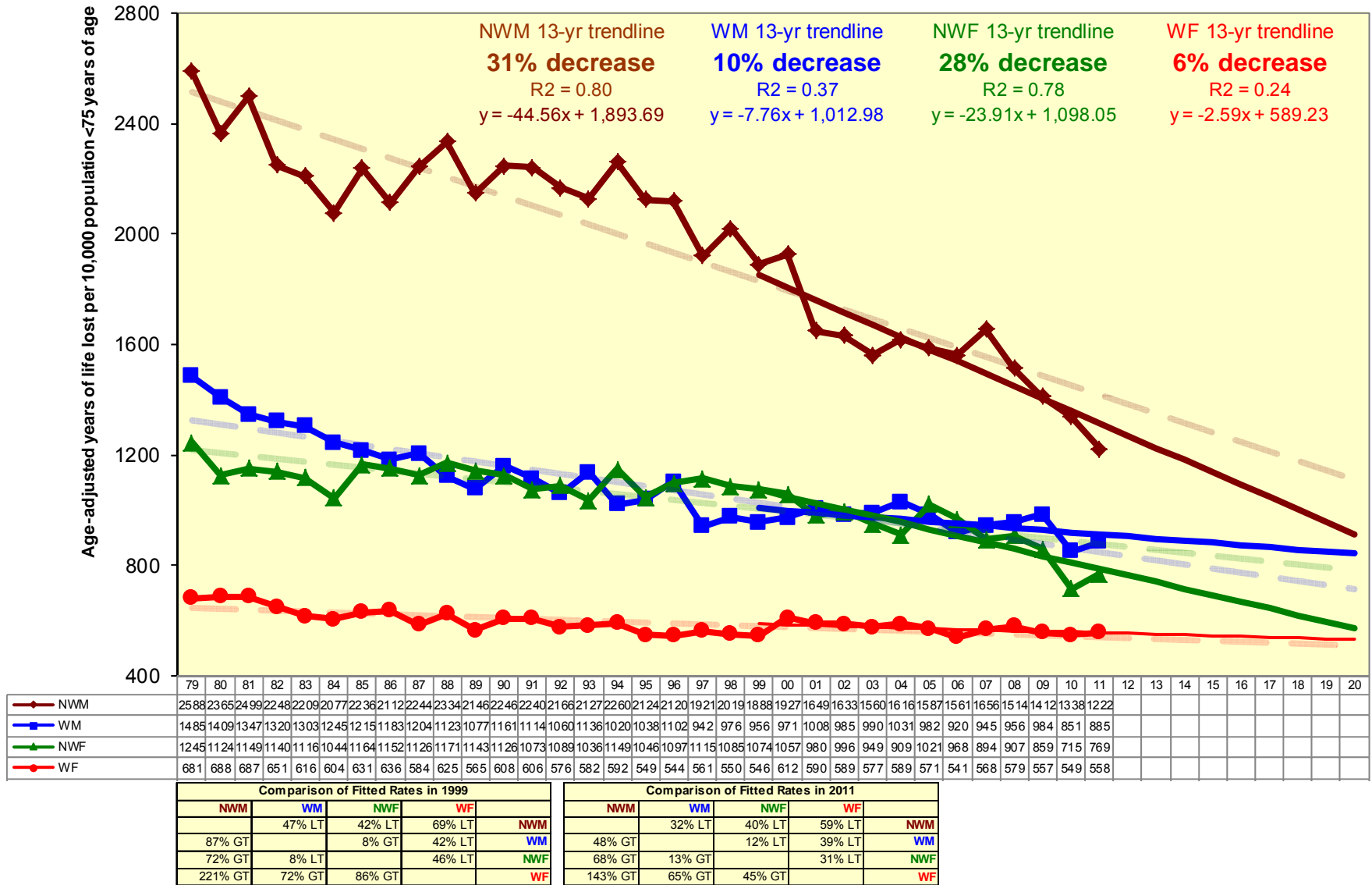


Figure 5.2 iv. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates by race for ENC29,
1979-2011 with projections to 2020

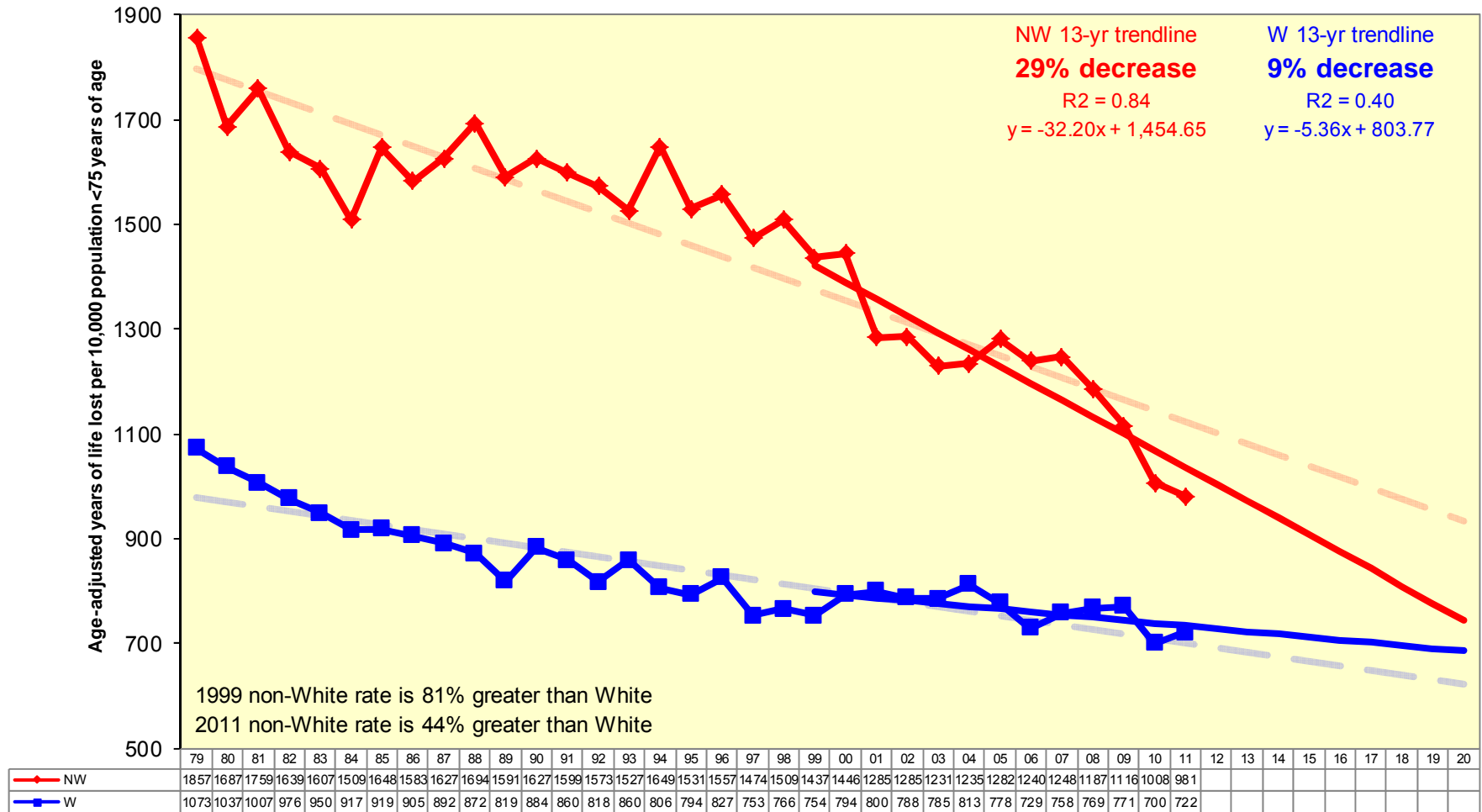
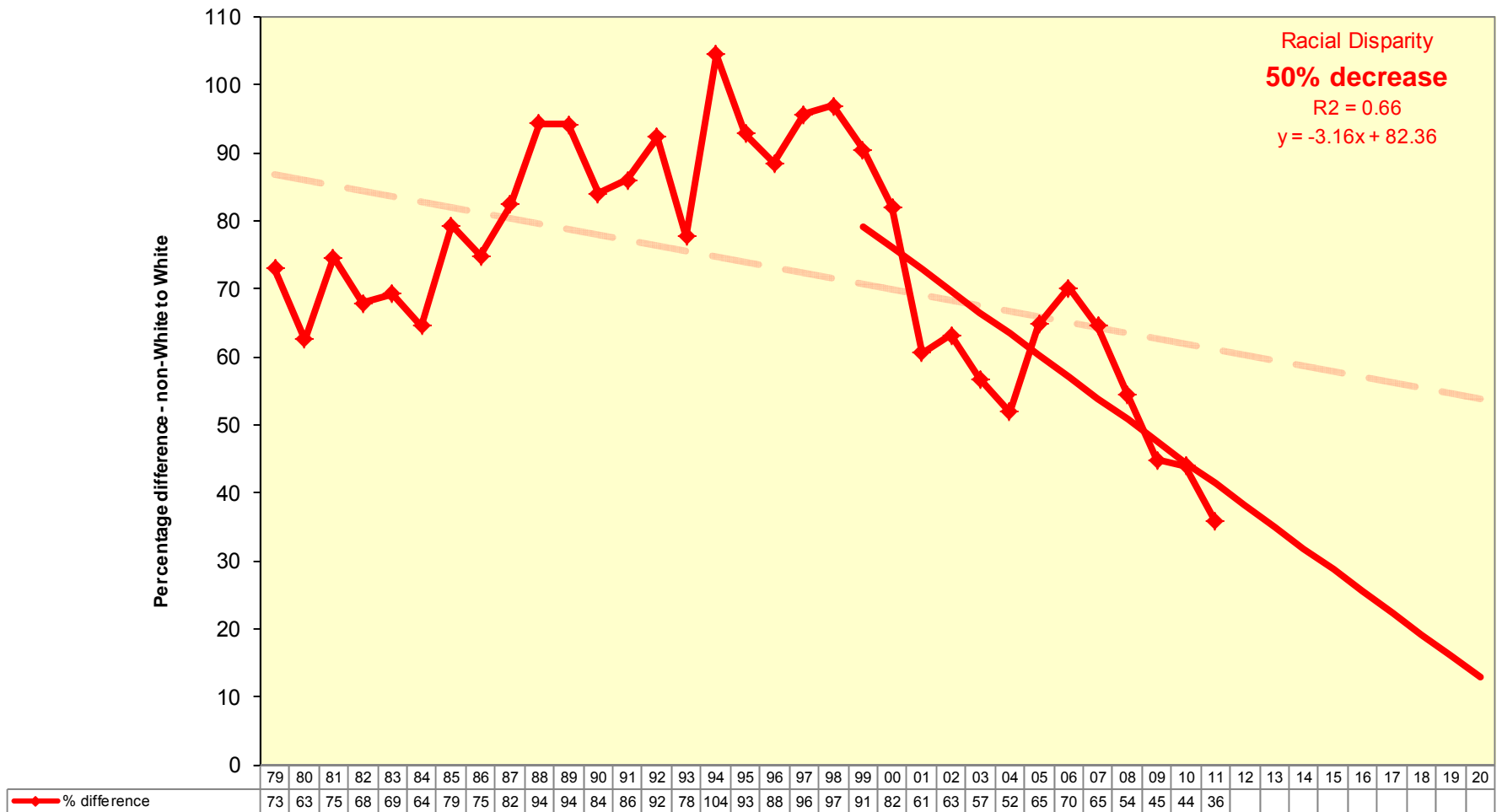


Figure 5.2 v. All Causes of Premature Mortality:
 Measuring disparity in age-adjusted premature mortality rates by race for ENC29,
 1979-2011 with projections to 2020



6. Trends and Disparities in Mortality in ENC29: Ten Specific Leading Causes of Death, 1979-2011

Diseases of Heart

- ENC's 13-year mortality rate trend is decreasing at about the same rate as RNC and NC, although ENC remains well above the others.
- While ENC's age-adjusted mortality rate trend is decreasing at a pace equal to RNC, the ENC rate remains 13% greater than RNC in 2011.
- The non-White male rate trend remains slightly higher than the White female trend but is decreasing at a quicker rate and is suggested to fall below White females in the future.
- The non-White rate trend remains 11% greater than for Whites, but the 13-year trends for both are decreasing, and convergence is suggested in the future.
- The 13-year trend line for racial disparity is unreliable.

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

Figure 6.1 i. Diseases of Heart:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

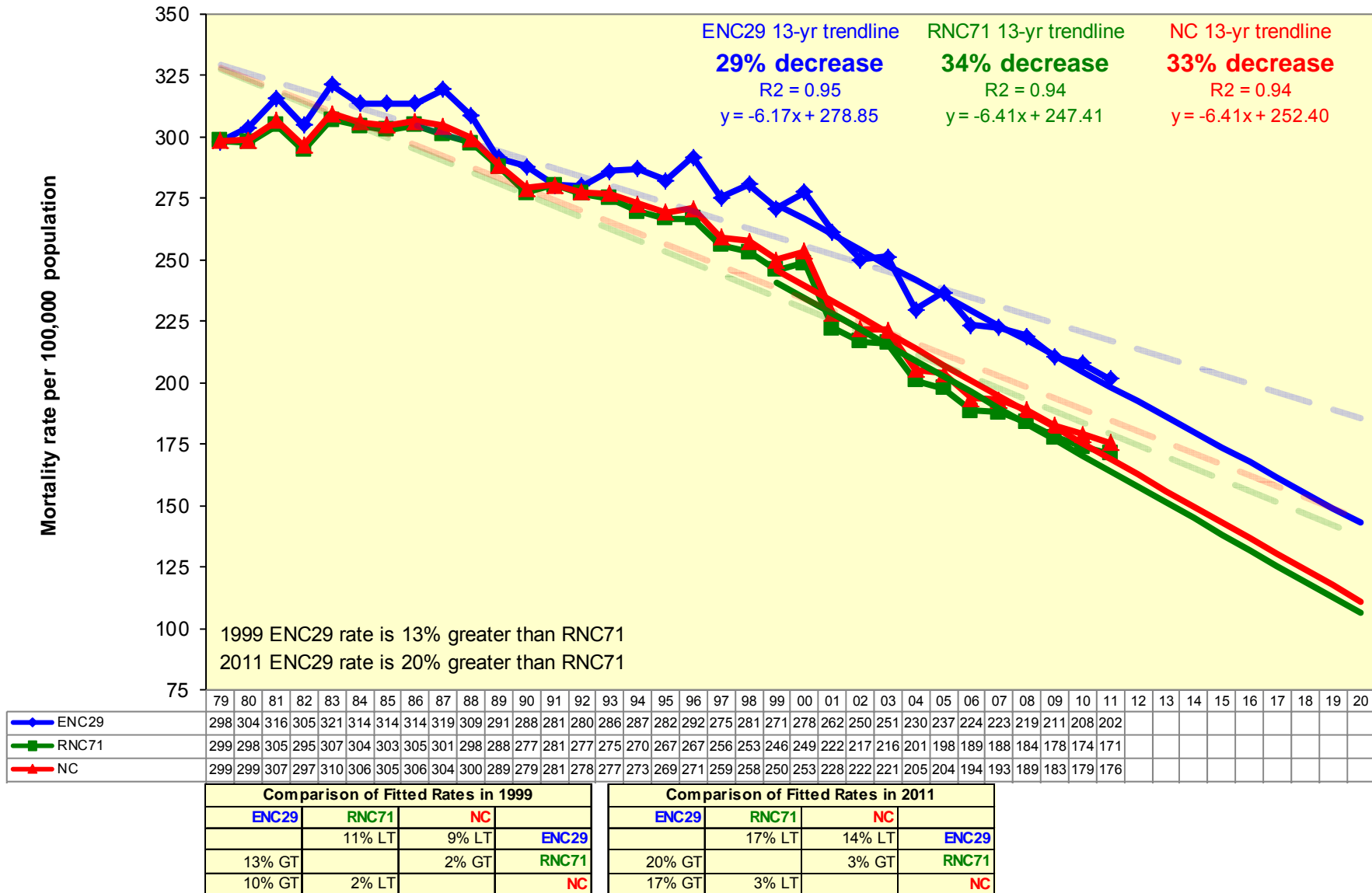


Figure 6.1 ii. Diseases of Heart:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

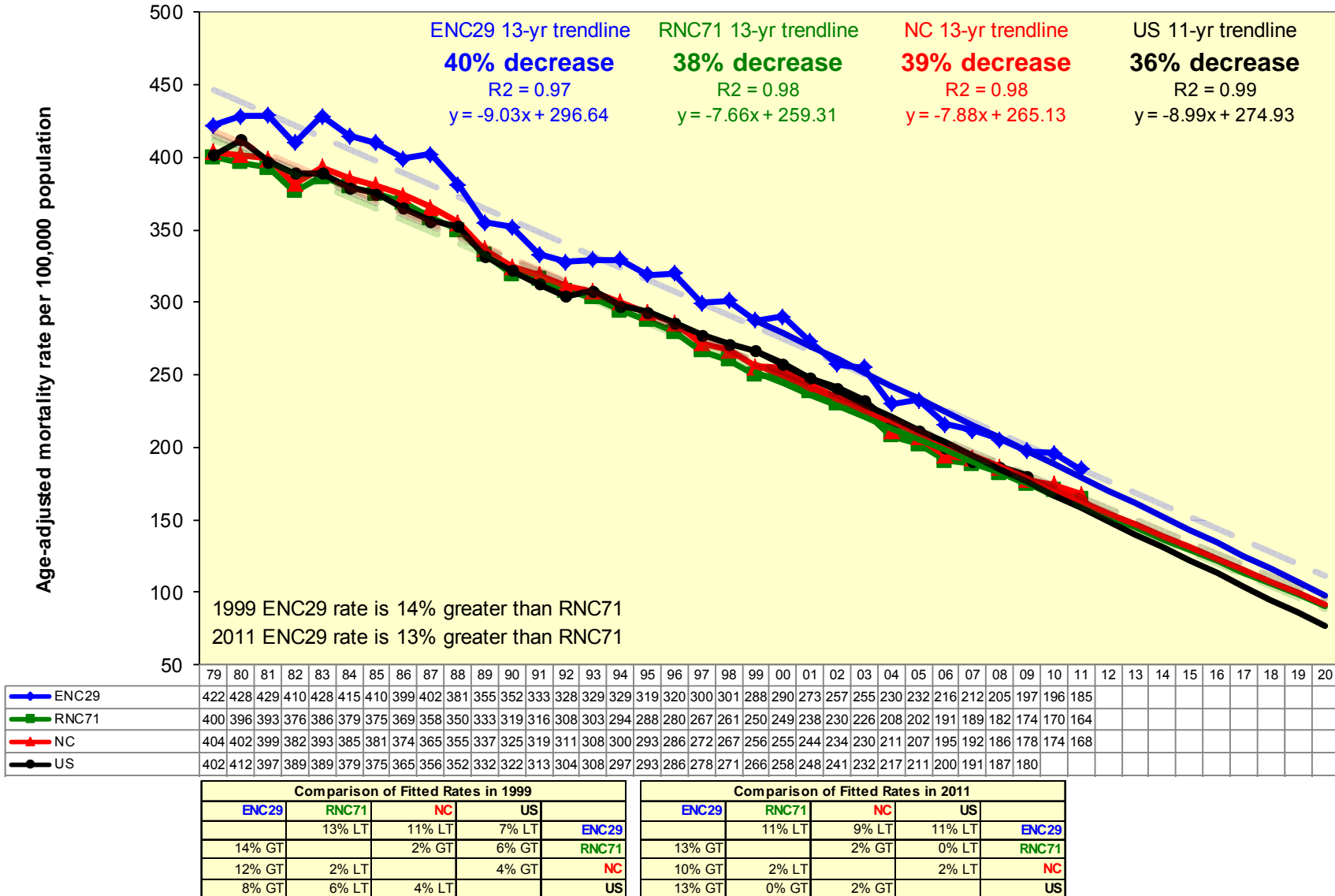


Figure 6.1 iii. Diseases of Heart:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

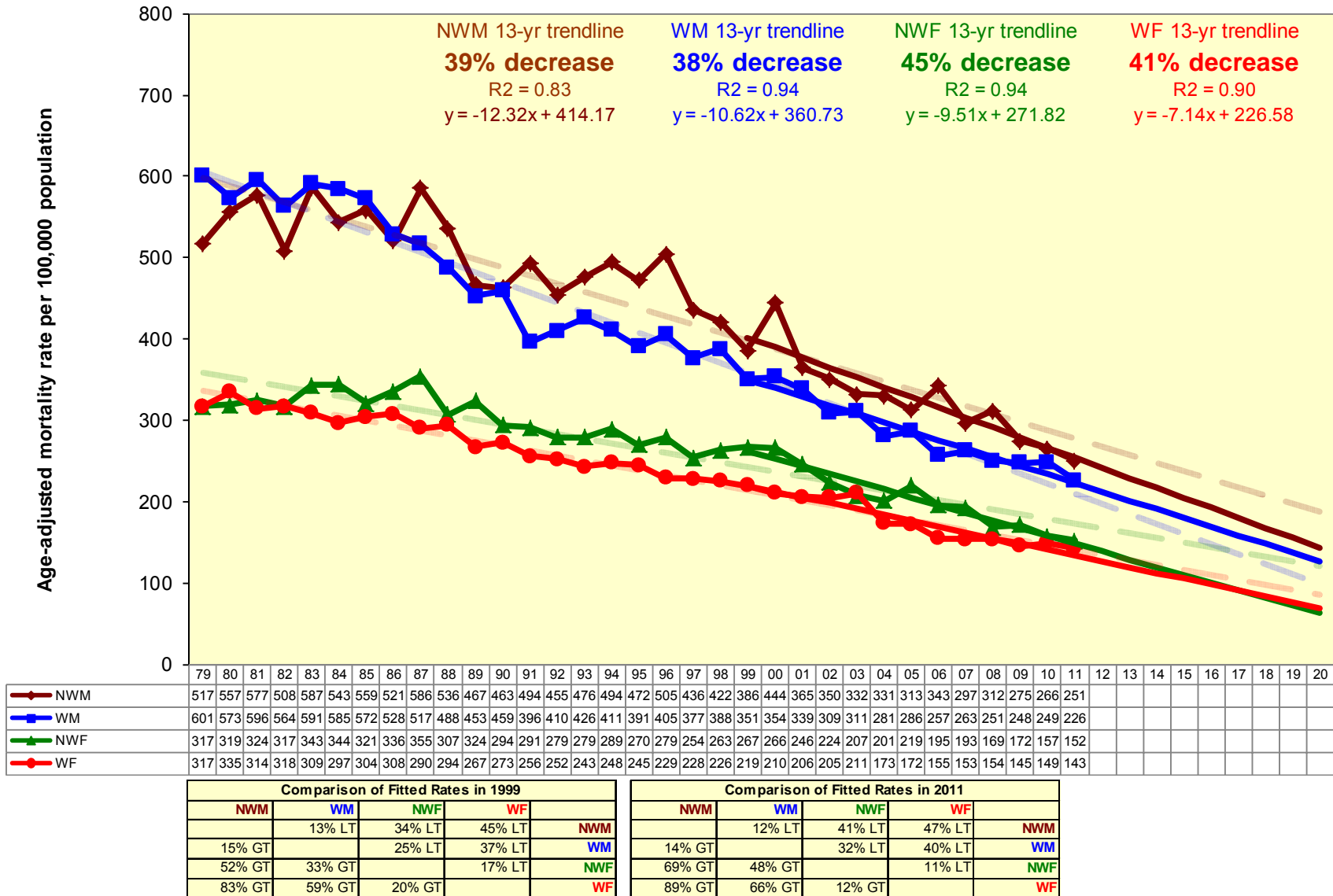


Figure 6.1 iv. Diseases of Heart:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

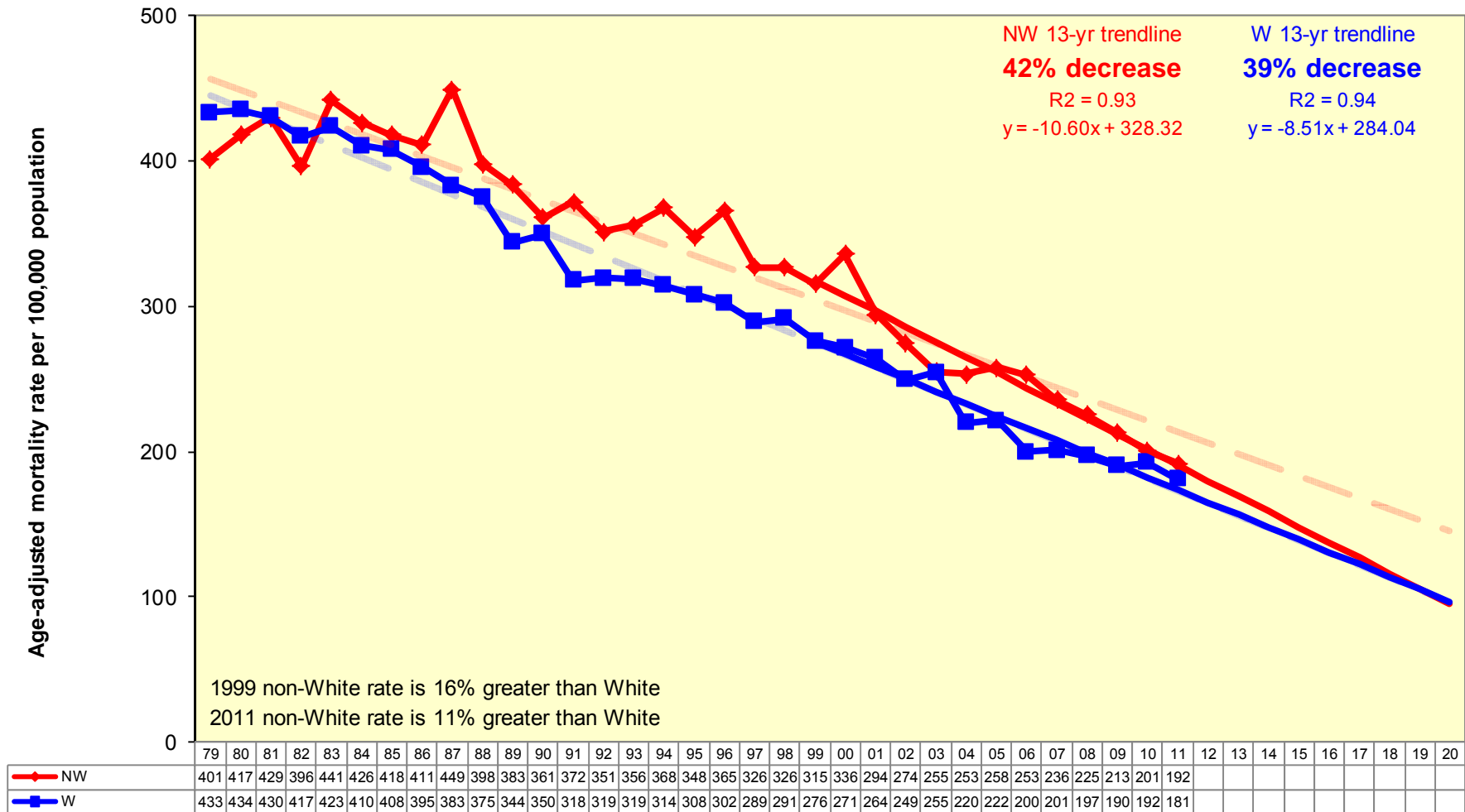
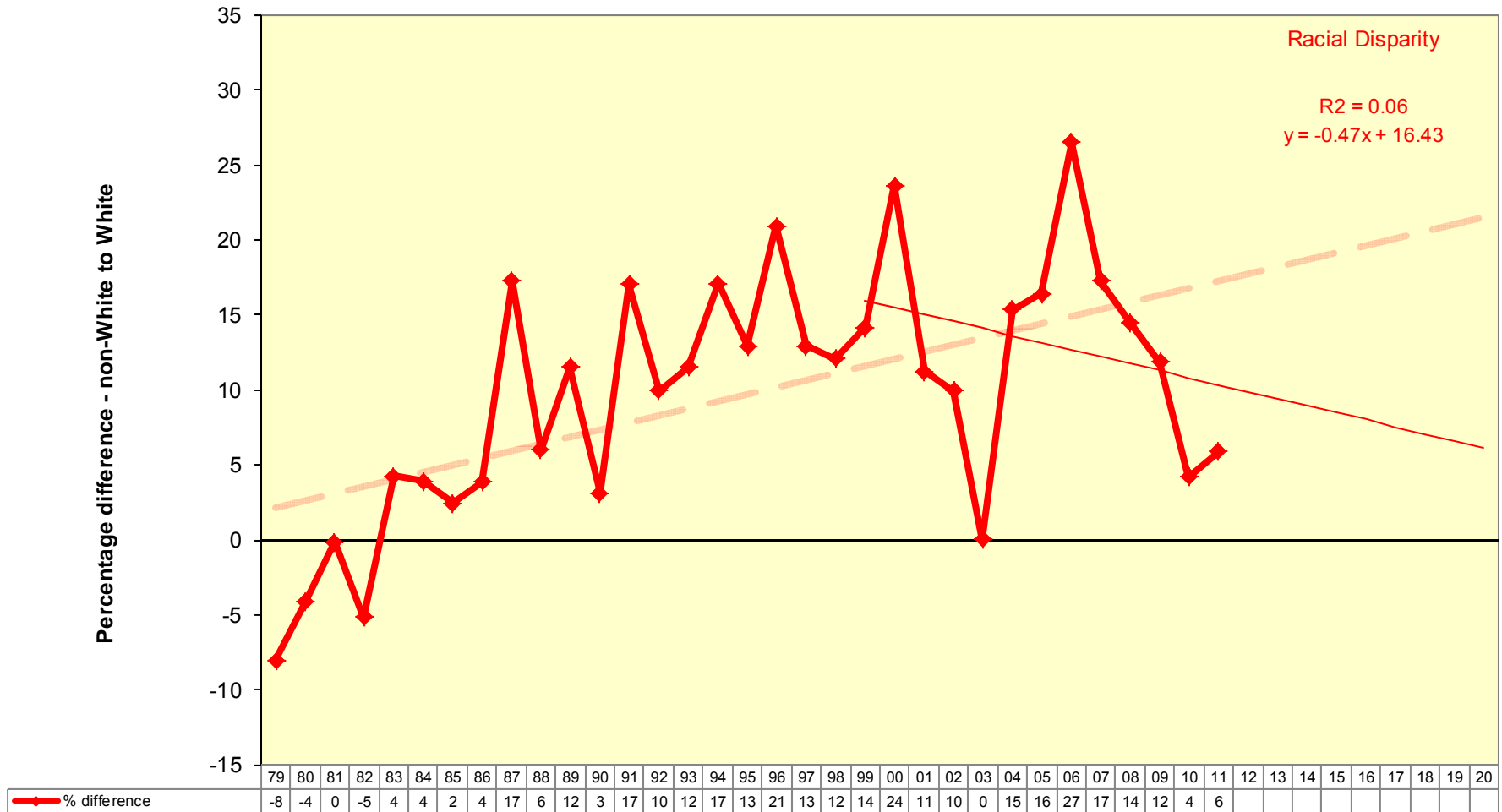


Figure 6.1 v. Diseases of Heart:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

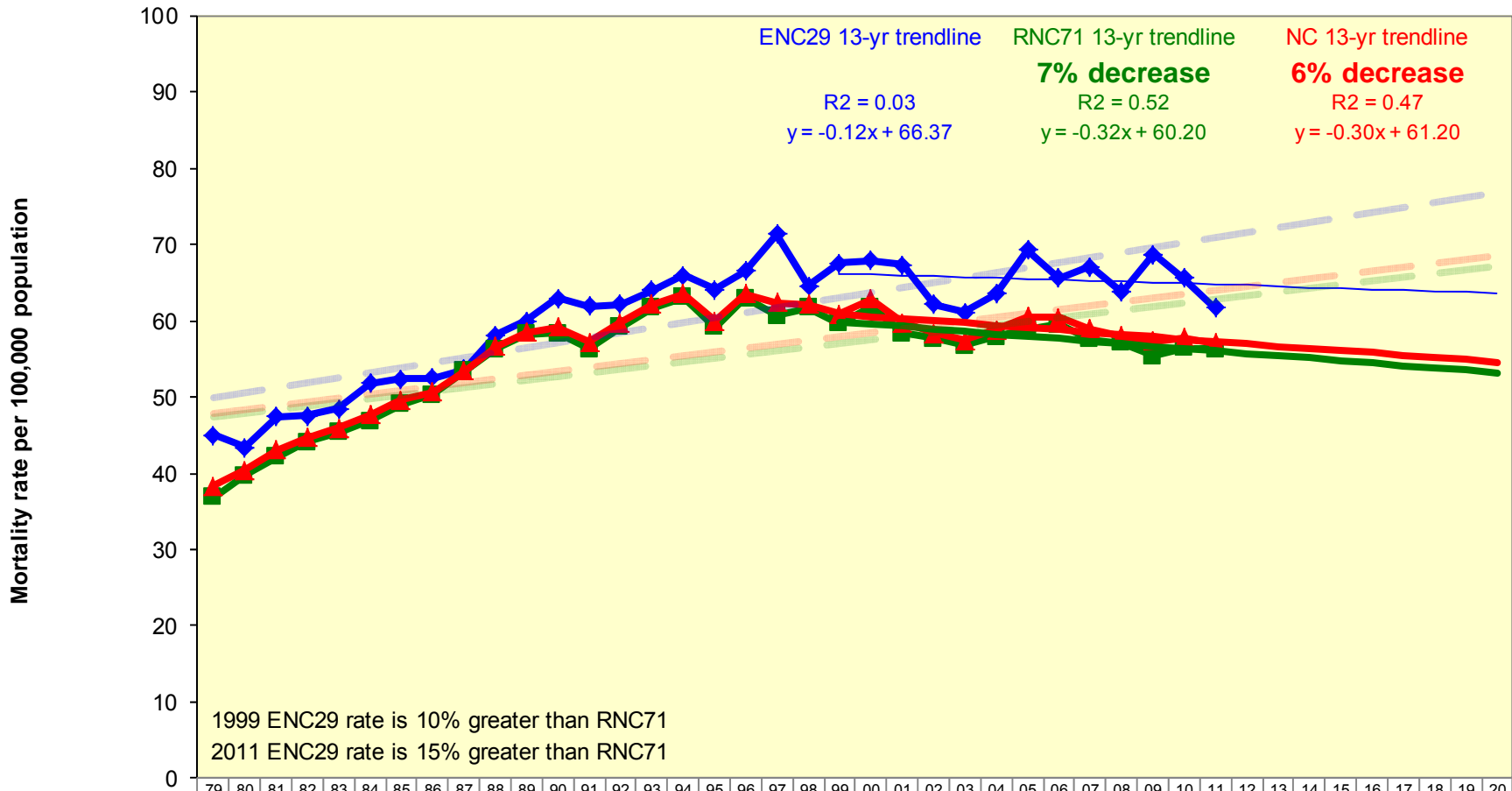


Cancer - Trachea, Bronchus, Lung

- The 13-year trend line for Cancer—TBL for ENC is 15% greater than RNC but is unreliable.
- In 2011, the age-adjusted rate trend for ENC is 6% above the RNC rate and 19% above the US rate. The 13-year trend lines suggest that the ENC rate is decreasing more quickly, suggesting convergence with RNC and NC in the future.
- The mortality rate trends for males are decreasing. Non-White males continue to have the highest rate, however the 13-year trend line suggests White males will have a higher rate than non-White males in the near future. The trends for White and non-White females are not reliable.
- The non-White mortality rate trend for this cancer is consistently lower than the White rate. Both trends are decreasing over the 13-year period, but non-White is decreasing more quickly.
- The moderately reliable 10-year trend for racial disparity shows a 469% 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 6.2 i. Cancer - Trachea, Bronchus, Lung:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020



1999 ENC29 rate is 10% greater than RNC71
2011 ENC29 rate is 15% greater than RNC71

	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20							
ENC29	45	43	47	48	48	52	52	52	54	58	60	63	62	62	64	66	64	67	71	65	68	68	67	62	61	64	69	66	67	64	69	66	62																
RNC71	37	40	42	44	45	47	49	50	53	56	58	58	56	59	62	63	59	63	61	62	60	62	58	58	57	58	59	59	58	57	55	56	56																
NC	38	40	43	45	46	48	50	51	53	57	59	59	57	60	62	64	60	64	62	62	61	63	60	58	57	59	61	60	59	58	57	58	57																

Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	
	9% LT	8% LT	ENC29
10% GT		2% GT	RNC71
8% GT	2% LT		NC

Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	
	13% LT	11% LT	ENC29
15% GT		2% GT	RNC71
13% GT	2% LT		NC

Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

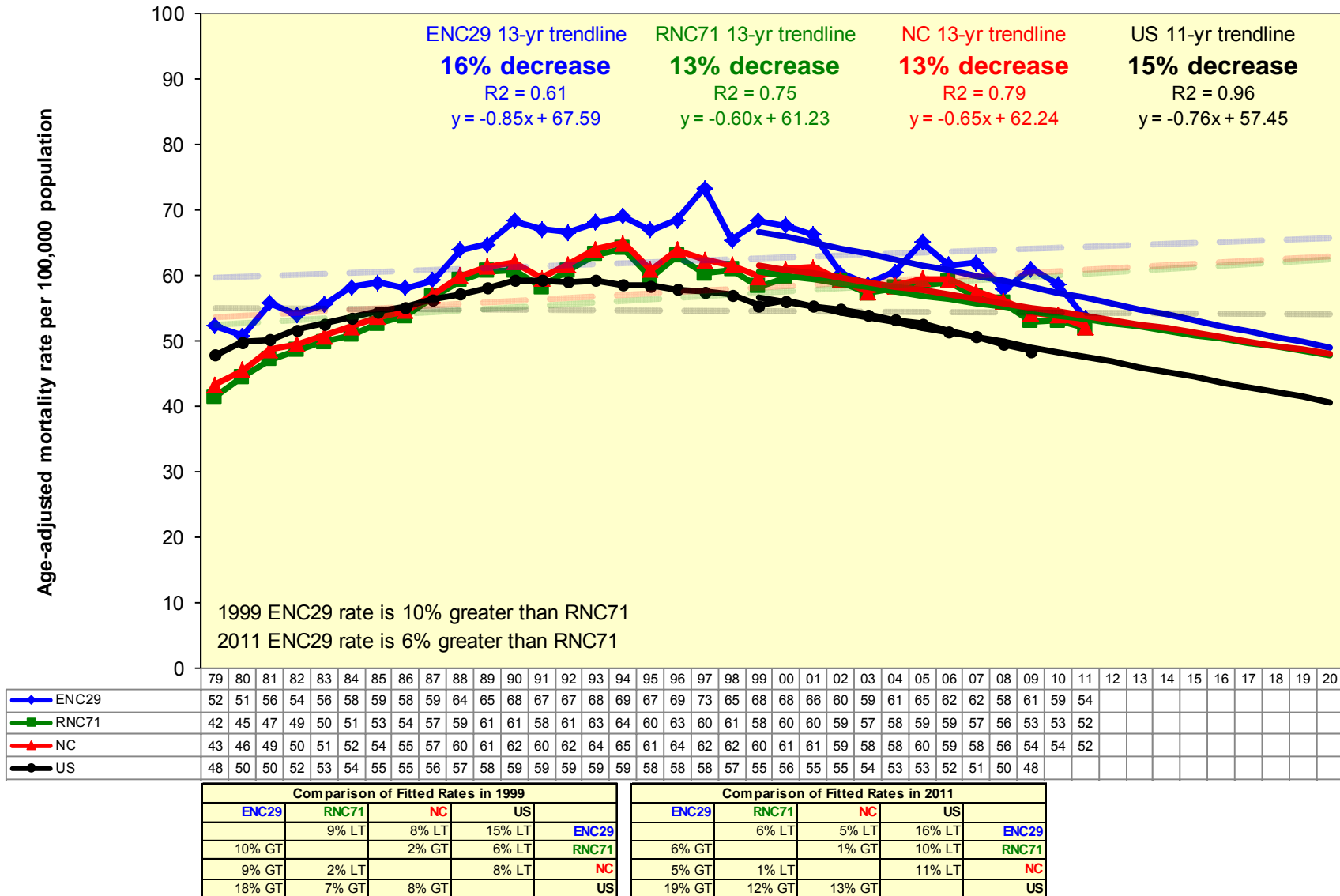


Figure 6.2 iii. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

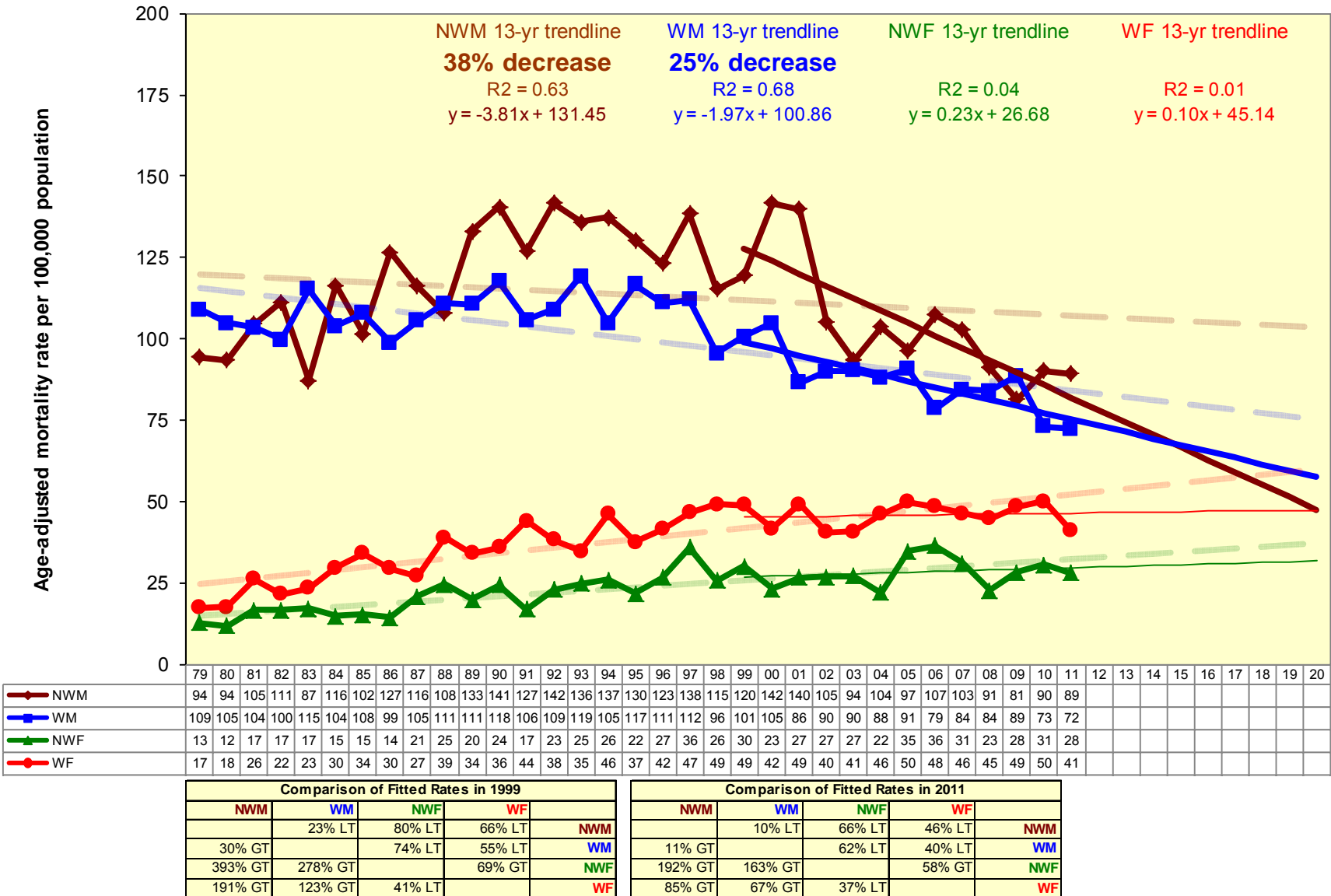


Figure 6.2 iv. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

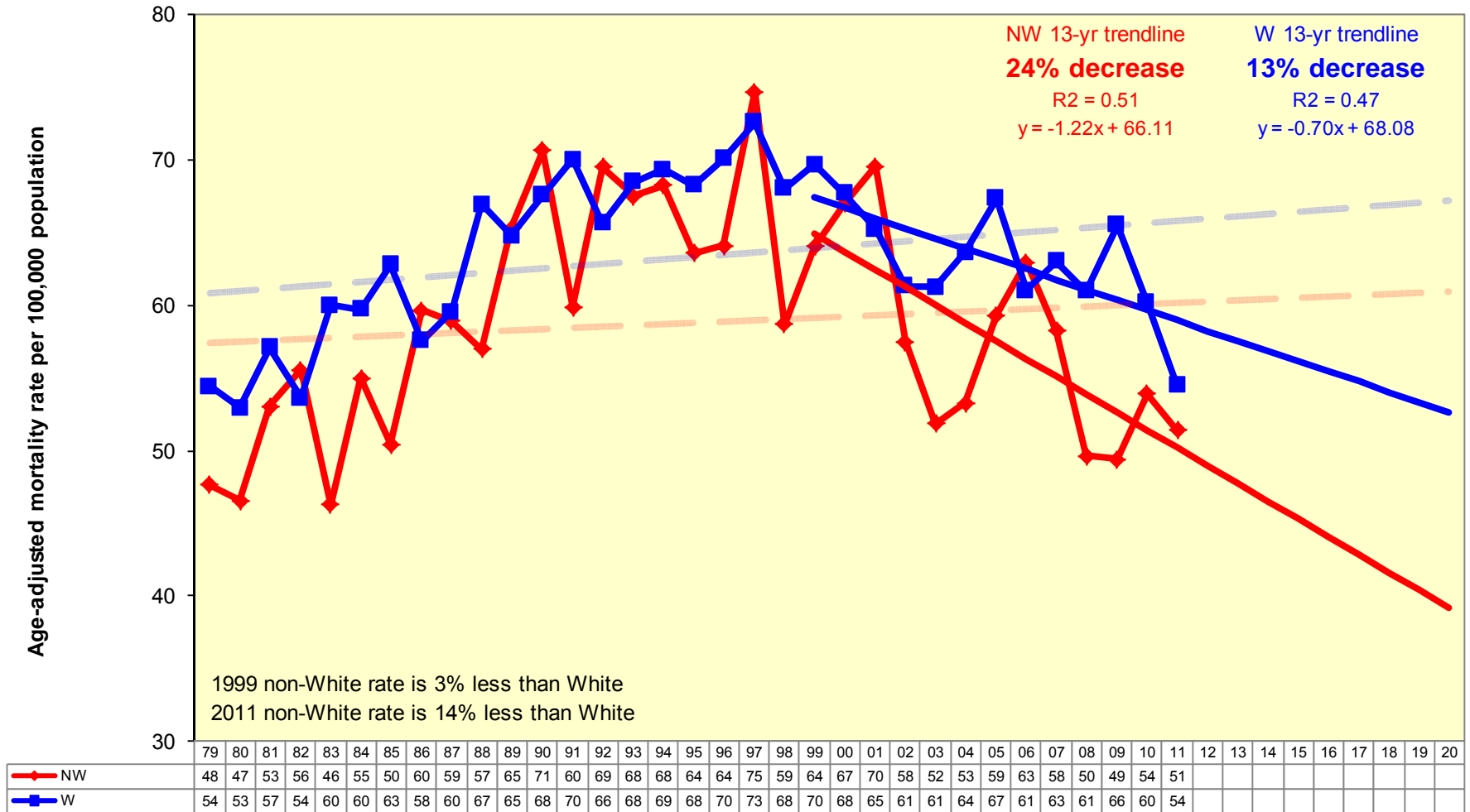
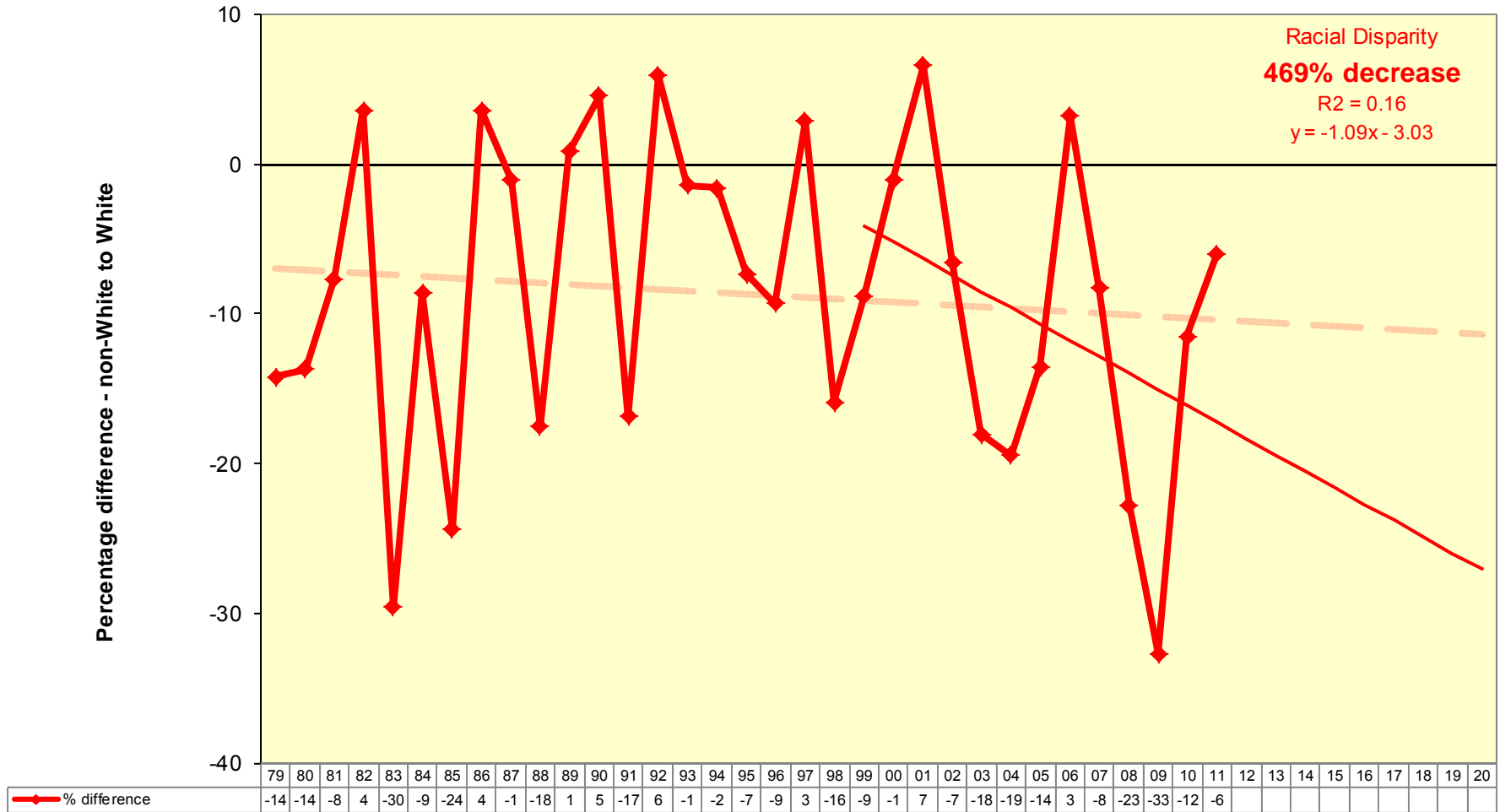


Figure 6.2 v. Cancer - Trachea, Bronchus, Lung:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



Cerebrovascular Disease

- ENC's cerebrovascular disease mortality trend line is decreasing but is 21% greater than RNC in 2011.
- The ENC age-adjusted cerebrovascular disease mortality rate trend is decreasing and converging with the RNC and NC rates. It remains 12% greater than the RNC trend. In 2011 there were 49 deaths per 100,000, which is almost at the *Healthy People 2010* goal of less than 48 deaths per 100,000.
- Non-Whites have the highest mortality rate for cerebrovascular disease but the rate trend continues to decrease and converge with the other demographic groups. Over the 13-year period the trend has decreased by about 50% for all demographic groups.
- The cerebrovascular disease mortality rate trend for non-Whites is decreasing and converging with that of whites but is still 52% greater than Whites in 2011.
- The 13-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 6.3 i. Cerebrovascular Disease:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

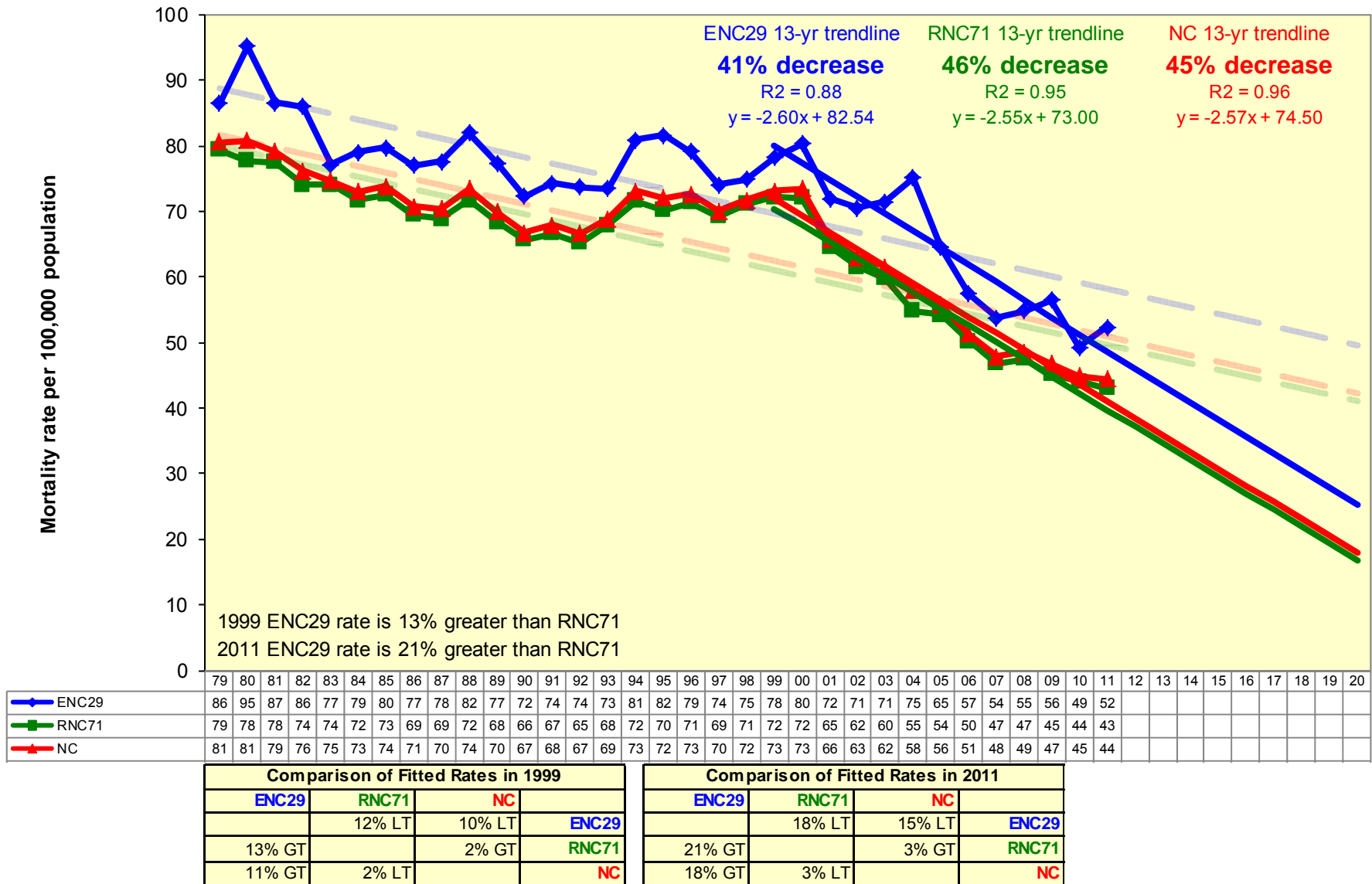


Figure 6.3 ii. Cerebrovascular Disease:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

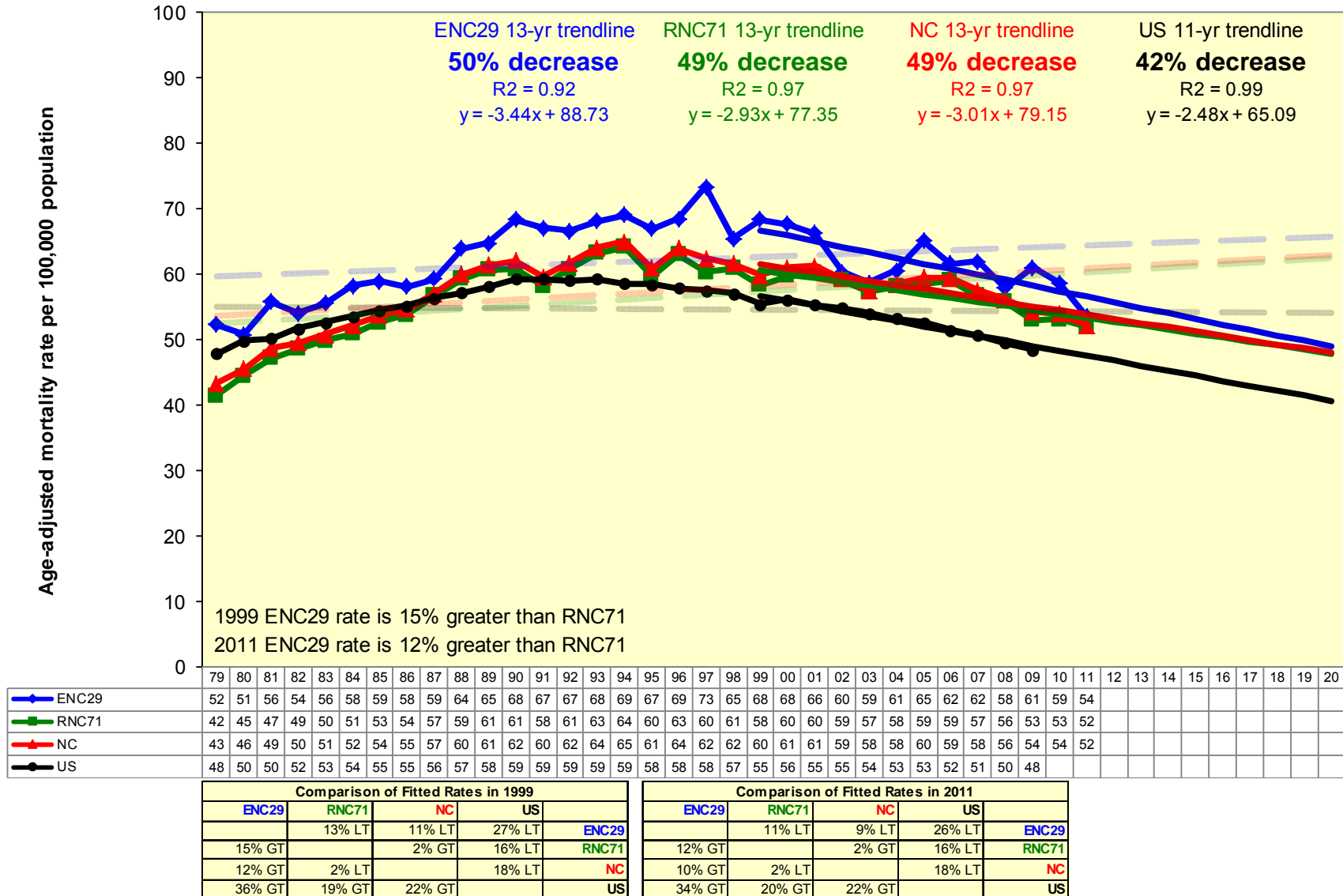


Figure 6.3 iii. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

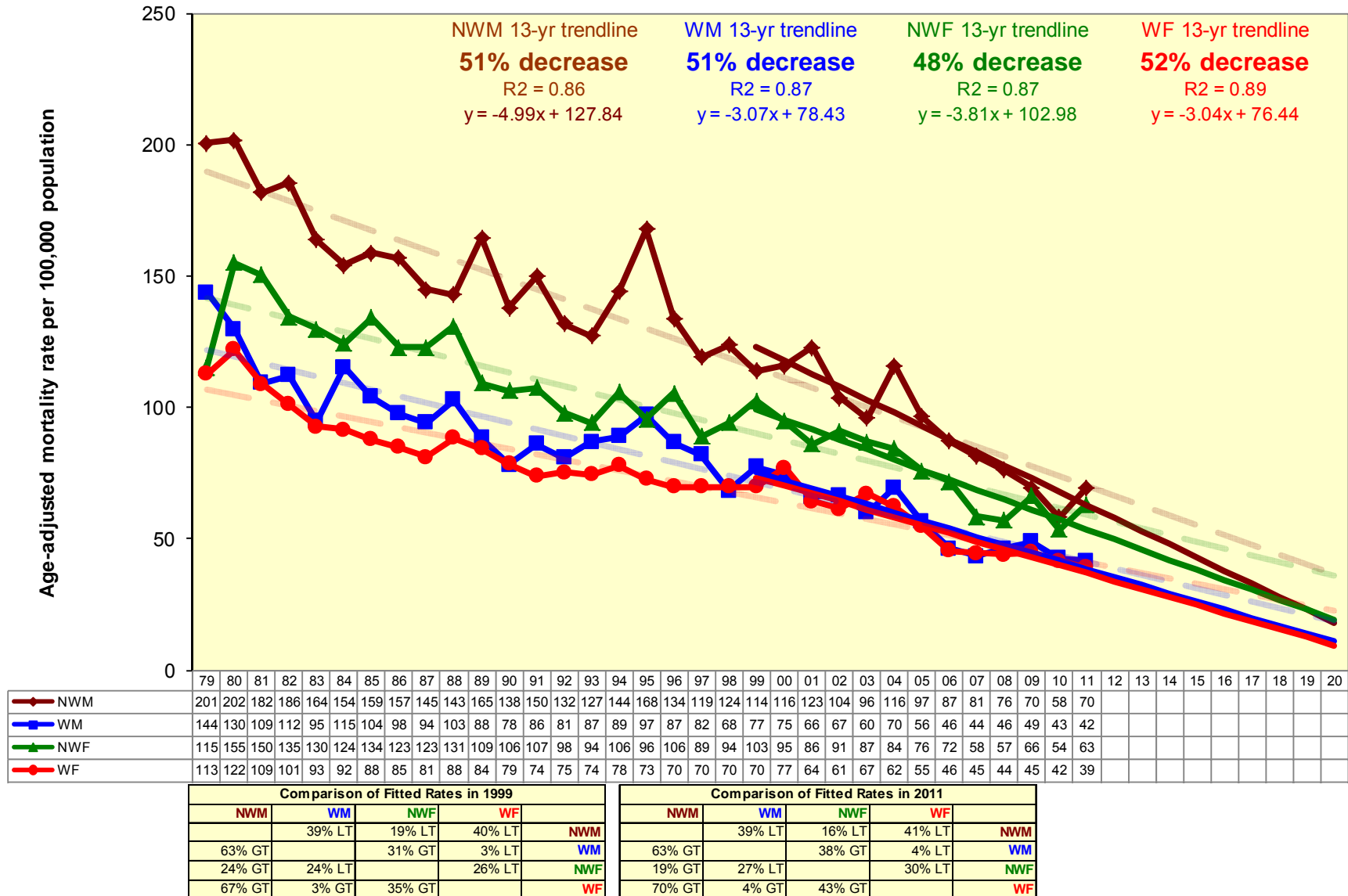


Figure 6.3 iv. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

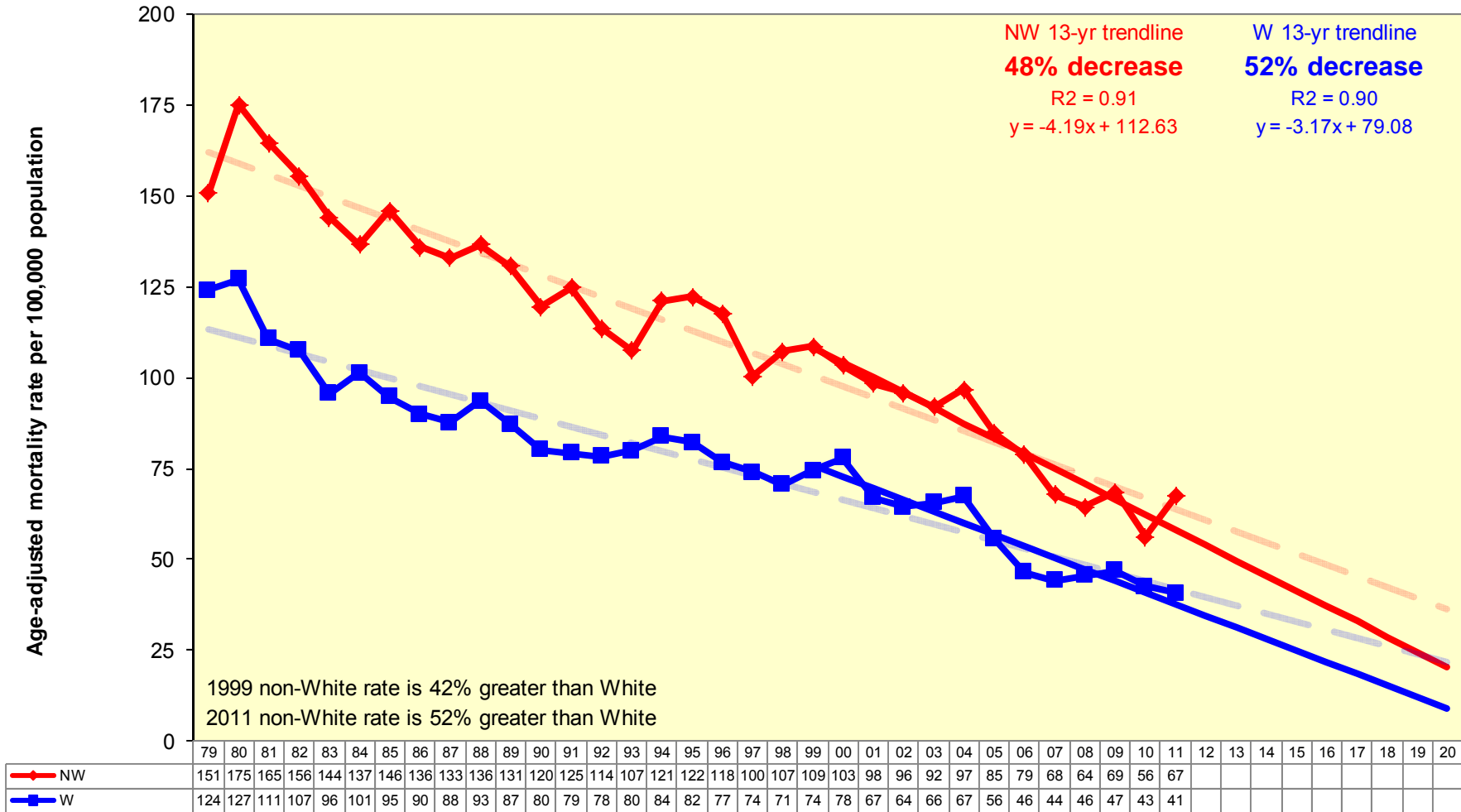
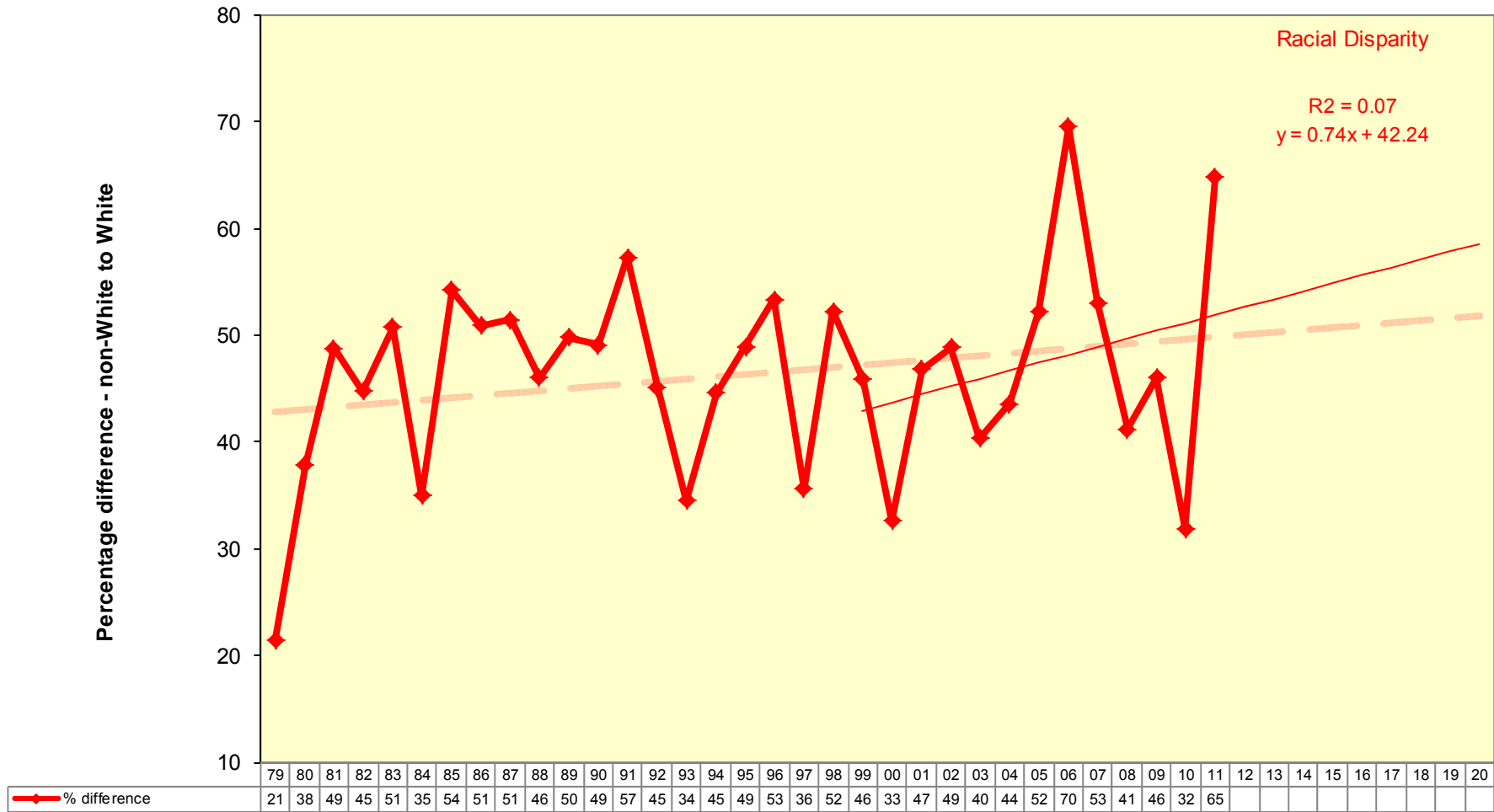


Figure 6.3 v. Cerebrovascular Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

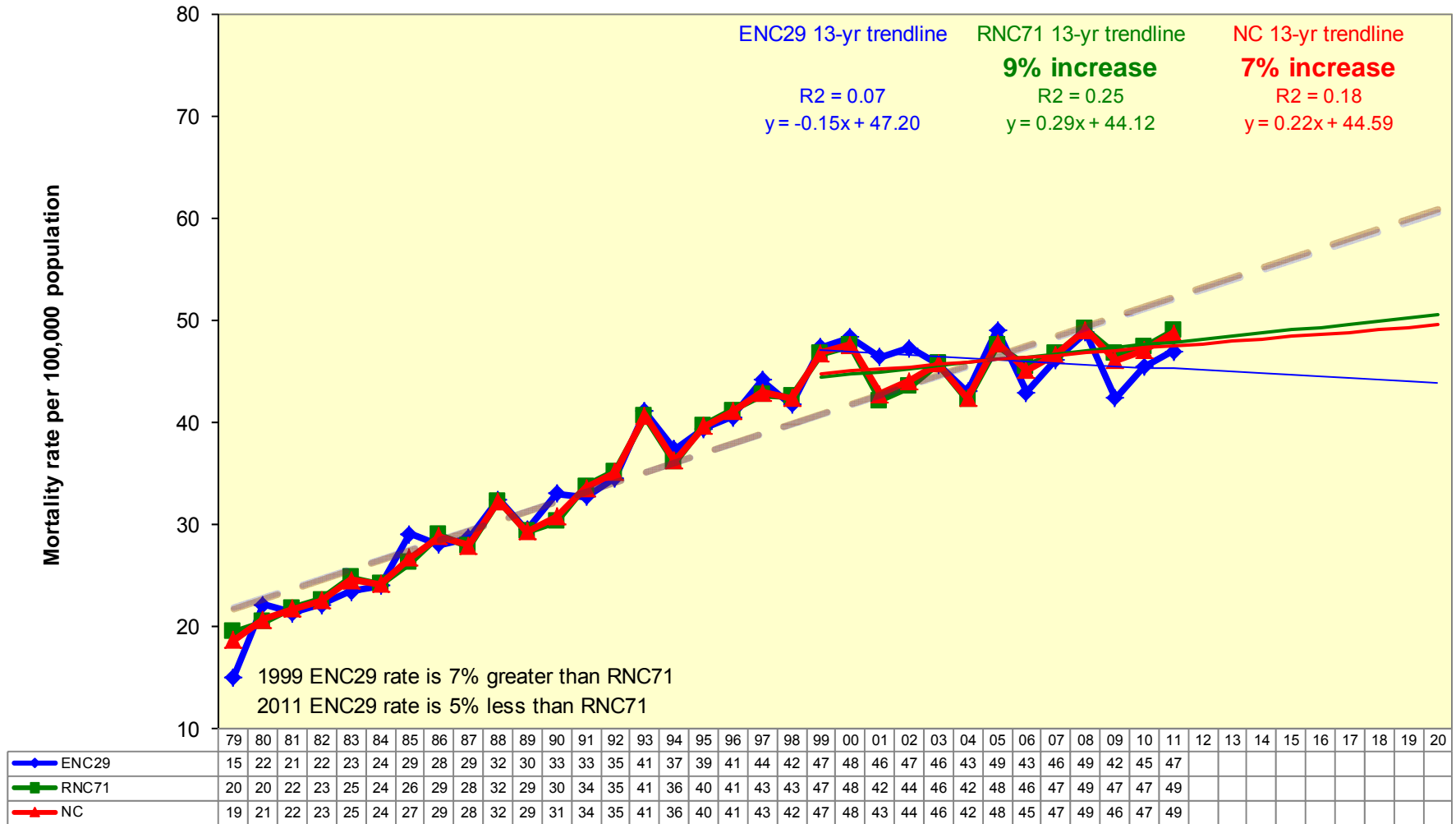


Chronic Lower Respiratory Diseases

- The 32 year ENC trend for CLRD mortality is increasing. The 13-year trend for ENC is unreliable.
- The 13-year CLRD age-adjusted rate trend for ENC is decreasing and converging with the US rate. The rate for ENC is lower than the rates for RNC and NC.
- Fitted rates for non-White males and White males have decreased over 13 years by 39% and 30%, respectively. White male rates remain the highest. The 13-year trend for White females is flat. The 13-year trend for non-White females is unreliable.
- The 13-year White mortality rate trend is higher than the non-White trend, although both are declining evenly. The non-White rate is 45% less than the White rate in 2011.
- There is a 36% decrease in the disparity between the White and non-White rate 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 $R^2 < 0.10$.

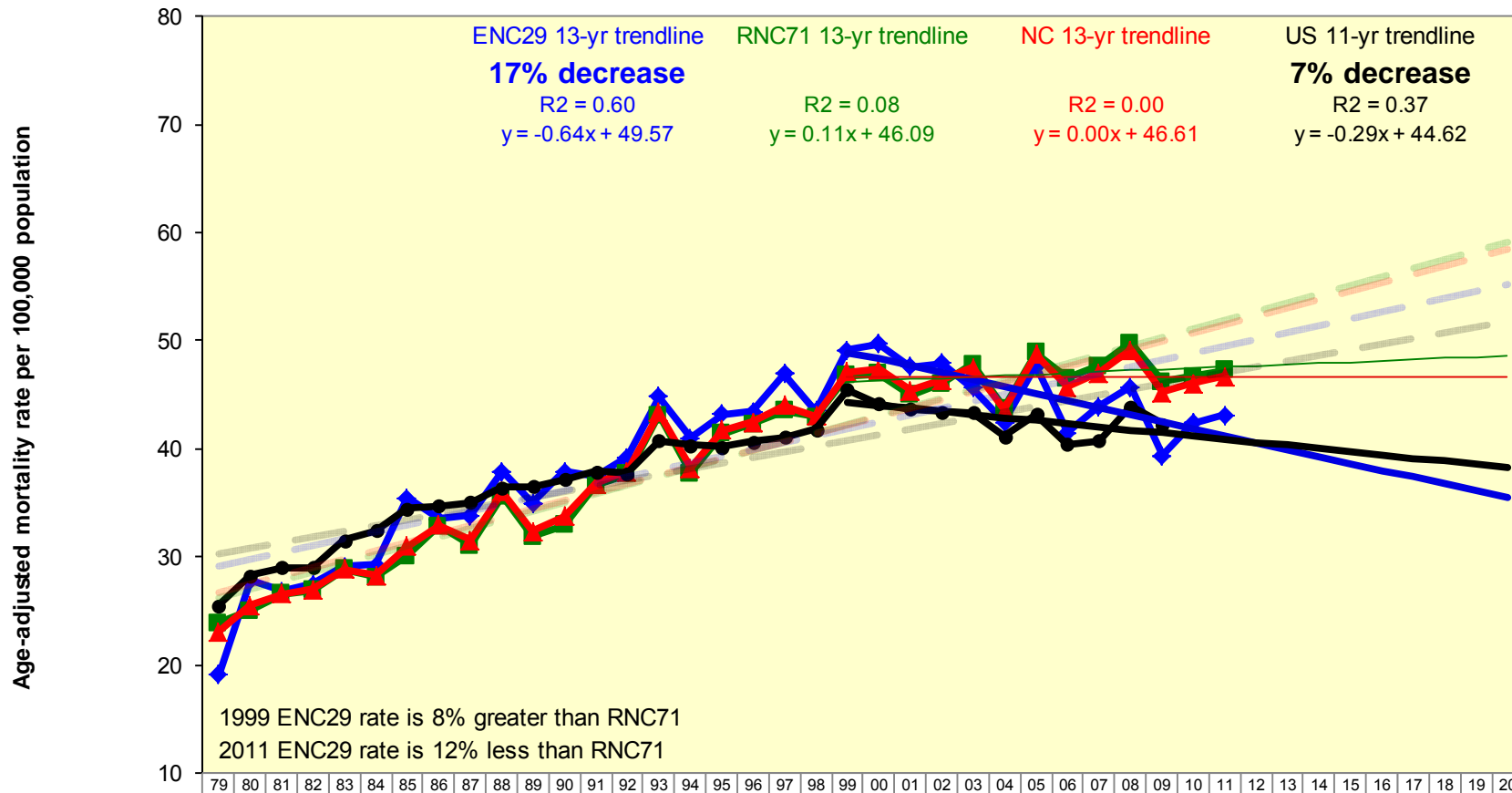
Figure 6.4 i. Chronic Lower Respiratory Diseases:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020



Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	
	7% LT	6% LT	ENC29
7% GT		1% GT	RNC71
6% GT	1% LT		NC

Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	
	5% GT	4% GT	ENC29
5% LT		1% LT	RNC71
4% LT	1% GT		NC

Figure 6.4 ii. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020



	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20						
ENC29	19	28	27	27	29	29	35	34	34	38	35	38	38	39	45	41	43	43	47	44	49	50	48	48	46	42	48	41	44	46	39	42	43															
RNC71	24	25	27	27	29	28	30	33	31	36	32	33	37	38	43	38	41	42	43	43	47	47	45	46	48	44	49	47	48	50	46	47	47															
NC	23	26	27	27	29	28	31	33	32	36	32	34	37	38	43	38	42	42	44	43	47	47	45	46	48	44	49	46	47	49	45	46	47															
US	26	28	29	29	32	32	35	35	35	36	37	37	38	38	41	40	40	41	41	42	45	44	44	43	43	41	43	40	41	44	42																	

Comparison of Fitted Rates in 1999					Comparison of Fitted Rates in 2011				
ENC29	RNC71	NC	US		ENC29	RNC71	NC	US	
	7% LT	6% LT	10% LT	ENC29		13% GT	11% GT	2% LT	ENC29
8% GT		1% GT	3% LT	RNC71	12% LT		2% LT	13% LT	RNC71
6% GT	1% LT		4% LT	NC	10% LT	2% GT		12% LT	NC
11% GT	3% GT	4% GT		US	2% GT	15% GT	13% GT		US

Figure 6.4 iii. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

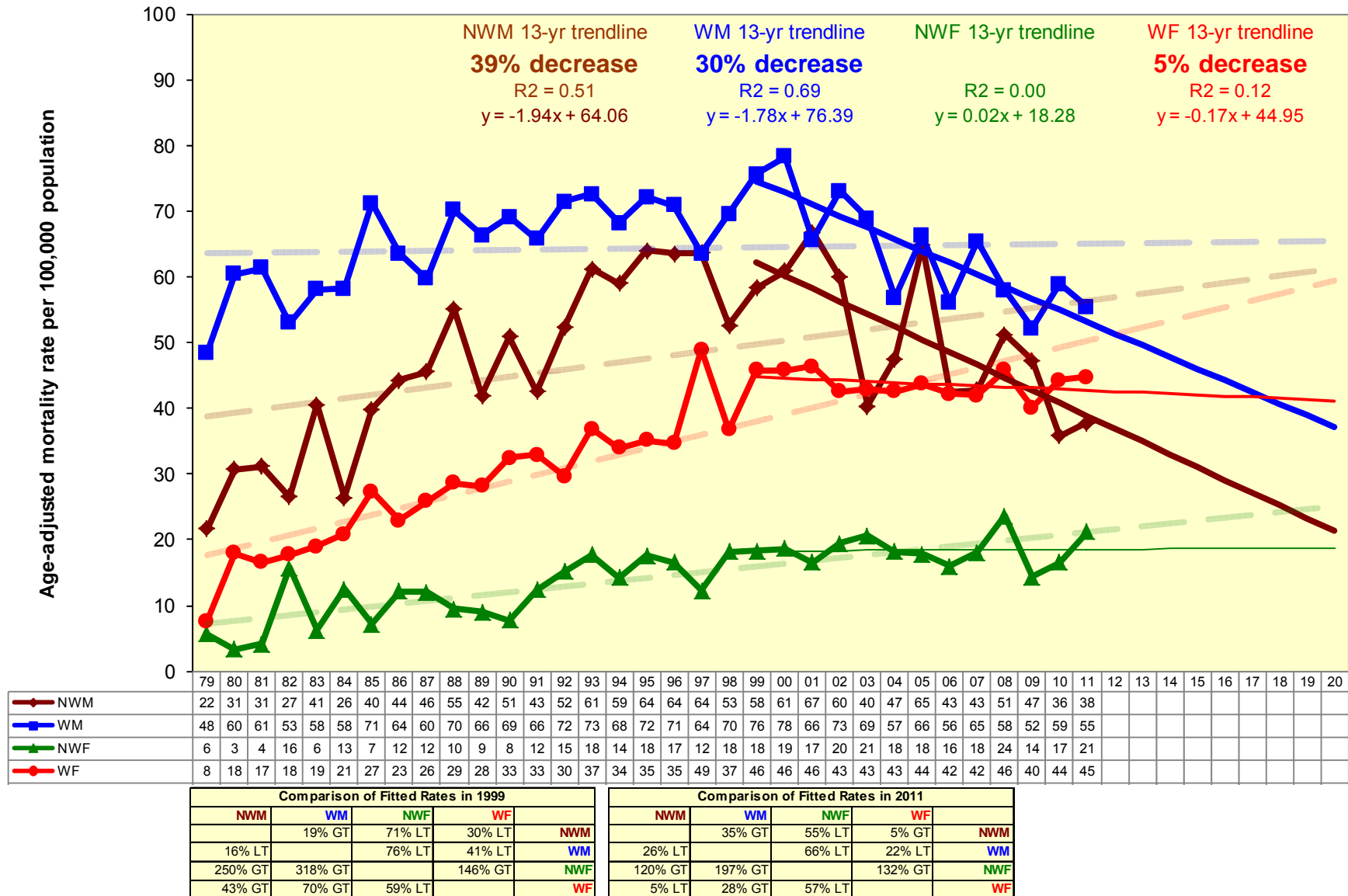


Figure 6.4 iv. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

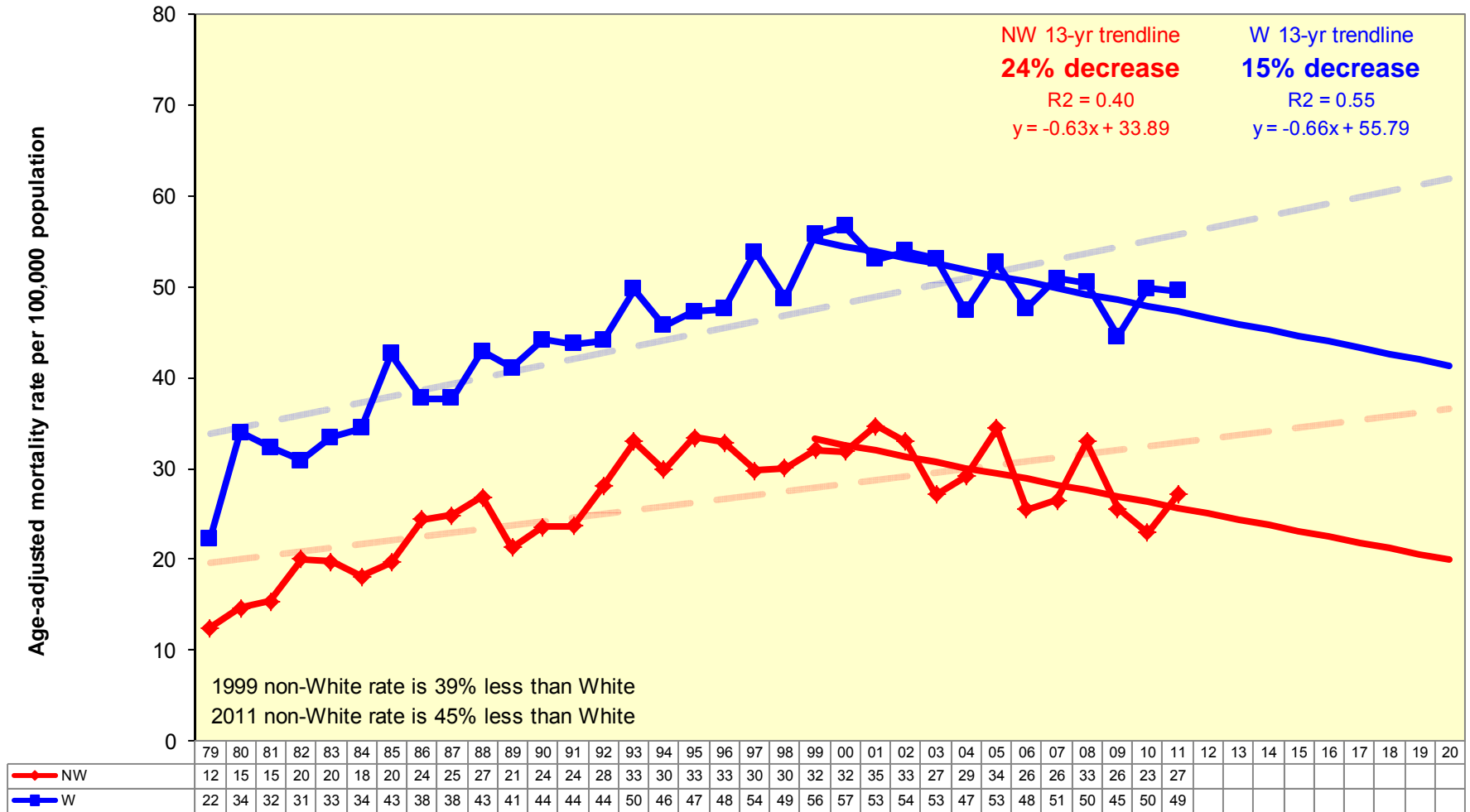
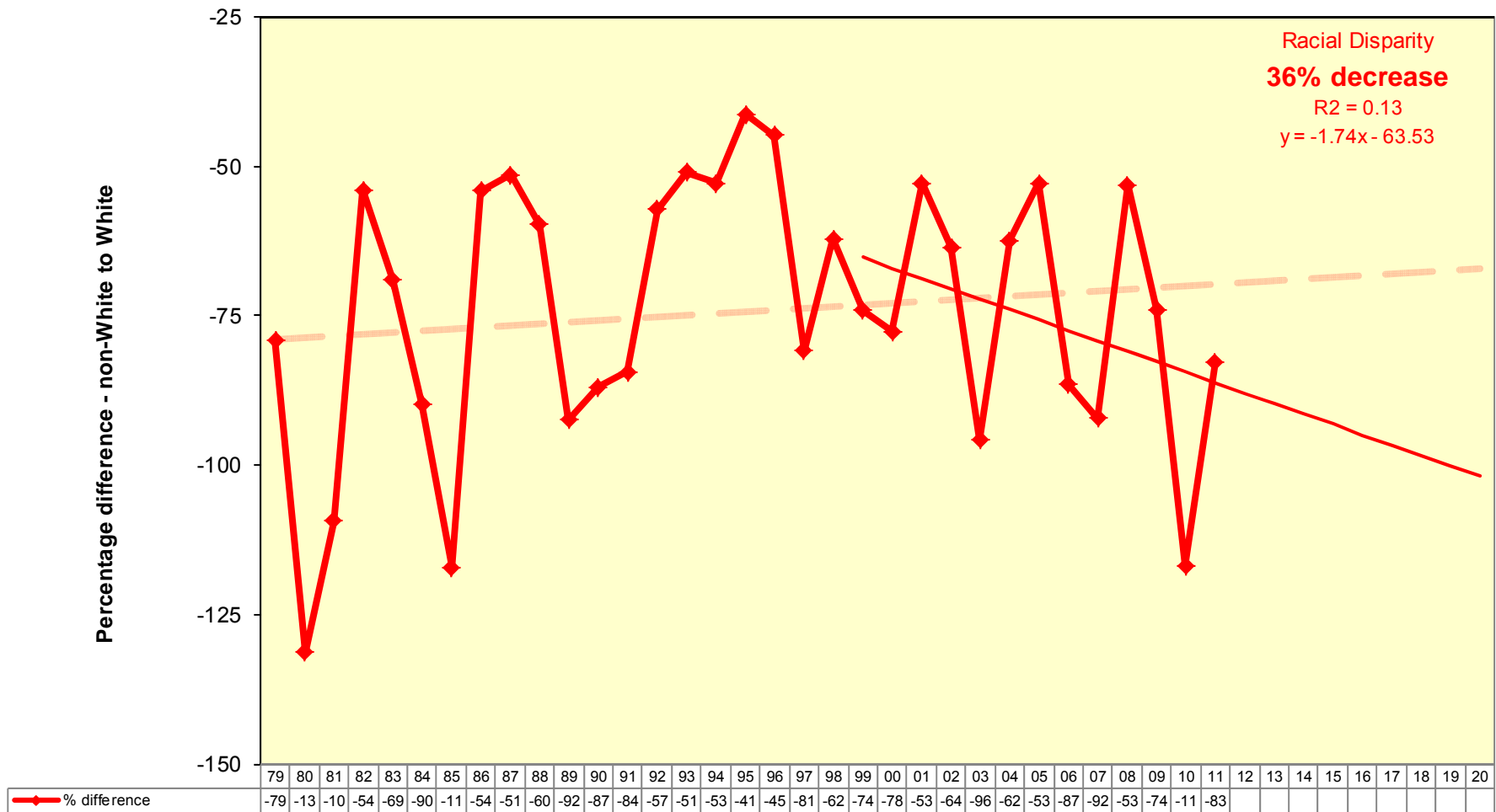


Figure 6.4 v. Chronic Lower Respiratory Diseases:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



Diabetes Mellitus

- The 13-year trend for diabetes mellitus mortality is decreasing for RNC and NC. The trend for ENC is higher and is also decreasing, but it is not reliable.
- The 13-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 18% for ENC. In 2011, the ENC age-adjusted rate trend remains 43% greater than RNC and 38% greater than the US.
- The non-White male and non-White female 13-year trends are decreasing more quickly than their White counterparts. The White male rate is flat and the White female rate is decreasing slightly.
- The non-White mortality rate trend decreased 25% over 13 years but remains 118% greater than the White rate.
- The 27% decrease in racial disparity for the last 13 years is moderately 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 6.5 i. Diabetes Mellitus:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

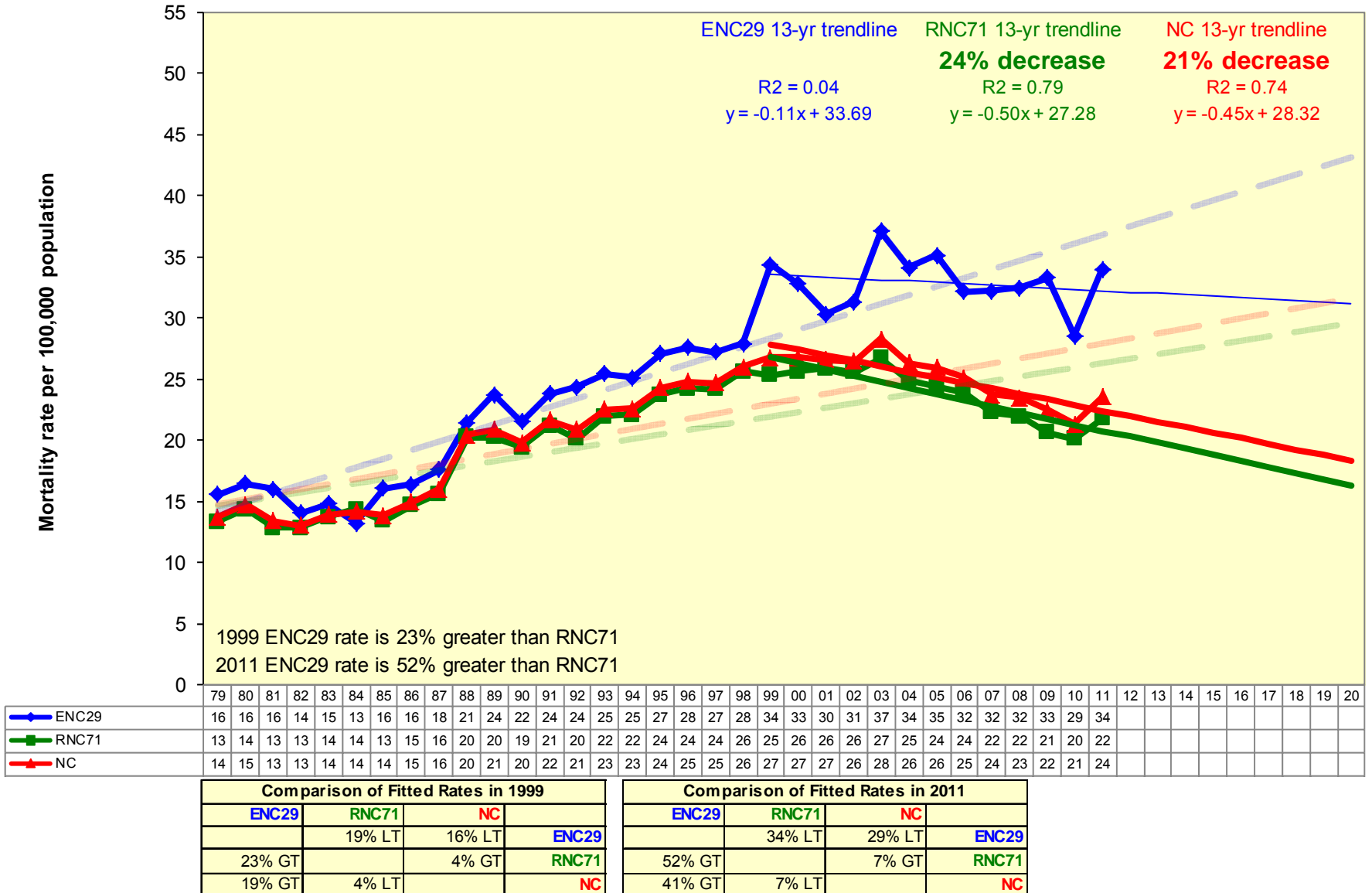


Figure 6.5 ii. Diabetes Mellitus:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

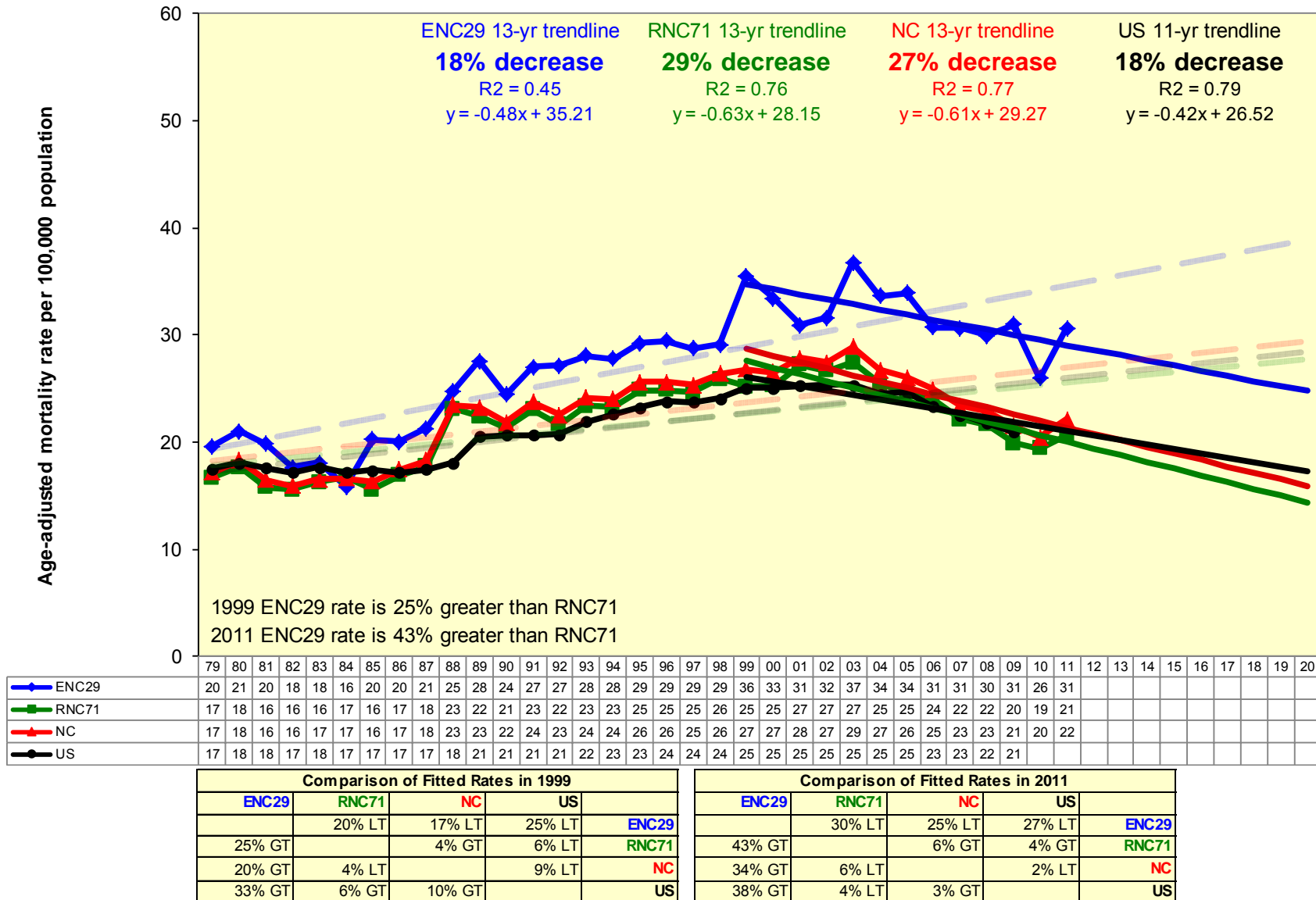


Figure 6.5 iii. Diabetes Mellitus:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

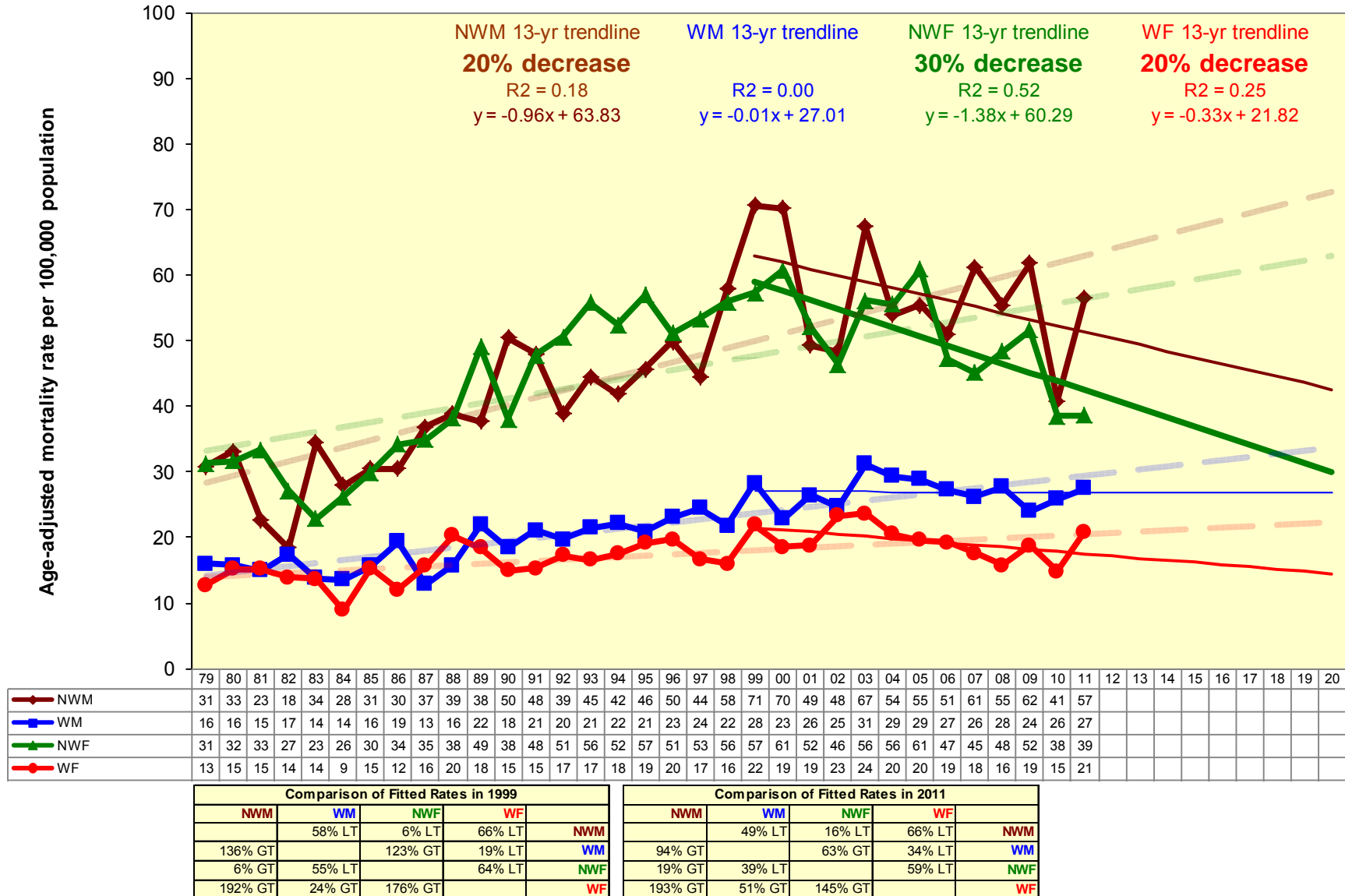


Figure 6.5 iv. Diabetes Mellitus:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

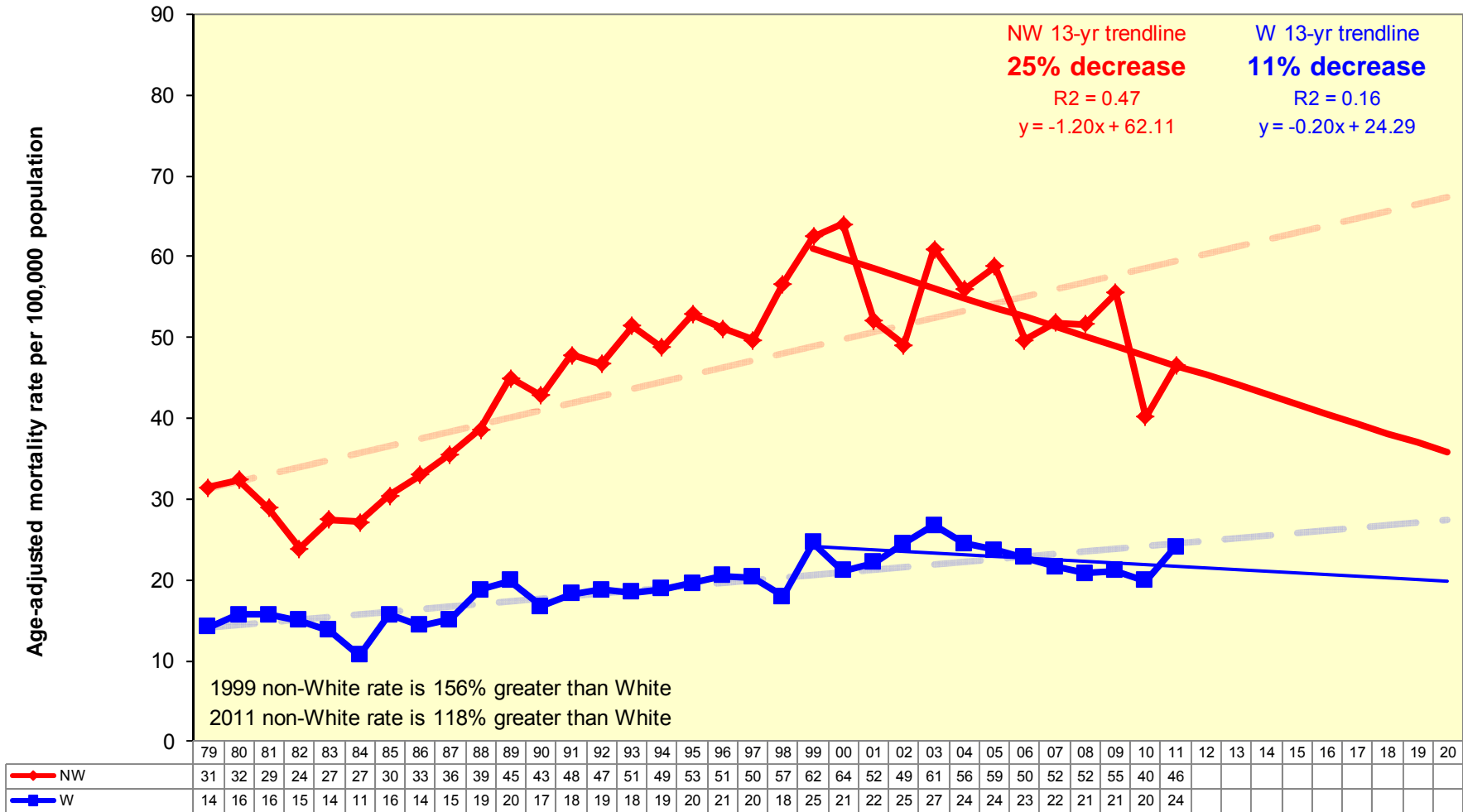
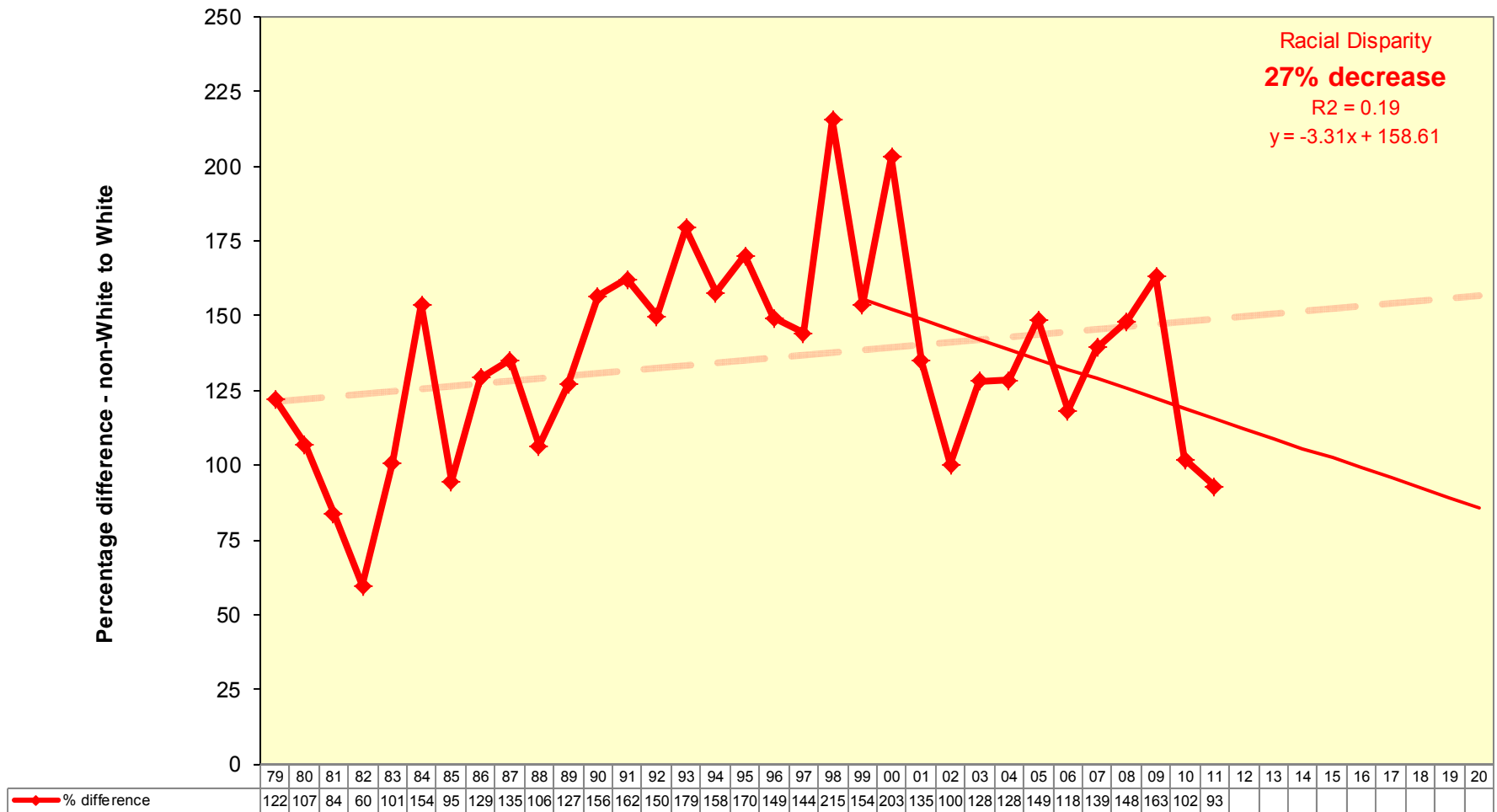


Figure 6.5 v. Diabetes Mellitus:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020



All Other Unintentional Injuries and Adverse Effects

- The mortality rate trend for unintentional injuries and adverse effects is increasing in ENC (39% over 13 years). The trends for RNC and NC are also increasing.
- The age-adjusted mortality rate trends for ENC, RNC, NC, and the US are all increasing. During the last 13 years, ENC has increased 29%, although it is 4% below RNC in 2011.
- The trends for White males and White females are both increasing (52% and 86% respectively over the 13-year period). The mortality rate trend for non-White males decreased 33% over 13 years. The trend for non-White females is not reliable.
- The White rate trend has increased 64% over the 13-year period. The non-White rate trend has dropped below the White and is decreasing in a moderately reliable trend.
- Over the last 13 years, racial disparity has decreased by 420% in a reliable trend, eliminating the unfavorable disparity in relation to Whites and favoring non-whites.

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

Figure 6.6 i. All Other Unintentional Injuries and Adverse Effects:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

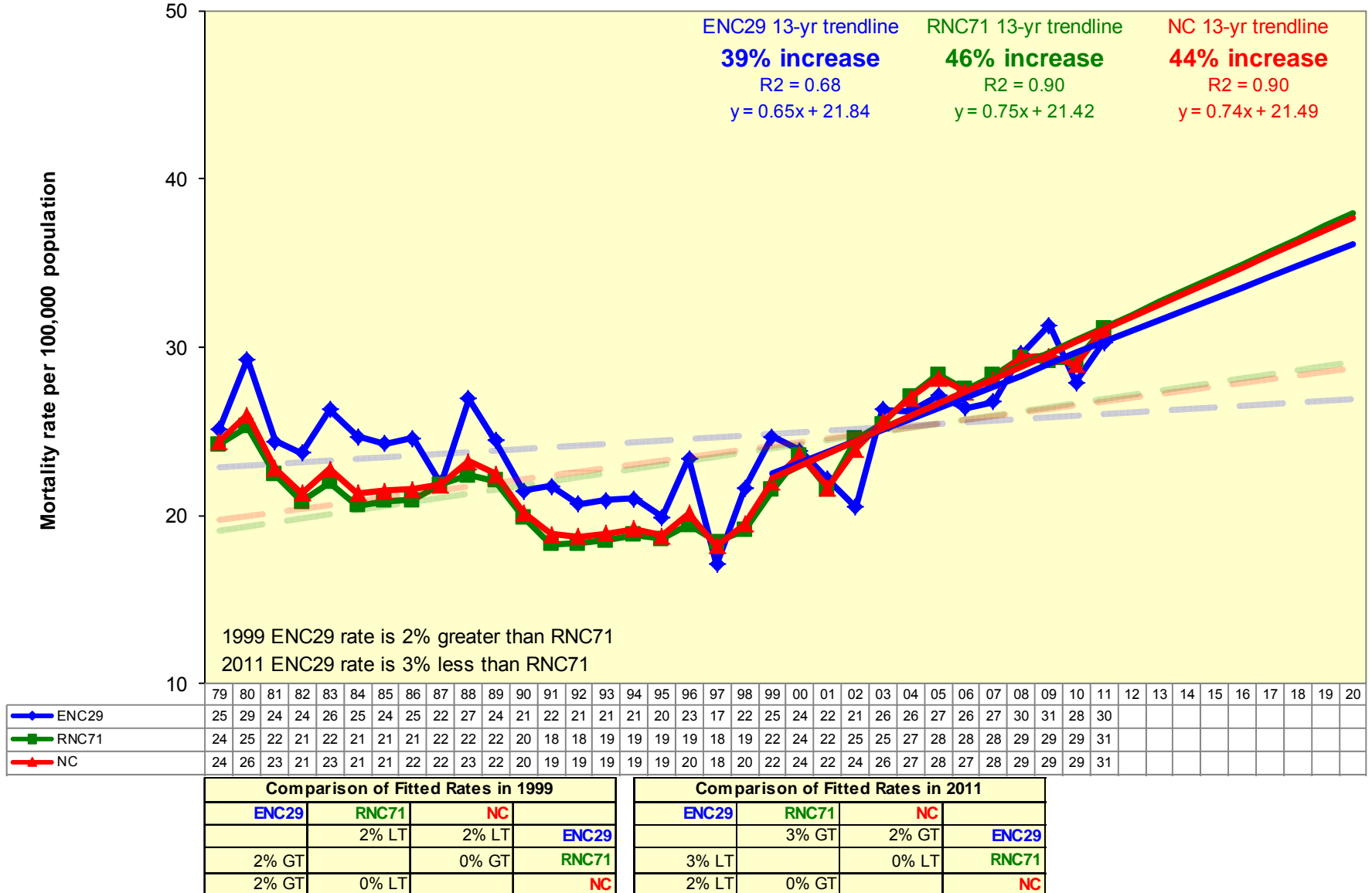


Figure 6.6 ii. All Other Unintentional Injuries and Adverse Effects:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

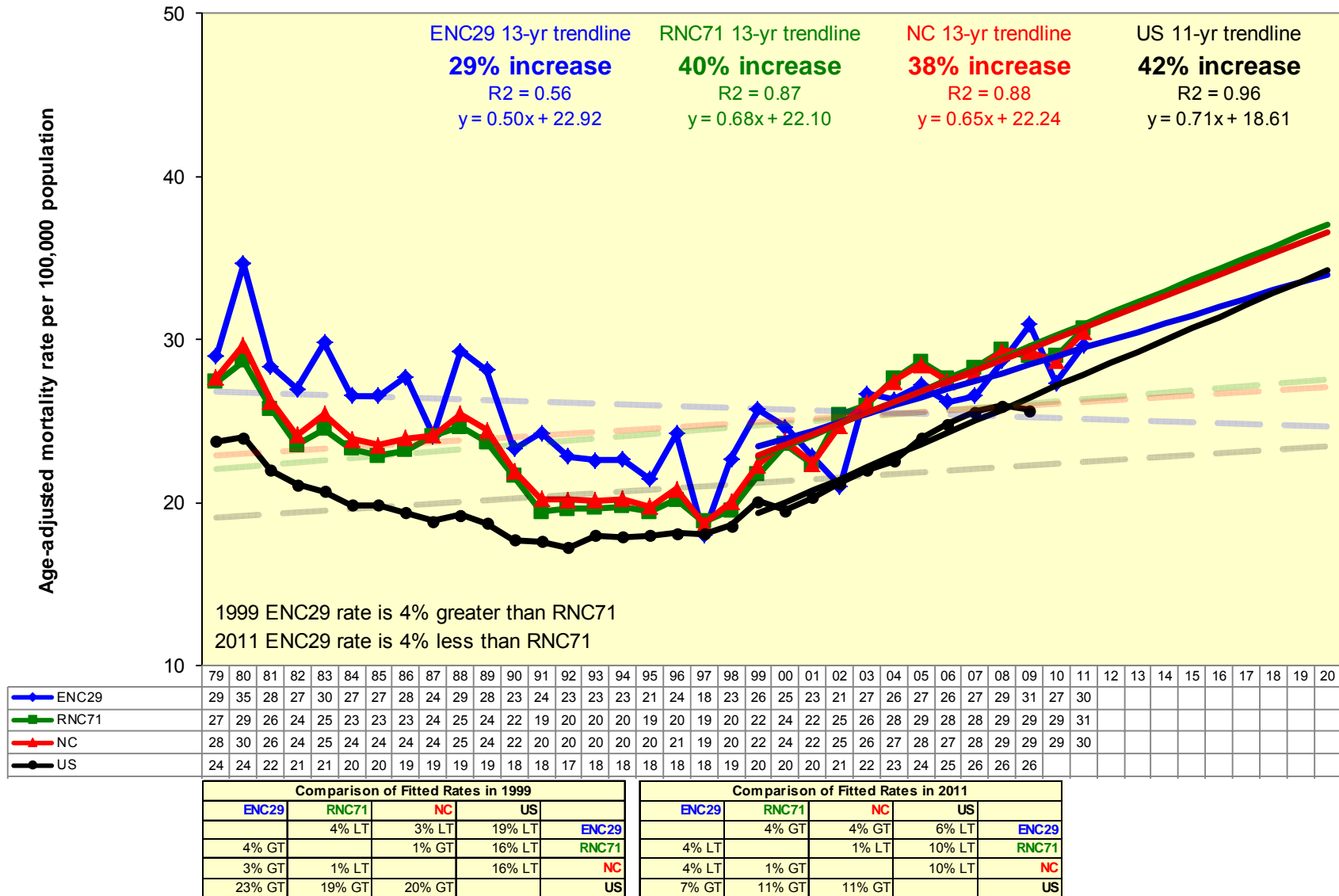


Figure 6.6 iii. All Other Unintentional Injuries and Adverse Effects:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

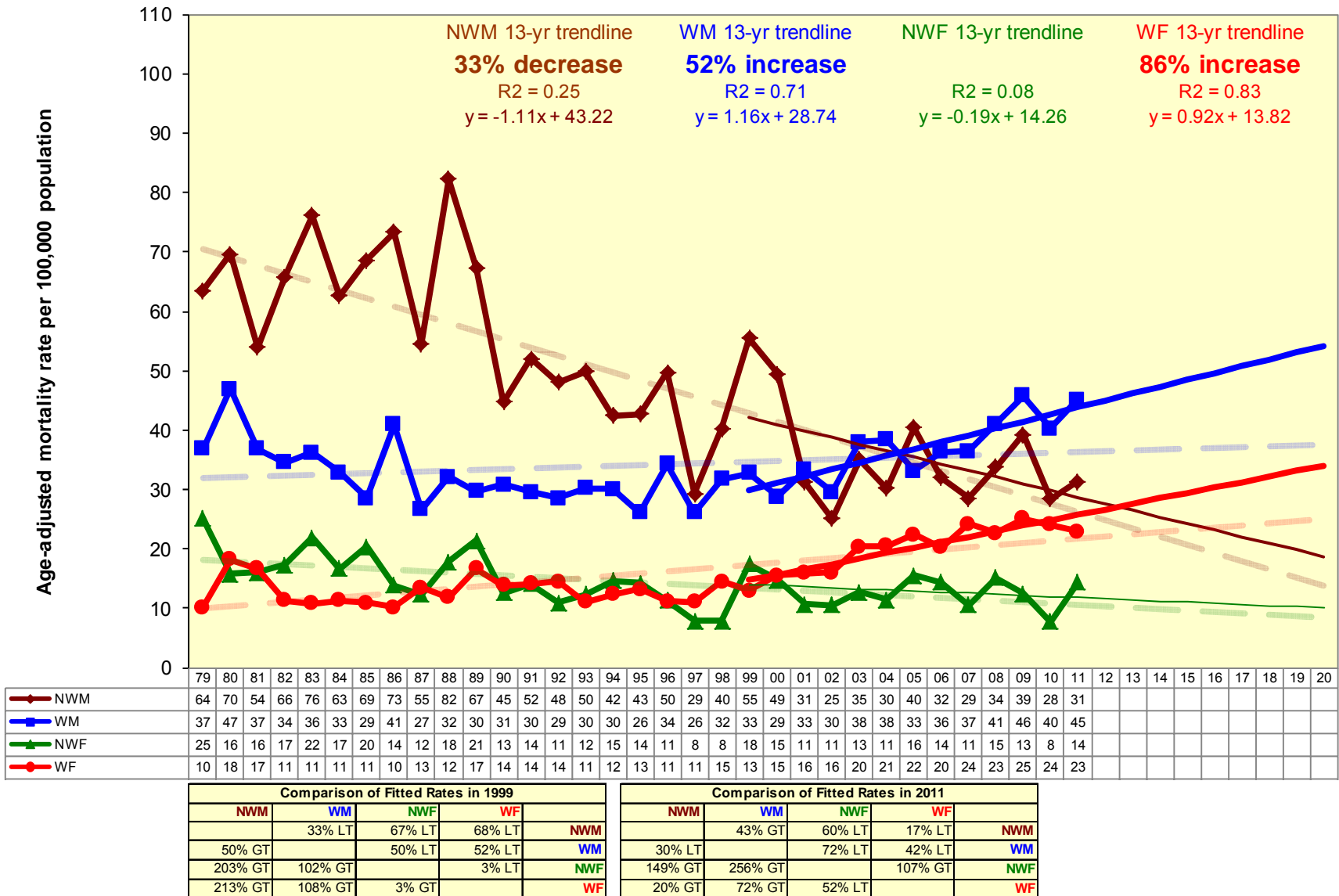


Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

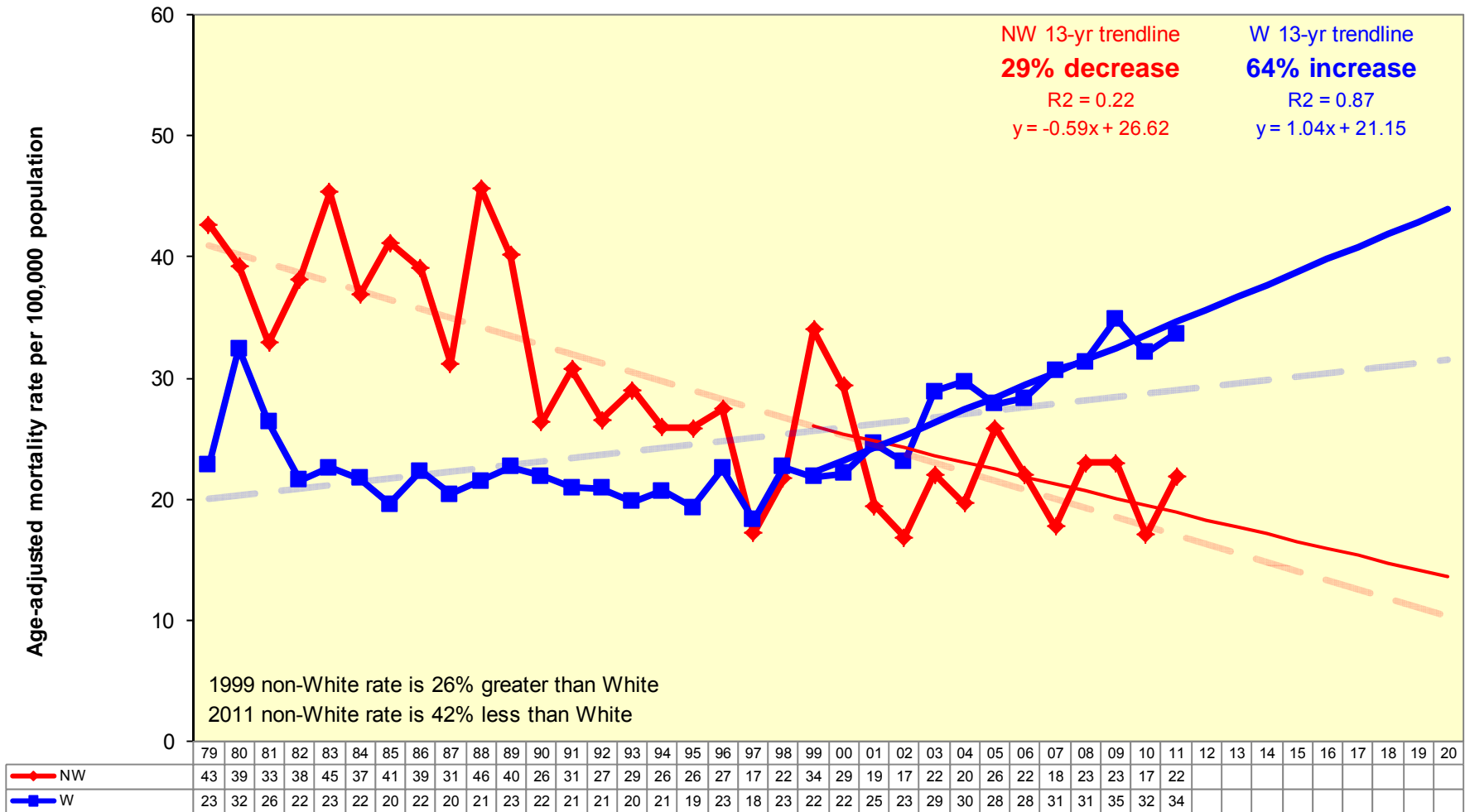
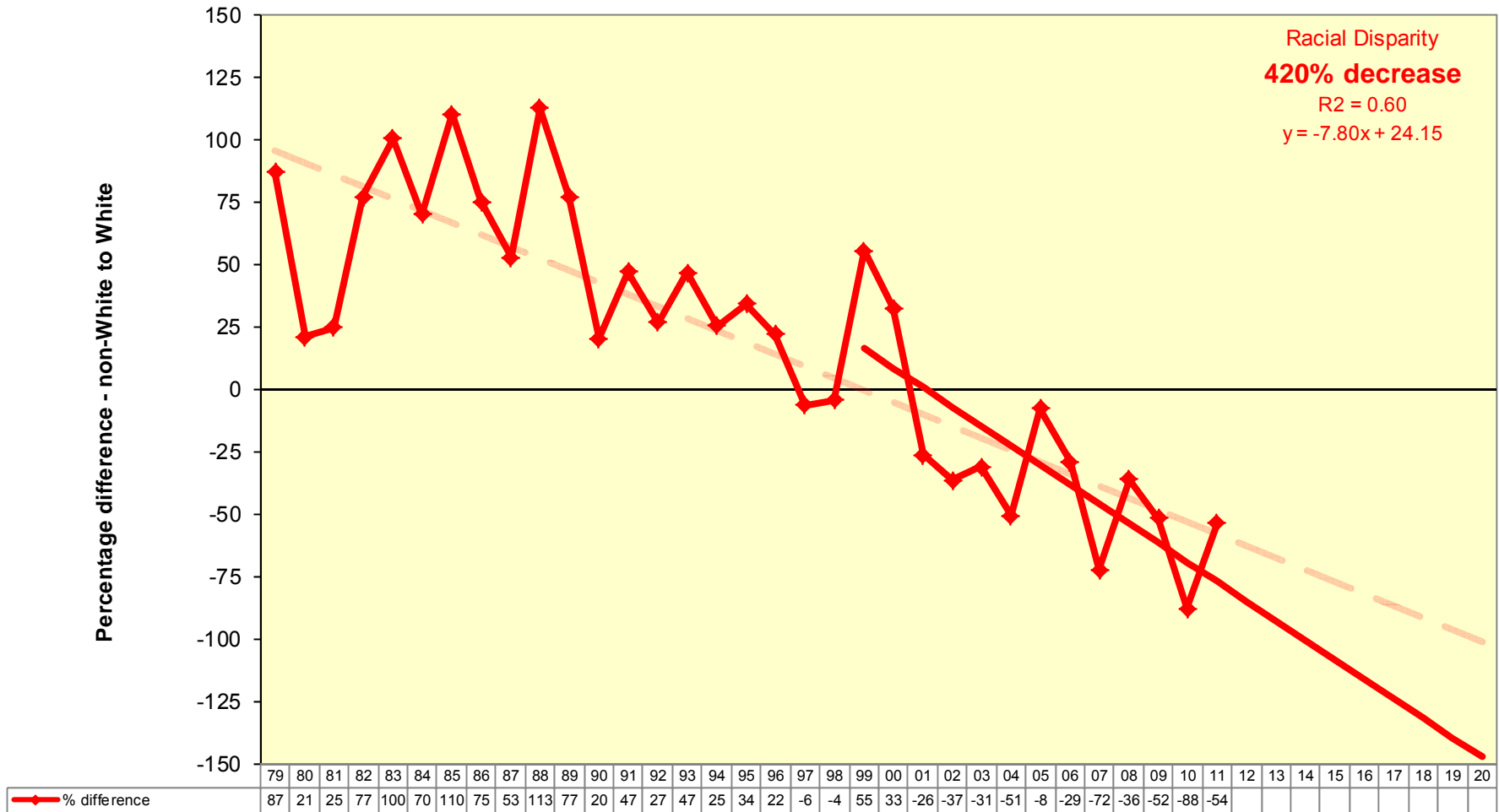


Figure 6.6 v. All Other Unintentional Injuries and Adverse Effects:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



Alzheimer's Disease

- The Alzheimer's mortality rate trend for ENC shows a 73% increase over the 13 year period. ENC's rate of increase was larger than RNC and NC but the rate for ENC still remains 17% less than RNC.
- In 2011, the age-adjusted rate trend for ENC is 5% below the US rate, but has increased 43% over the 13-year period. The ENC rate is 22% less than RNC.
- The 13-year mortality rate trends for White and non-White females are greater than White males and non-White males. Rate trends for all demographic groups are increasing but non-White males are increasing the most.
- The non-White mortality rate for Alzheimer's remains 14% less than the White mortality rate in 2011 but the 13-year trend is increasing for both and suggests convergence in the near future.
- The 13-year moderately-reliable trend suggests an 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 ENC29, RNC71, and NC,
1979-2011 with projections to 2020

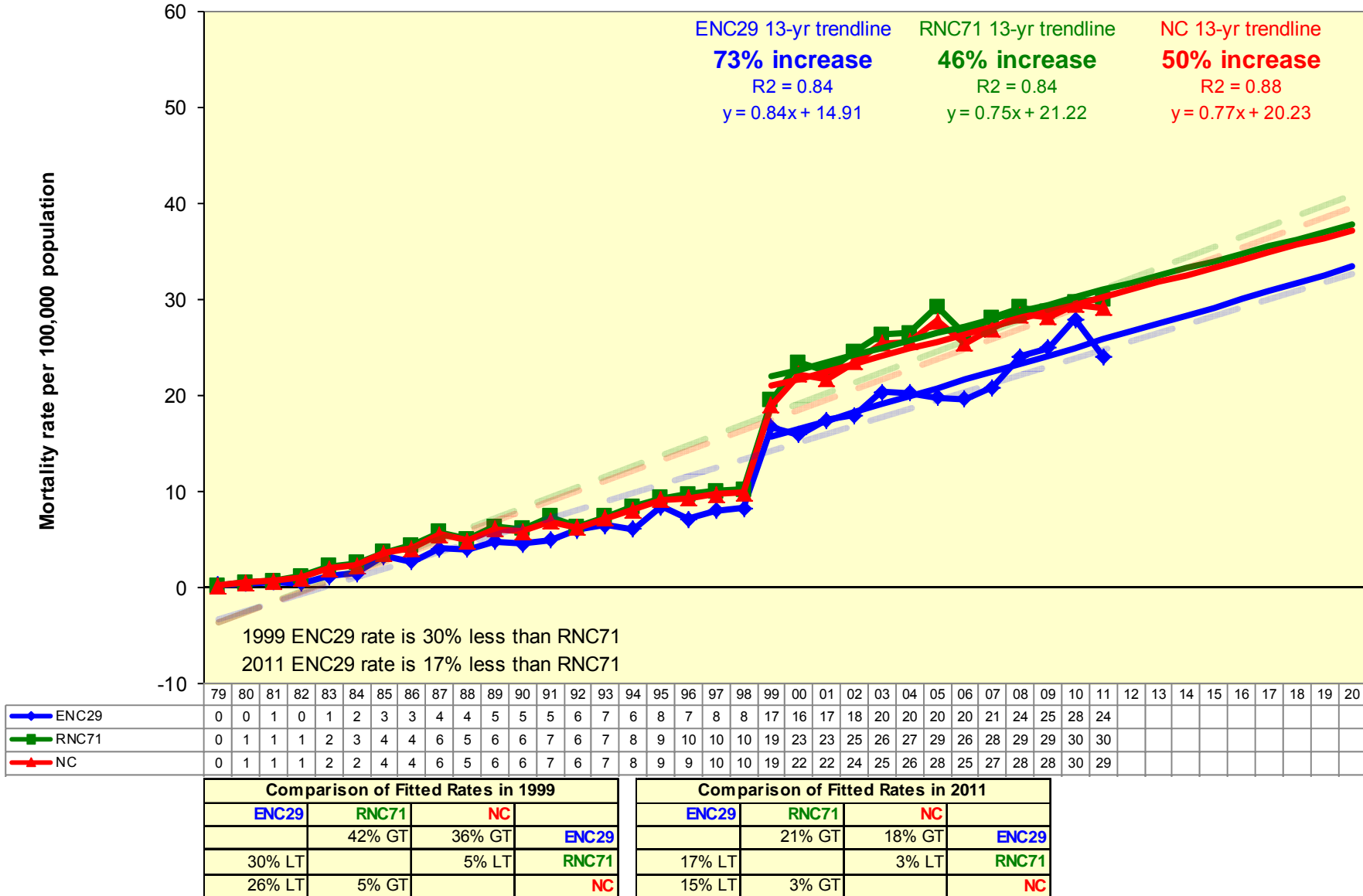


Figure 6.7 ii. Alzheimer's Disease:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

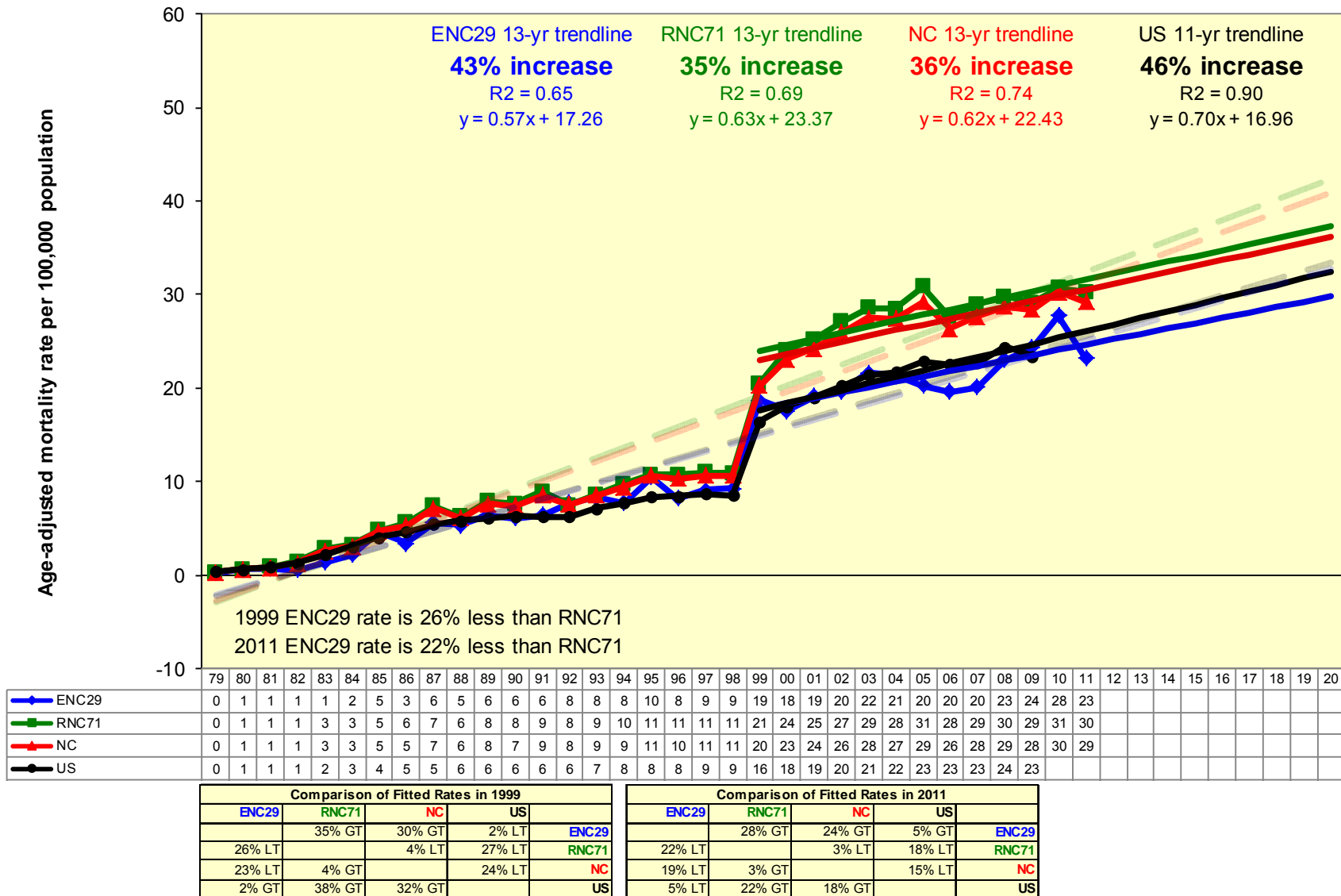


Figure 6.7 iii. Alzheimer's Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

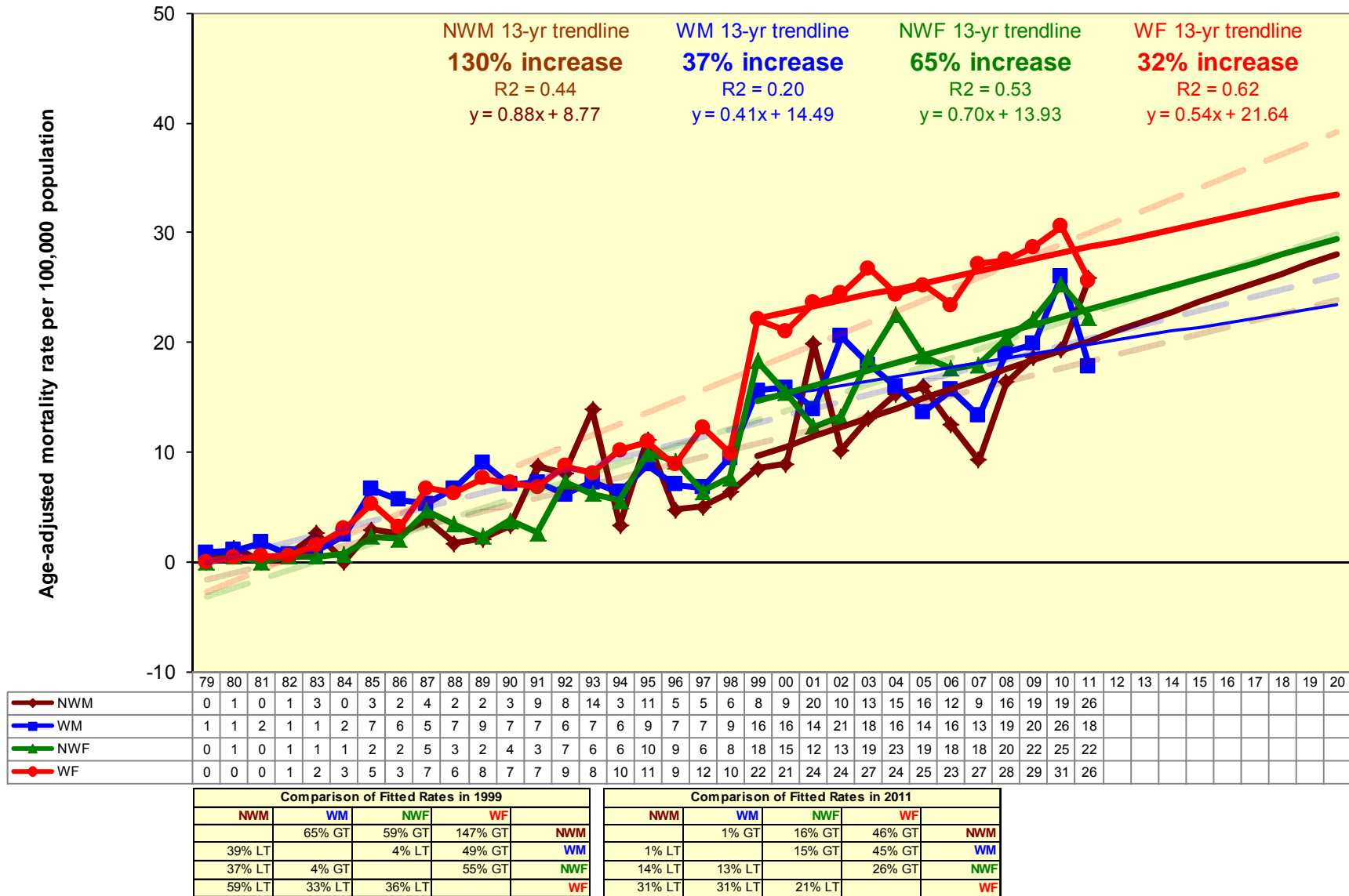


Figure 6.7 iv. Alzheimer's Disease:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

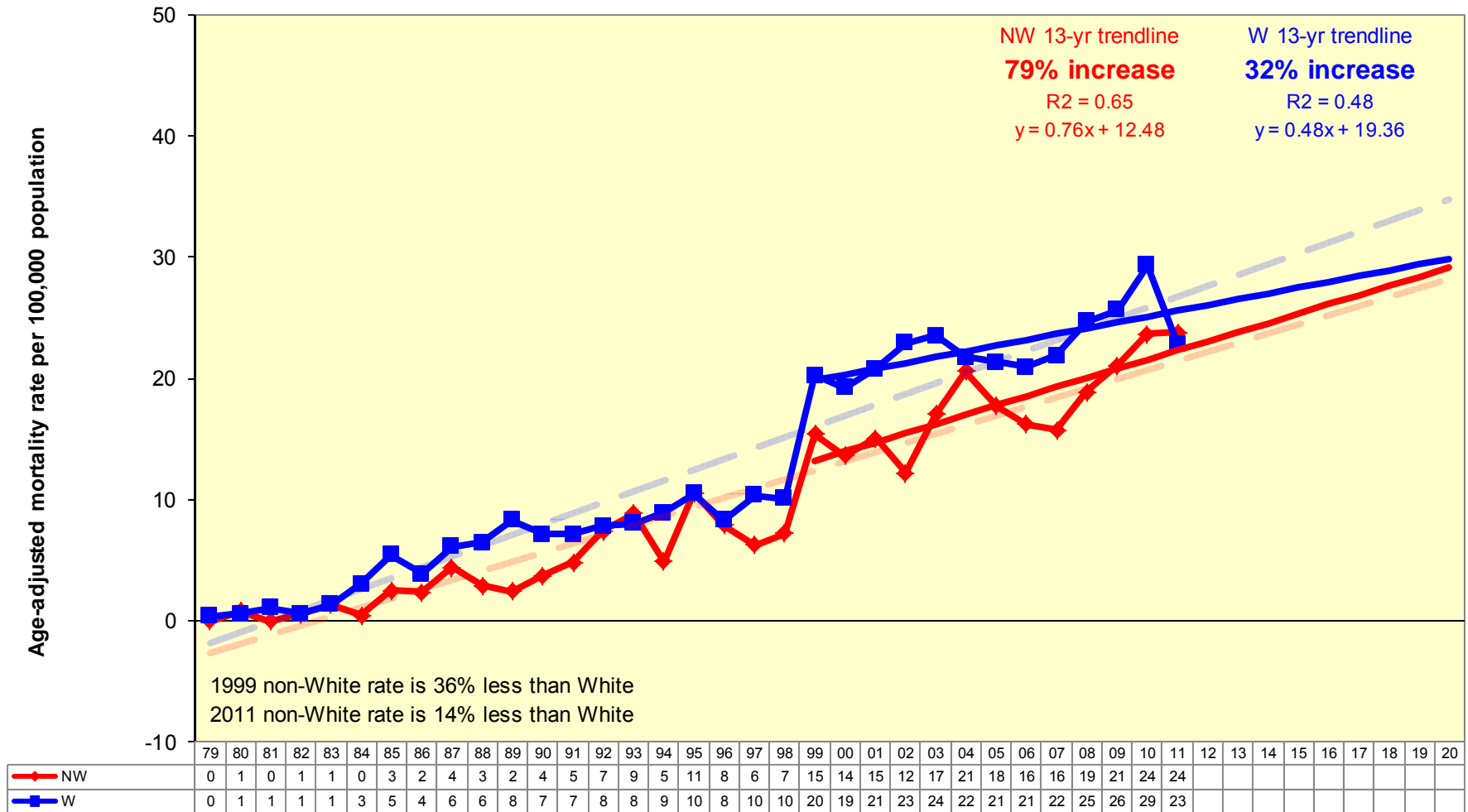
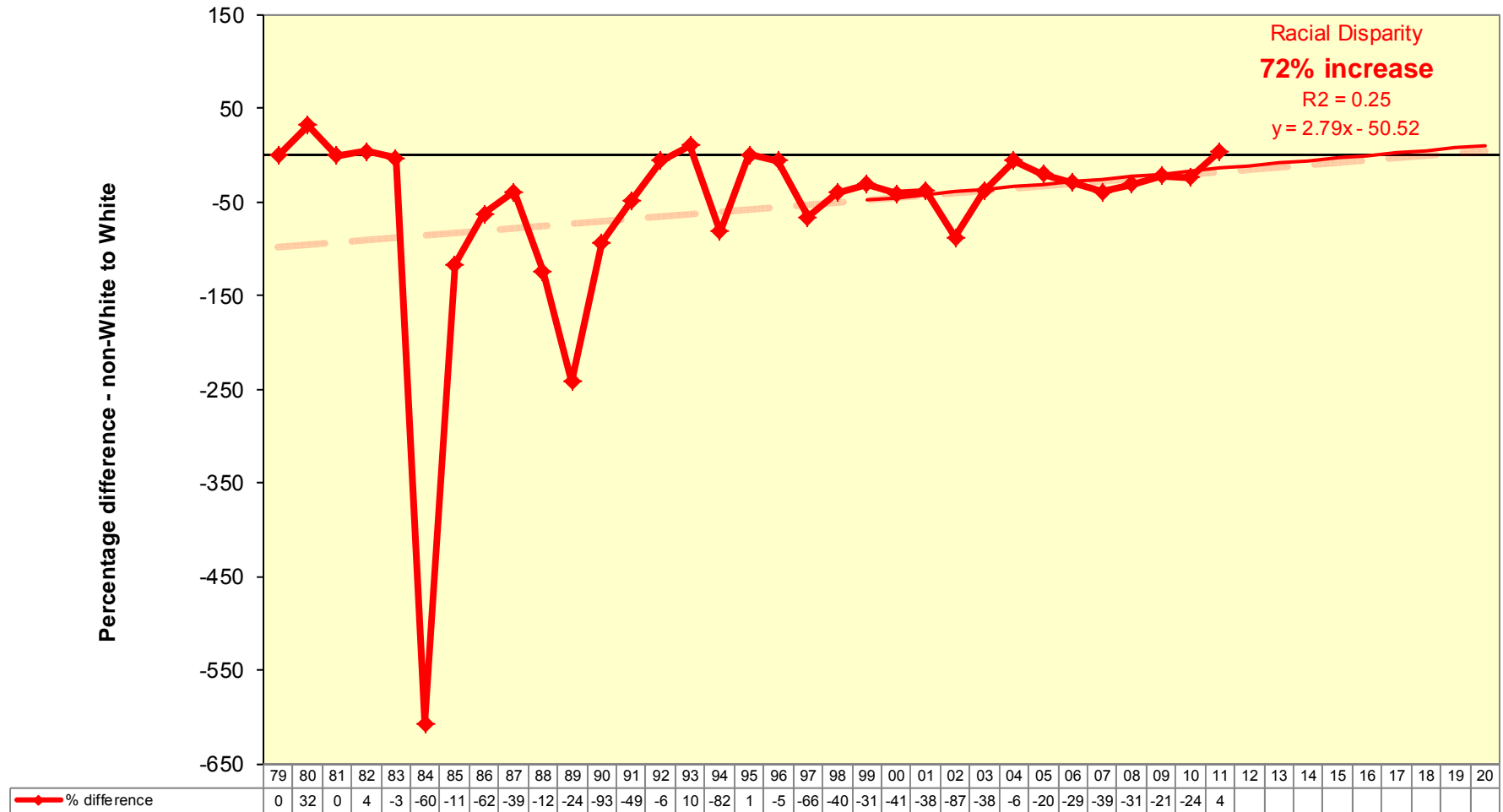


Figure 6.7 v. Alzheimer's Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020



Nephritis, Nephrotic Syndrome, and Nephrosis

- The mortality rate trend for nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 33% over 13 years. The rate trends for RNC and NC have also increased, but not as much. In 2011 ENC's rate is 22% greater than RNC.
- With age-adjustment, the rate of increase is the same for RNC and NC, but ENC is 15% greater than RNC, and 40% greater than the US rate trend.
- The 13 year trend for non-White males is the highest and increasing the most rapidly. The trends for White males and White females are increasing but more slowly. The trend for non-White females is not reliable.
- In 2011, the non-White rate was 136% greater than the White rate. Both the White rate and the non-White rate are increasing.
- The racial disparity trend is decreasing but 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 6.8 i. Nephritis, Nephrotic Syndrome, and Nephrosis:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

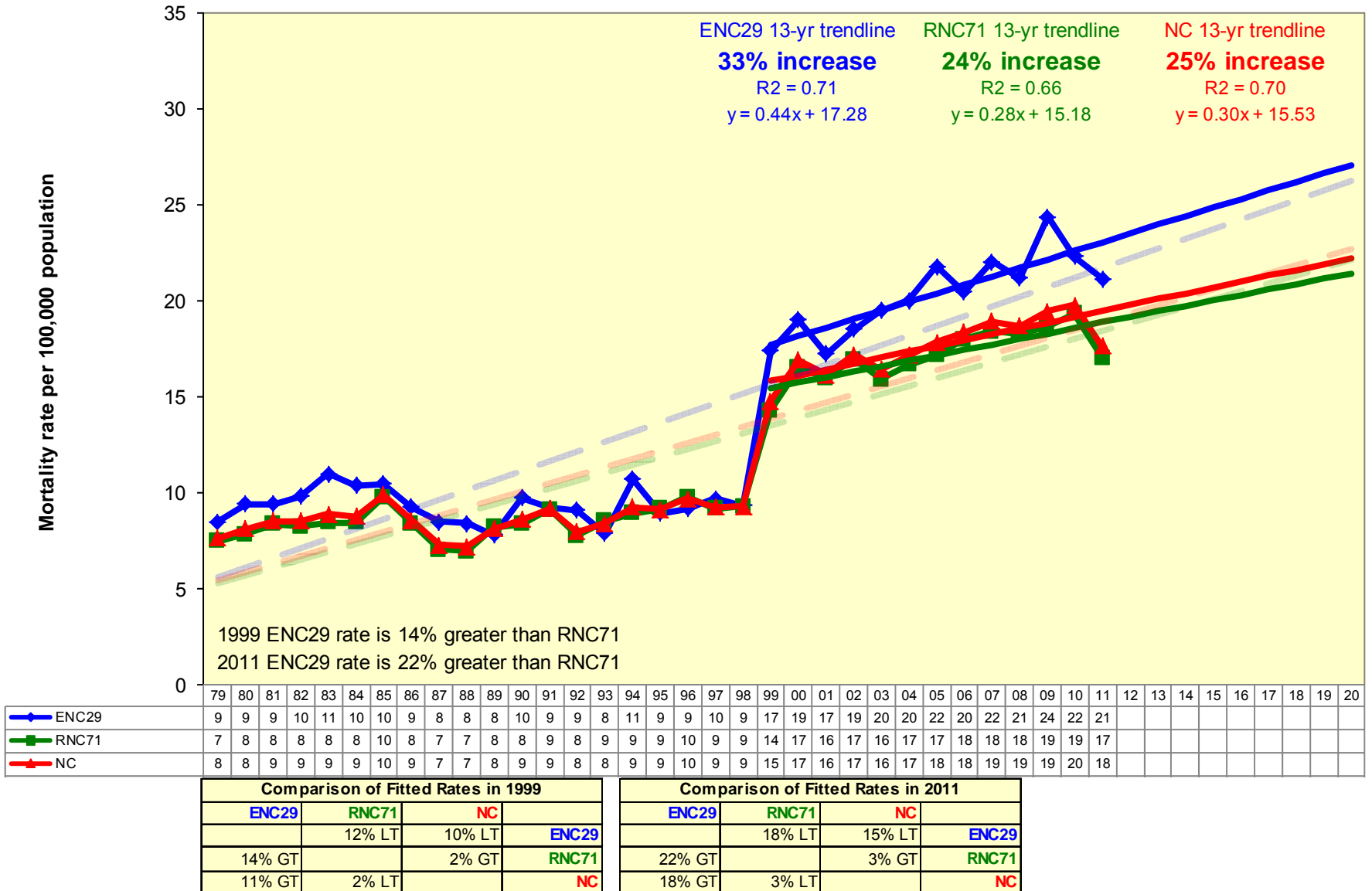


Figure 6.8 ii. Nephritis, Nephrotic Syndrome, and Nephrosis:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

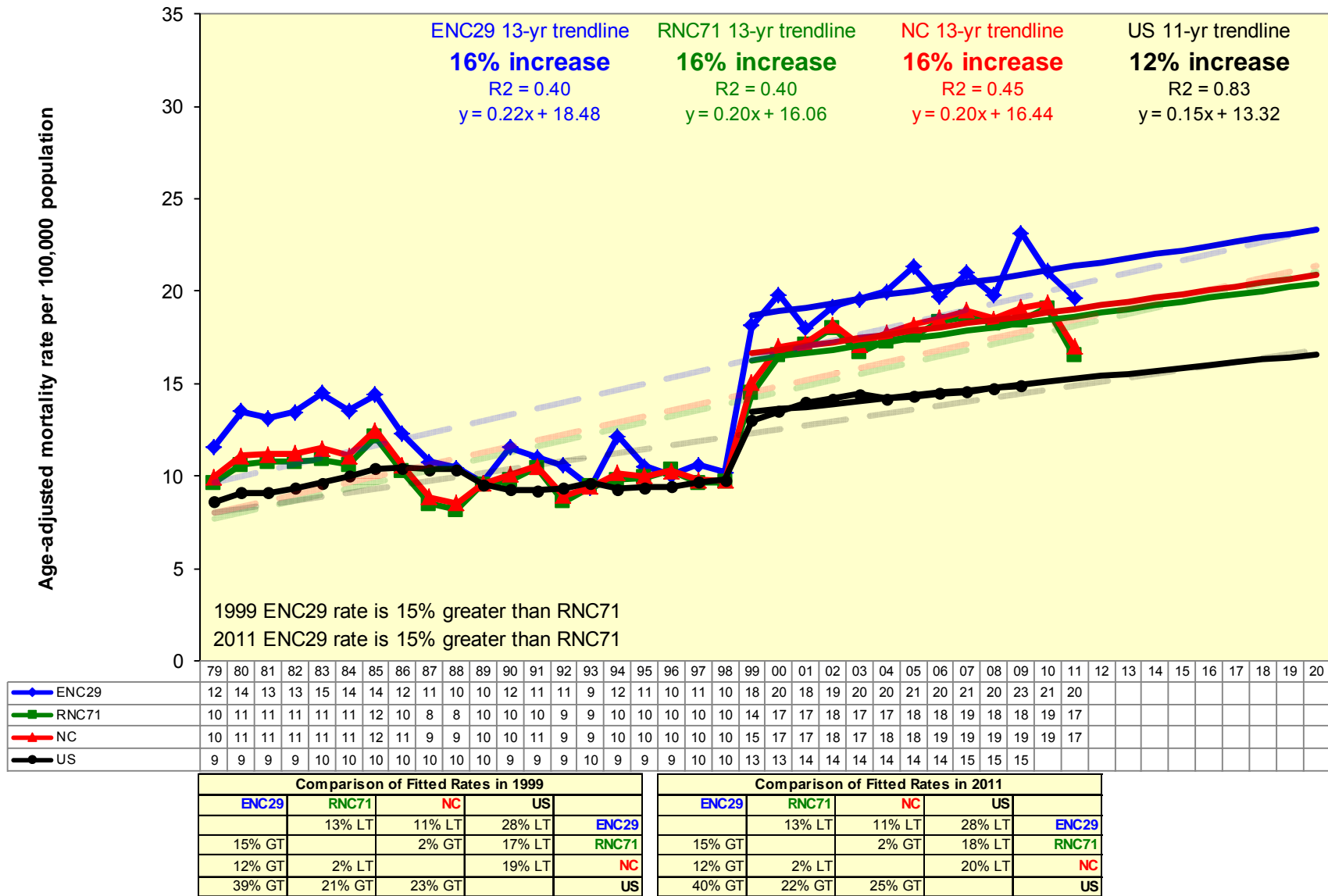


Figure 6.8 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

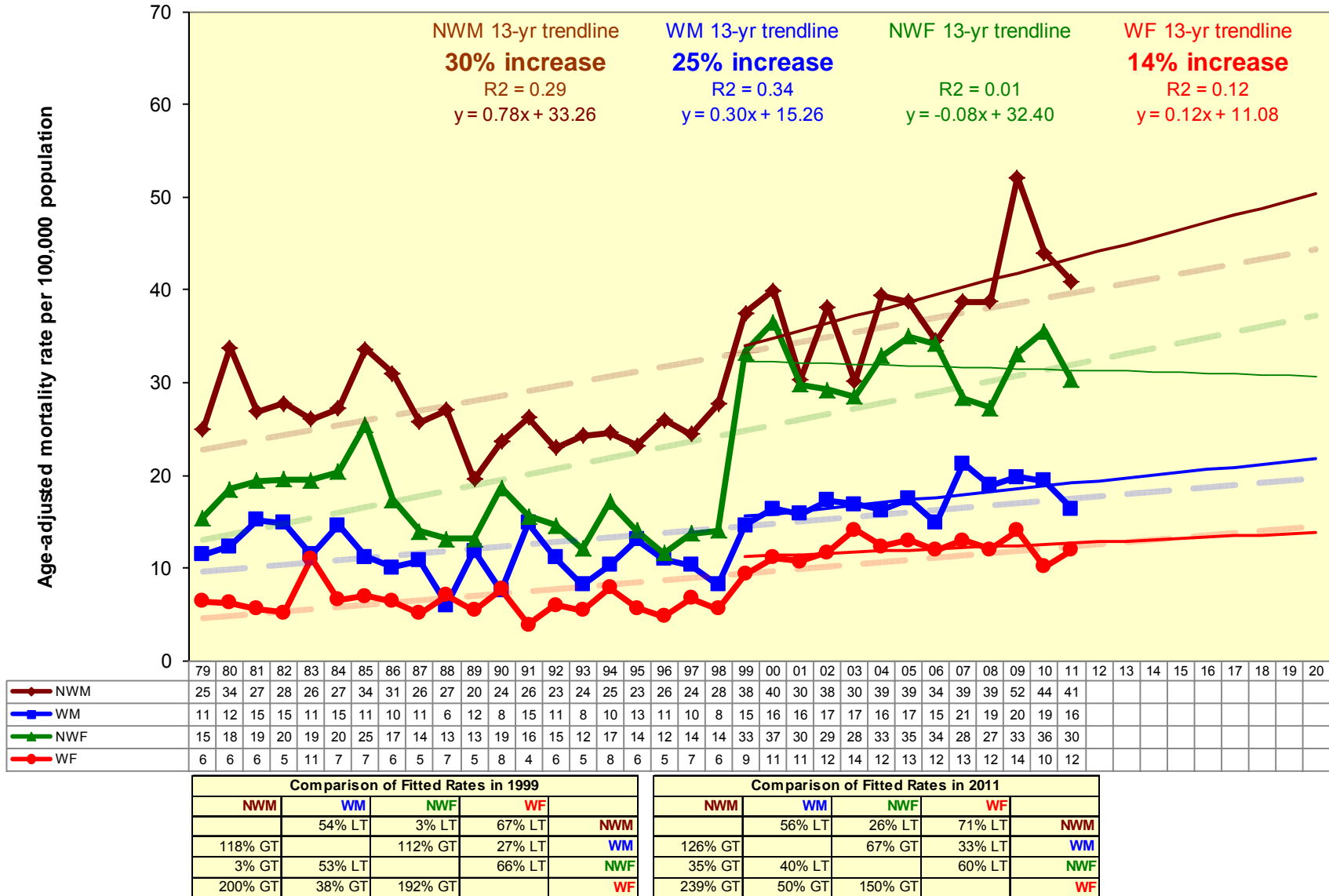


Figure 6.8 iv. Nephritis, Nephrotic Syndrome, and Nephrosis:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

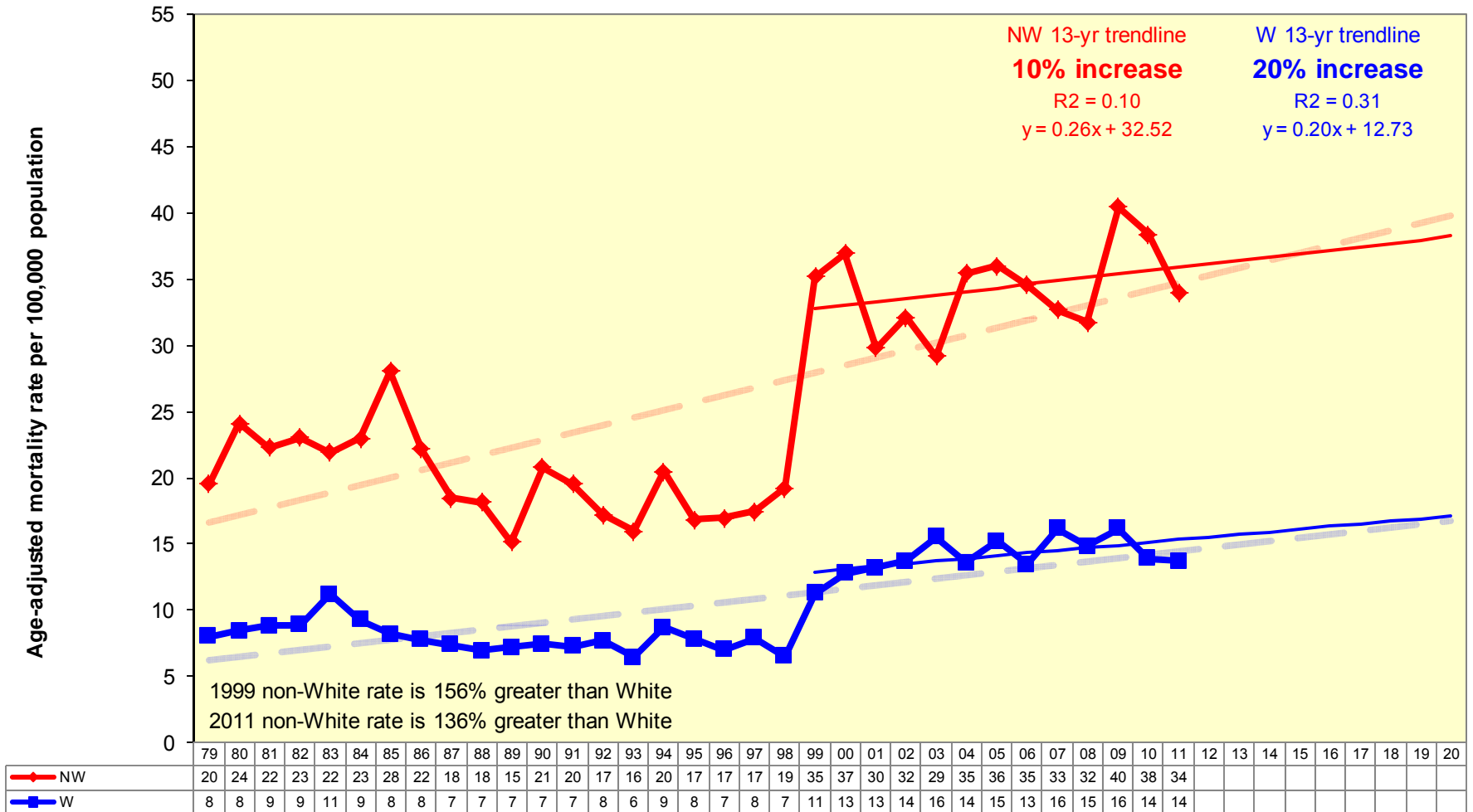
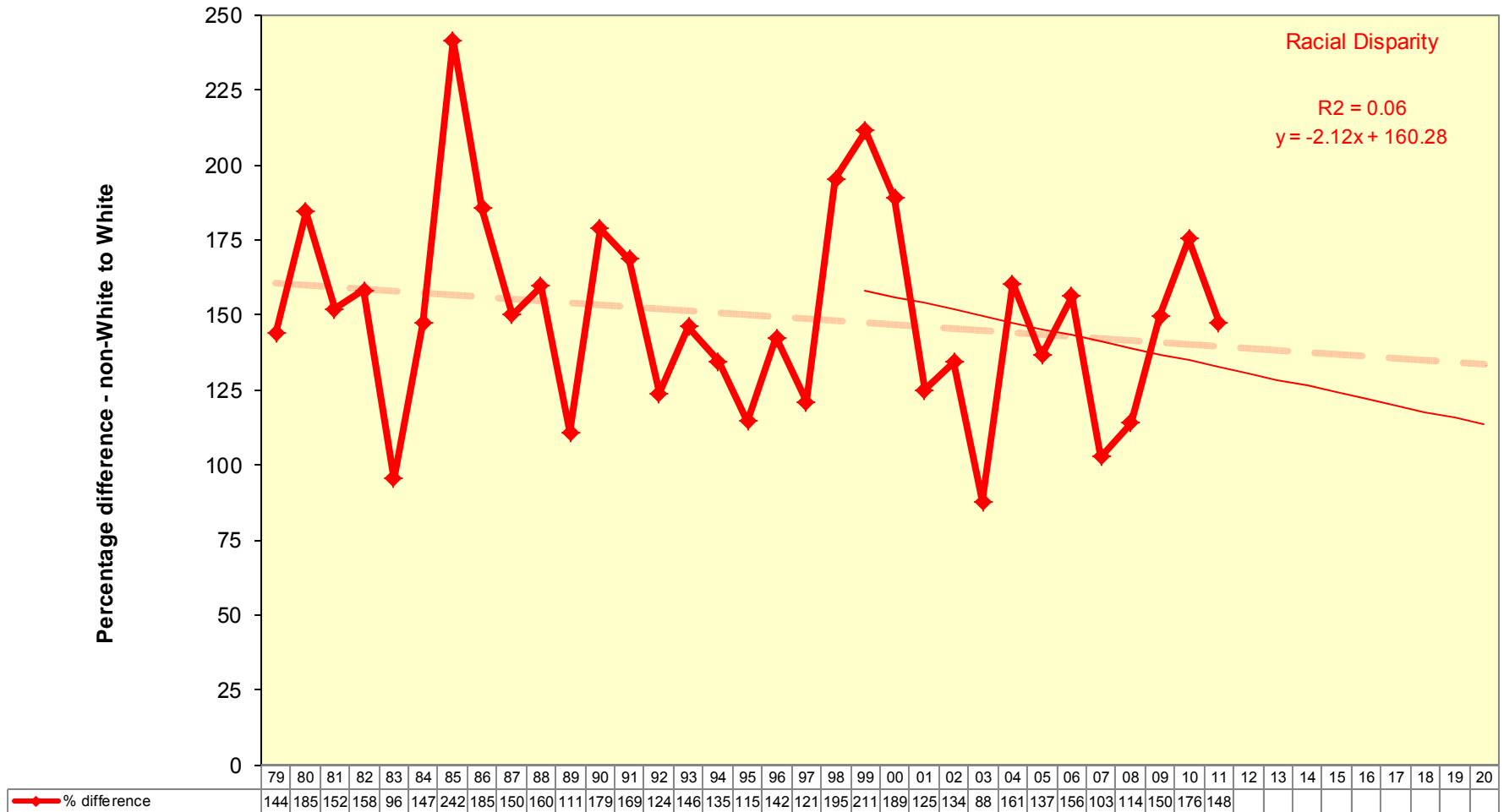


Figure 6.8 v. Nephritis, Nephrotic Syndrome, and Nephrosis:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



Cancer - Colon, Rectum, Anus

- The 13-year rate trends for colon cancer for ENC, RNC and NC have all declined over the period. In 2011 ENC's rate was 29% greater than RNC.
- The age-adjusted mortality rate trend for colon cancer for ENC has declined 32% over the 13-year period. The ENC rate is the highest (14% greater than RNC) but is projected to converge with the NC and RNC trends.
- The non-White male mortality rate trend is the highest of the demographic groups and is decreasing the most slowly. White males and non-White females are about 40% less than non-White males. White females have the lowest rate trend.
- The non-White rate in 2011 is 47% greater than the White rate. Both are declining but the White rate is declining more quickly.
- 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 6.9 i. Cancer - Colon, Rectum, Anus:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

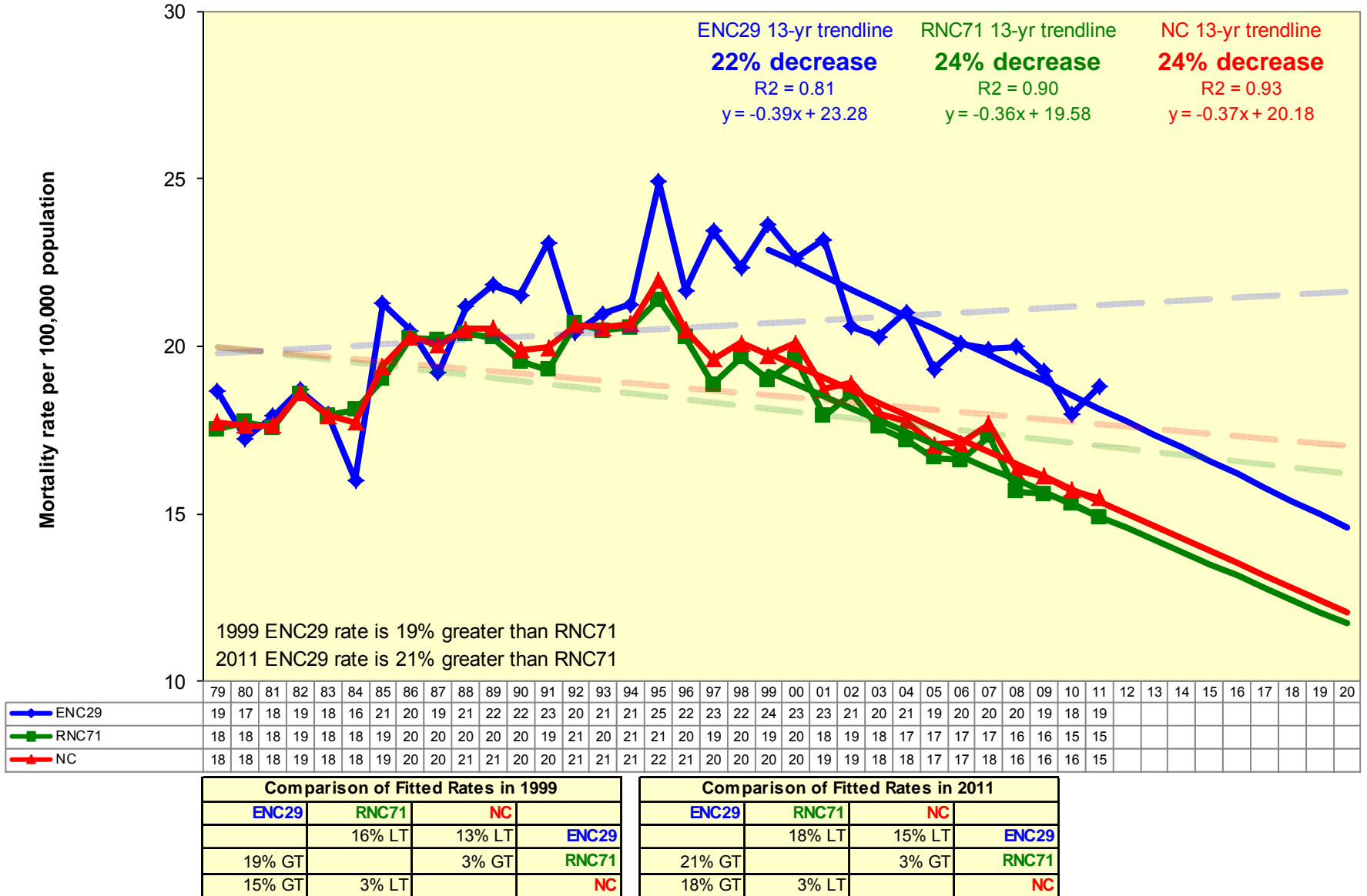


Figure 6.9 ii. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

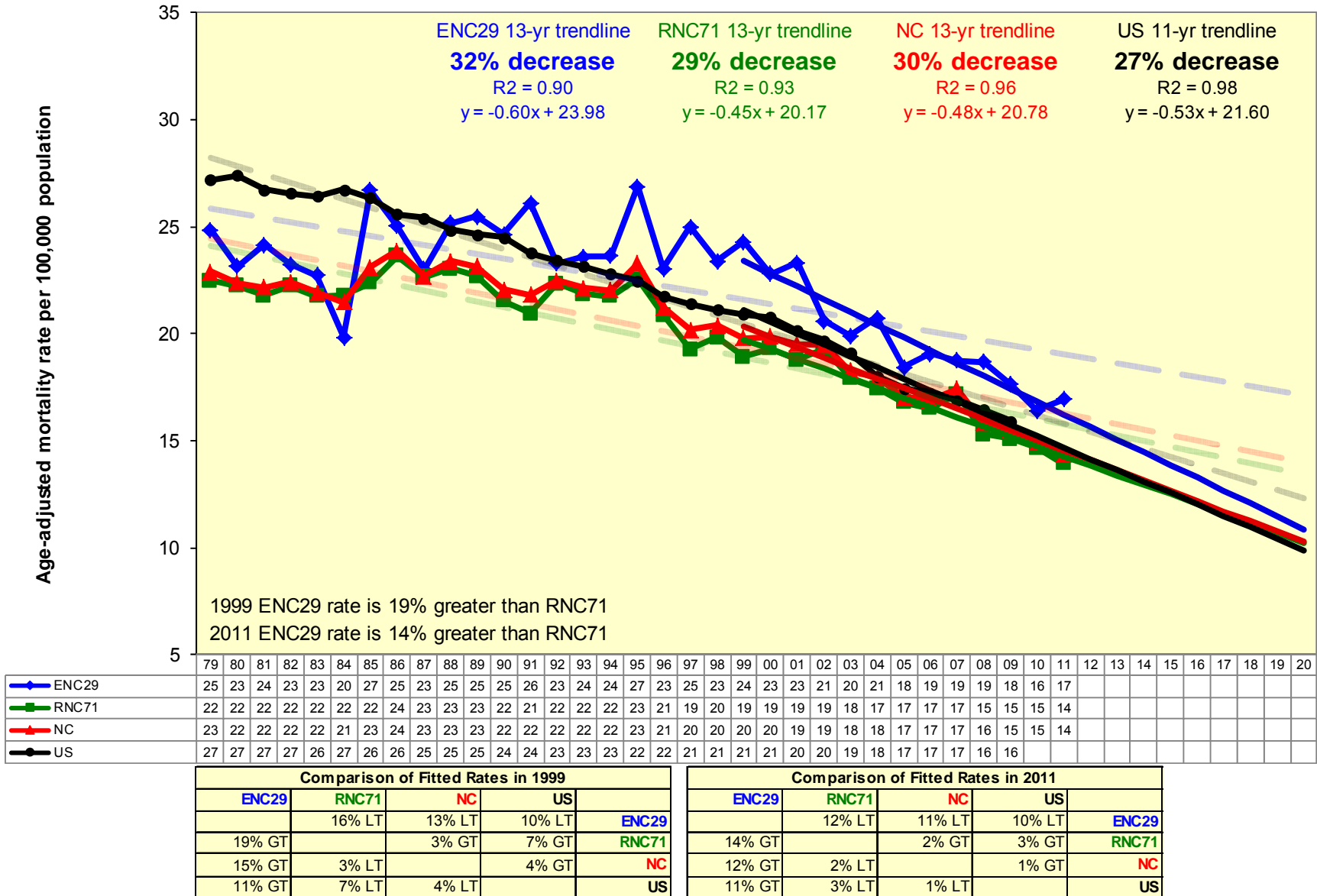


Figure 6.9 iii. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

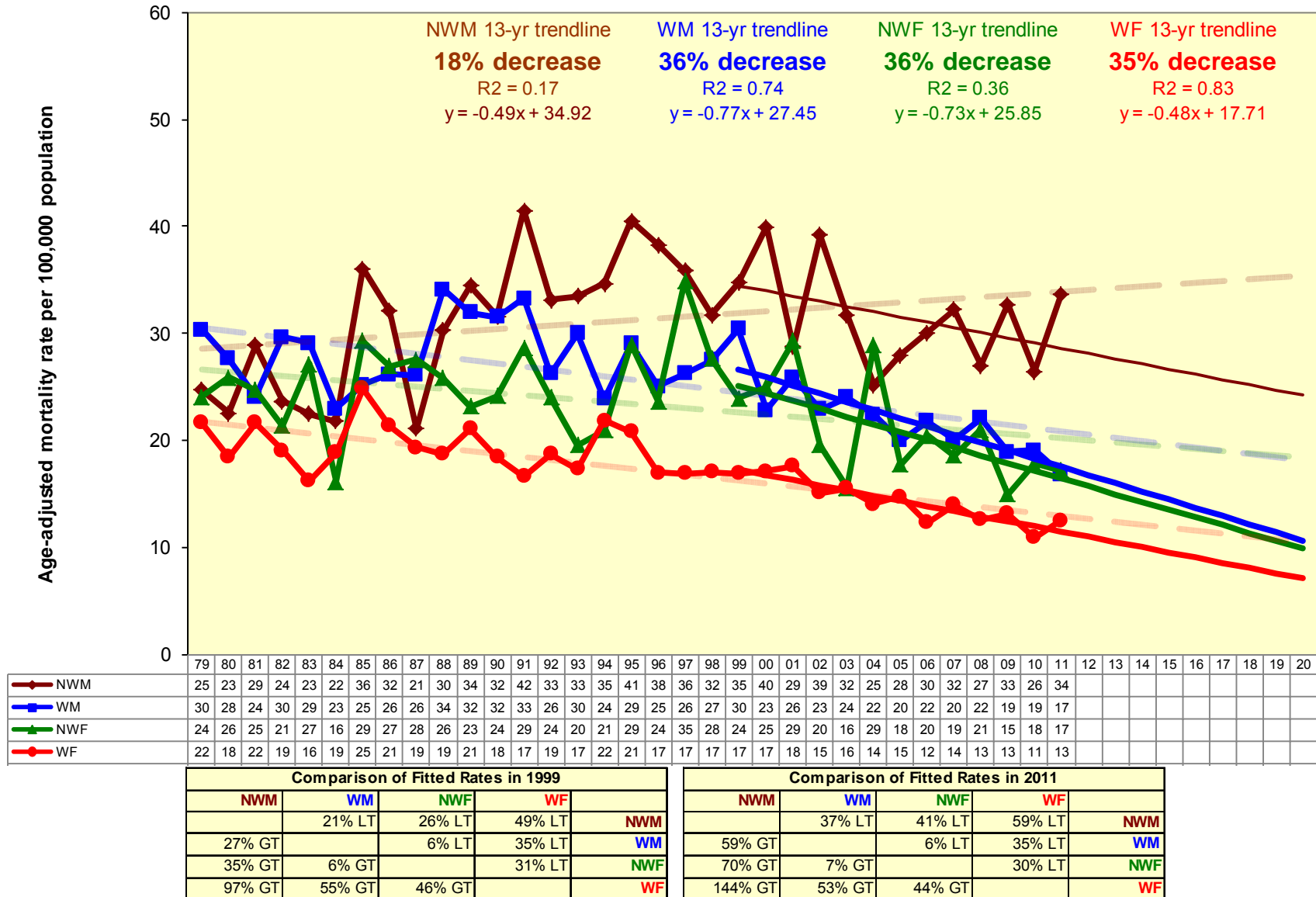


Figure 6.9 iv. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

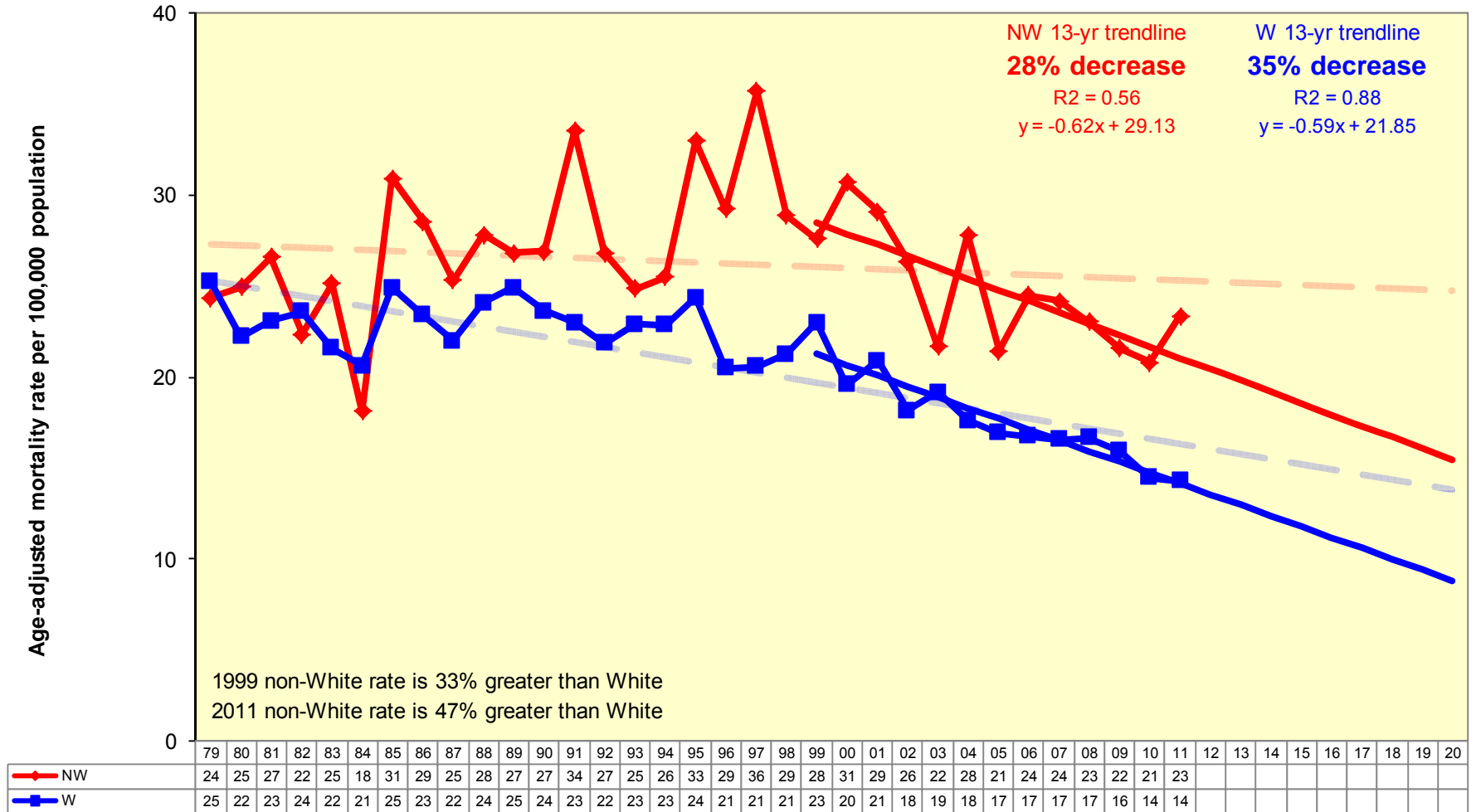
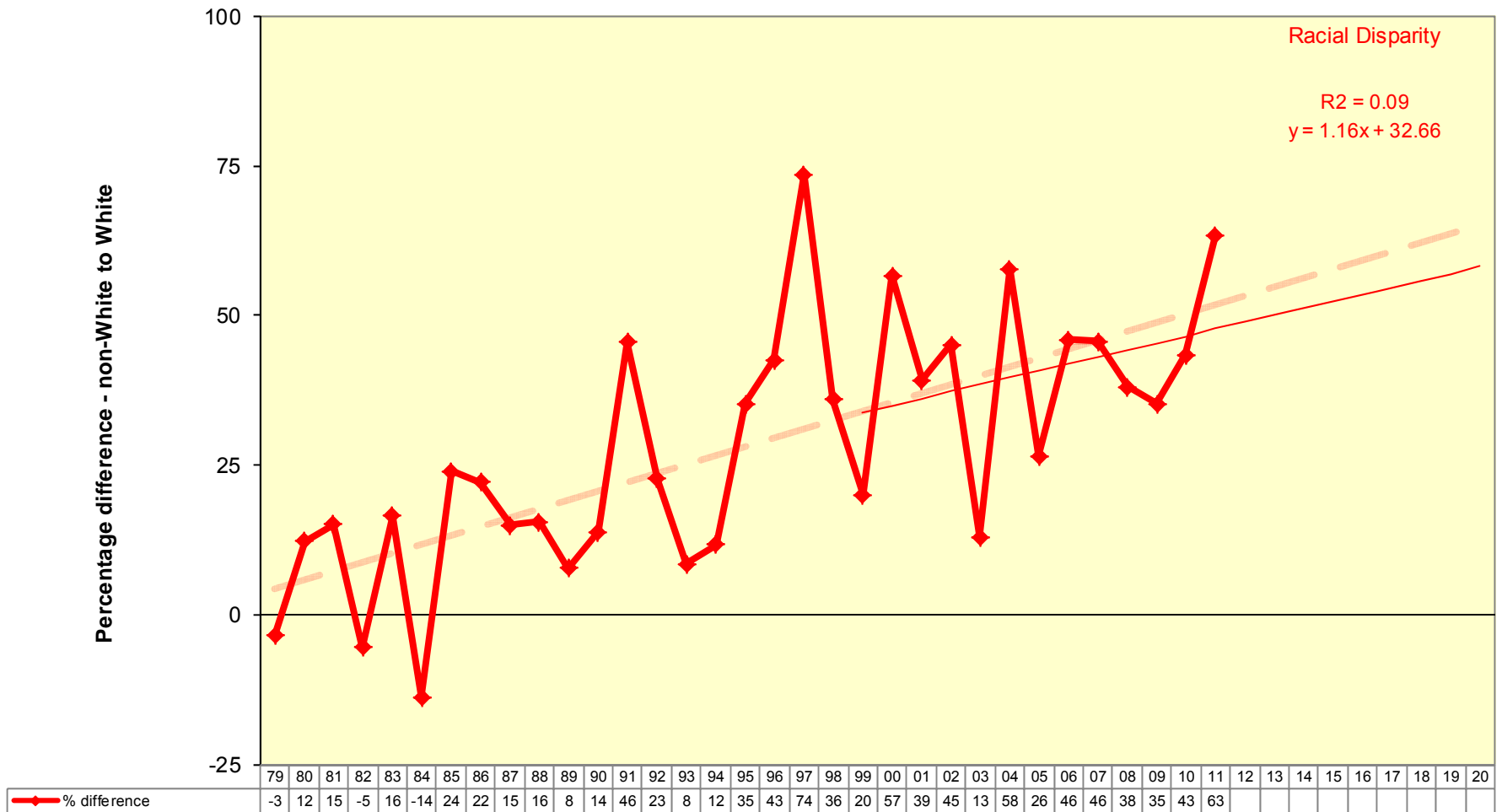


Figure 6.9 v. Cancer - Colon, Rectum, Anus:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



Pneumonia and Influenza

- The mortality rate trend for pneumonia and influenza for ENC, RNC and NC have all declined over the 13 year period. The ENC rate in 2011 is 11% higher than the RNC rate.
- The age-adjusted mortality rate trends for all NC regions are similar and are decreasing at about the same pace. The ENC rate is 20% higher than the US rate.
- The age-adjusted mortality rate trend for all four demographics are decreasing. The trends for non-White males and White males are the highest. Trend lines predict convergence of all four groups in the future.
- The Non-White mortality rate is 11% less than the White rate in 2011. Both are decreasing.
- The 13-year decreasing 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 ENC29, RNC71, and NC,
1979-2011 with projections to 2020

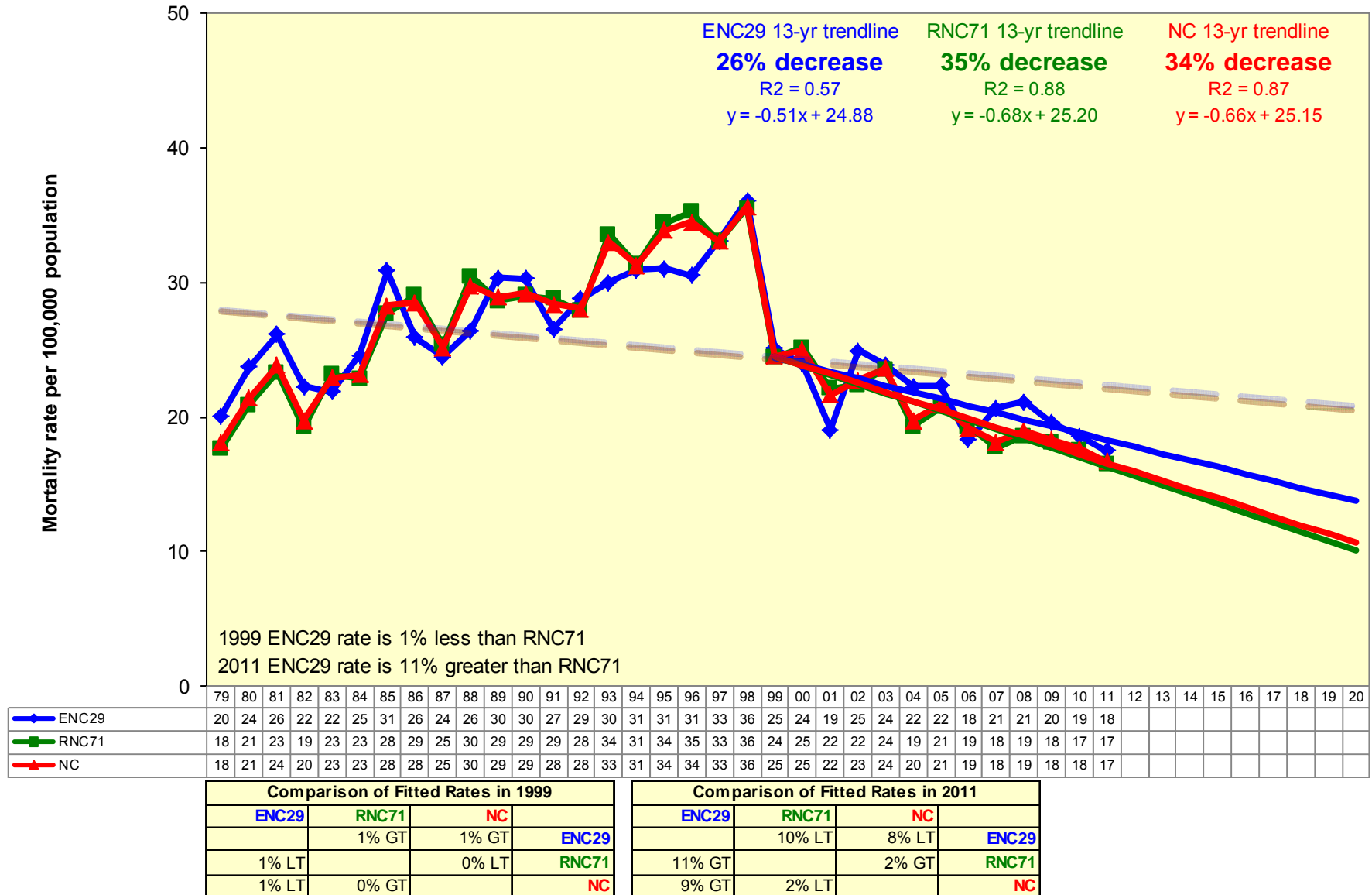


Figure 6.10 ii. Pneumonia and Influenza:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

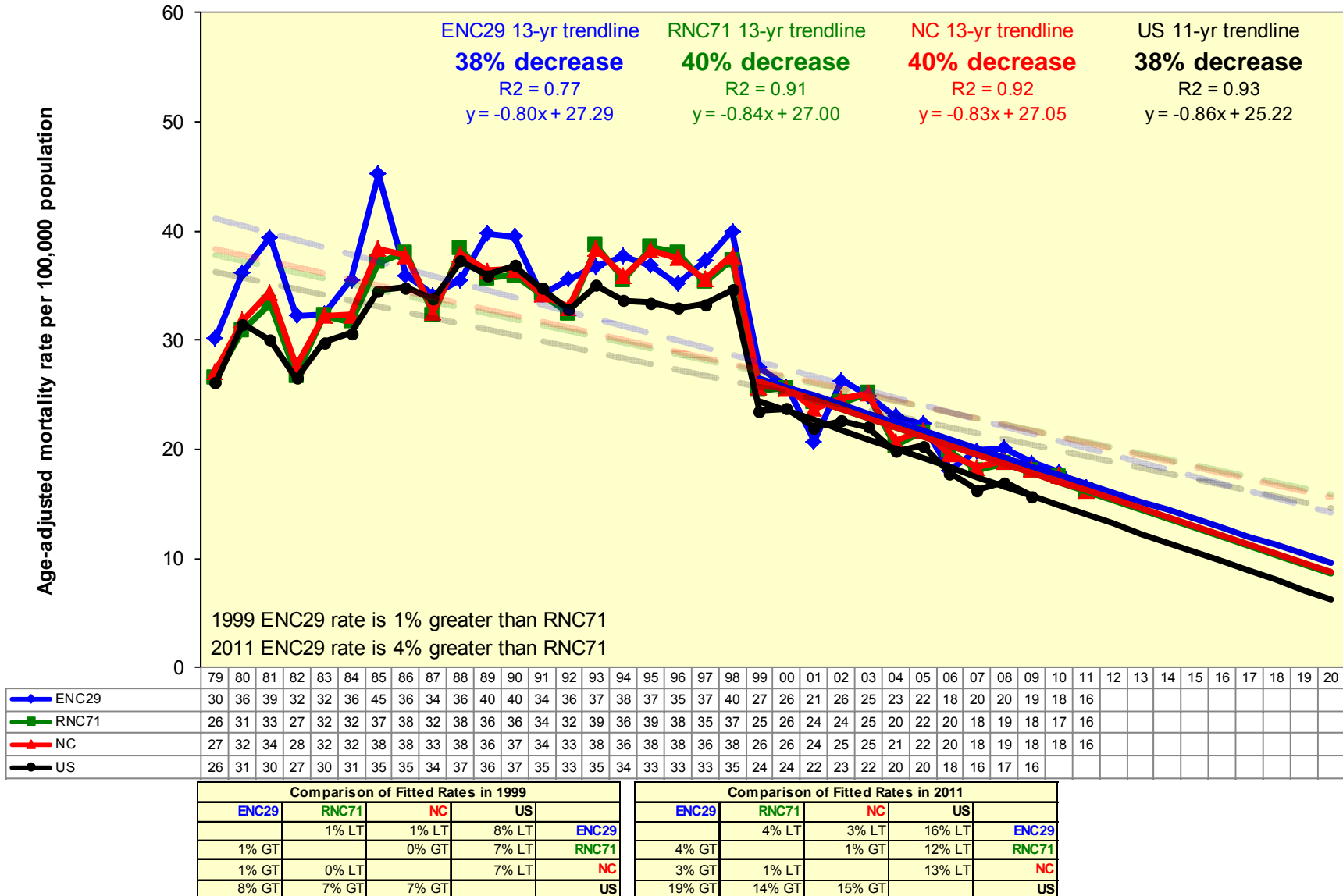


Figure 6.10 iii. Pneumonia and Influenza:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

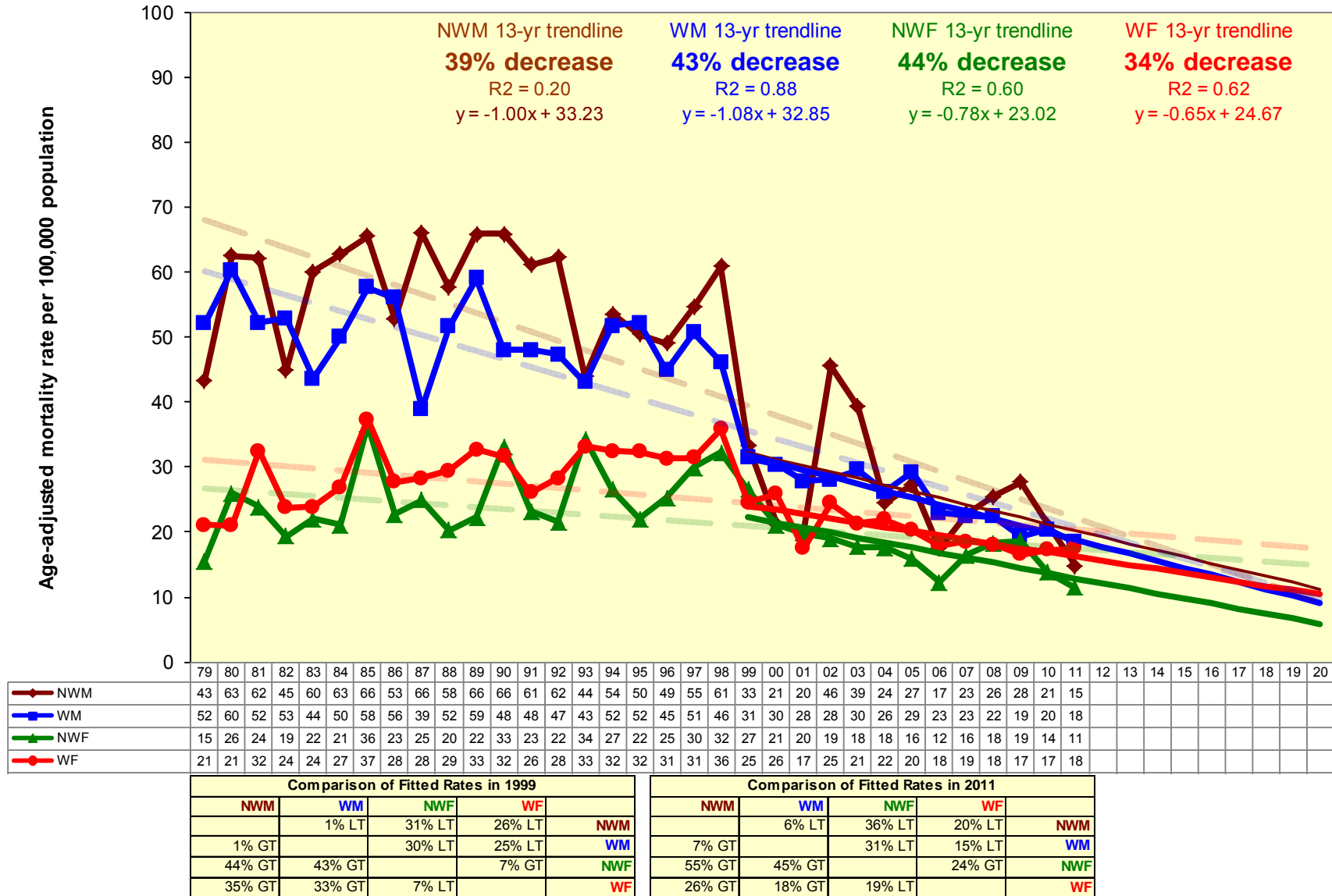


Figure 6.10 iv. Pneumonia and Influenza:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

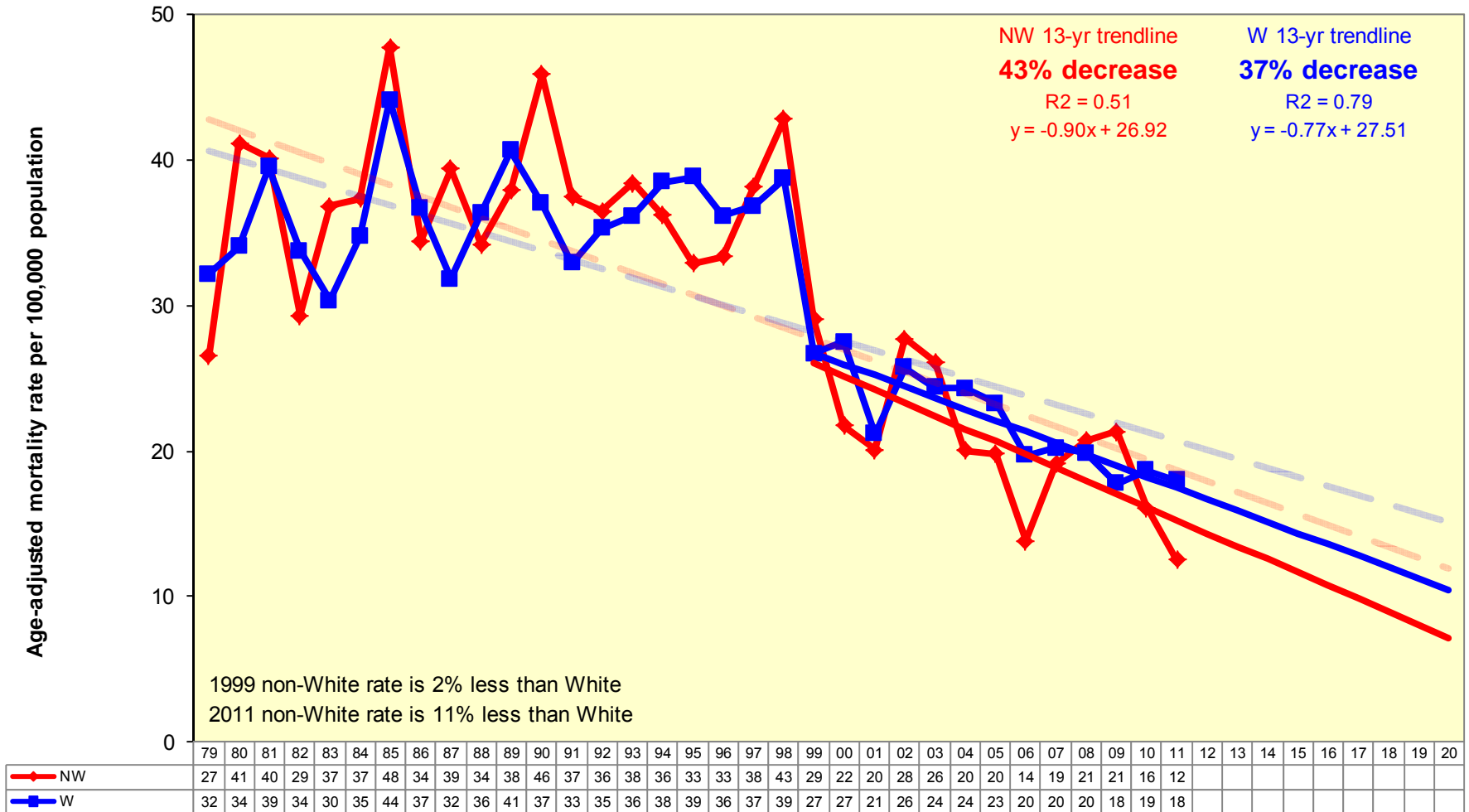
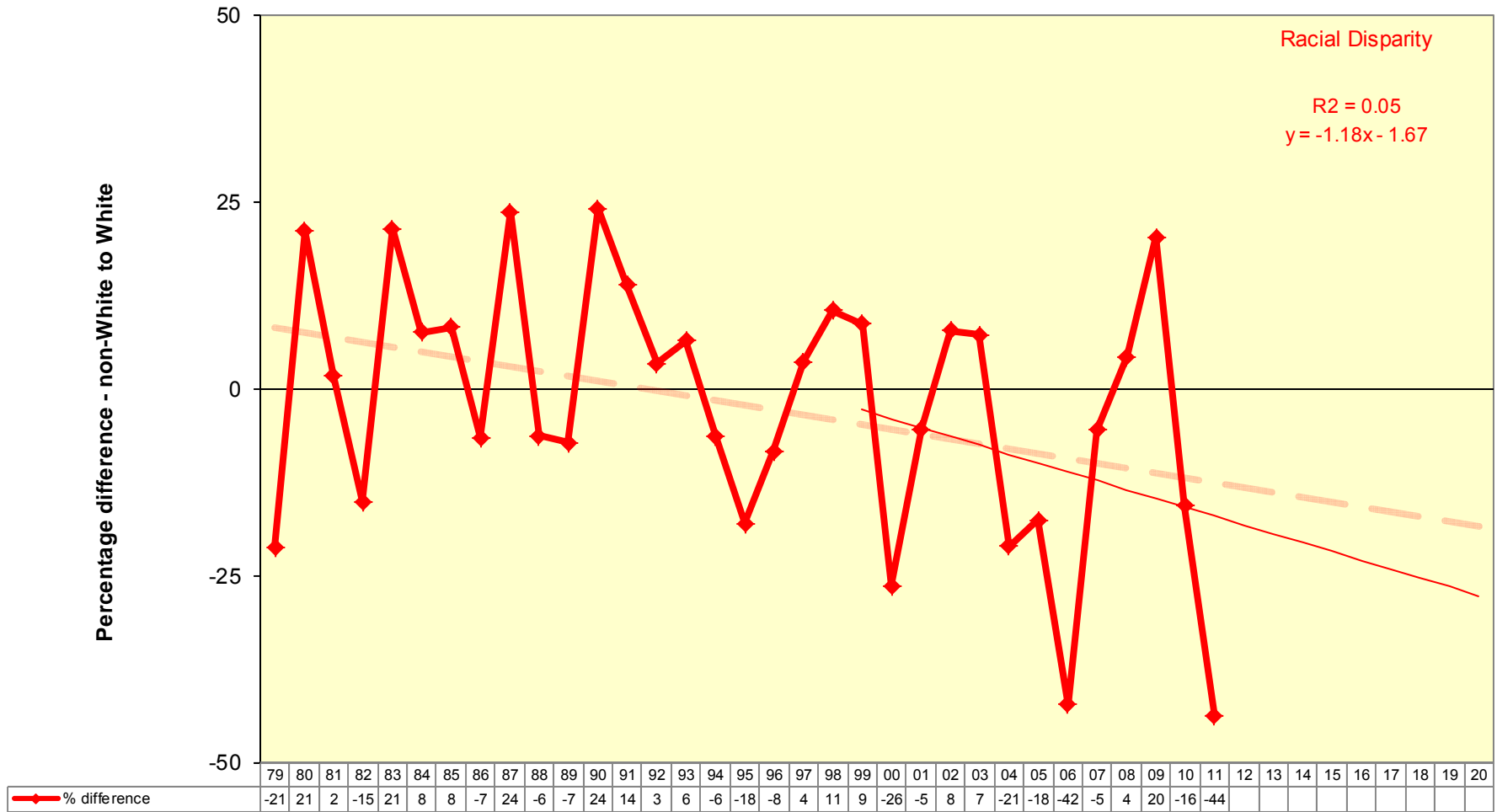


Figure 6.10 v. Pneumonia and Influenza:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



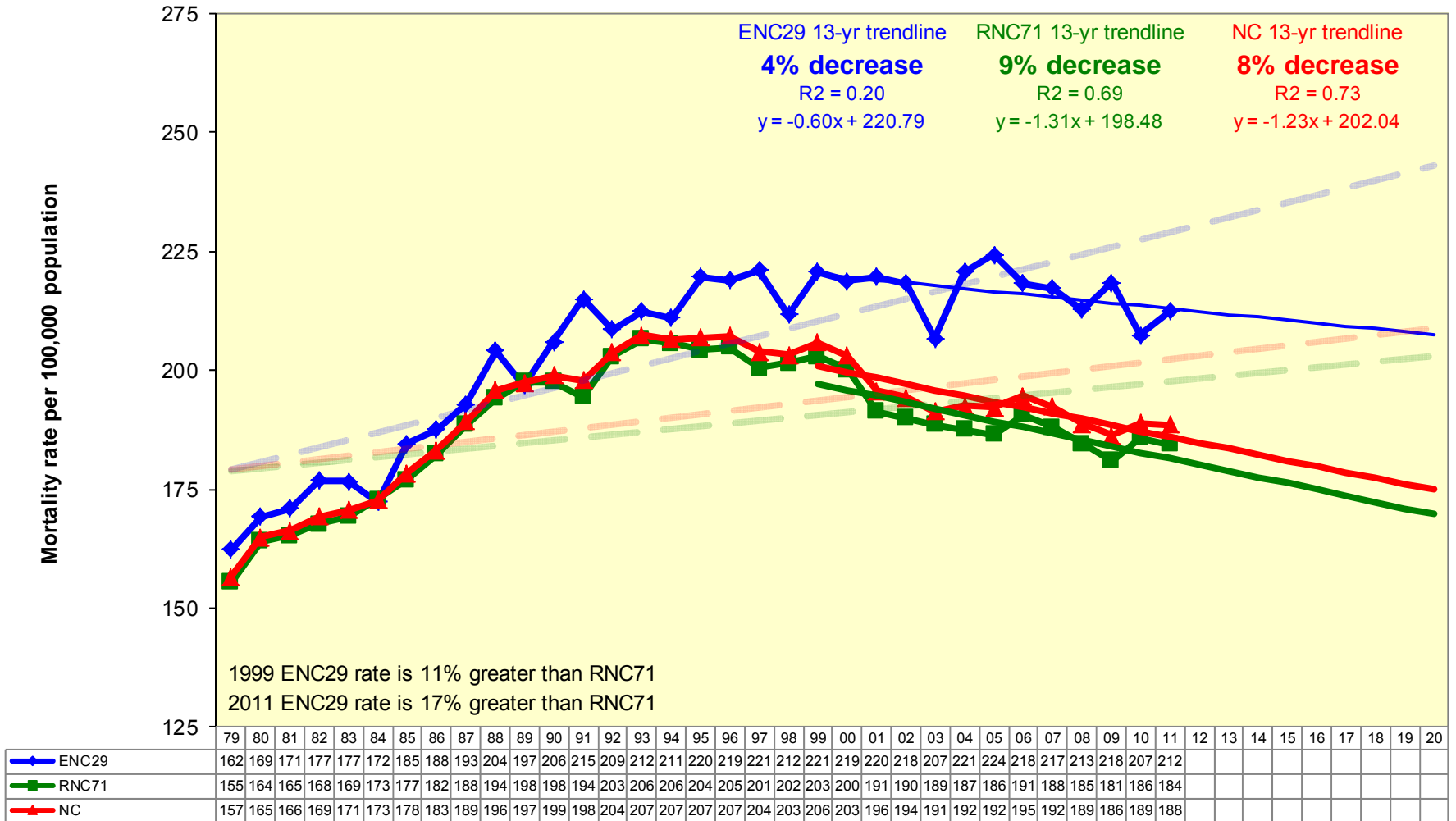
7. Trends and Disparities in Mortality in ENC29: Cancer - All Sites and HIV Disease; 1979-2011

Cancer - All Sites

- The cancer – all sites mortality rates for ENC have decreased slightly (4%) over 13 years. The RNC and NC rates are lower, and have decreased more than ENC, causing these rates to diverge.
- The age-adjusted cancer – all sites mortality rates for ENC, NC and RNC are all decreasing at about the same level, although the ENC rate is 9% greater than the RNC rate.
- The rate trend is decreasing for all regions. The rate for non-White males is the highest but is decreasing the most. White and non-White females show slight decreases.
- Both White and non-White cancer mortality trends are decreasing over the 13 year period. The Non-White rate decreased 22% and the White rate decreased 15%. The non-White rate remains 16% greater than the White rate in 2011.
- The moderately reliable 13-year trend for racial disparity shows a 38% 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 $R^2 < 0.10$.

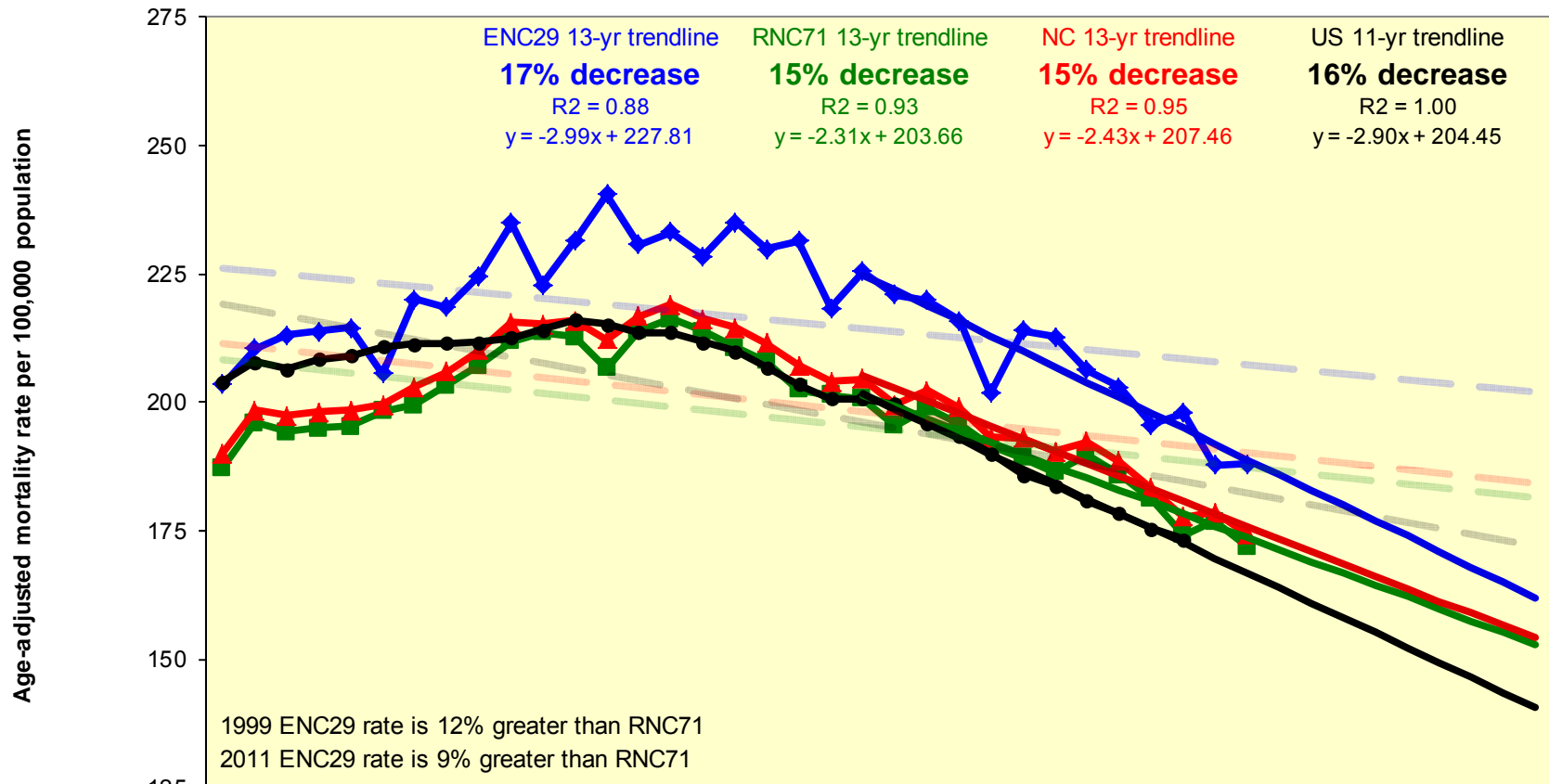
Figure 7.1 i. Cancer - All Sites:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020



Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	
	10% LT	8% LT	ENC29
11% GT		2% GT	RNC71
9% GT	2% LT		NC

Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	
	14% LT	12% LT	ENC29
17% GT		2% GT	RNC71
14% GT	2% LT		NC

Figure 7.1 ii. Cancer - All Sites:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020



	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20						
ENC29	203	210	213	214	214	206	220	218	225	235	223	231	240	231	233	228	235	230	231	218	225	221	220	216	202	214	213	206	203	196	198	188	188															
RNC71	187	196	194	195	195	198	199	203	207	212	214	213	207	214	216	214	211	208	202	201	201	195	199	196	192	189	186	190	186	181	174	177	172															
NC	190	198	197	198	198	199	203	206	210	216	215	216	212	217	219	216	214	212	207	204	205	199	202	199	193	193	190	192	188	183	178	178	174															
US	204	208	206	208	209	211	211	212	212	212	214	216	215	214	214	212	210	207	203	201	201	200	196	193	190	186	184	181	178	175	173																	

Comparison of Fitted Rates in 1999			
ENC29	RNC71	NC	US
	11% LT	9% LT	10% LT
12% GT		2% GT	0% GT
10% GT	2% LT		1% LT
11% GT	0% LT	1% GT	

Comparison of Fitted Rates in 2011			
ENC29	RNC71	NC	US
	8% LT	7% LT	12% LT
9% GT		1% GT	4% LT
8% GT	1% LT		5% LT
13% GT	4% GT	5% GT	

Figure 7.1 iii. Cancer - All Sites:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

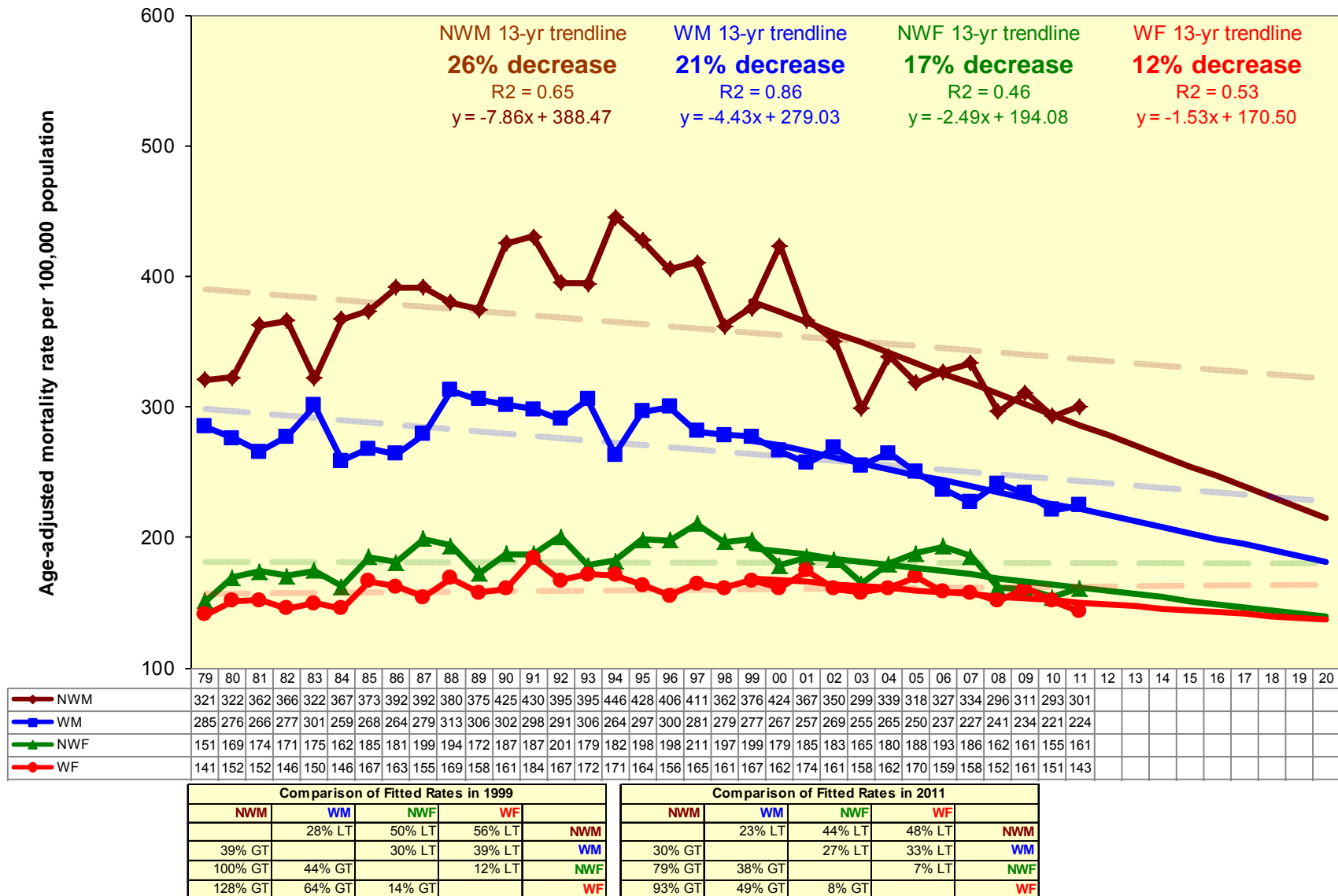


Figure 7.1 iv. Cancer - All Sites:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

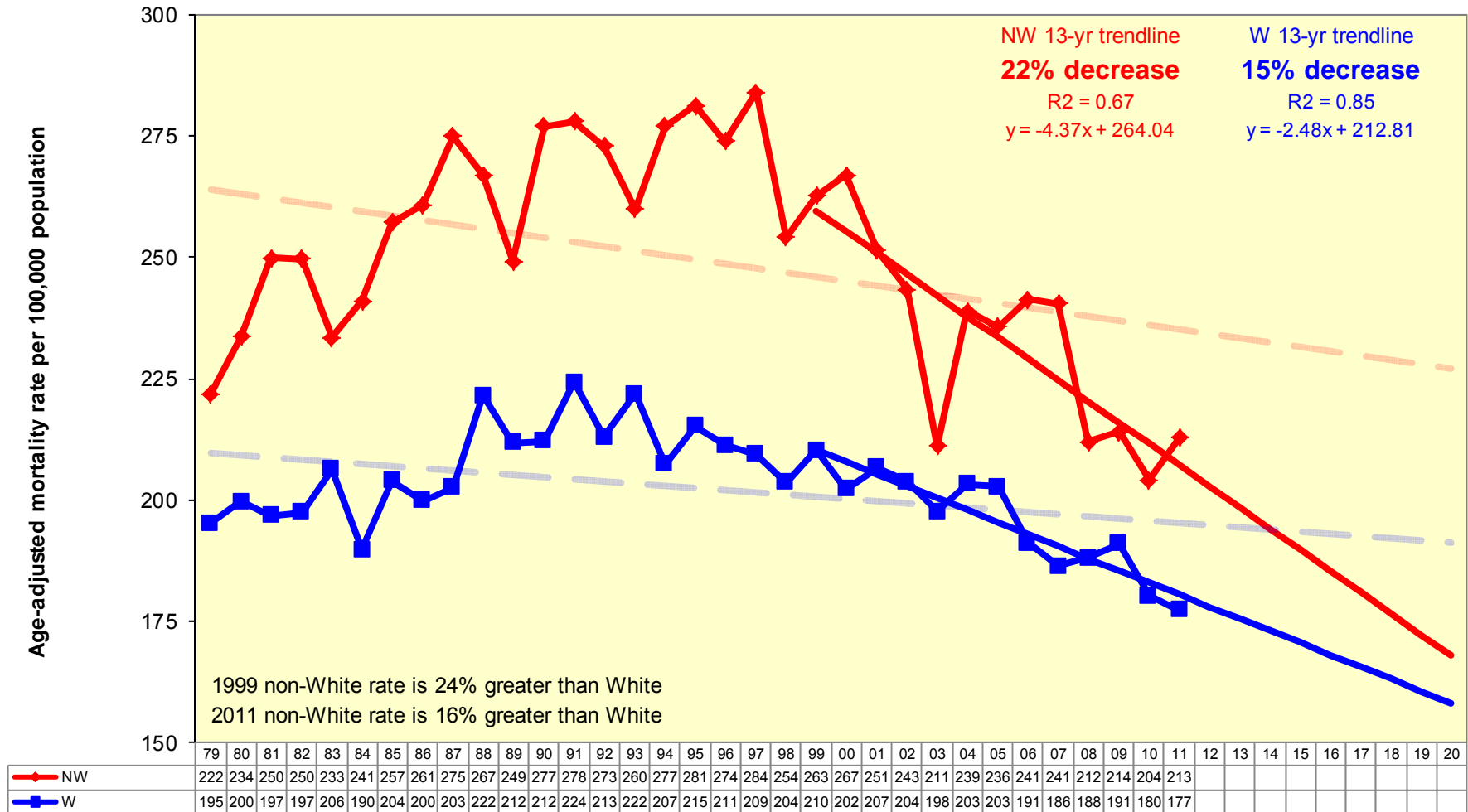
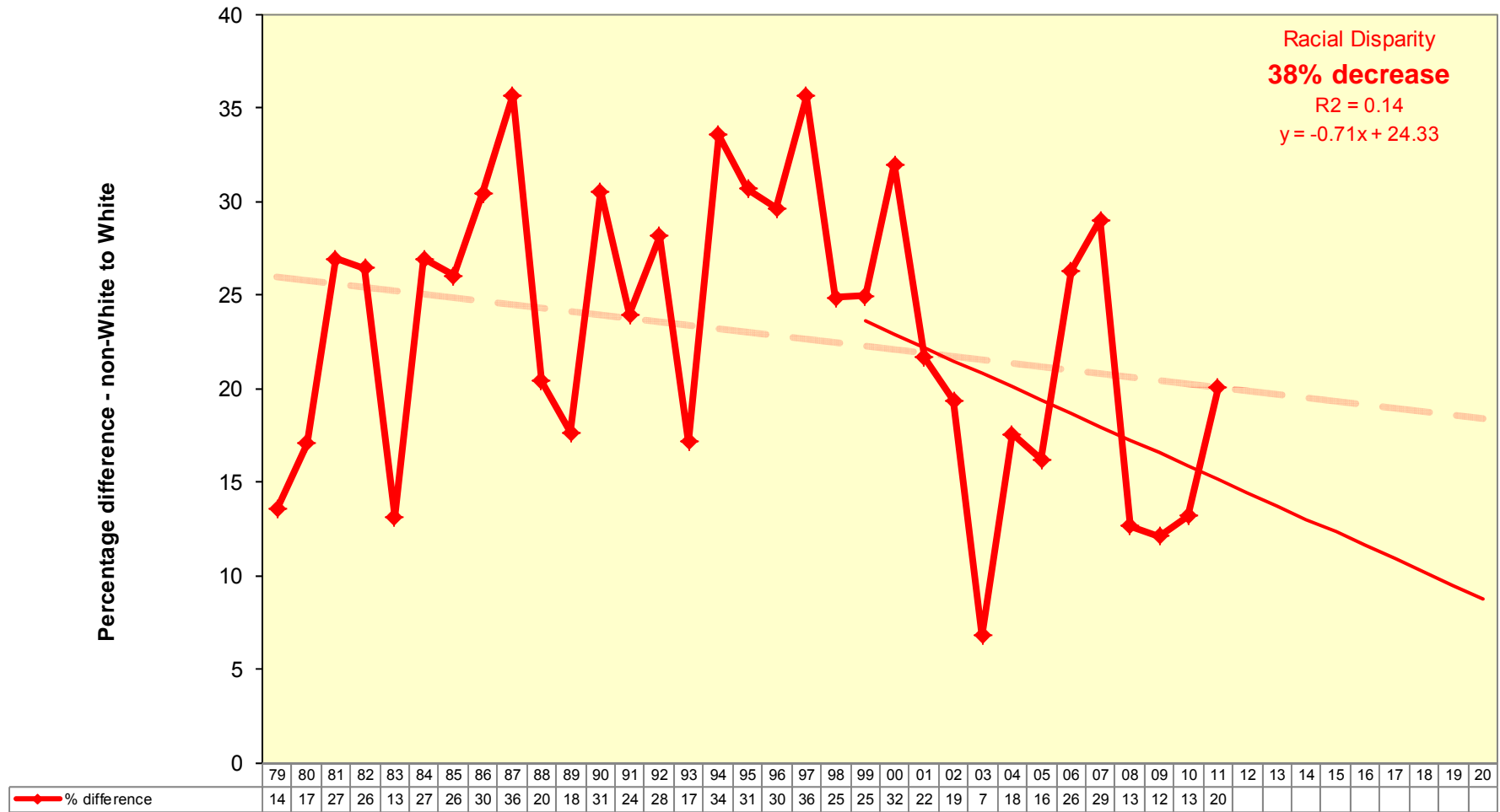


Figure 7.1 v. Cancer - All Sites:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



HIV Disease

- The fitted HIV mortality rates for ENC have been decreasing over the past 13 years, but are still 62% greater than RNC in 2011.
- The age-adjusted rate trend for ENC, RNC and the US are all decreasing. The ENC rate is 68% greater than RNC in 2011.
- Non-White males continue to have the highest rates of age-adjusted mortality, but these rates have also decreased 15% in a 13-year reliable trend. Non-White females have the second highest rate, but it has also declined over the 13-year period. The rate for White males is lower but has also decreased. The White female rate is not reliable.
- The 13-year age-adjusted HIV mortality rates have decreased by 43% in a reliable trend for both Whites and non-Whites. The non-White rate is still 1068% greater 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 7.2 i. HIV Disease:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

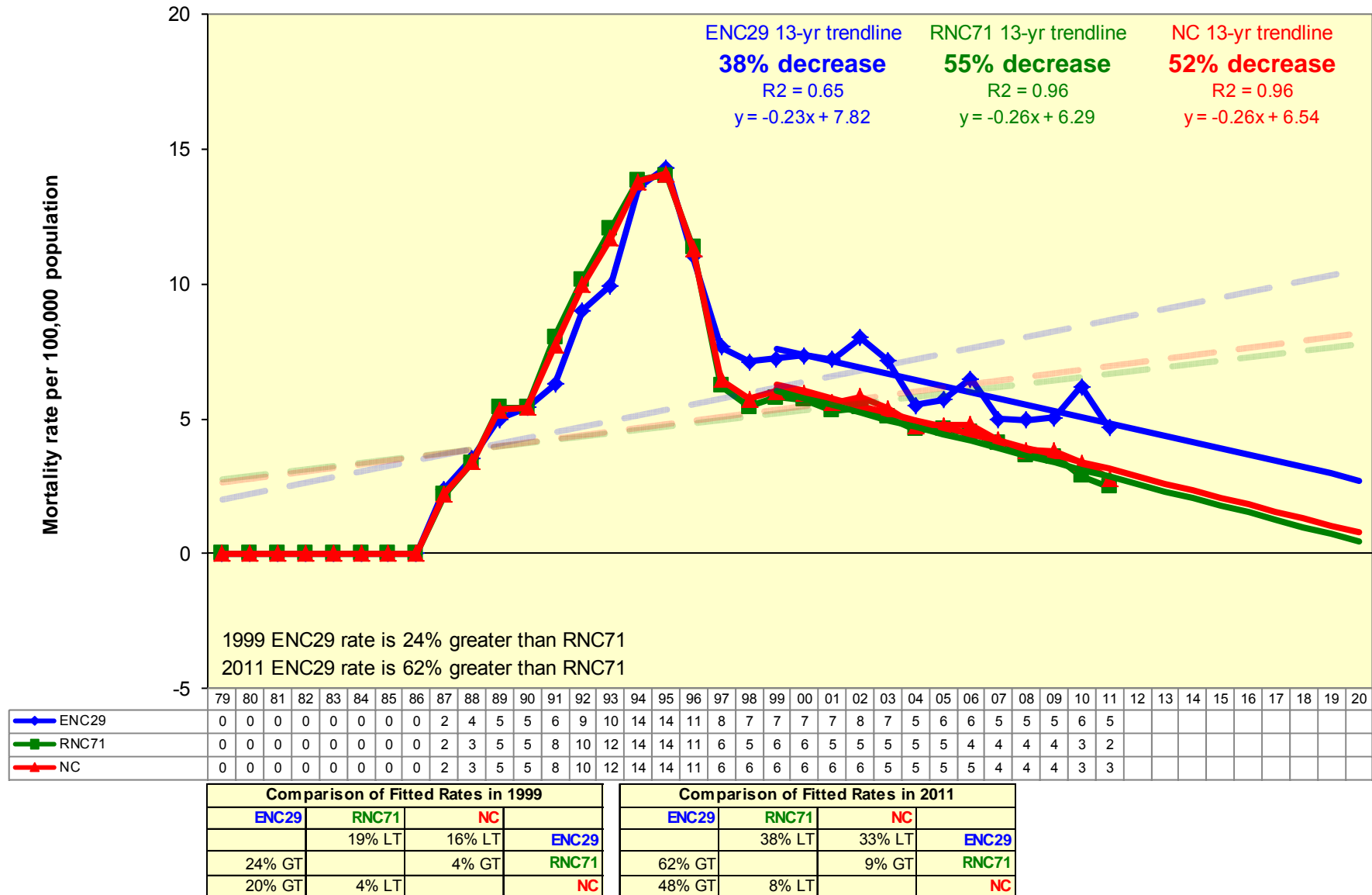


Figure 7.2 ii. HIV Disease:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

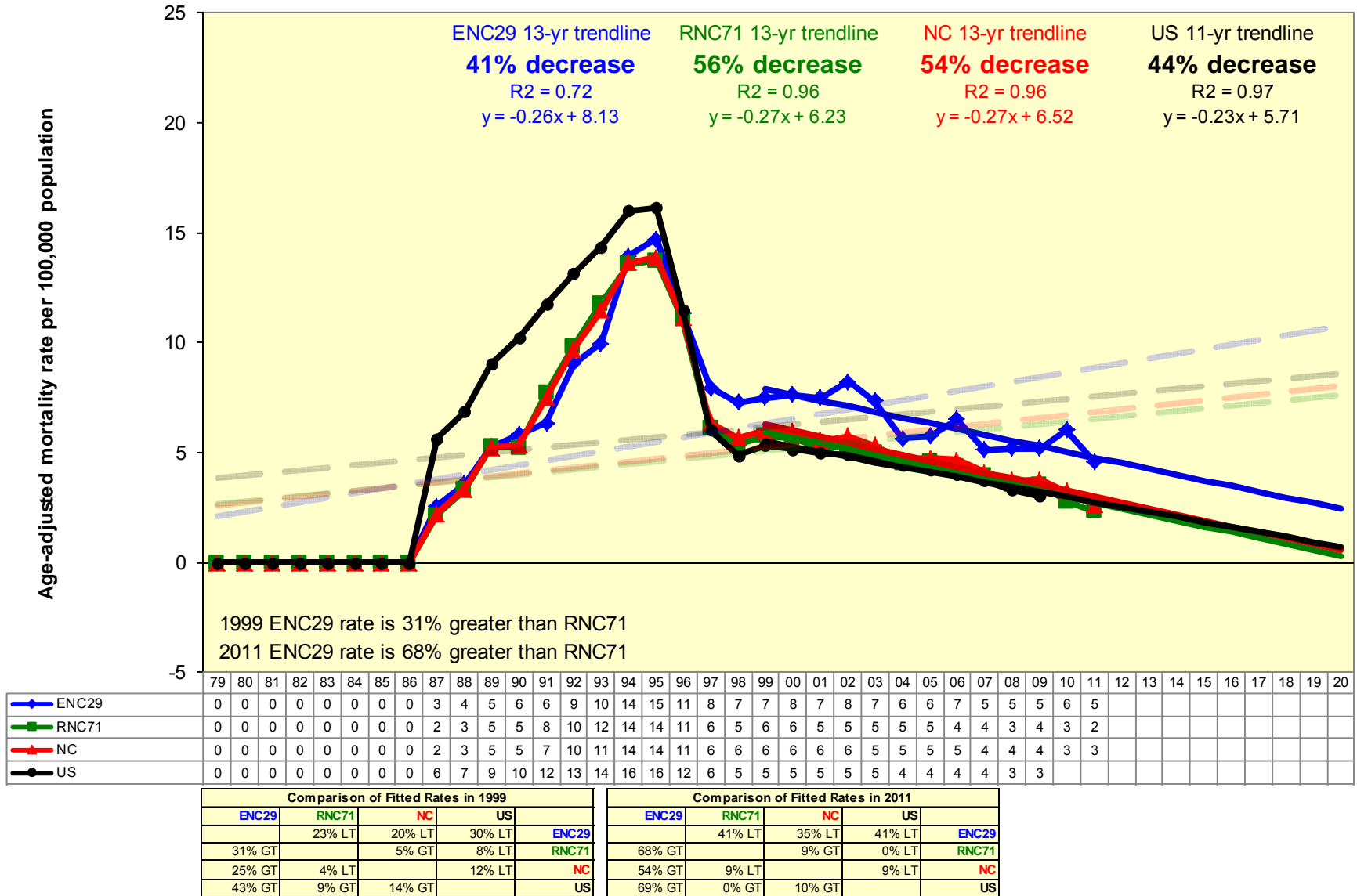


Figure 7.2 iii. HIV Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

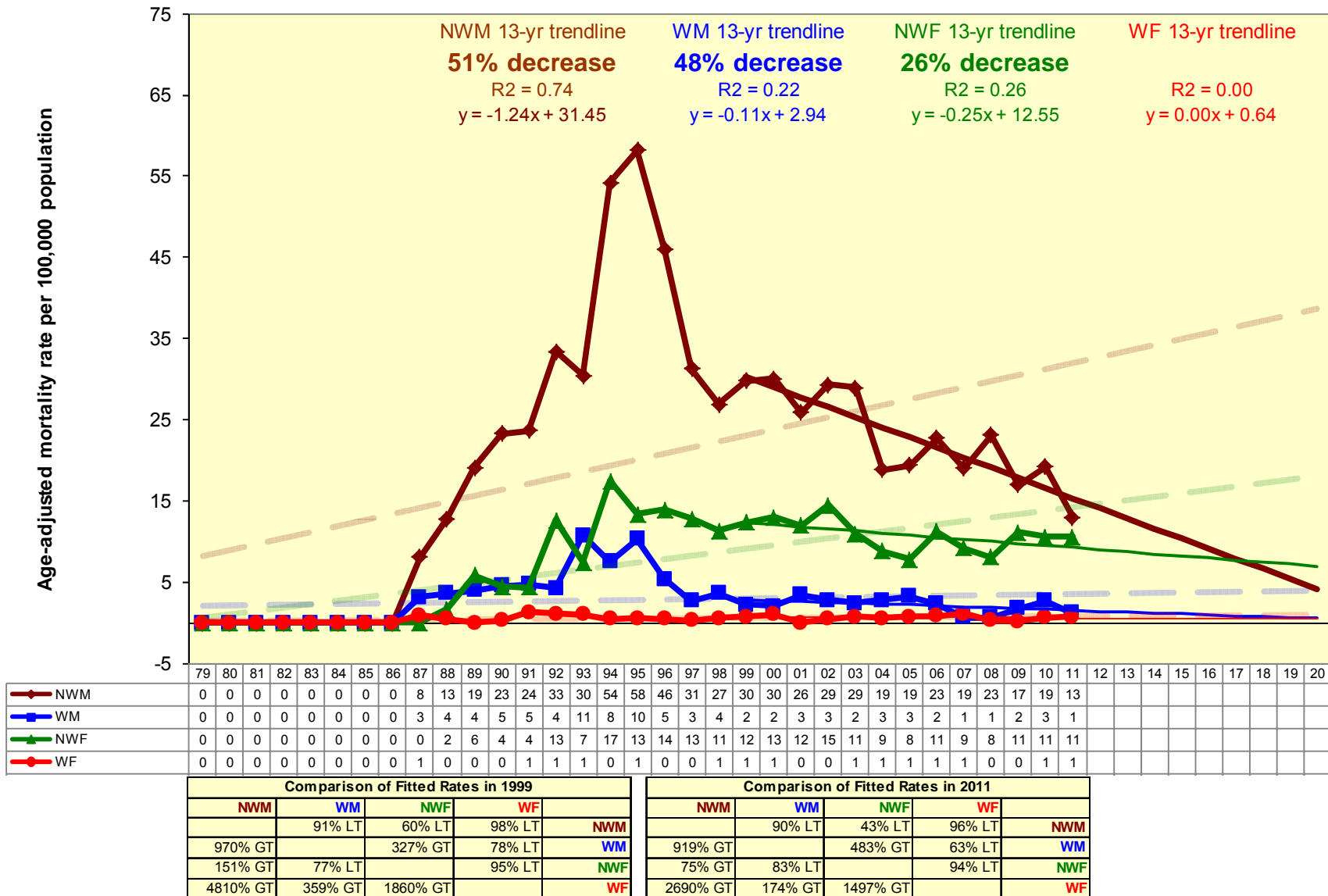


Figure 7.2 iv. HIV Disease:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

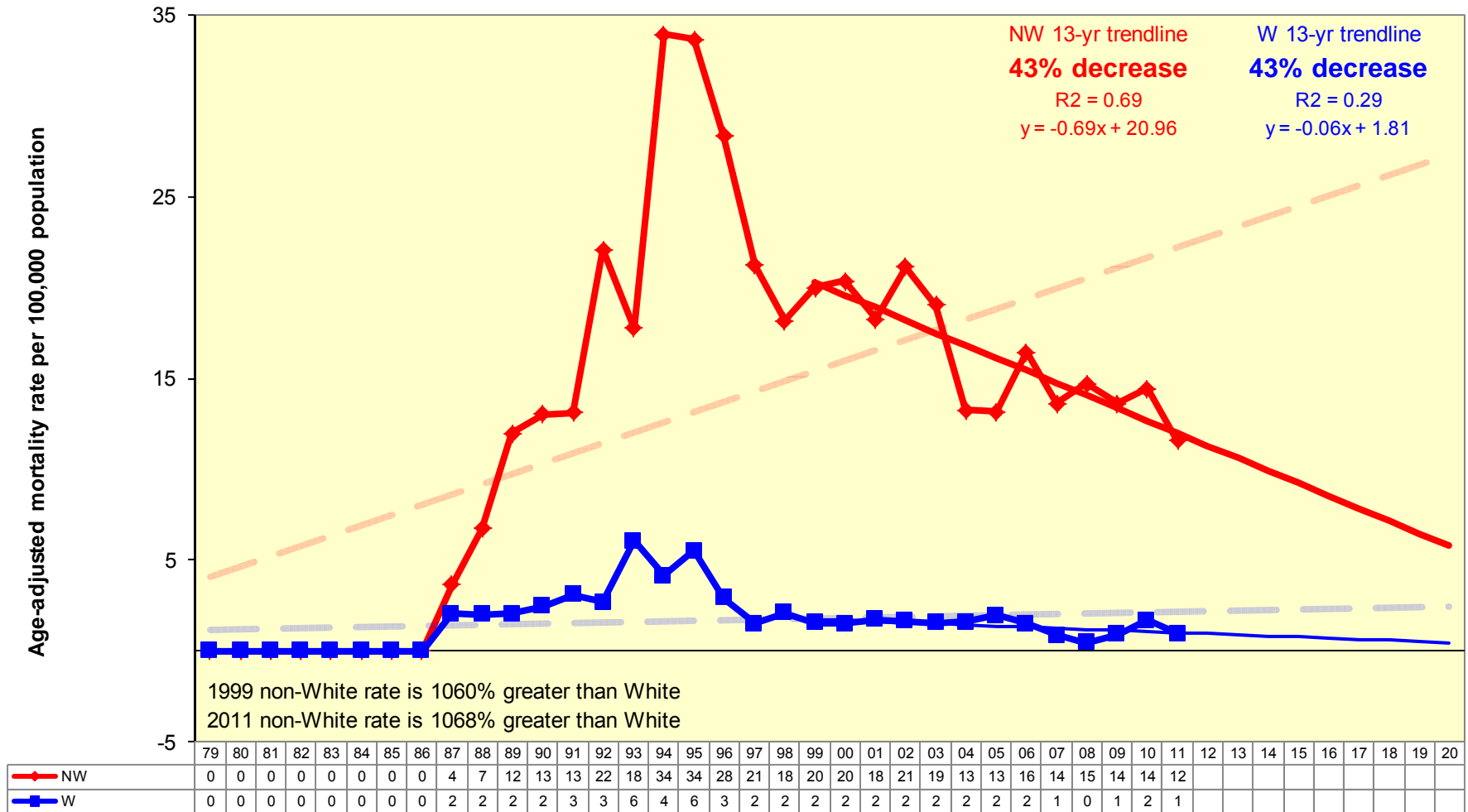
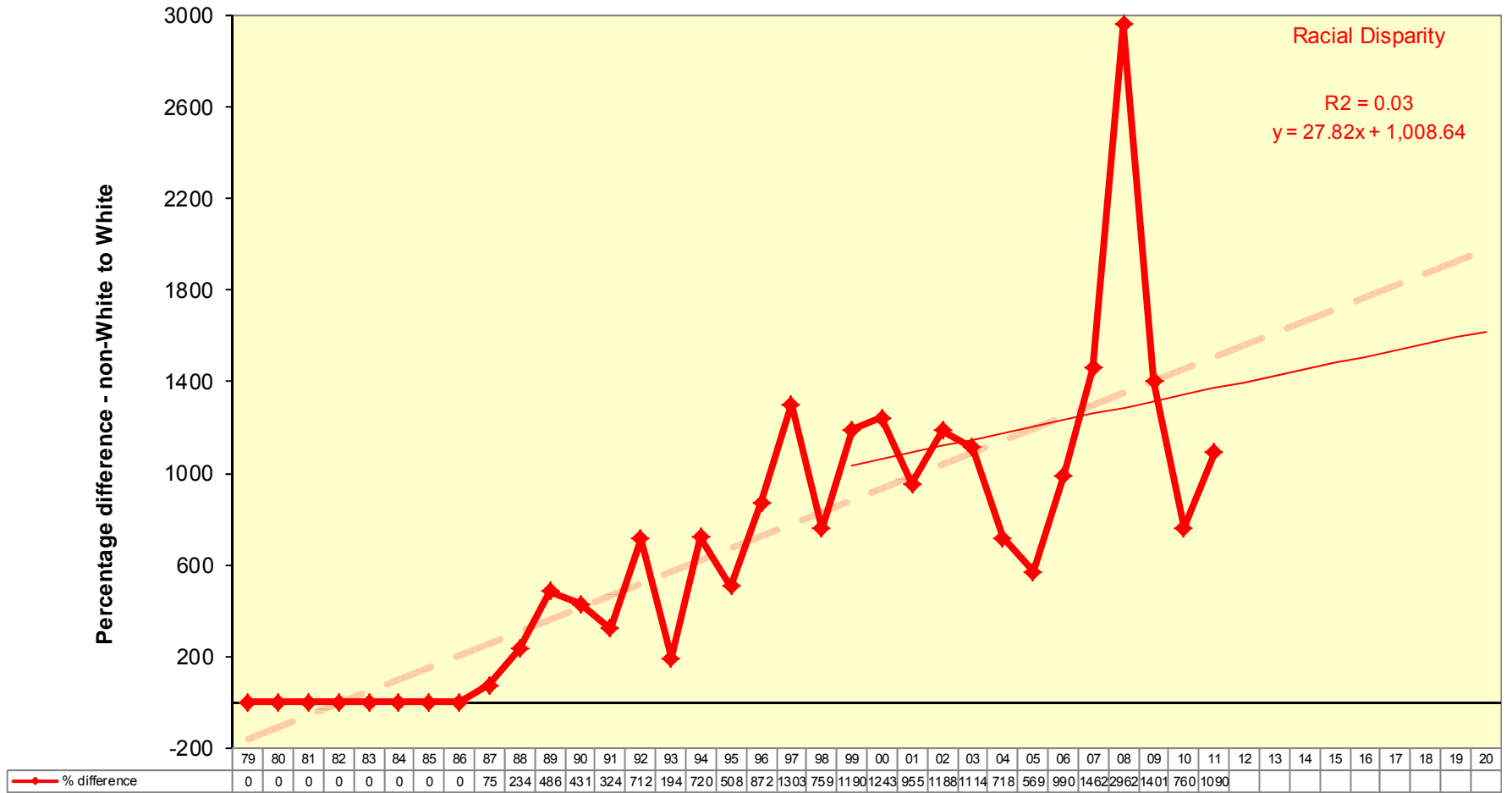


Figure 7.2 v. HIV Disease:
 Measuring disparity in age-adjusted mortality rates by race for ENC29,
 1979-2011 with projections to 2020



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