Trends and Disparities in Mortality in Eastern North Carolina
Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1979-2008

A Resource for Healthy Communities
Table of Contents

List of Figures ................................................................................................................................................................................................. iii

1. Introduction ............................................................................................................................................................................................ 1.1

2. Data Highlights ....................................................................................................................................................................................... 2.1

3. Methods, Interpretation, and References ............................................................................................................................................ 3.1
   Data Sources .......................................................................................................................................................................................... 3.1
   Measures ................................................................................................................................................................................................ 3.1
   Interpreting the Pie Charts ................................................................................................................................................................ 3.2
   Interpreting the Trend Figures ................................................................................................................................................................ 3.3
   Caveats about the Concepts of Race, Gender, and Geography ............................................................................................................ 3.5
   References .......................................................................................................................................................................................... 3.6

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

   All Causes of Death ................................................................................................................................................................................ 5.1
   All Causes of Premature Mortality .......................................................................................................................................................... 5.7

   Diseases of Heart ................................................................................................................................................................................... 6.1
   Cancer - Trachea, Bronchus, Lung ......................................................................................................................................................... 6.7
   Cerebrovascular Disease ..................................................................................................................................................................... 6.13
   Chronic Lower Respiratory Diseases ................................................................................................................................................... 6.19
   Diabetes Mellitus ................................................................................................................................................................................ 6.25
   All Other Unintentional Injuries and Adverse Effects ............................................................................................................................ 6.31
   Alzheimers Disease .............................................................................................................................................................................. 6.37
   Nephritis, Nephrotic Syndrome, and Nephrosis ................................................................................................................................... 6.43
   Pneumonia and Influenza ..................................................................................................................................................................... 6.49
   Unintentional Motor Vehicle Injuries .................................................................................................................................................. 6.55

7. Trends and Disparities in Mortality in ENC29: Cancer - All Sites and HIV Disease, 1979-2008 ................................................................................................................................................................................. 7
   Cancer - All Sites ................................................................................................................................................................................... 7.1
   HIV Disease .......................................................................................................................................................................................... 7.7

8. Appendix ................................................................................................................................................................................................... 8
List of Figures

Figure 4.1 i. General leading causes of death for ENC29 (2008), NC (2008), and US (2006). Mortality rate per 100,000 population .......................... 4.1
Figure 4.1 ii. General leading causes of death for ENC29 (2008), NC (2008), and US (2006). Age-adjusted mortality rate per 100,000 population ......................................................................................................................... 4.2
Figure 4.2 i. General leading causes of death for ENC29 by race and gender, (2008). Mortality rate per 100,000 population .......................... 4.3
Figure 4.2 ii. General leading causes of death for ENC29 by race and gender, (2008). Age-adjusted mortality rate per 100,000 population ......................................................................................................................... 4.4
Figure 4.3 i. General leading causes of death for ENC29 by race, (2008). Mortality rate per 100,000 population ......................................................................................................................... 4.5
Figure 4.3 ii. General leading causes of death for ENC29 by race, (2008). Age-adjusted mortality rate per 100,000 population ......................................................................................................................... 4.6
Figure 5.1 i. All Causes of Death: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ..................... 5.2
Figure 5.1 ii. All Causes of Death: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ......................................................................................................................... 5.3
Figure 5.1 iii. All Causes of Death: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 5.4
Figure 5.1 iv. All Causes of Death: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 5.5
Figure 5.1 v. All Causes of Death: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 5.6
Figure 5.2 i. All Causes of Premature Mortality: Trends in premature mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ......................................................................................................................... 5.8
Figure 5.2 ii. All Causes of Premature Mortality: Trends in age-adjusted premature mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ......................................................................................................................... 5.9
Figure 5.2 iii. All Causes of Premature Mortality: Trends in age-adjusted premature mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 5.10
Figure 5.2 iv. All Causes of Premature Mortality: Trends in age-adjusted premature mortality rates by race for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 5.11
Figure 5.2 v. All Causes of Premature Mortality: Measuring disparity in age-adjusted premature mortality rates by race for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 5.12
Figure 6.1 i. Diseases of Heart: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ......................................................................................................................... 6.2
Figure 6.1 ii. Diseases of Heart: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ......................................................................................................................... 6.3
Figure 6.1 iii. Diseases of Heart: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 6.4
Figure 6.1 iv. Diseases of Heart: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 6.5
Figure 6.1 v. Diseases of Heart: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ......................................................................................................................... 6.6
Figure 6.2 i. Cancer - Trachea, Bronchus, Lung: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ......................................................................................................................... 6.8
Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ................................................................. 6.9
Figure 6.2 iii. Cancer - Trachea, Bronchus, Lung: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ......................................................... 6.10
Figure 6.2 iv. Cancer - Trachea, Bronchus, Lung: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.11
Figure 6.2 v. Cancer - Trachea, Bronchus, Lung: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ..................................................... 6.12
Figure 6.3 i. Cerebrovascular Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ................................................................. 6.14
Figure 6.3 ii. Cerebrovascular Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ................................................................. 6.15
Figure 6.3 iii. Cerebrovascular Disease: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.16
Figure 6.3 iv. Cerebrovascular Disease: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.17
Figure 6.3 v. Cerebrovascular Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.18
Figure 6.4 i. Chronic Lower Respiratory Diseases: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ................................................................. 6.20
Figure 6.4 ii. Chronic Lower Respiratory Diseases: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ................................................................. 6.21
Figure 6.4 iii. Chronic Lower Respiratory Diseases: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.22
Figure 6.4 iv. Chronic Lower Respiratory Diseases: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.23
Figure 6.4 v. Chronic Lower Respiratory Diseases: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.24
Figure 6.5 i. Diabetes Mellitus: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ................................................................. 6.26
Figure 6.5 ii. Diabetes Mellitus: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ................................................................. 6.27
Figure 6.5 iii. Diabetes Mellitus: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.28
Figure 6.5 iv. Diabetes Mellitus: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.29
Figure 6.5 v. Diabetes Mellitus: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ................................................................. 6.30
Figure 6.6 i. All Other Unintentional Injuries and Adverse Effects: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ................................................................. 6.32
Figure 6.6 ii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ................................................................. 6.33
Figure 6.6 iii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.34
Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.35
Figure 6.6 v. All Other Unintentional Injuries and Adverse Effects: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.35
Figure 6.7 i. Alzheimers Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ........................................................................................................................ 6.38
Figure 6.7 ii. Alzheimers Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ........................................................................................................................ 6.39
Figure 6.7 iii. Alzheimers Disease: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.39
Figure 6.7 iv. Alzheimers Disease: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.41
Figure 6.7 v. Alzheimers Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.42
Figure 6.8 i. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ........................................................................................................................ 6.44
Figure 6.8 ii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ........................................................................................................................ 6.45
Figure 6.8 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.46
Figure 6.8 iv. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.47
Figure 6.8 v. Nephritis, Nephrotic Syndrome, and Nephrosis: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.48
Figure 6.9 i. Pneumonia and Influenza: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ........................................................................................................................ 6.50
Figure 6.9 ii. Pneumonia and Influenza: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ........................................................................................................................ 6.51
Figure 6.9 iii. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.51
Figure 6.9 iv. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.52
Figure 6.9 v. Pneumonia and Influenza: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.53
Figure 6.10 i. Unintentional Motor Vehicle Injuries: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ........................................................................................................................ 6.56
Figure 6.10 ii. Unintentional Motor Vehicle Injuries: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ........................................................................................................................ 6.57
Figure 6.10 iii. Unintentional Motor Vehicle Injuries: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................ 6.58
Figure 6.10 iv. Unintentional Motor Vehicle Injuries: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 6.59
Figure 6.10 v. Unintentional Motor Vehicle Injuries: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 6.60
Figure 7.1 i. Cancer - All Sites: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.2
Figure 7.1 ii. Cancer - All Sites: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.3
Figure 7.1 iii. Cancer - All Sites: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.4
Figure 7.1 iv. Cancer - All Sites: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.5
Figure 7.2 i. HIV Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.6
Figure 7.2 ii. HIV Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.7
Figure 7.2 iii. HIV Disease: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.8
Figure 7.2 iv. HIV Disease: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.9
Figure 7.2 v. HIV Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.10
Figure 7.2 vi. HIV Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.11
Figure 7.2 vii. HIV Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020 ........................................................................................................................................................................ 7.12
1. Introduction

Health Indicators Series:  
A Resource for Healthy Communities  
April 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 Services 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 the two 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 Carolinians 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 29-year period (1979 to 2008), as well as the most recent ten year period (1999-2008). 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 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 2008, age-adjusted mortality rate for Eastern North Carolina is 878 deaths per 100,000. This rate is 6% higher than the state rate. Within Eastern North Carolina, the non-White rate is 16% 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 11% higher than the rate for White females.

The five specific leading causes of cancer mortality in Eastern North Carolina (2008) are:
1. Diseases of Heart
2. Cancer - All Sites
3. Cerebrovascular Disease
4. Chronic Lower Respiratory Diseases
5. Diabetes Mellitus

The five specific leading causes of mortality in Eastern North Carolina by race and gender (2008) are:

<table>
<thead>
<tr>
<th>Race and Gender</th>
<th>non-White Males</th>
<th>White Males</th>
<th>non-White Females</th>
<th>White Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Diseases of Heart</td>
<td>Cancer - All Sites</td>
<td>Diseases of Heart</td>
<td>Diseases of Heart</td>
</tr>
<tr>
<td>2nd</td>
<td>Cancer - All Sites</td>
<td>Diseases of Heart</td>
<td>Cancer - All Sites</td>
<td>Cancer - All Sites</td>
</tr>
<tr>
<td>3rd</td>
<td>Cerebrovascular Disease</td>
<td>Chronic Lower Respiratory Diseases</td>
<td>Cerebrovascular Disease</td>
<td>Chronic Lower Respiratory Diseases</td>
</tr>
<tr>
<td>4th</td>
<td>Diabetes Mellitus</td>
<td>Cerebrovascular Disease</td>
<td>Diabetes Mellitus</td>
<td>Cerebrovascular Disease</td>
</tr>
<tr>
<td>5th</td>
<td>Chronic Lower Respiratory Diseases</td>
<td>All Other Unintentional Injuries and Adverse Effects</td>
<td>Nephritis, Nephrotic Syndrome, and Nephrosis</td>
<td>Alzheimers Disease</td>
</tr>
</tbody>
</table>
Trends in Mortality from All Causes

- While the 30-year ENC trend line shows all-cause mortality rates are increasing and diverging from RNC and NC trends, the 10-year trend line shows that all three trends have been decreasing. The ENC all-cause mortality rates are still diverging slightly from RNC and NC 10-year trends.
- The age-adjusted, all-cause mortality rates are decreasing for all four 30-year trends with ENC remaining above the rest. The 10-year trends suggest convergence of ENC with RNC and NC in the future.
- The non-White male mortality rate remains higher than other demographic groups, although convergence in the future is suggested.
- The non-White mortality rate remains 20% higher than Whites in 2008 but the 10-year trends suggest convergence in the future, as both are decreasing.
- The 10-year trend for racial disparity shows a 28% decrease in a moderately reliable trend.

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

- ENC’s premature mortality rate has decreased by 3% since 1999. However, this trend is diverging from both RNC and NC, which have decreased 8% and 7% respectively since 1999.
- The age-adjusted premature mortality trend for ENC continues to decrease but at a slower decline than RNC, NC, and US. ENC remains 20% greater than RNC in 2008.
- The non-White male rates of premature mortality are significantly higher than other demographic groups but also have the greatest rate of decrease (slope of trend). White females have the lowest rate of premature mortality.
- The non-White rate remains 57% greater than the White rate but is decreasing at a rate of 17% in the 10-year trend compared to 4% for the White 10-year trend.
- The 10-year trend for racial disparity shows a 31% decrease in a reliable trend.

Diseases of Heart

- Based on the 10 year trend line, ENC’s heart disease mortality rate is decreasing, but not as quickly as RNC and NC, resulting in an increased geographical disparity. In 1999, ENC’s rate was 11% greater than RNC; by 2008, the disparity between the two was 19%.
- ENC’s age-adjusted mortality rate is decreasing more quickly than RNC, NC and the US. The ENC rate was 15% greater than RNC in 2008 and convergence in the future appears likely.
- The trend for males, both non-White and White, are converging with those of non-White and White females. Non-White males continue to have the highest rate for all demographic groups.
- The 10-year trend lines by race show an estimated 57% decrease in heart disease mortality rates for Whites versus a 47% decrease for non-Whites.
- The 10-year increasing trend line for racial disparity is unreliable.

Cancer - Trachea, Bronchus, Lung

- The 10-year trend line for ENC crude mortality of Cancer – TBL is unreliable though continually higher than the rates of RNC and NC. In 2008, the ENC rate was 13% greater than RNC.
- During the period 1999-2008, the age-adjusted rate for ENC is decreasing at a greater rate than RNC, US, and NC and convergence in the near future is suggested. All four rates remain significantly higher than the goal set by Healthy People 2010 of less than 44.9 deaths per 100,000.
The mortality rate trends for males are decreasing; convergence with the increasing female trends is suggested in the future. Non-white males continue to have the highest rates in 2008.

The non-White mortality rate for this cancer continues to decrease over the 10-year period and is diverging from the White rate. In 2008, the non-White rate was 11% less than the White rate.

The moderately reliable trend for racial disparity has continued to decrease significantly over the 10 year period.

Cerebrovascular Disease

ENC’s cerebrovascular disease mortality trend line is decreasing but is diverging slightly from both RNC and NC. In 2008, the ENC rate was 20% greater than RNC.

The ENC age-adjusted cerebrovascular disease mortality rate is decreasing and converging on the RNC and NC rates. Projected to 2020, the Healthy People 2010 goal of less than 48 deaths per 100,000 could be achieved in the region.

Although both non-White males and non-White females continue to have the highest cerebrovascular disease mortality rates, the rates are decreasing and converging on White male and White female rates. The non-White male rate in 2008 was 78% greater than the rate for White males; the non-White female rate was 37% greater than the rate for White females.

The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of Whites but remains 52% greater than Whites in 2008.

The trend for racial disparity from 1999-2008 shows a 35% increase in a moderately reliable trend.

Chronic Lower Respiratory Diseases

The 30-year CLRD mortality rate for ENC is increasing substantially at an annual rate of 5.5%. However, the 10-year trend for ENC appears to be decreasing, but the trend is not reliable. In 2008, the ENC rate was 1% less than RNC, decreasing below RNC for the first time.

The 10-year CLRD age-adjusted rate for ENC is decreasing and converging with the US rate, remaining lower than RNC and NC. The ENC rate in 2008 was 8% less than RNC, whereas in 1999 the ENC rate was 9% greater than RNC.

Fitted rates for non-White male, White male, and White female mortality have decreased over 10 years by 28%, 26%, and 6%, respectively, and are converging. Non-White males have the greatest rates of decrease. The 10-year trend for non-White females is unreliable.

The 10-year White mortality rate trend is higher than the non-White trend, but the white trend is decreasing at a greater rate, although convergence is not suggested in the near future. The non-White rate remains 41% less than the White rate in 2008.

The trend for racial disparity is not reliable.

Diabetes Mellitus

The 30-year CLRD mortality rate for ENC is increasing substantially at an annual rate of 5.5%. However, the 10-year trend for ENC appears to be decreasing, but the trend is not reliable. In 2008, the ENC rate was 1% less than RNC, decreasing below RNC for the first time.

The 10-year CLRD age-adjusted rate for ENC is decreasing and converging with the US rate, remaining lower than RNC and NC. The ENC rate in 2008 was 8% less than RNC, whereas in 1999 the ENC rate was 9% greater than RNC.

Fitted rates for non-White male, White male, and White female mortality have decreased over 10 years by 28%, 26%, and 6%, respectively, and are converging. Non-White males have the greatest rates of decrease. The 10-year trend for non-White females is unreliable.

The 10-year White mortality rate trend is higher than the non-White trend, but the white trend is decreasing at a greater rate, although convergence is not suggested in the near future. The non-White rate remains 41% less than the White rate in 2008.

The trend for racial disparity is not reliable.
All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects has increased substantially in ENC (29% over 10 years). In 1999, ENC was 5% greater than RNC. In 2008, ENC is 4% less than RNC, suggesting a regional disparity that favors ENC.
- The age-adjusted mortality 10-year trend lines also suggest a regional disparity that favors ENC. The ENC rate is 6% less than the RNC rate in 2008. The ENC rate has increased 20% over 10 years. All trends are higher than the Healthy People 2010 projected goal of less than 17.5 deaths per 100,000.
- The non-White male rates continue to decrease at a greater rate (39%) than other demographic groups and convergence with White female and non-White female rates is suggested in the future. The White male rate is now the highest rate of all demographic groups and has increased 32% over 10 years. White females had the greatest rate of increase (90%) over 10 years.
- Non-White rates have decreased by 31% over 10 years, whereas white rates have increased 52%, causing these two rates to diverge significantly. In 2008, the non-White rate is 35% less than the White rate.
- The racial disparity associated with deaths from unintentional injuries has decreased by 304% between 1999 and 2008, eliminating the unfavorable disparity in relation to Whites, and favoring non-Whites.

Alzheimer's Disease

- The Alzheimer’s mortality rate is increasing at a rate of 4.6% per year, showing a 46% increase over the 10-year period, about the same rate of increase as RNC and NC.
- In 2008, the age-adjusted rate for ENC is on par with the US (2006) rate. The rate of increase for ENC is below the US and NC rates of increase.
- The mortality rate for females, both White and non-White, is greater than that of non-White and White males.
- The non-White mortality rate for Alzheimer's has been increasing continually but remains less than the White mortality rate by 22% in 2008.
- The trend for racial disparity is not reliable, but currently favors non-Whites in a moderately reliable trend.

Nephritis, Nephrotic Syndrome, and Nephrosis

- Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 29% over 10 years, a rate divergent from those of RNC and NC. While other regions have also experienced large increases, ENC rate of increase remains the greatest.
- With age-adjustment, ENC has increased by 13% contrasting to the 21% rate increase for RNC. This suggests convergence of ENC with RNC and NC in the near future.
- The 10-year trend for non-White males is unreliable but continues to remain the demographic group with the highest mortality rates. Non-white females have the greatest rate of decline, 12% decrease over 10 years, suggesting convergence with White males in the near future.
- In 2008, the non-White rate was 116% greater than the White rate.
- A reliable trend shows a 41% decrease in racial disparity over the 10-year period.

Pneumonia and Influenza

- The mortality rates for pneumonia and influenza have all been decreasing over the 1999-2008 period. ENC is decreasing less (18% over the 10-year period) and therefore diverging from RNC and NC.
- The age-adjusted mortality rates for all NC regions are decreasing at very similar rates (decreasing approximately 3.1% annually), all declining at a rate slightly greater than the US (2.5% decrease annually).
- The age-adjusted mortality rates for both genders of both races appear to be decreasing with Non-White males and White males remaining
the highest. Non-White females have seen the greatest decrease, 39% from 1999-2008.
- White mortality rates remain higher and diverging from non-Whites rates. Non-white rates were 10% less than White rates in 2008.
- The decreasing 10-year trend in racial disparity is not reliable.

Unintentional Motor Vehicle Injuries
- ENC's unintentional motor vehicle injury rate is unreliable but is continually higher than the RNC rate (29% greater than RNC in 2008).
- There is a similar unreliable trend in the age-adjusted mortality rate for ENC. The ENC age-adjusted rate is 28% greater than RNC and 49% greater than the US rate in 2008. Regardless of reliability, the trends indicate that the HP2010 target will not be met soon.
- All 10-year trends for males are unreliable though rates are continually higher in men, both White and non-White. Non-White female mortality rate has decreased 41% over the 10-year period and has achieved the HP2010 goal of less than 9.2 deaths per 100,000.
- The non-White rates have decreased by 10% and converged with the White rates suggesting a reversal in disparity within ENC. In 2008, the non-White rate was 9% less than the White rate compared to 1999 when the non-White rate was 7% greater than the White rate.
- Recent observed rates and fitted rates suggest that the racial disparity in ENC is eliminated, and may actually be favoring non-Whites. With a moderately reliable trend, the racial disparity has decreased by 259% over the 10-year period.

Cancer - All Sites
- The cancer – all sites mortality rate trend for ENC is unreliable but continuously higher than both RNC and NC rate trends. The 30-year trend shows ENC as increasingly divergent from RNC and NC rate trends. In 2008, the ENC rate was 17% greater than RNC.
- The age-adjusted cancer – all sites mortality trends for all regions are decreasing with ENC decreasing at the fastest rate (12% over 10 years) but continuing to have the highest rates. All regions are not projected to achieve the Healthy People 2010 goal of less than 159.9 deaths per 100,000.
- The cancer – all sites mortality rates for White and non-White males are decreasing. Non-White males have seen the greatest decrease from 1999-2008 (24% decrease) while White females have reached the HP2010 goal of fewer than 159.9 deaths per 100,000.
- Both Whites and non-White cancer mortality trends have been decreasing over the 10-year period (11% and 16% decreases, respectively) but the non-White rate remains 18% greater than the White rate in 2008.
- The decreasing 10-year trend for racial disparity is not reliable.

HIV Disease
- According to the 10-year trend lines for HIV mortality, rates are decreasing for all regions but ENC has the greater rate of decrease suggesting convergence with RNC and NC in the future. Although the ENC rate has been decreasing, it is still 33% greater than RNC in 2008.
- The age-adjusted rates for all NC regions are similar and are decreasing, suggesting convergence in the future. Based on current projections, the goal set by Healthy People 2010 of 0.7 deaths per 100,000 will not be met by any region in NC.
- Non-White males continue to have the highest rates of age-adjusted mortality for all demographic groups. White males had the greatest rate of decline (52% over 10 years) of all groups. Convergence of all trends is projected in the future.
- From 1999-2008, the non-White age-adjusted HIV mortality rate has decreased by 38% but remains 1138% greater than the White rate. Age-adjusted mortality rates for Whites decreased by 45% in a reliable trend.
- In a moderately reliable trend, the 10 year period shows a 129% increase in racial disparity.
3. Methods, Interpretation, and References

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

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

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

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

Age-adjustment to control for a population’s age structure requires an external reference or standard to weight the comparison populations by age groups. Currently, the US 2000 Standard Million Population (SMP) is used as the external reference. The US 2000 SMP is divided into a number of age groups whose sizes or proportions serve as weights to be applied to the corresponding age groups of the study population. This proportional redistribution generates new numbers of expected deaths in each of the corresponding age groups of the study population. These expected deaths are the number of deaths we would expect if the study population had the same age structure as the US 2000 SMP. The
expected number of deaths are summed and normalized by the total population yielding an age-adjusted death rate. Once the effects of age structure are controlled, the way is paved for making comparisons among populations (Buescher, 1998).

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

Age-adjusted rates for both mortality and premature mortality have little intrinsic meaning, however, and can mask the burden and trends of mortality (or health event) that may be of local importance. A casual inspection of adjusted rates may divert attention from the actual health problems of a population and inappropriately guide interventions or resource allocation. Thus, it is important to consider the actual number of deaths (count data) in conjunction with the basic non-adjusted mortality rate first, and then use the adjusted rate only if one wishes to factor out age in understanding the pattern of mortality among populations and regions. For regions with larger populations the statistics presented here are for the year 2008. 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 2008--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 29-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 29 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 2008) 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 1990 is the 12th year in the series, so 12 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 2008), the 1990 expected or fitted age-adjusted rate is calculated to be a little more than 36 deaths per 100,000 people. The observed age-adjusted rate for 1990 is 38 deaths per 100,000 people. (The observed rates are the values found in the table that runs along the x-axis of the time series chart.) The numeric difference between the expected and observed rates for 1990 is 2—the model (the equation of the line) underestimates the observed value by 2 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.

Coefficient of determination ($R^2$) are provided to indicate how well the fitted line predicts or explains the observed rates. When variation in the observed rates is relatively high (the fitted trend line does not correspond well to the observed trend line) $R^2$ approaches 0.0, when the variation
is low, $R^2$ approaches 1.0. A low $R^2$ implies low reliability and a larger $R^2$ indicates that a greater degree of confidence can be placed in the trend line. The trend lines are generally unreliable when $R^2$ is less than 0.10, moderately reliable when $R^2$ is between 0.10 and 0.35, and most reliable when $R^2$ is equal to or greater than 0.35. Graphically, data points, data lines and trend lines are weighted according to their reliability and significance. The thinnest, dashed trend lines are for those where $R^2$ is less than 0.10 and should be considered not reliable. The thickest dotted lines are used for trends where the $R^2$ is equal to or greater than 0.35. In some cases, the trend lines do not fit the data well (i.e. small $R^2$). In other words, the presentation of a trend line does not necessarily indicate a linear trend in the data line. In several instances a non-linear trend may be present. It should be noted that the linear trend modeling undertaken here is a major simplification of real world processes. These processes are dynamical in nature and can be modeled and fitted with certain limitations and assumptions. Time series of epidemic infectious disease mortality rates typically exhibit a curvilinear pattern. A marked curvilinear pattern is seen in the mortality series for HIV/AIDS mortality, general cancer mortality, and several others which can be approximated into at least two sequential linear segments. Each segment is joined to another in the sequence at a point in time or year. In this series (#2), we begin to explore alternative methods for examining trends that show discontinuities and reversals within the set of time series observations, particularly within the mortality time series for HIV/AIDS.

Percent change provides a measure of the estimated change in mortality over the most recent ten year period (1999-2008). 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 2008 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 9% greater than (GT) RNC’s fitted rate. In 2008, ENC29’s fitted rate is 8% 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.
Trends and Disparities in Mortality in Eastern North Carolina—29 Counties

General References


Cited References

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 (2008), NC (2008), and US (2006). Mortality rate per 100,000 population.

ENC29

North Carolina

United States

936 deaths/100,000

836 deaths/100,000

810 deaths/100,000

2008 NC rate is 3% higher than 2006 US rate

Pie Charts are Proportionately scaled using the state age-adjusted mortality rate of white females (702 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 (2008), NC (2008), and US (2006). Age-adjusted mortality rate per 100,000 population.

Pie Charts are proportionately scaled using the state age-adjusted mortality rate of white females (702 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.

2008 NC age-adjusted rate is 6% higher than 2006 US age-adjusted rate.
Figure 4.2 i. General leading causes of death for ENC29 (2008) by race and gender. Mortality rate per 100,000 population.

**Non-White Males**
- 2008 ENC29 NWM rate is 3% higher than 2008 ENC29 WM rate
- 982 deaths/100,000

**Non-White Females**
- 2008 ENC29 NWF rate is 10% lower than 2008 ENC29 WF rate
- 849 deaths/100,000

**White Males**
- 953 deaths/100,000

**White Females**
- 946 deaths/100,000

Pie Charts are proportionately scaled using the state age-adjusted mortality rate of white females (702 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.2 ii. General leading causes of death for ENC29 (2008) by race and gender. Age-adjusted mortality rate per 100,000 population.

Non-White Males

- Diseases of Heart: 40%
- Cancer - All Sites: 6%
- Cerebrovascular Disease: 4%
- Chronic Lower Respiratory Diseases: 4%
- Diabetes Mellitus: 6%
- Nephritis, Nephrotic Syndrome, and Nephrosis: 4%
- Alzheimers Disease: 4%
- All Other Unintentional Injuries and Adverse Effects: 4%
- All Other Deaths: 23%

2008 ENC29 NWM age-adjusted rate is 28% higher than 2008 ENC29 WM age-adjusted rate

1272 deaths/100,000

White Males

- Diseases of Heart: 36%
- Cancer - All Sites: 6%
- Cerebrovascular Disease: 4%
- Chronic Lower Respiratory Diseases: 6%
- Diabetes Mellitus: 4%
- Nephritis, Nephrotic Syndrome, and Nephrosis: 4%
- Alzheimers Disease: 4%
- All Other Unintentional Injuries and Adverse Effects: 4%
- All Other Deaths: 25%

702 deaths/100,000

Non-White Females

- Diseases of Heart: 41%
- Cancer - All Sites: 6%
- Cerebrovascular Disease: 4%
- Chronic Lower Respiratory Diseases: 6%
- Diabetes Mellitus: 4%
- Nephritis, Nephrotic Syndrome, and Nephrosis: 4%
- Alzheimers Disease: 4%
- All Other Unintentional Injuries and Adverse Effects: 4%
- All Other Deaths: 22%

2008 ENC29 NWF age-adjusted rate is 11% higher than 2008 ENC29 WF age-adjusted rate

781 deaths/100,000

White Females

- Diseases of Heart: 39%
- Cancer - All Sites: 6%
- Cerebrovascular Disease: 4%
- Chronic Lower Respiratory Diseases: 7%
- Diabetes Mellitus: 4%
- Nephritis, Nephrotic Syndrome, and Nephrosis: 4%
- Alzheimers Disease: 4%
- All Other Unintentional Injuries and Adverse Effects: 4%
- All Other Deaths: 23%

702 deaths/100,000

Pie Charts are Proportionately scaled using the state age-adjusted mortality rate of white females (702 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 i. General leading causes of death for ENC29 (2008) by race. Mortality rate per 100,000 population.

Pie Charts are proportionately scaled using the state age-adjusted mortality rate of white females (702 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 (2008) 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 (702 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; 1979-2008
All Causes of Death

- While the 30-year ENC trend line shows all-cause mortality rates are increasing and diverging from RNC and NC trends, the 10-year trend line shows that all three trends have been decreasing. The ENC all-cause mortality rates are still diverging slightly from RNC and NC 10-year trends.

- The age-adjusted, all-cause mortality rates are decreasing for all four 30-year trends with ENC remaining above the rest. The 10-year trends suggest convergence of ENC with RNC and NC in the future.

- The non-White male mortality rate remains higher than other demographic groups, although convergence in the future is suggested.

- The non-White mortality rate remains 20% higher than Whites in 2008 but the 10-year trends suggest convergence in the future, as both are decreasing.

- The 10-year trend for racial disparity shows a 28% decrease in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
**Figure 5.1 i. All Causes of Death:**

Trends in mortality rates for ENC29, RNC71, and NC 1979-2008 with projections to 2020

- **ENC29 10-yr trendline**: 6% decrease
  - $R^2 = 0.67$
  - $y = -5.74x + 991.95$
- **RNC71 10-yr trendline**: 10% decrease
  - $R^2 = 0.72$
  - $y = -8.82x + 895.20$
- **NC 10-yr trendline**: 9% decrease
  - $R^2 = 0.74$
  - $y = -8.54x + 910.85$

- **1999 ENC29 rate is 11% greater than RNC71**
- **2008 ENC29 rate is 15% greater than RNC71**

- **Comparison of Fitted Rates in 1999**
  - ENC29: 13% LT
  - RNC71: 11% LT
  - NC: 9% LT

- **Comparison of Fitted Rates in 2008**
  - ENC29: 15% GT
  - RNC71: 2% LT
  - NC: 2% LT
Figure 5.1 ii. All Causes of Death:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
17% decrease
R2 = 0.96
y = -17.57x + 1,054.78

RNC71 10-yr trendline
12% decrease
R2 = 0.94
y = -11.18x + 925.52

NC 10-yr trendline
13% decrease
R2 = 0.95
y = -12.23x + 945.80

US 8-yr trendline
13% decrease
R2 = 0.97
y = -14.48x + 896.87

1999 ENC29 rate is 14% greater than RNC71
2008 ENC29 rate is 9% greater than RNC71

Comparison of Fitted Rates in 1999

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Figure 5.1 iii. All Causes of Death:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

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Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2008

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Figure 5.1 iv. All Causes of Death: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

- 1999 non-White rate is 27% greater than White
- 2008 non-White rate is 20% greater than White

Regression equations:
- NW 10-yr trendline: \( y = -25.17x + 1240.52 \)
- W 10-yr trendline: \( y = -14.72x + 975.63 \)
Figure 5.1 v. All Causes of Death:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
28% decrease
R2 = 0.16
y = -0.77x + 27.37
All Causes of Premature Mortality

- ENC’s premature mortality rate has decreased by 3% since 1999. However, this trend is diverging from both RNC and NC, which have decreased 8% and 7% respectively since 1999.

- The age-adjusted premature mortality trend for ENC continues to decrease but at a slower decline than RNC, NC, and US. ENC remains 20% greater than RNC in 2008.

- The non-White male rates of premature mortality are significantly higher than other demographic groups but also have the greatest rate of decrease (slope of trend). White females have the lowest rate of premature mortality.

- The non-White rate remains 57% greater than the White rate but is decreasing at a rate of 17% in the 10-year trend compared to 4% for the White 10-year trend.

- The 10-year trend for racial disparity shows a 31% 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, 1979-2008 with projections to 2020

ENC29 10-yr trendline: 3% decrease
R2 = 0.26
y = -3.10x + 988.08

RNC71 10-yr trendline: 8% decrease
R2 = 0.61
y = -6.71x + 858.64

NC 10-yr trendline: 7% decrease
R2 = 0.63
y = -6.43x + 879.67

1999 ENC29 rate is 15% greater than RNC71
2008 ENC29 rate is 20% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2008

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<tbody>
<tr>
<td>17% GT</td>
<td>3% LT</td>
<td>NC</td>
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</table>
Figure 5.2 ii. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
9% decrease
R^2 = 0.75
y = -9.00x + 998.08

RNC71 10-yr trendline
11% decrease
R^2 = 0.84
y = -9.82x + 855.49

NC 10-yr trendline
11% decrease
R^2 = 0.86
y = -9.93x + 877.95

US 8-yr trendline
6% decrease
R^2 = 0.89
y = -5.69x + 768.30

1999 ENC29 rate is 17% greater than RNC71
2008 ENC29 rate is 20% greater than RNC71
Figure 5.2 iii. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020
Figure 5.2 iv. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates by race for ENC29,
1979-2008 with projections to 2020

NW 10-yr trendline
17% decrease
R2 = 0.67
y = -23.44x + 1,416.46

W 10-yr trendline
4% decrease
R2 = 0.12
y = -2.90x + 792.81

1999 non-White rate is 79% greater than White
2008 non-White rate is 57% greater than White
Figure 5.2 v. All Causes of Premature Mortality: Measuring disparity in age-adjusted premature mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
31% decrease
$R^2 = 0.36$
$y = -2.42x + 79.21$
6. Trends and Disparities in Mortality in ENC29:
Ten Specific Leading Causes of Death, 1979-2008
Diseases of Heart

- Based on the 10 year trend line, ENC’s heart disease mortality rate is decreasing, but not as quickly as RNC and NC, resulting in an increased geographical disparity. In 1999, ENC’s rate was 11% greater than RNC; by 2008, the disparity between the two was 19%.

- ENC’s age-adjusted mortality rate is decreasing more quickly than RNC, NC and the US. The ENC rate was 15% greater than RNC in 2008 and convergence in the future appears likely.

- The trend for males, both non-White and White, are converging with those of non-White and White females. Non-White males continue to have the highest rate for all demographic groups.

- The 10-year trend lines by race show an estimated 57% decrease in heart disease mortality rates for Whites versus a 47% decrease for non-Whites.

- The 10-year increasing trend line for racial disparity is unreliable.

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

Figure 6.1 i. Diseases of Heart:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline 24% decrease
R2 = 0.92
y = -6.69x + 281.08

RNC71 10-yr trendline 29% decrease
R2 = 0.93
y = -7.42x + 251.79

NC 10-yr trendline 29% decrease
R2 = 0.93
y = -7.37x + 256.53

1999 ENC29 rate is 12% greater than RNC71
2008 ENC29 rate is 19% greater than RNC71

Comparison of Fitted Rates in 1999

ENC29 RNC71 NC
10% LT 9% LT ENC29

Comparison of Fitted Rates in 2008

ENC29 RNC71 NC
12% GT 2% GT RNC71
10% GT 2% LT NC
Figure 6.1 ii. Diseases of Heart:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
34% decrease  
$R^2 = 0.97$

y = -10.13x + 301.40

RNC71 10-yr trendline
32% decrease  
$R^2 = 0.98$

y = -8.27x + 261.99

NC 10-yr trendline
32% decrease  
$R^2 = 0.98$

y = -8.57x + 268.14

US 8-yr trendline
27% decrease  
$R^2 = 0.99$

y = -9.49x + 276.87

1999 ENC29 rate is 15% greater than RNC71
2008 ENC29 rate is 12% greater than RNC71

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2008

Report #2.201, April 2011
Center for Health Services Research and Development, ECU
Page 6.3
Figure 6.1 iii. Diseases of Heart:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
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<tr>
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<th>NWF 10-yr trendline</th>
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<td>28% decrease</td>
<td>y = -11.68x + 411.51</td>
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<td>R² = 0.67</td>
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Comparison of Fitted Rates in 2008

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<td>y = -12.41x + 368.28</td>
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<td>R² = 0.67</td>
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Report #2.201, April 2011
Center for Health Services Research and Development, ECU
Figure 6.1 iv. Diseases of Heart: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

1999 non-White rate is 13% greater than White
2008 non-White rate is 16% greater than White

NW 10-yr trendline
R2 = 0.85
y = -10.70x + 328.76

W 10-yr trendline
R2 = 0.94
y = -9.98x + 290.41
Figure 6.1 v. Diseases of Heart: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity

$R^2 = 0.03$

$y = 0.42x + 12.61$
Cancer - Trachea, Bronchus, Lung

- The 10-year trend line for ENC crude mortality of Cancer – TBL is unreliable though continually higher than the rates of RNC and NC. In 2008, the ENC rate was 13% greater than RNC.

- During the period 1999-2008, the age-adjusted rate for ENC is decreasing at a greater rate than RNC, US, and NC and convergence in the near future is suggested. All four rates remain significantly higher than the goal set by Healthy People 2010 of less than 44.9 deaths per 100,000.

- The mortality rate trends for males are decreasing; convergence with the increasing female trends is suggested in the future. Non-white males continue to have the highest rates in 2008.

- The non-White mortality rate for this cancer continues to decrease over the 10-year period and is diverging from the White rate. In 2008, the non-White rate was 11% less than the White rate.

- The moderately reliable trend for racial disparity has continued to decrease significantly over the 10 year period.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.2 i. Cancer - Trachea, Bronchus, Lung:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline
RNC71 10-yr trendline
NC 10-yr trendline

R2 = 0.03
y = -0.15x + 66.38

R2 = 0.27
y = -0.26x + 59.96

R2 = 0.23
y = -0.25x + 61.01

1999 ENC29 rate is 11% greater than RNC71
2008 ENC29 rate is 13% greater than RNC71

Comparison of Fitted Rates in 1999

<table>
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<tr>
<th>ENC29 11% GT</th>
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Comparison of Fitted Rates in 2008

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Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
13% decrease
R2 = 0.48
y = -0.85x + 67.52

RNC71 10-yr trendline
5% decrease
R2 = 0.47
y = -0.31x + 59.99

NC 10-yr trendline
6% decrease
R2 = 0.56
y = -0.40x + 61.18

US 8-yr trendline
9% decrease
R2 = 0.92
y = -0.62x + 56.94

1999 ENC29 rate is 13% greater than RNC71
2008 ENC29 rate is 5% greater than RNC71
Figure 6.2 iii. Cancer - Trachea, Bronchus, Lung: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020
Figure 6.2 iv. Cancer - Trachea, Bronchus, Lung: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

- 20% decrease: $y = -1.32x + 66.57$, $R^2 = 0.37$
- 10% decrease: $y = -0.68x + 67.82$, $R^2 = 0.41$

1999 non-White rate is 2% less than White
2008 non-White rate is 11% less than White
Figure 6.2 v. Cancer - Trachea, Bronchus, Lung: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
780% decrease
$R^2 = 0.16$
$y = -1.31x - 1.68$
Cerebrovascular Disease

- ENC’s cerebrovascular disease mortality trend line is decreasing but is diverging slightly from both RNC and NC. In 2008, the ENC rate was 20% greater than RNC.

- The ENC age-adjusted cerebrovascular disease mortality rate is decreasing and converging on the RNC and NC rates. Projected to 2020, the Healthy People 2010 goal of less than 48 deaths per 100,000 could be achieved in the region.

- Although both non-White males and non-White females continue to have the highest cerebrovascular disease mortality rates, the rates are decreasing and converging on White male and White female rates. The non-White male rate in 2008 was 78% greater than the rate for White males; the non-White female rate was 37% greater than the rate for White females.

- The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of Whites but remains 52% greater than Whites in 2008.

- The trend for racial disparity from 1999-2008 shows a 35% increase in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.3 i. Cerebrovascular Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline
35% decrease
R² = 0.84
y = -2.93x + 83.96

RNC71 10-yr trendline
40% decrease
R² = 0.97
y = -3.02x + 74.99

NC 10-yr trendline
39% decrease
R² = 0.97
y = -3.02x + 76.42

1999 ENC29 rate is 12% greater than RNC71
2008 ENC29 rate is 20% greater than RNC71
Figure 6.3 ii. Cerebrovascular Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
44% decrease
R2 = 0.91
y = -4.00x + 91.15

RNC71 10-yr trendline
42% decrease
R2 = 0.98
y = -3.31x + 79.00

NC 10-yr trendline
42% decrease
R2 = 0.99
y = -3.42x + 80.92

US 8-yr trendline
32% decrease
R2 = 0.98
y = -2.67x + 65.79

1999 ENC29 rate is 15% greater than RNC71
2008 ENC29 rate is 12% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2008

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Figure 6.3 iii. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2008

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Figure 6.3 iv. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

1999 non-White rate is 41% greater than White
2008 non-White rate is 52% greater than White
Figure 6.3 v. Cerebrovascular Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
35% increase
R2 = 0.18
y = 1.38x + 39.80
Chronic Lower Respiratory Diseases

- The 30-year CLRD mortality rate for ENC is increasing substantially at an annual rate of 5.5%. However, the 10-year trend for ENC appears to be decreasing, but the trend is not reliable. In 2008, the ENC rate was 1% less than RNC, decreasing below RNC for the first time.

- The 10-year CLRD age-adjusted rate for ENC is decreasing and converging with the US rate, remaining lower than RNC and NC. The ENC rate in 2008 was 8% less than RNC, whereas in 1999 the ENC rate was 9% greater than RNC.

- Fitted rates for non-White male, White male, and White female mortality have decreased over 10 years by 28%, 26%, and 6%, respectively, and are converging. Non-White males have the greatest rates of decrease. The 10-year trend for non-White females is unreliable.

- The 10-year White mortality rate trend is higher than the non-White trend, but the white trend is decreasing at a greater rate, although convergence is not suggested in the near future. The non-White rate remains 41% less than the White rate in 2008.

- The trend for racial disparity is not reliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.4 i. Chronic Lower Respiratory Diseases: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline

RNC71 10-yr trendline

NC 10-yr trendline

R2 = 0.02

R2 = 0.10

R2 = 0.07

y = -0.10x + 47.08

y = 0.25x + 44.32

y = 0.20x + 44.75

1999 ENC29 rate is 6% greater than RNC71

2008 ENC29 rate is 1% less than RNC71

Comparison of Fitted Rates in 1999

ENC29

RNC71

NC

6% LT

5% LT

ENC29

6% GT

1% GT

ENC29

5% GT

1% LT

NC
Figure 6.4 ii. Chronic Lower Respiratory Diseases: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

1999 ENC29 rate is 9% greater than RNC71
2008 ENC29 rate is 8% less than RNC71

ENC29 10-yr trendline: 13% decrease
\[ R^2 = 0.49 \]
\[ y = -0.64x + 49.66 \]

RNC71 10-yr trendline: 6% increase
\[ R^2 = 0.22 \]
\[ y = 0.27x + 45.43 \]

NC 10-yr trendline: 10% decrease
\[ R^2 = 0.06 \]
\[ y = 0.13x + 46.08 \]

US 8-yr trendline: 15% decrease
\[ R^2 = 0.74 \]
\[ y = -0.57x + 45.66 \]
Figure 6.4 iii. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

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Comparison of Fitted Rates in 1999

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Figure 6.4 iv. Chronic Lower Respiratory Diseases: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

- NW 10-yr trendline: 13% decrease
  - R² = 0.14
  - y = -0.42x + 33.01
- W 10-yr trendline: 13% decrease
  - R² = 0.55
  - y = -0.75x + 56.28

1999 non-White rate is 41% less than White
2008 non-White rate is 41% less than White
Figure 6.4 v. Chronic Lower Respiratory Diseases:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2008 with projections to 2020

Racial Disparity

R² = 0.00
y = -0.10x - 70.58
Diabetes Mellitus

- The 30-year CLRD mortality rate for ENC is increasing substantially at an annual rate of 5.5%. However, the 10-year trend for ENC appears to be decreasing, but the trend is not reliable. In 2008, the ENC rate was 1% less than RNC, decreasing below RNC for the first time.

- The 10-year CLRD age-adjusted rate for ENC is decreasing and converging with the US rate, remaining lower than RNC and NC. The ENC rate in 2008 was 8% less than RNC, whereas in 1999 the ENC rate was 9% greater than RNC.

- Fitted rates for non-White male, White male, and White female mortality have decreased over 10 years by 28%, 26%, and 6%, respectively, and are converging. Non-White males have the greatest rates of decrease. The 10-year trend for non-White females is unreliable.

- The 10-year White mortality rate trend is higher than the non-White trend, but the white trend is decreasing at a greater rate, although convergence is not suggested in the near future. The non-White rate remains 41% less than the White rate in 2008.

- 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 6.5 i. Diabetes Mellitus:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline
RNC71 10-yr trendline
NC 10-yr trendline

16% decrease
13% decrease

R2 = 0.00
R2 = 0.66
R2 = 0.59

ENC29
RNC71
NC

ENC29
RNC71
NC

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2008

1999 ENC29 rate is 24% greater than RNC71
2008 ENC29 rate is 43% greater than RNC71

19% LT 16% LT
ENC29
4% GT
RNC71
34% GT
6% LT
NC
Figure 6.5 ii. Diabetes Mellitus:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
RNC71 10-yr trendline
NC 10-yr trendline
US 8-yr trendline

12% decrease
R2 = 0.29
y = -0.41x + 34.94

17% decrease
R2 = 0.54
y = -0.48x + 27.57

17% decrease
R2 = 0.57
y = -0.48x + 28.74

6% decrease
R2 = 0.49
y = -0.20x + 25.69

1999 ENC29 rate is 27% greater than RNC71
2008 ENC29 rate is 34% greater than RNC71

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2008

Report #2.201, April 2011
Center for Health Services Research and Development, ECU
Figure 6.5 iii. Diabetes Mellitus: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

NWM 10-yr trendline
17% decrease
$R^2 = 0.16$
y = -1.11x + 64.38

WM 10-yr trendline
18% decrease
$R^2 = 0.07$
y = 0.21x + 26.14

NWF 10-yr trendline
20% decrease
$R^2 = 0.28$
y = -1.04x + 58.72

WF 10-yr trendline
$R^2 = 0.30$
y = -0.45x + 22.35
Figure 6.5 iv. Diabetes Mellitus: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

NW 10-yr trendline
17% decrease
R² = 0.32
y = -1.03x + 61.32

W 10-yr trendline
8% decrease
R² = 0.10
y = -0.20x + 24.32

1999 non-White rate is 152% greater than White
2008 non-White rate is 131% greater than White
Figure 6.5 v. Diabetes Mellitus:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity

R² = 0.09
y = -2.63x + 154.77
All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects has increased substantially in ENC (29% over 10 years). In 1999, ENC was 5% greater than RNC. In 2008, ENC is 4% less than RNC, suggesting a regional disparity that favors the ENC region.

- The age-adjusted mortality 10-year trend lines also suggest a regional disparity that favors ENC. The ENC rate is 6% less than the RNC rate in 2008. The ENC rate has increased 20% over 10 years. All trends are higher than the Healthy People 2010 projected goal of less than 17.5 deaths per 100,000.

- The non-White male rates continue to decrease at a greater rate (39%) than other demographic groups and convergence with White female and non-White female rates is suggested in the future. The White male rate is now the highest rate of all demographic groups and has increased 32% over 10 years. White females had the greatest rate of increase (90%) over 10 years.

- Non-White rates have decreased by 31% over 10 years, whereas white rates have increased 52%, causing these two rates to diverge significantly. In 2008, the non-White rate is 35% less than the White rate.

- The racial disparity associated with deaths from unintentional injuries has decreased by 304% between 1999 and 2008, 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, 1979-2008 with projections to 2020

ENC29 10-yr trendline 29% increase
R2 = 0.54
y = 0.64x + 21.86
RNC71 10-yr trendline 43% increase
R2 = 0.89
y = 0.89x + 20.84
NC 10-yr trendline 41% increase
R2 = 0.89
y = 0.85x + 21.00

1999 ENC29 rate is 5% greater than RNC71
2008 ENC29 rate is 4% less than RNC71

Comparison of Fitted Rates in 1999

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Figure 6.6 ii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020.

ENC29 10-yr trendline
20% increase
R2 = 0.38
y = 0.45x + 23.09

RNC71 10-yr trendline
40% increase
R2 = 0.88
y = 0.85x + 21.40

NC 10-yr trendline
36% increase
R2 = 0.88
y = 0.79x + 21.66

US 8-yr trendline
32% increase
R2 = 0.94
y = 0.75x + 18.46

1999 ENC29 rate is 8% greater than RNC71
2008 ENC29 rate is 6% less than RNC71

Comparison of Fitted Rates in 1999

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Report #2.201, April 2011 Center for Health Services Research and Development, ECU Page 6.33
Figure 6.6 iii. All Other Unintentional Injuries and Adverse Effects:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

Comparison of Fitted Rates in 1999

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Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

NW 10-yr trendline
31% decrease
R² = 0.24
y = -0.86x + 27.77

W 10-yr trendline
52% increase
R² = 0.83
y = 1.08x + 20.90

1999 non-White rate is 33% greater than White
2008 non-White rate is 35% less than White
Figure 6.6 v. All Other Unintentional Injuries and Adverse Effects: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
304% decrease
R2 = 0.53
y = -9.12x + 29.96
Alzheimers Disease

- The Alzheimer’s mortality rate is increasing at a rate of 4.6% per year, showing a 46% increase over the 10-year period, about the same rate of increase as RNC and NC.

- In 2008, the age-adjusted rate for ENC is on par with the US (2006) rate. The rate of increase for ENC is below the US and NC rates of increase.

- The mortality rate for females, both White and non-White, is greater than that of non-White and White males.

- The non-White mortality rate for Alzheimer’s has been increasing continually but remains less than the White mortality rate by 22% in 2008.

- The trend for racial disparity is not reliable, but currently favors non-Whites in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.7 i. Alzheimers Disease:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

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- ENC29 10-yr trendline: 46% increase, R² = 0.82, y = 0.71x + 15.43
- RNC71 10-yr trendline: 45% increase, R² = 0.82, y = 0.93x + 20.48
- NC 10-yr trendline: 46% increase, R² = 0.86, y = 0.90x + 19.67

- 1999 ENC29 rate is 25% less than RNC71
- 2008 ENC29 rate is 24% less than RNC71

Comparison of Fitted Rates in 1999
- ENC29: 25% LT, ENC29
- RNC71: 27% GT, RNC71
- NC: 27% GT, NC

Comparison of Fitted Rates in 2008
- ENC29: 24% LT, ENC29
- RNC71: 4% LT, RNC71
- NC: 4% GT, NC
Figure 6.7 ii. Alzheimers Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
-20% increase
  \[ R^2 = 0.50 \]
  \[ y = 0.37x + 18.08 \]

RNC71 10-yr trendline
-38% increase
  \[ R^2 = 0.70 \]
  \[ y = 0.85x + 22.45 \]

NC 10-yr trendline
-36% increase
  \[ R^2 = 0.72 \]
  \[ y = 0.78x + 21.78 \]

US 8-yr trendline
-45% increase
  \[ R^2 = 0.95 \]
  \[ y = 0.91x + 16.23 \]

1999 ENC29 rate is 19% less than RNC71
2008 ENC29 rate is 29% less than RNC71

Comparison of Fitted Rates in 1999

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<td>NC</td>
</tr>
<tr>
<td>11% GT</td>
<td>38% GT</td>
<td>34% GT</td>
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</table>

Comparison of Fitted Rates in 2008

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
<th>US</th>
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<tr>
<td>29% LT</td>
<td>41% GT</td>
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<tr>
<td>29% LT</td>
<td>4% LT</td>
<td>19% LT</td>
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<tr>
<td>26% LT</td>
<td>5% LT</td>
<td>15% LT</td>
<td>NC</td>
</tr>
<tr>
<td>12% LT</td>
<td>23% GT</td>
<td>18% GT</td>
<td>US</td>
</tr>
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</table>
## Figure 6.7 iii. Alzheimers Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

### Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>Race</th>
<th>Gender</th>
<th>NWM</th>
<th>WM</th>
<th>NWF</th>
<th>WF</th>
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<td></td>
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<td>45% GT</td>
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<td>48% GT</td>
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### Comparison of Fitted Rates in 2008

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<th>WM</th>
<th>NWF</th>
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<td></td>
<td>37% GT</td>
<td>27% LT</td>
<td>39% LT</td>
<td>27% LT</td>
</tr>
</tbody>
</table>
Figure 6.7 iv. Alzheimers Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

NW 10-yr trendline
31% increase
R2 = 0.29
y = 0.43x + 13.87

W 10-yr trendline
16% increase
R2 = 0.36
y = 0.32x + 19.97

1999 non-White rate is 31% less than White
2008 non-White rate is 22% less than White
Figure 6.7 v. Alzheimers Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity

R2 = 0.07
y = 1.77x - 45.9

% difference
-650 -550 -450 -350 -250 -150 -50 50 150 250
Percentage difference - non-White to White
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

% difference 0 3 2 0 4 - 3 - 6 0- 1 1- 6 2- 3 9- 1 2- 2 4- 9 3- 4 9 - 6 1 0- 8 2 1 - 5 - 6 6- 4 0- 3 1- 4 1- 3 8- 8 7- 3 8 - 6 - 2 0- 2 9- 3 9- 3 1
Nephritis, Nephrotic Syndrome, and Nephrosis

- Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 29% over 10 years, a rate divergent from those of RNC and NC. While other regions have also experienced large increases, ENC rate of increase remains the greatest.

- With age-adjustment, ENC has increased by 13% contrasting to the 21% rate increase for RNC. This suggests convergence of ENC with RNC and NC in the near future.

- The 10-year trend for non-White males is unreliable but continues to remain the demographic group with the highest mortality rates. Non-white females have the greatest rate of decline, 12% decrease over 10 years, suggesting convergence with White males in the near future.

- In 2008, the non-White rate was 116% greater than the White rate.

- A reliable trend shows a 41% decrease in racial disparity over the 10-year period.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Trends and Disparities in Mortality in Eastern North Carolina—29 Counties

Figure 6.8 i. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

- ENC29 10-yr trendline: 29% increase, \( y = 0.50x + 17.00 \)
- RNC71 10-yr trendline: 25% increase, \( y = 0.37x + 14.79 \)
- NC 10-yr trendline: 25% increase, \( y = 0.38x + 15.16 \)

1999 ENC29 rate is 15% greater than RNC71
2008 ENC29 rate is 18% greater than RNC71

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
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<tbody>
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Comparison of Fitted Rates in 2008

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<th>NC</th>
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</thead>
<tbody>
<tr>
<td>16% LT</td>
<td>13% LT</td>
<td>ENC29</td>
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</table>

Report #2.201, April 2011
Center for Health Services Research and Development, ECU
Figure 6.8 ii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline: 13% increase
R2 = 0.45
y = 0.23x + 18.37

RNC71 10-yr trendline: 21% increase
R2 = 0.67
y = 0.33x + 15.48

NC 10-yr trendline: 20% increase
R2 = 0.72
y = 0.31x + 15.92

US 8-yr trendline: 11% increase
R2 = 0.76
y = 0.18x + 13.21

1999 ENC29 rate is 19% greater than RNC71
2008 ENC29 rate is 11% greater than RNC71

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2008
Figure 6.8 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2008
Figure 6.8 iv. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

1999 non-White rate is 183% greater than White
2008 non-White rate is 116% greater than White

NW 10-yr trendline
W 10-yr trendline
R² = 0.02
R² = 0.56

y = -0.11x + 33.98
y = 0.36x + 12.01
Figure 6.8 v. Nephritis, Nephrotic Syndrome, and Nephrosis: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
41% decrease
R² = 0.36
y = -7.55x + 183.26
Pneumonia and Influenza

- The mortality rates for pneumonia and influenza have all been decreasing over the 1999-2008 period. ENC is decreasing less (18% over the 10-year period) and therefore diverging from RNC and NC.

- The age-adjusted mortality rates for all NC regions are decreasing at very similar rates (decreasing approximately 3.1% annually), all declining at a rate slightly greater than the US (2.5% decrease annually).

- The age-adjusted mortality rates for both genders of both races appear to be decreasing with Non-White males and White males remaining the highest. Non-White females have seen the greatest decrease, 39% from 1999-2008.

- White mortality rates remain higher and diverging from non-Whites rates. Non-white rates were 10% less than White rates in 2008.

- The decreasing 10-year trend in racial disparity is not reliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.9 i. Pneumonia and Influenza: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline
18% decrease
R2 = 0.31
y = -0.44x + 24.56

RNC71 10-yr trendline
30% decrease
R2 = 0.82
y = -0.77x + 25.57

NC 10-yr trendline
28% decrease
R2 = 0.80
y = -0.72x + 25.42

1999 ENC29 rate is 4% less than RNC71
2008 ENC29 rate is 11% greater than RNC71

Comparison of Fitted Rates in 1999
ENC29 | RNC71 | NC
--- | --- | ---
4% LT | 4% GT | ENC29
3% LT | 1% GT | NC

Comparison of Fitted Rates in 2008
ENC29 | RNC71 | NC
--- | --- | ---
10% LT | 8% LT | ENC29
11% GT | 2% GT | RNC71
9% GT | 2% LT | NC
Figure 6.9 ii. Pneumonia and Influenza:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

1999 ENC29 rate is the same as RNC71
2008 ENC29 rate is 4% greater than RNC71

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
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<tr>
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<tr>
<td>10% GT</td>
<td>9% LT</td>
<td>9% LT</td>
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Comparison of Fitted Rates in 2008

<table>
<thead>
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<th>RNC71</th>
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<tr>
<td>11% GT</td>
<td>6% GT</td>
<td>7% LT</td>
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</table>
Figure 6.9 iii. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020.
Figure 6.9 iv. Pneumonia and Influenza:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

1999 non-White rate is 2% less than White
2008 non-White rate is 10% less than White

NW 10-yr trendline
35% decrease
R2 = 0.38
y = -0.93x + 26.96

W 10-yr trendline
28% decrease
R2 = 0.65
y = -0.77x + 27.52
Figure 6.9 v. Pneumonia and Influenza: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity

R² = 0.04
y = -1.11x - 2.94
Unintentional Motor Vehicle Injuries

- ENC's unintentional motor vehicle injury rate is unreliable but is continually higher than the RNC rate (29% greater than RNC in 2008).

- There is a similar unreliable trend in the age-adjusted mortality rate for ENC. The ENC age-adjusted rate is 28% greater than RNC and 49% greater than the US rate in 2008. Regardless of reliability, the trends indicate that the HP2010 target will not be met soon.

- All 10-year trends for males are unreliable though rates are continually higher in men, both White and non-White. Non-White female mortality rate has decreased 41% over the 10-year period and has achieved the HP2010 goal of less than 9.2 deaths per 100,000.

- The non-White rates have decreased by 10% and converged with the White rates suggesting a reversal in disparity within ENC. In 2008, the non-White rate was 9% less than the White rate compared to 1999 when the non-White rate was 7% greater than the White rate.

- Recent observed rates and fitted rates suggest that the racial disparity in ENC is eliminated, and may actually be favoring non-Whites. With a moderately reliable trend, the racial disparity has decreased by 259% over the 10-year period.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.10 i. Unintentional Motor Vehicle Injuries: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

1999 ENC29 rate is 18% greater than RNC71
2008 ENC29 rate is 29% greater than RNC71

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
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<td>RNC71</td>
</tr>
<tr>
<td>15% GT</td>
<td>3% LT</td>
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Comparison of Fitted Rates in 2008

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<th>NC</th>
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<td>23% LT</td>
<td>19% LT</td>
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</tr>
<tr>
<td>29% GT</td>
<td>4% GT</td>
<td>RNC71</td>
</tr>
<tr>
<td>24% GT</td>
<td>4% LT</td>
<td>NC</td>
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Figure 6.10 ii. Unintentional Motor Vehicle Injuries: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

1999 ENC29 rate is 17% greater than RNC71
2008 ENC29 rate is 28% greater than RNC71

Comparison of Fitted Rates in 1999
- ENC29: 17% GT
- RNC71: 3% LT
- NC: 14% GT
- US: 53% GT

Comparison of Fitted Rates in 2008
- ENC29: 28% GT
- RNC71: 4% LT
- NC: 23% GT
- US: 49% GT
Figure 6.10 iii. Unintentional Motor Vehicle Injuries: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

NWM 10-yr trendline  WM 10-yr trendline  NWF 10-yr trendline  WF 10-yr trendline

R2 = 0.01
y = -0.18x + 36.53

R2 = 0.02
y = 0.13x + 30.67

R2 = 0.48
y = -0.62x + 15.28

R2 = 0.08
y = -0.23x + 16.43

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2008

NWM  WM  NWF  WF
19% GT 10% GT 139% GT 144% GT
16% LT 58% LT 55% LT 7% LT

NWM  WM  NWF  WF
13% GT 50% LT 8% GT 33% GT
10% LT 72% LT 46% LT 33% LT

13% GT 50% LT 8% GT 33% GT
10% LT 72% LT 46% LT 33% LT

13% GT 50% LT 8% GT 33% GT
10% LT 72% LT 46% LT 33% LT

41% decrease
Figure 6.10 iv. Unintentional Motor Vehicle Injuries: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

16% decrease

NW 10-yr trendline
W 10-yr trendline

R² = 0.27
y = -0.41x + 24.86

R² = 0.00
y = 0.01x + 23.18

1999 non-White rate is 7% greater than White
2008 non-White rate is 9% less than White
Figure 6.10 v. Unintentional Motor Vehicle Injuries:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
259% decrease
R2 = 0.16
y = -2.05x + 7.93
7. Trends and Disparities in Mortality in ENC29:
Cancer - All Sites and HIV Disease;
1979-2008
Cancer - All Sites

- The cancer – all sites mortality rate trend for ENC is unreliable but continuously higher than both RNC and NC rate trends. The 30-year trend shows ENC as increasingly divergent from RNC and NC rate trends. In 2008, the ENC rate was 17% greater than RNC.

- The age-adjusted cancer – all sites mortality trends for all regions are decreasing with ENC decreasing at the fastest rate (12% over 10 years) but continuing to have the highest rates. All regions are not projected to achieve the Healthy People 2010 goal of less than 159.9 deaths per 100,000.

- The cancer – all sites mortality rates for White and non-White males are decreasing. Non-White males have seen the greatest decrease from 1999-2008 (24% decrease) while White females have reached the HP2010 goal of fewer than 159.9 deaths per 100,000.

- Both Whites and non-White cancer mortality trends have been decreasing over the 10-year period (11% and 16% decreases, respectively) but the non-White rate remains 18% greater than the White rate in 2008.

- The decreasing 10-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 7.1 i. Cancer - All Sites:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline  RNC71 10-yr trendline  NC 10-yr trendline

8% decrease  7% decrease
R2 = 0.05     R2 = 0.67     R2 = 0.67
y = -0.36x + 219.68 y = -1.60x + 199.79 y = -1.45x + 203.03

1999 ENC29 rate is 10% greater than RNC71
2008 ENC29 rate is 17% greater than RNC71

Comparison of Fitted Rates in 1999

ENC29  RNC71  NC
9% LT  8% LT  ENC29

Comparison of Fitted Rates in 2008

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, 1979-2008 with projections to 2020

ENC29 10-yr trendline
12% decrease
R2 = 0.77
y = -2.79x + 226.86

RNC71 10-yr trendline
10% decrease
R2 = 0.89
y = -1.94x + 202.14

NC 10-yr trendline
10% decrease
R2 = 0.91
y = -2.09x + 206.03

US 8-yr trendline
12% decrease
R2 = 0.99
y = -3.01x + 204.85

1999 ENC29 rate is 12% greater than RNC71
2008 ENC29 rate is 9% greater than RNC71

Comparison of Fitted Rates in 1999
Comparison of Fitted Rates in 2008
Figure 7.1 iii. Cancer - All Sites:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th></th>
<th>NWM</th>
<th>WM</th>
<th>NWF</th>
<th>WF</th>
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<tr>
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<td>373</td>
</tr>
<tr>
<td>R2</td>
<td>0.58</td>
<td>0.76</td>
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<tr>
<td>y</td>
<td>-9.68x + 396.26</td>
<td>-4.54x + 279.48</td>
<td>-1.30x + 189.14</td>
<td>-1.33x + 169.40</td>
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Comparison of Fitted Rates in 2008

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<th>NWF</th>
<th>WF</th>
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<td>49% LT</td>
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<tr>
<td>R2</td>
<td>0.58</td>
<td>0.76</td>
<td>0.12</td>
<td>0.36</td>
</tr>
<tr>
<td>y</td>
<td>-9.68x + 396.26</td>
<td>-4.54x + 279.48</td>
<td>-1.30x + 189.14</td>
<td>-1.33x + 169.40</td>
</tr>
</tbody>
</table>

24% decrease  16% decrease  7% decrease  8% decrease
Figure 7.1 iv. Cancer - All Sites: Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

1999 non-White rate is 24% greater than White
2008 non-White rate is 18% greater than White

NW 10-yr trendline
16% decrease
R² = 0.47
y = -4.16x + 263.26

W 10-yr trendline
11% decrease
R² = 0.76
y = -2.33x + 212.03
Figure 7.1 v. Cancer - All Sites:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity

$R^2 = 0.06$

$y = -0.65x + 24.22$
HIV Disease

- According to the 10-year trend lines for HIV mortality, rates are decreasing for all regions but ENC has the greater rate of decrease suggesting convergence with RNC and NC in the future. Although the ENC rate has been decreasing, it is still 33% greater than RNC in 2008.

- The age-adjusted rates for all NC regions are similar and are decreasing, suggesting convergence in the future. Based on current projections, the goal set by Healthy People 2010 of 0.7 deaths per 100,000 will not be met by any region in NC.

- Non-White males continue to have the highest rates of age-adjusted mortality for all demographic groups. White males had the greatest rate of decline (52% over 10 years) of all groups. Convergence of all trends is projected in the future.

- From 1999-2008, the non-White age-adjusted HIV mortality rate has decreased by 38% but remains 1138% greater than the White rate. Age-adjusted mortality rates for Whites decreased by 45% in a reliable trend.

- In a moderately reliable trend, the 10 year period shows a 129% increase in racial disparity.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 7.2 i. HIV Disease:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2008 with projections to 2020

ENC29 10-yr trendline
RNC71 10-yr trendline
NC 10-yr trendline

37% decrease
R2 = 0.68
y = -0.30x + 8.10

37% decrease
R2 = 0.96
y = -0.23x + 6.13

37% decrease
R2 = 0.93
y = -0.24x + 6.44

1999 ENC29 rate is 32% greater than RNC71
2008 ENC29 rate is 33% greater than RNC71

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2008
Figure 7.2 ii. HIV Disease:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2008 with projections to 2020

ENC29 10-yr trendline
38% decrease
R² = 0.70
y = -0.31x + 8.37

RNC71 10-yr trendline
39% decrease
R² = 0.96
y = -0.24x + 6.07

NC 10-yr trendline
39% decrease
R² = 0.94
y = -0.25x + 6.43

US 8-yr trendline
27% decrease
R² = 0.98
y = -0.19x + 5.55

1999 ENC29 rate is 38% greater than RNC71
2008 ENC29 rate is 40% greater than RNC71
Figure 7.2 iii. HIV Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2008 with projections to 2020

Age-adjusted mortality rate per 100,000 population

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>Race/Gender</th>
<th>NWM 90% LT</th>
<th>WM 56% LT</th>
<th>NWF 98% LT</th>
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<th>NWM 1123% GT</th>
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Comparison of Fitted Rates in 2008

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<th>Race/Gender</th>
<th>NWM 92% LT</th>
<th>WM 57% LT</th>
<th>NWF 97% LT</th>
<th>WF</th>
<th>NWM 2970% GT</th>
<th>WM 151% GT</th>
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Figure 7.2 iv. HIV Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

NW 10-yr trendline
W 10-yr trendline

38% decrease
R2 = 0.61
y = -0.81x + 21.45

45% decrease
R2 = 0.36
y = -0.09x + 1.92

1999 non-White rate is 1018% greater than White
2008 non-White rate is 1138% greater than White
Figure 7.2 v. HIV Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2008 with projections to 2020

Racial Disparity
129% increase
R2 = 0.18
y = 93.36x + 725.72
### 8. Appendix

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<tr>
<th>Disease</th>
<th>ICD 10 Code</th>
<th>ICD 9 Code</th>
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<tr>
<td>Diseases of Heart</td>
<td>I00-I09, I11, I13, I20-I51</td>
<td>390-398, 402, 404, 410-429</td>
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<td>Cerebrovascular Disease</td>
<td>I60-I69</td>
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<td>Atherosclerosis</td>
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<td>Cancer - All Sites</td>
<td>C00-C97</td>
<td>140-208</td>
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<tr>
<td>Cancer - Lip, Oral Cavity, and Pharynx</td>
<td>C00-C14</td>
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<td>Cancer - Stomach</td>
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<td>Cancer - Colon, Rectum, and Anus</td>
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<td>Cancer - Liver</td>
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<td>Cancer - Leukemia</td>
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<td>Pneumonia and Influenza</td>
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<td>Chronic Lower Respiratory Diseases</td>
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<td>Chronic Liver Disease and Cirrhosis</td>
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<td>Nephritis, Nephrotic Syndrome, and Nephrosis</td>
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<td>Unintentional Motor Vehicle Injuries</td>
<td>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</td>
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<td>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</td>
<td>E800-E807,E826-E829,E830-E848,E929.0,E929.1,E850-E869,E880-E928,E929.2-E929.9</td>
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