Trends and Disparities in Mortality in Eastern North Carolina
Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1979-2011

A Resource for Healthy Communities
# 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
   Alzheimer’s Disease ........................................................................................................................................................................... 6.37
   Nephritis, Nephrotic Syndrome, and Nephrosis .................................................................................................................................. 6.43
   Cancer - Colon, Rectum, Anus ............................................................................................................................................................. 6.49
   Pneumonia and Influenza .................................................................................................................................................................. 6.55

7. Trends and Disparities in Mortality in ENC29: Cancer - All Sites and HIV Disease, 1979-2011 ........................................................................................................................................................................................................... 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 (2011), NC (2011), and US (2009). Mortality rate per 100,000 population ..... 4.1
Figure 4.1 ii. General leading causes of death for ENC29 (2011), NC (2011), and US (2009). Age-adjusted mortality rate per 100,000 population...................................................... 4.2
Figure 4.2 i. General leading causes of death for ENC29 by race and gender, (2011). Mortality rate per 100,000 population ............ 4.3
Figure 4.2 ii. General leading causes of death for ENC29 by race and gender, (2011). Age-adjusted mortality rate per 100,000 population............................................................................................................................................................................. 4.4
Figure 4.3 i. General leading causes of death for ENC29 by race, (2011). Mortality rate per 100,000 population .................................... 4.5
Figure 4.3 ii. General leading causes of death for ENC29 by race, (2011). 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, 1979-2011 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, 1979-2011 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, 1979-2011 with projections to 2020 ..................................................................................................................................................................................... 5.4
Figure 5.1 iv. All Causes of Death: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 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, 1979-2011 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, 1979-2011 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, 1979-2011 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, 1979-2011 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, 1979-2011 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, 1979-2011 with projections to 2020 ..................................................................................................................................................................................... 5.12
Figure 6.1 i. Diseases of Heart: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 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, 1979-2011 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, 1979-2011 with projections to 2020 ................................................................. 6.4
Figure 6.1 iv. Diseases of Heart: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 .......... 6.5
Figure 6.1 v. Diseases of Heart: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ..................................................................................................................................................................................... 6.6
Figure 6.2 i. Cancer - Trachea, Bronchus, Lung: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020 ................................................................. 6.8
Figure 6.6 iii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020......................................................................................................................... 6.34
Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ............................................................................................................................................... 6.35
Figure 6.6 v. All Other Unintentional Injuries and Adverse Effects: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ............................................................................................................................................... 6.36
Figure 6.7 i. Alzheimer’s Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020............. 6.38
Figure 6.7 ii. Alzheimer’s Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.40
Figure 6.7 iii. Alzheimer’s Disease: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.42
Figure 6.7 iv. Alzheimer’s Disease: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ...... 6.29
Figure 6.7 v. Alzheimer’s Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.44
Figure 6.8 i. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 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, 1979-2011 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, 1979-2011 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, 1979-2011 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, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.48
Figure 6.9 i. Cancer - Colon, Rectum, Anus: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.51
Figure 6.9 ii. Cancer - Colon, Rectum, Anus: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.50
Figure 6.9 iii. Cancer - Colon, Rectum, Anus: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.51
Figure 6.9 iv. Cancer - Colon, Rectum, Anus: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.52
Figure 6.9 v. Cancer - Colon, Rectum, Anus: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.53
Figure 6.10 i. Pneumonia and Influenza: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020......................................................................................................................................................... 6.54
Figure 6.10 ii. Pneumonia and Influenza: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.55
Figure 6.10 iii. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020 ......................................................................................................................................................... 6.56
Figure 6.10 iv. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ........................................................................................................................................................ 6.59
Figure 6.10 v. Pneumonia and Influenza: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ........................................................................................................................................................ 6.60
Figure 7.1 i. Cancer - All Sites: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 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, 1979-2011 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, 1979-2011 with projections to 2020 .................................................................................................................................................................................... 7.4
Figure 7.1 iv. Cancer - All Sites: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 .................................................................................................................................................................................. 7.5
Figure 7.1 v. HIV Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 ........................................................................................................................................................ 7.6
Figure 7.2 i. HIV Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020 .................................................................................................................................................................................... 7.8
Figure 7.2 ii. HIV Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020 .................................................................................................................................................................................... 7.9
Figure 7.2 iii. HIV Disease: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020 .................................................................................................................................................................................. 7.10
Figure 7.2 iv. HIV Disease: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 .................................................................................................................................................................................. 7.11
Figure 7.2 v. HIV Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020 .................................................................................................................................................................................. 7.12
1. Introduction

Health Indicators Series:
A Resource for Healthy Communities
June 2013


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

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

This report describes the leading contributors to mortality, provides a geographic context, and examines trends and inequalities over a 32-year period (1979-2011), as well as the most recent 13 year period (1999 to 2011). The report begins with data highlights, provided as an introduction to the data, rather than a summary of it. Readers are encouraged to draw their own conclusions from the data and pose new questions suggested by what they see. The following section presents both the overall and five leading contributors to mortality for the state by race and gender. In this section, pie charts describe the relative contribution of each of five leading contributors to the overall, general rate. These charts also make regional and demographic comparisons. Making the area of each pie chart equivalent to the rate for the population group helps convey the dimension of disparity across population groups. The next section charts recent trends and disparities in mortality and provides projections to the year 2020. These charts place Eastern North Carolina’s health status in a historical context and provide a glimpse into the future.
The region Eastern North Carolina is comprised of 29 counties located in the extreme east of North Carolina and approximates the coastal plain physiographic province of the state. It includes the northern counties east of I-95. This region is characterized by its rurality, poverty, and some of the highest mortality rates in the nation. The name of the region is abbreviated as ENC29 or ENC. The rest of North Carolina is the remaining 71 counties; abbreviated as RNC71 or RNC.
2. Data Highlights

Trends and Disparities in Mortality in Eastern North Carolina

The following highlights of mortality in the 29 counties of Eastern North Carolina (ENC29) describe current status and trends in the causes of death from major diseases and how they vary across different population groups. The graphs, charts, and tables paint a picture of the region’s health with a broad brush. The study of mortality in populations should include consideration of time and geographic space as well as underlying demographic, political-economic, and socio-cultural conditions. Readers are encouraged to think of these factors as they consider the data presented in this report, formulate their own questions about the causes of mortality, and think about strategies to reduce mortality in the population described.

Current Disparities in Mortality by Geography, Race, and Gender

In 2011, age-adjusted mortality rate for Eastern North Carolina is 838 deaths per 100,000. This rate is 6% higher than the state rate. Within Eastern North Carolina, the non-White rate is 15% higher than the White rate. The non-White male rate is 21% higher than the rate for White males. The non-White female rate is 13% higher than the rate for White females.

The five general leading causes of mortality in Eastern North Carolina (2011) are:
1. Cancer - All Sites
2. Diseases of Heart
3. Cerebrovascular Disease
4. Chronic Lower Respiratory Diseases
5. Diabetes Mellitus

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

<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>Cancer - All Sites</td>
<td>Cancer - All Sites</td>
<td>Cancer - All Sites</td>
<td>Diseases of Heart</td>
</tr>
<tr>
<td>2nd</td>
<td>Diseases of Heart</td>
<td>Diseases of Heart</td>
<td>Diseases of Heart</td>
<td>Cancer - All Sites</td>
</tr>
<tr>
<td>3rd</td>
<td>Cerebrovascular Disease</td>
<td>Chronic Lower Respiratory Disease</td>
<td>Cerebrovascular Disease</td>
<td>Chronic Lower Respiratory Disease</td>
</tr>
<tr>
<td>4th</td>
<td>Diabetes Mellitus</td>
<td>All Other Unintentional Injuries and Adverse Effects</td>
<td>Diabetes Mellitus</td>
<td>Cerebrovascular Disease</td>
</tr>
<tr>
<td>5th</td>
<td>Nephritis, Nephrotic Syndrome, and Nephrosis</td>
<td>Cerebrovascular Disease</td>
<td>Nephritis, Nephrotic Syndrome, and Nephrosis</td>
<td>Alzheimers Disease</td>
</tr>
</tbody>
</table>

Trends in Mortality from All Causes

- The 32 year ENC trend line shows all cause mortality rates are increasing. The 13 year trend line shows ENC’s rate is decreasing but is still higher than NC and RNC.
- The age-adjusted, all-cause mortality rate trend for ENC has decreasing over the 30 year period. The 13-year trend shows greater decrease and suggests the ENC rate will converge with the RNC and NC rates. ENC’s rate remains 10% greater than the rate for RNC.
The non-White male mortality rate trend remains higher than other demographic groups but has had the greatest rate of decrease (27%) in the 13-year trend. Convergence of non-White males with White males and non-White females with White females is suggested in the future.

The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 16% greater than the White rate, but the recent 13-year trend suggests they will converge in the future.

Over the recent 13-year period there is a drop in racial disparity, in a moderately reliable trend.

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

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

**Diseases of the Heart**

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

**Cancer – Trachea, Bronchus, Lung**

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

**Cerebrovascular Disease**

- ENC’s cerebrovascular disease mortality trend line is decreasing but is 21% greater than RNC in 2011.
The ENC age-adjusted cerebrovascular disease mortality rate trend is decreasing and converging with the RNC and NC rates. It remains 12% greater than the RNC trend. In 2011 there were 49 deaths per 100,000, which is almost at the Healthy People 2010 goal of less than 48 deaths per 100,000.

Non-Whites have the highest mortality rate for cerebrovascular disease but the rate trend continues to decrease and converge with the other demographic groups. Over the 13-year period the trend has decreased by about 50% for all demographic groups.

The cerebrovascular disease mortality rate trend for non-Whites is decreasing and converging with that of whites but is still 52% greater than Whites in 2011.

The 13-year trend for racial disparity is unreliable.

**Chronic Lower Respiratory Diseases**

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

**Diabetes Mellitus**

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

**All Other Unintentional Injuries and Adverse Effects**

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

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

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

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

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

The Non-White mortality rate is 11% less than the White rate in 2011. Both are decreasing.

The 13-year decreasing trend for racial disparity is unreliable.

**Cancer – All Sites**

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

**HIV Disease**

- The fitted HIV mortality rates for ENC have been decreasing over the past 13 years, but are still 62% greater than RNC in 2011.
- The age-adjusted rate trend for ENC, RNC and the US are all decreasing. The ENC rate is 68% greater than RNC in 2011.
- Non-White males continue to have the highest rates of age-adjusted mortality, but these rates have also decreased 15% in a 13-year reliable trend. Non-White females have the second highest rate, but it has also declined over the 13-year period. The rate for White males is lower but has also decreased. The White female rate is not reliable.
- The 13-year age-adjusted HIV mortality rates have decreased by 43% in a reliable trend for both Whites and non-Whites. The non-White rate is still 1068% greater than the White rate.
- The trend for racial disparity is unreliable.
3. Methods, Interpretation, and References

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

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

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

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

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

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

Age-adjusted rates for both mortality and premature mortality have little intrinsic meaning, however, and can mask the burden and trends of mortality (or health event) that may be of local importance. A casual inspection of adjusted rates may divert attention from the actual health problems of a population and inappropriately guide interventions or resource allocation. Thus, it is important to consider the actual number of deaths (count data) in conjunction with the basic non-adjusted mortality rate first, and then use the adjusted rate only if one wishes to factor out age in understanding the pattern of mortality among populations and regions. For regions with larger populations the statistics presented here are for the year 2011. Smaller areas like counties will usually be aggregated into 5-year intervals (e.g., 2003 to 2007). A five-year interval is used because it provides a useful summary of the mortality experience while minimizing wide year-to-year fluctuations in the rate due to the effect of small numbers.

**Interpreting the Pie Charts**

Pie charts are provided as a visual representation of the burden of mortality. They depict the proportion of mortality accounted for by each of the leading contributors. (The leading causes of death are found in the table preceding the pie chart section.) The pie charts compare the relative levels of burden and proportions by region and demographic groups. Each regional and demographic set of pie charts is based on the observed mortality rate and the age-adjusted (expected) mortality rate. The area of each pie is based on the age-adjusted mortality rate for the year 2011--larger pie charts will represent larger mortality rates. For purposes of presentation, we set the smallest area of a circle on the lowest meaningful rate as a benchmark, the age-adjusted rate for White females in North Carolina. We then scaled up the circles for all other groups proportionately based on their rates.

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

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

Four types of figures are used to show trends in mortality, for all causes combined, and for each of the ten leading causes in the region/county over a 32-year period. Premature mortality is described for deaths by all causes only. The first of the four types of figures depicts the observed mortality rates for the region/county and state. The second figure type shows age-adjusted mortality rates for the region/county, state, and nation allowing comparisons among geographical areas. The third figure type compares trends in age-adjusted mortality rates by race and gender. Adjustment is made for age structure differences among demographic groups, which permits observation on the effects of race and gender on these groups. The last figure type depicts racial differences (or disparities) expressed as a ratio (in percent) of age-adjusted mortality for non-Whites to the age-adjusted rates for Whites over the 32 year time series. Trend lines provide historical depth to mortality processes and a basis for prediction, future comparisons, and action.

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

The equation of the line is derived from a set of observation points. This line is an estimate of where each observed rate would be if the previous observation could predict with 100% accuracy the value of the next observation. In nature, this situation seldom arises and the degree to which individual observations deviate from this linear trend line is an indication of how well they “fit” or conform to the trend. The linear trend lines in the time series figures project expected rates to the year 2020 from known historical values (1979 to 2011) to provide a general idea about where mortality trends are heading.

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

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

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

Percent change provides a measure of the estimated change in mortality over the most recent ten year period (1999-2011). The percent value is followed by the term increase or decrease to help denote the direction of the overall trend. This information is in boldface and included with the \( R^2 \) value and the equation of the line. Percent change and the direction of that change is provided on the graphs for trends where \( R^2 \) is greater than 0.10.

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

The final tool is the pair of comparison tables located in the lower portion of the page. The tables, found in every time series figure (except the ones showing comparisons by race and disparity) are structured so that the reader can make comparisons of rates derived from the equation of the line (i.e., the fitted rates) among all regions or demographic groups portrayed in the figure. The 1999 and 2011 tables compare the fitted rates calculated for the beginning and end of the observed time series in terms of percent difference. Returning to figure 6.4 ii, ENC29’s age-adjusted fitted rate for chronic lower respiratory diseases in 1999 is 8% greater than (GT) RNC’s fitted rate. In 2011, ENC29’s fitted rate is 12% less than (LT) RNC’s fitted rate. The tables permit a quick assessment of trends calculated from observed time series data.

The reader should notice that some data lines in the trend figures fluctuate widely. This fluctuation is due to two main factors. In a small population, the number of deaths may vary widely from year-to-year and lead to large changes in annual mortality and premature mortality rates, a phenomenon known as the effect of small numbers. In addition, because mortality is based on the age of death, any fluctuation in the
distribution of deaths across age groups from year-to-year can cause rates to change dramatically. Both the number of deaths and the age of
decedents influence trends in mortality. The reader should evaluate all available data carefully before drawing conclusions about current, past
and future mortality patterns.

Caveats about the Concepts of Race, Gender, and Geography

Several caveats are offered about the concepts of race, gender, and geography as they apply to the analysis of mortality patterns. While we do
intend to bring attention to the stark racial inequalities in mortality across North Carolina, we do not mean to imply that this is a biological
phenomenon. Other factors such as differences in socioeconomic status, educational attainment, occupation, and lifestyle probably account for
the large racial gaps in mortality rates. Likewise, gender inequalities may have less to do with biological differences between men and women
than with socially structured gender roles, health behaviors, occupational exposures, and use of health services. Finally, it is important to
consider that county borders may not always be the most appropriate way to look at specific health problems. Few of our health care problems
begin or end at political boundary lines and many of our health problems in North Carolina are common to large groups of counties. Counties
and larger regions composed of counties are convenient units of data collection and readers should not jump to conclusions about health
problems or possible solutions based solely on the way data appear when aggregated to this level. In some cases, data at multi-county, zip
code, or minor civil division levels are a better way to understand problems and solutions. Similarly, as indicated in Healthy Carolinians 2020,
consideration needs to be given to whether or not a county is characterized as rural or urban, as this can be an indication to the level of
development and amount of resources available in a county.
General References


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 (2011), NC (2011), and US (2009). Mortality rate per 100,000 population.

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

2011 NC rate is 4% higher than 2009 US rate

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.1 ii. General leading causes of death for ENC29 (2011), NC (2011), and US (2009). Age-adjusted mortality rate per 100,000 population.

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<tr>
<th>ENC29</th>
<th>North Carolina</th>
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<td>741 deaths/100,000</td>
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<table>
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2011 NC age-adjusted rate is 6% higher than 2009 US age-adjusted rate

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.2 i. General leading causes of death for ENC29 (2011) by race and gender. Mortality rate per 100,000 population.

**Non-White Males**
- 2011 ENC29 NWM rate is 5% lower than 2011 ENC29 WM rate
- 900 deaths/100,000
- Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.

**Non-White Females**
- 2011 ENC29 NWF rate is 8% lower than 2011 ENC29 WF rate
- 841 deaths/100,000

**White Males**
- 946 deaths/100,000
- 25% 36% 4%

**White Females**
- 919 deaths/100,000
- 22% 21% 4%
Figure 4.2 ii. General leading causes of death for ENC29 (2011) by race and gender. Age-adjusted mortality rate per 100,000 population.

**Non-White Males**
- 2011 ENC29 NWM age-adjusted rate is 21% higher than 2011 ENC29 WM age-adjusted rate
- 1145 deaths/100,000

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

**Non-White Females**
- 2011 ENC29 NWF age-adjusted rate is 13% higher than 2011 ENC29 WF age-adjusted rate
- 766 deaths/100,000

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

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.3 i. General leading causes of death for ENC29 (2011) by race. Mortality rate per 100,000 population.

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.3 ii. General leading causes of death for ENC29 (2011) by race. Age-adjusted mortality rate per 100,000 population.

Pie charts are proportionately scaled using the state age-adjusted mortality rate of white females (679 deaths/100,000 pop) as a standard. The areas are proportional to the rates. Slices without percentages constitute less than 5% of the deaths within that chart.
5. Trends and Disparities in Mortality in ENC29: All Causes of Death and All Causes of Premature Mortality; 1979-2011
All Causes of Death

- The 32 year ENC trend line shows all cause mortality rates are increasing. The 13 year trend line shows ENC’s rate is decreasing but is still higher than NC and RNC.

- The age-adjusted, all-cause mortality rate trend for ENC has decreasing over the 30 year period. The 13-year trend shows greater decrease and suggests the ENC rate will converge with the RNC and NC rates. ENC’s rate remains 10% greater than the rate for RNC.

- The non-White male mortality rate trend remains higher than other demographic groups but has had the greatest rate of decrease (27%) in the 13-year trend. Convergence of non-White males with White males and non-White females with White females is suggested in the future.

- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 16% greater than the White rate, but the recent 13-year trend suggests they will converge in the future.

- Over the recent 13-year period there is a drop in racial disparity, in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 5.1 i. All Causes of Death:
Trends in mortality rates for ENC29, RNC71, and NC
1979-2011 with projections to 2020

1999 ENC29 rate is 12% greater than RNC71
2011 ENC29 rate is 14% greater than RNC71

1999 ENC29 rate is 12% greater than RNC71
2011 ENC29 rate is 14% greater than RNC71
Figure 5.1 ii. All Causes of Death:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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<td>17% GT</td>
<td>9% GT</td>
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1999 ENC29 rate is 13% greater than RNC71
2011 ENC29 rate is 8% greater than RNC71

ENC29 13-yr trendline: 21% decrease
R2 = 0.98
y = -16.75x + 1,051.42

RNC71 13-yr trendline: 16% decrease
R2 = 0.96
y = -11.45x + 926.42

NC 13-yr trendline: 17% decrease
R2 = 0.97
y = -12.33x + 945.99

US 11-yr trendline: 17% decrease
R2 = 0.98
y = -14.25x + 895.85
Figure 5.1 iii. All Causes of Death:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

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<tbody>
<tr>
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Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

1999 non-White rate is 28% greater than White
2011 non-White rate is 16% greater than White

NW 13-yr trendline
27% decrease
R2 = 0.91
y = -25.31x + 1,241.37

W 13-yr trendline
18% decrease
R2 = 0.92
y = -13.40x + 970.06
Figure 5.1 v. All Causes of Death: 
Measuring disparity in age-adjusted mortality rates by race for ENC29, 
1979-2011 with projections to 2020

Racial Disparity
47% decrease
R² = 0.41
y = -1.04x + 28.55
All Causes of Premature Mortality

- ENC’s premature mortality rate trend has decreased by 11% over the 13 year period since 1999. This decline is similar to RNC and NC, but ENC remains about 20% higher.

- The age-adjusted premature mortality rate trend for ENC is also decreasing, but remains 19% higher than the RNC rate in 2011.

- The non-White male rate trend is significantly higher than any other demographic group, but also has the highest rate of decrease (31% over 13 years). White females have the lowest rate and also the lowest rate of decrease (6% over 13 years).

- A recent decrease in the premature mortality rate for non-Whites and leveling of rates for Whites suggests a reduction in racial disparity.

- The 13 year trend for racial disparity shows a 50% decrease, in a reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 5.2 i. All Causes of Premature Mortality:
Trends in premature mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline: 11% decrease
R2 = 0.60
y = -8.79x + 1,012.96

RNC71 13-yr trendline: 14% decrease
R2 = 0.82
y = -9.12x + 869.00

NC 13-yr trendline: 13% decrease
R2 = 0.82
y = -9.26x + 891.88

1999 ENC29 rate is 17% greater than RNC71
2011 ENC29 rate is 19% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

ENC29 13-yr trendline
18% decrease
$R^2 = 0.82$
y = -13.80x + 1,019.14

RNC71 13-yr trendline
18% decrease
$R^2 = 0.92$
y = -12.20x + 865.71

NC 13-yr trendline
18% decrease
$R^2 = 0.92$
y = -12.60x + 889.53

US 11-yr trendline
9% decrease
$R^2 = 0.93$
y = -6.60x + 769.65

1999 ENC29 rate is 18% greater than RNC71
2011 ENC29 rate is 19% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

NW 13-yr trendline
29% decrease
R² = 0.84
y = -32.20x + 1,454.65

W 13-yr trendline
9% decrease
R² = 0.40
y = -5.36x + 803.77

1999 non-White rate is 81% greater than White
2011 non-White rate is 44% greater than White
Figure 5.2 v. All Causes of Premature Mortality:
Measuring disparity in age-adjusted premature mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity
50% decrease
R² = 0.66
y = -3.16x + 82.36
6. Trends and Disparities in Mortality in ENC29:
Ten Specific Leading Causes of Death, 1979-2011
Diseases of Heart

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

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.1 i. Diseases of Heart:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline
29% decrease
R² = 0.95
y = -6.17x + 278.85

RNC71 13-yr trendline
34% decrease
R² = 0.94
y = -6.41x + 247.41

NC 13-yr trendline
33% decrease
R² = 0.94
y = -6.41x + 252.40

1999 ENC29 rate is 13% greater than RNC71
2011 ENC29 rate is 20% greater than RNC71

Comparison of Fitted Rates in 1999
ENC29  | RNC71  | NC
11% LT  | 9% LT  | ENC29

Comparison of Fitted Rates in 2011
ENC29  | RNC71  | NC
17% LT  | 14% LT | ENC29
20% GT  | 3% GT  | RNC71
17% GT  | 3% LT  | NC

Report #2.201, February 2014
Center for Health Systems Research and Development, ECU
Figure 6.1 ii. Diseases of Heart:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

1999 ENC29 rate is 14% greater than RNC71
2011 ENC29 rate is 13% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

- NWM 13-yr trendline: 39% decrease, $R^2 = 0.83$, $y = -12.32x + 414.17$
- WM 13-yr trendline: 38% decrease, $R^2 = 0.94$, $y = -10.62x + 360.73$
- NWF 13-yr trendline: 45% decrease, $R^2 = 0.94$, $y = -9.51x + 271.82$
- WF 13-yr trendline: 41% decrease, $R^2 = 0.90$, $y = -7.14x + 226.58$

Comparison of Fitted Rates in 1999:
- NWM: 15% GT, 13% LT
- WM: 25% GT, 34% LT
- NWF: 37% GT, 45% LT
- WF: 33% GT, 17% LT

Comparison of Fitted Rates in 2011:
- NWM: 14% GT, 12% LT
- WM: 32% GT, 41% LT
- NWF: 40% GT, 47% LT
- WF: 48% GT, 66% LT
Figure 6.1 iv. Diseases of Heart:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

NW 13-yr trendline
R2 = 0.93
\[ y = -10.60x + 328.32 \]

W 13-yr trendline
R2 = 0.94
\[ y = -8.51x + 284.04 \]

1999 non-White rate is 16% greater than White
2011 non-White rate is 11% greater than White
Figure 6.1 v. Diseases of Heart:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity

R2 = 0.06
y = -0.47x + 16.43
Cancer - Trachea, Bronchus, Lung

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

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.2 i. Cancer - Trachea, Bronchus, Lung: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline
R2 = 0.03
y = -0.12x + 66.37

RNC71 13-yr trendline
R2 = 0.52
y = -0.32x + 60.20

NC 13-yr trendline
R2 = 0.47
y = -0.30x + 61.20

1999 ENC29 rate is 10% greater than RNC71
2011 ENC29 rate is 15% greater than RNC71
Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

ENC29 13-yr trendline
16% decrease
R2 = 0.61
y = -0.85x + 67.59

RNC71 13-yr trendline
13% decrease
R2 = 0.75
y = -0.60x + 61.23

NC 13-yr trendline
13% decrease
R2 = 0.79
y = -0.65x + 62.24

US 11-yr trendline
15% decrease
R2 = 0.96
y = -0.76x + 57.45

1999 ENC29 rate is 10% greater than RNC71
2011 ENC29 rate is 6% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

NWM 13-yr trendline: 38% decrease
WM 13-yr trendline: 25% decrease
NWF 13-yr trendline: 23% decrease
WF 13-yr trendline: 11% decrease

Comparison of Fitted Rates in 1999

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

NW 13-yr trendline
24% decrease
R² = 0.51
y = -1.22x + 66.11

W 13-yr trendline
13% decrease
R² = 0.47
y = -0.70x + 68.08

1999 non-White rate is 3% less than White
2011 non-White rate is 14% less than White

Age-adjusted mortality rate per 100,000 population
Figure 6.2 v. Cancer - Trachea, Bronchus, Lung:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity
469% decrease
R2 = 0.16
y = -1.09x - 3.03
Cerebrovascular Disease

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

- The ENC age-adjusted cerebrovascular disease mortality rate trend is decreasing and converging with the RNC and NC rates. It remains 12% greater than the RNC trend. In 2011 there were 49 deaths per 100,000, which is almost at the Healthy People 2010 goal of less than 48 deaths per 100,000.

- Non-Whites have the highest mortality rate for cerebrovascular disease but the rate trend continues to decrease and converge with the other demographic groups. Over the 13-year period the trend has decreased by about 50% for all demographic groups.

- The cerebrovascular disease mortality rate trend for non-Whites is decreasing and converging with that of whites but is still 52% greater than Whites in 2011.

- The 13-year trend for racial disparity is unreliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.3 i. Cerebrovascular Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

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41% decrease (R2 = 0.88)
y = -2.60x + 82.54

46% decrease (R2 = 0.95)
y = -2.55x + 73.00

45% decrease (R2 = 0.96)
y = -2.57x + 74.50
Figure 6.3 ii. Cerebrovascular Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

ENC29 13-yr trendline 50% decrease
RNC71 13-yr trendline 49% decrease
NC 13-yr trendline 49% decrease
US 11-yr trendline 42% decrease

R² = 0.92 R² = 0.97 R² = 0.97 R² = 0.99
y = -3.44x + 88.73 y = -2.93x + 77.35 y = -3.01x + 79.15 y = -2.48x + 65.09

1999 ENC29 rate is 15% greater than RNC71
2011 ENC29 rate is 12% greater than RNC71
Figure 6.3 iii. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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NWM 13-yr trendline: 51% decrease, $R^2 = 0.86$, $y = -4.99x + 127.84$
WM 13-yr trendline: 51% decrease, $R^2 = 0.87$, $y = -3.07x + 78.43$
NWF 13-yr trendline: 48% decrease, $R^2 = 0.87$, $y = -3.81x + 102.98$
WF 13-yr trendline: 52% decrease, $R^2 = 0.89$, $y = -3.04x + 76.44$
Figure 6.3 iv. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

NW 13-yr trendline
48% decrease
R2 = 0.91
y = -4.19x + 112.63

W 13-yr trendline
52% decrease
R2 = 0.90
y = -3.17x + 79.08

1999 non-White rate is 42% greater than White
2011 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, 1979-2011 with projections to 2020

Racial Disparity

\[ R^2 = 0.07 \]
\[ y = 0.74x + 42.24 \]
Chronic Lower Respiratory Diseases

- The 32 year ENC trend for CLRD mortality is increasing. The 13-year trend for ENC is unreliable.

- The 13-year CLRD age-adjusted rate trend for ENC is decreasing and converging with the US rate. The rate for ENC is lower than the rates for RNC and NC.

- Fitted rates for non-White males and White males have decreased over 13 years by 39% and 30%, respectively. White male rates remain the highest. The 13-year trend for White females is flat. The 13-year trend for non-White females is unreliable.

- The 13-year White morality rate trend is higher than the non-White trend, although both are declining evenly. The non-White rate is 45% less than the White rate in 2011.

- There is a 36% decrease in the disparity between the White and non-White rate in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.4 i. Chronic Lower Respiratory Diseases: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline
\[ y = -0.15x + 47.20 \]
\[ R^2 = 0.07 \]

RNC71 13-yr trendline
\[ y = 0.29x + 44.12 \]
\[ R^2 = 0.25 \]

NC 13-yr trendline
\[ y = 0.22x + 44.59 \]
\[ R^2 = 0.18 \]

1999 ENC29 rate is 7% greater than RNC71
2011 ENC29 rate is 5% less than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

ENC29 13-yr trendline 17% decrease
R2 = 0.60
y = -0.64x + 49.57

RNC71 13-yr trendline 7% decrease
R2 = 0.08
y = 0.11x + 46.09

NC 13-yr trendline
R2 = 0.00
y = 0.00x + 46.61

US 11-yr trendline
R2 = 0.37
y = -0.29x + 44.62

1999 ENC29 rate is 8% greater than RNC71
2011 ENC29 rate is 12% less than RNC71
Figure 6.4 iii. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

NWM 13-yr trendline
WM 13-yr trendline
NWF 13-yr trendline
WF 13-yr trendline

39% decrease
30% decrease
5% decrease

R2 = 0.51
R2 = 0.69
R2 = 0.00
R2 = 0.12

y = -1.94x + 64.06
y = -1.78x + 76.39
y = 0.02x + 18.28
y = -0.17x + 44.95

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2011

Report #2.201, February 2014
Center for Health Systems Research and Development, ECU
Figure 6.4 iv. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

NW 13-yr trendline
24% decrease
R² = 0.40
y = -0.63x + 33.89

W 13-yr trendline
15% decrease
R² = 0.55
y = -0.66x + 55.79

1999 non-White rate is 39% less than White
2011 non-White rate is 45% less than White
Figure 6.4 v. Chronic Lower Respiratory Diseases:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity
36% decrease
R2 = 0.13
y = -1.74x - 63.53
Diabetes Mellitus

- The 13-year trend for diabetes mellitus mortality is decreasing for RNC and NC. The trend for ENC is higher and is also decreasing, but it is not reliable.

- The 13-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 18% for ENC. In 2011, the ENC age-adjusted rate trend remains 43% greater than RNC and 38% greater than the US.

- The non-White male and non-White female 13-year trends are decreasing more quickly than their White counterparts. The White male rate is flat and the White female rate is decreasing slightly.

- The non-White mortality rate trend decreased 25% over 13 years but remains 118% greater than the White rate.

- The 27% decrease in racial disparity for the last 13 years is moderately reliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.5 i. Diabetes Mellitus:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline

RNC71 13-yr trendline

NC 13-yr trendline

24% decrease
R2 = 0.04
y = -0.11x + 33.69

21% decrease
R2 = 0.79
y = -0.50x + 27.28

1999 ENC29 rate is 23% greater than RNC71
2011 ENC29 rate is 52% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

ENC29 13-yr trendline
18% decrease
R2 = 0.45
y = -0.48x + 35.21

RNC71 13-yr trendline
29% decrease
R2 = 0.76
y = -0.63x + 28.15

NC 13-yr trendline
27% decrease
R2 = 0.77
y = -0.61x + 29.27

US 11-yr trendline
18% decrease
R2 = 0.79
y = -0.42x + 26.52

1999 ENC29 rate is 25% greater than RNC71
2011 ENC29 rate is 43% greater than RNC71
Figure 6.5 iii. Diabetes Mellitus:
Trends in age-adjusted mortality rates by race and gender for ENC29,
1979-2011 with projections to 2020

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2011

Report #2.201, February 2014
Center for Health Systems Research and Development, ECU
Figure 6.5 iv. Diabetes Mellitus: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

1999 non-White rate is 156% greater than White
2011 non-White rate is 118% greater than White

NW 13-yr trendline
W 13-yr trendline

25% decrease
R2 = 0.47
y = -1.20x + 62.11

11% decrease
R2 = 0.16
y = -0.20x + 24.29
Figure 6.5 v. Diabetes Mellitus:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

Racial Disparity
27% decrease
$R^2 = 0.19$
$y = -3.31x + 158.61$
All Other Unintentional Injuries and Adverse Effects

- The mortality rate trend for unintentional injuries and adverse effects is increasing in ENC (39% over 13 years). The trends for RNC and NC are also increasing.

- The age-adjusted mortality rate trends for ENC, RNC, NC, and the US are all increasing. During the last 13 years, ENC has increased 29%, although it is 4% below RNC in 2011.

- The trends for White males and White females are both increasing (52% and 86% respectively over the 13-year period). The mortality rate trend for non-White males decreased 33% over 13 years. The trend for non-White females is not reliable.

- The White rate trend has increased 64% over the 13-year period. The non-White rate trend has dropped below the White and is decreasing in a moderately reliable trend.

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

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.6 i. All Other Unintentional Injuries and Adverse Effects: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

- ENC29 13-yr trendline: 39% increase
  - $R^2 = 0.68$
  - $y = 0.65x + 21.84$

- RNC71 13-yr trendline: 46% increase
  - $R^2 = 0.90$
  - $y = 0.75x + 21.42$

- NC 13-yr trendline: 44% increase
  - $R^2 = 0.90$
  - $y = 0.74x + 21.49$

- 1999 ENC29 rate is 2% greater than RNC71
- 2011 ENC29 rate is 3% 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, 1979-2011 with projections to 2020

ENC29 13-yr trendline
29% increase
R² = 0.56
y = 0.50x + 22.92

RNC71 13-yr trendline
40% increase
R² = 0.87
y = 0.68x + 22.10

NC 13-yr trendline
38% increase
R² = 0.88
y = 0.65x + 22.24

US 11-yr trendline
42% increase
R² = 0.96
y = 0.71x + 18.61

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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

NWM 13-yr trendline

33% decrease

R2 = 0.25

y = -1.11x + 43.22

WM 13-yr trendline

52% increase

R2 = 0.71

y = 1.16x + 28.74

NWF 13-yr trendline

86% increase

R2 = 0.08

y = -0.19x + 14.26

WF 13-yr trendline

R2 = 0.83

y = 0.92x + 13.82

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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R2 = 0.25

y = -1.11x + 43.22

R2 = 0.71

y = 1.16x + 28.74

R2 = 0.08

y = -0.19x + 14.26

R2 = 0.83

y = 0.92x + 13.82
Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

- NW 13-yr trendline
  - 29% decrease
  - $R^2 = 0.22$
  - $y = -0.59x + 26.62$

- W 13-yr trendline
  - 64% increase
  - $R^2 = 0.87$
  - $y = 1.04x + 21.15$

- 1999 non-White rate is 26% greater than White
- 2011 non-White rate is 42% 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, 1979-2011 with projections to 2020

Racial Disparity
420% decrease
$R^2 = 0.60$
$y = -7.80x + 24.15$
Alzheimer’s Disease

- The Alzheimer’s mortality rate trend for ENC shows a 73% increase over the 13 year period. ENC’s rate of increase was larger than RNC and NC but the rate for ENC still remains 17% less than RNC.

- In 2011, the age-adjusted rate trend for ENC is 5% below the US rate, but has increased 43% over the 13-year period. The ENC rate is 22% less than RNC.

- The 13-year mortality rate trends for White and non-White females are greater than White males and non-White males. Rate trends for all demographic groups are increasing but non-White males are increasing the most.

- The non-White mortality rate for Alzheimer’s remains 14% less than the White mortality rate in 2011 but the 13-year trend is increasing for both and suggests convergence in the near future.

- The 13-year moderately-reliable trend suggests an increase in disparity that favors whites.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.7 i. Alzheimer’s Disease: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline
73% increase
R2 = 0.84
y = 0.84x + 14.91

RNC71 13-yr trendline
46% increase
R2 = 0.84
y = 0.75x + 21.22

NC 13-yr trendline
50% increase
R2 = 0.88
y = 0.77x + 20.23

1999 ENC29 rate is 30% less than RNC71
2011 ENC29 rate is 17% less than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2011

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Report #2.201, February 2014
Center for Health Systems Research and Development, ECU
Figure 6.7 ii. Alzheimer’s Disease: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

ENC29 13-yr trendline

43% increase

R2 = 0.65

y = 0.57x + 17.26

RNC71 13-yr trendline

35% increase

R2 = 0.69

y = 0.63x + 23.37

NC 13-yr trendline

36% increase

R2 = 0.74

y = 0.62x + 22.43

US 11-yr trendline

46% increase

R2 = 0.90

y = 0.70x + 16.96

1999 ENC29 rate is 26% less than RNC71

2011 ENC29 rate is 22% less than RNC71

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Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2011

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

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Comparison of Fitted Rates in 1999

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</table>

Report #2.201, February 2014

Center for Health Systems Research and Development, ECU
Figure 6.7 iv. Alzheimer’s Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

NW 13-yr trendline
79% increase
R2 = 0.65
y = 0.76x + 12.48

W 13-yr trendline
32% increase
R2 = 0.48
y = 0.48x + 19.36

1999 non-White rate is 36% less than White
2011 non-White rate is 14% less than White

Age-adjusted mortality rate per 100,000 population
Figure 6.7 v. Alzheimer’s Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity
72% increase
R2 = 0.25
y = 2.79x - 50.52
Nephritis, Nephrotic Syndrome, and Nephrosis

- The mortality rate trend for nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 33% over 13 years. The rate trends for RNC and NC have also increased, but not as much. In 2011 ENC’s rate is 22% greater than RNC.

- With age-adjustment, the rate of increase is the same for RNC and NC, but ENC is 15% greater than RNC, and 40% greater than the US rate trend.

- The 13 year trend for non-White males is the highest and increasing the most rapidly. The trends for White males and White females are increasing but more slowly. The trend for non-White females is not reliable.

- In 2011, the non-White rate was 136% greater than the White rate. Both the White rate and the non-White rate are increasing.

- The racial disparity trend is decreasing but is unreliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.8 i. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline
RNC71 13-yr trendline
NC 13-yr trendline

33% increase 24% increase 25% increase
R2 = 0.71 R2 = 0.66 R2 = 0.70
y = 0.44x + 17.28 y = 0.28x + 15.18 y = 0.30x + 15.53

1999 ENC29 rate is 14% greater than RNC71
2011 ENC29 rate is 22% greater than RNC71

Comparison of Fitted Rates in 1999
ENC29 14% GT 12% LT
RNC71 2% GT 10% LT
NC

Comparison of Fitted Rates in 2011
ENC29 18% GT 18% LT
RNC71 3% GT 15% LT
NC
Figure 6.8 ii. Nephritis, Nephrotic Syndrome, and Nephrosis:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US,
1979-2011 with projections to 2020

ENC29 13-yr trendline
R2 = 0.40
y = 0.22x + 18.48

RNC71 13-yr trendline
R2 = 0.40
y = 0.20x + 16.06

NC 13-yr trendline
R2 = 0.45
y = 0.20x + 16.44

US 11-yr trendline
R2 = 0.83
y = 0.15x + 13.32

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

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2011

Report #2.201, February 2014
Center for Health Systems Research and Development, ECU
Figure 6.8 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

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Comparison of Fitted Rates in 1999

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<th>Race/Gender</th>
<th>NWM 13-yr trendline</th>
<th>WM 13-yr trendline</th>
<th>NWF 13-yr trendline</th>
<th>WF 13-yr trendline</th>
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</thead>
<tbody>
<tr>
<td>NWM</td>
<td>30% increase</td>
<td>R2 = 0.29</td>
<td>y = 0.78x + 33.26</td>
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<tr>
<td>WM</td>
<td>25% increase</td>
<td>R2 = 0.34</td>
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<tr>
<td>NWF</td>
<td>14% increase</td>
<td>R2 = 0.01</td>
<td>y = -0.08x + 32.40</td>
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<tr>
<td>WF</td>
<td></td>
<td>R2 = 0.12</td>
<td>y = 0.12x + 11.08</td>
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Comparison of Fitted Rates in 2011

<table>
<thead>
<tr>
<th>Race/Gender</th>
<th>NWM 13-yr trendline</th>
<th>WM 13-yr trendline</th>
<th>NWF 13-yr trendline</th>
<th>WF 13-yr trendline</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWM</td>
<td>56% LT</td>
<td>24% LT</td>
<td>71% LT</td>
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<tr>
<td>WM</td>
<td>66% LT</td>
<td>19% LT</td>
<td>33% LT</td>
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<tr>
<td>NWF</td>
<td>33% LT</td>
<td>50% LT</td>
<td>60% LT</td>
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</tr>
<tr>
<td>WF</td>
<td>80% LT</td>
<td>60% LT</td>
<td>150% LT</td>
<td></td>
</tr>
</tbody>
</table>
Figure 6.8 iv. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

1999 non-White rate is 156% greater than White
2011 non-White rate is 136% greater than White

NW 13-yr trendline
R2 = 0.10
y = 0.26x + 32.52

W 13-yr trendline
R2 = 0.31
y = 0.20x + 12.73
Figure 6.8 v. Nephritis, Nephrotic Syndrome, and Nephrosis: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity

$R^2 = 0.06$

$y = -2.12x + 160.28$
Cancer - Colon, Rectum, Anus

- The 13-year rate trends for colon cancer for ENC, RNC and NC have all declined over the period. In 2011 ENC’s rate was 29% greater than RNC.

- The age-adjusted mortality rate trend for colon cancer for ENC has declined 32% over the 13-year period. The ENC rate is the highest (14% greater than RNC) but is projected to converge with the NC and RNC trends.

- The non-White male mortality rate trend is the highest of the demographic groups and is decreasing the most slowly. White males and non-White females are about 40% less than non-White males. White females have the lowest rate trend.

- The non-White rate in 2011 is 47% greater than the White rate. Both are declining but the White rate is declining more quickly.

- The trend for racial disparity is unreliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.9 i. Cancer - Colon, Rectum, Anus:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2011 with projections to 2020

ENC29 13-yr trendline
RNC71 13-yr trendline
NC 13-yr trendline

22% decrease
R² = 0.81
y = -0.39x + 23.28

24% decrease
R² = 0.90
y = -0.36x + 19.58

24% decrease
R² = 0.93
y = -0.37x + 20.18

1999 ENC29 rate is 19% greater than RNC71
2011 ENC29 rate is 21% greater than RNC71
Figure 6.9 ii. Cancer - Colon, Rectum, Anus: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

<table>
<thead>
<tr>
<th>Year</th>
<th>ENC29 Rate</th>
<th>RNC71 Rate</th>
<th>NC Rate</th>
<th>US Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>19% greater</td>
<td>19% greater</td>
<td>19% greater</td>
<td>19% greater</td>
</tr>
<tr>
<td>2011</td>
<td>14% greater</td>
<td>14% greater</td>
<td>14% greater</td>
<td>14% greater</td>
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</table>

**Comparison of Fitted Rates in 1999**

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>16% LT</td>
<td>13% LT</td>
<td>10% LT</td>
<td>ENC29</td>
</tr>
<tr>
<td>19% GT</td>
<td>3% LT</td>
<td>7% LT</td>
<td>RNC71</td>
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</table>

**Comparison of Fitted Rates in 2011**

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>14% LT</td>
<td>11% LT</td>
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<td>ENC29</td>
</tr>
<tr>
<td>12% GT</td>
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</tr>
<tr>
<td>11% GT</td>
<td>3% LT</td>
<td>1% LT</td>
<td>US</td>
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</tbody>
</table>

**Trends and Disparities in Mortality in Eastern North Carolina-29 Counties**
Figure 6.9 iii. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>Race</th>
<th>NWM</th>
<th>WM</th>
<th>WNF</th>
<th>WF</th>
</tr>
</thead>
<tbody>
<tr>
<td>27% GT</td>
<td>21% LT</td>
<td>26% LT</td>
<td>49% LT</td>
<td>NWM</td>
</tr>
<tr>
<td>35% GT</td>
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<td>NWF</td>
<td>WM</td>
</tr>
<tr>
<td>97% GT</td>
<td>55% GT</td>
<td>46% GT</td>
<td>WF</td>
<td>NWM</td>
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</tbody>
</table>

Comparison of Fitted Rates in 2011

<table>
<thead>
<tr>
<th>Race</th>
<th>NWM</th>
<th>WM</th>
<th>WNF</th>
<th>WF</th>
</tr>
</thead>
<tbody>
<tr>
<td>27% GT</td>
<td>37% LT</td>
<td>41% LT</td>
<td>59% LT</td>
<td>NWM</td>
</tr>
<tr>
<td>35% GT</td>
<td>7% GT</td>
<td>30% LT</td>
<td>NWF</td>
<td>WM</td>
</tr>
<tr>
<td>97% GT</td>
<td>144% GT</td>
<td>53% GT</td>
<td>44% GT</td>
<td>WF</td>
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</table>

18% decrease
R2 = 0.17
y = -0.49x + 34.92

36% decrease
R2 = 0.74
y = -0.77x + 27.45

36% decrease
R2 = 0.36
y = -0.73x + 25.85

35% decrease
R2 = 0.83
y = -0.48x + 17.71
Figure 6.9 iv. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

- NW 13-yr trendline: 28% decrease
  - R² = 0.56
  - y = -0.62x + 29.13

- W 13-yr trendline: 35% decrease
  - R² = 0.88
  - y = -0.59x + 21.85

1999 non-White rate is 33% greater than White
2011 non-White rate is 47% greater than White
Figure 6.9 v. Cancer - Colon, Rectum, Anus: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity

\[ R^2 = 0.09 \]

\[ y = 1.16x + 32.66 \]
Pneumonia and Influenza

- The mortality rate trend for pneumonia and influenza for ENC, RNC and NC have all declined over the 13 year period. The ENC rate in 2011 is 11% higher than the RNC rate.

- The age-adjusted mortality rate trends for all NC regions are similar and are decreasing at about the same pace. The ENC rate is 20% higher than the US rate.

- The age-adjusted mortality rate trend for all four demographics are decreasing. The trends for non-White males and White males are the highest. Trend lines predict convergence of all four groups in the future.

- The Non-White mortality rate is 11% less than the White rate in 2011. Both are decreasing.

- The 13-year decreasing trend for racial disparity is unreliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.10 i. Pneumonia and Influenza: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

ENC29 13-yr trendline
26% decrease
R² = 0.57
y = -0.51x + 24.88

RNC71 13-yr trendline
35% decrease
R² = 0.88
y = -0.68x + 25.20

NC 13-yr trendline
34% decrease
R² = 0.87
y = -0.66x + 25.15

1999 ENC29 rate is 1% less than RNC71
2011 ENC29 rate is 11% greater than RNC71

Comparison of Fitted Rates in 1999
ENC29  RNC71  NC
1% GT  1% GT  ENC29
1% LT  0% LT  RNC71
1% LT  0% GT  NC

Comparison of Fitted Rates in 2011
ENC29  RNC71  NC
10% LT  8% LT  ENC29
11% GT  2% GT  RNC71
9% GT  2% LT  NC
Figure 6.10 ii. Pneumonia and Influenza: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

ENC29 13-yr trendline
38% decrease
R² = 0.77
y = -0.80x + 27.29

RNC71 13-yr trendline
40% decrease
R² = 0.91
y = -0.84x + 27.00

NC 13-yr trendline
40% decrease
R² = 0.92
y = -0.83x + 27.05

US 11-yr trendline
38% decrease
R² = 0.93
y = -0.86x + 25.22

1999 ENC29 rate is 1% greater than RNC71
2011 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>
<th>US</th>
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<tbody>
<tr>
<td>1% LT</td>
<td>1% LT</td>
<td>8% LT</td>
<td>ENC29</td>
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Comparison of Fitted Rates in 2011
<table>
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<th>RNC71</th>
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<th>US</th>
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<tbody>
<tr>
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<tr>
<td>19% LT</td>
<td>14% LT</td>
<td>15% LT</td>
<td>US</td>
</tr>
</tbody>
</table>
Figure 6.10 iii. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
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<th></th>
<th>NWM</th>
<th>WM</th>
<th>NWF</th>
<th>WF</th>
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<td>26%</td>
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Comparison of Fitted Rates in 2011

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<td>18% GT</td>
<td>26%</td>
<td>18%</td>
<td>19%</td>
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R^2 = 0.20 0.88 0.60 0.62
y = -1.00x + 33.23 y = -1.08x + 32.85 y = -0.78x + 23.02 y = -0.65x + 24.67

39% decrease 43% decrease 44% decrease 34% decrease
Figure 6.10 iv. Pneumonia and Influenza:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

NW 13-yr trendline
43% decrease
R^2 = 0.51
y = -0.90x + 26.92

W 13-yr trendline
37% decrease
R^2 = 0.79
y = -0.77x + 27.51

1999 non-White rate is 2% less than White
2011 non-White rate is 11% less than White
Figure 6.10 v. Pneumonia and Influenza:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2011 with projections to 2020

Racial Disparity

$R^2 = 0.05$

$y = -1.18x - 1.67$
7. Trends and Disparities in Mortality in ENC29:
Cancer - All Sites and HIV Disease; 1979-2011
Cancer - All Sites

- The cancer – all sites mortality rates for ENC have decreased slightly (4%) over 13 years. The RNC and NC rates are lower, and have decreased more than ENC, causing these rates to diverge.

- The age-adjusted cancer – all sites mortality rates for ENC, NC and RNC are all decreasing at about the same level, although the ENC rate is 9% greater than the RNC rate.

- The rate trend is decreasing for all regions. The rate for non-White males is the highest but is decreasing the most. White and non-White females show slight decreases.

- Both White and non-White cancer mortality trends are decreasing over the 13 year period. The Non-White rate decreased 22% and the White rate decreased 15%. The non-White rate remains 16% greater than the White rate in 2011.

- The moderately reliable 13-year trend for racial disparity shows a 38% decrease.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 7.1. Cancer - All Sites: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020.

1999 ENC29 rate is 11% greater than RNC71
2011 ENC29 rate is 17% greater than RNC71

ENC29 13-yr trendline
4% decrease
R2 = 0.20
y = -0.60x + 220.79

RNC71 13-yr trendline
9% decrease
R2 = 0.69
y = -1.31x + 198.48

NC 13-yr trendline
8% decrease
R2 = 0.73
y = -1.23x + 202.04

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>11% GT</td>
<td>2% LT</td>
<td>ENC29</td>
</tr>
<tr>
<td>9% GT</td>
<td>2% LT</td>
<td>NC</td>
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Comparison of Fitted Rates in 2011

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<th>RNC71</th>
<th>NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>17% GT</td>
<td>2% GT</td>
<td>ENC29</td>
</tr>
<tr>
<td>14% GT</td>
<td>2% LT</td>
<td>NC</td>
</tr>
</tbody>
</table>
Figure 7.1 ii. Cancer - All Sites:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

ENC29 13-yr trendline
17% decrease
R2 = 0.88
y = -2.99x + 227.81

RNC71 13-yr trendline
15% decrease
R2 = 0.93
y = -2.31x + 203.66

NC 13-yr trendline
15% decrease
R2 = 0.95
y = -2.43x + 207.46

US 11-yr trendline
16% decrease
R2 = 1.00
y = -2.90x + 204.45

1999 ENC29 rate is 12% greater than RNC71
2011 ENC29 rate is 9% greater than RNC71

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>Year</th>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>12% GT</td>
<td>11% LT</td>
<td>9% LT</td>
<td>10% LT</td>
</tr>
</tbody>
</table>

Comparison of Fitted Rates in 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>13% GT</td>
<td>8% LT</td>
<td>7% LT</td>
<td>12% LT</td>
</tr>
</tbody>
</table>

Report #2.201, February 2014
Center for Health Systems Research and Development, ECU
Figure 7.1 iii. Cancer - All Sites:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>Race</th>
<th>NWM</th>
<th>WM</th>
<th>NWF</th>
<th>WF</th>
</tr>
</thead>
<tbody>
<tr>
<td>39% GT</td>
<td>28% LT</td>
<td>50% LT</td>
<td>56% LT</td>
<td>NWM</td>
</tr>
<tr>
<td>100% GT</td>
<td>44% GT</td>
<td>12% LT</td>
<td>NWF</td>
<td></td>
</tr>
<tr>
<td>128% GT</td>
<td>64% GT</td>
<td>14% GT</td>
<td>WF</td>
<td></td>
</tr>
</tbody>
</table>

Comparison of Fitted Rates in 2011

<table>
<thead>
<tr>
<th>Race</th>
<th>NWM</th>
<th>WM</th>
<th>NWF</th>
<th>WF</th>
</tr>
</thead>
<tbody>
<tr>
<td>39% GT</td>
<td>23% LT</td>
<td>44% LT</td>
<td>48% LT</td>
<td>NWM</td>
</tr>
<tr>
<td>100% GT</td>
<td>30% GT</td>
<td>27% LT</td>
<td>33% LT</td>
<td>WM</td>
</tr>
<tr>
<td>128% GT</td>
<td>93% GT</td>
<td>49% GT</td>
<td>8% GT</td>
<td>WF</td>
</tr>
</tbody>
</table>

NWM 13-yr trendline: 26% decrease
WM 13-yr trendline: 21% decrease
NWF 13-yr trendline: 17% decrease
WF 13-yr trendline: 12% decrease

R² = 0.65
y = -7.86x + 388.47
R² = 0.86
y = -4.43x + 279.03
R² = 0.46
y = -2.49x + 194.08
R² = 0.53
y = -1.53x + 170.50
Figure 7.1 iv. Cancer - All Sites:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

NW 13-yr trendline
22% decrease
R2 = 0.67
y = -4.37x + 264.04

W 13-yr trendline
15% decrease
R2 = 0.85
y = -2.48x + 212.81

1999 non-White rate is 24% greater than White
2011 non-White rate is 16% greater than White
Figure 7.1 v. Cancer - All Sites:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity
38% decrease
R² = 0.14
y = -0.71x + 24.33
HIV Disease

- The fitted HIV mortality rates for ENC have been decreasing over the past 13 years, but are still 62% greater than RNC in 2011.

- The age-adjusted rate trend for ENC, RNC and the US are all decreasing. The ENC rate is 68% greater than RNC in 2011.

- Non-White males continue to have the highest rates of age-adjusted mortality, but these rates have also decreased 15% in a 13-year reliable trend. Non-White females have the second highest rate, but it has also declined over the 13-year period. The rate for White males is lower but has also decreased. The White female rate is not reliable.

- The 13-year age-adjusted HIV mortality rates have decreased by 43% in a reliable trend for both Whites and non-Whites. The non-White rate is still 1068% greater than the White rate.

- The trend for racial disparity is unreliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 7.2 i. HIV Disease:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2011 with projections to 2020

1999 ENC29 rate is 24% greater than RNC71
2011 ENC29 rate is 62% greater than RNC71

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>19% LT</td>
<td>16% LT</td>
<td>ENC29</td>
</tr>
</tbody>
</table>

Comparison of Fitted Rates in 2011

<table>
<thead>
<tr>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>38% LT</td>
<td>33% LT</td>
<td>ENC29</td>
</tr>
</tbody>
</table>

ENC29 13-yr trendline: 38% decrease
\[ R^2 = 0.65 \]
\[ y = -0.23x + 7.82 \]
RNC71 13-yr trendline: 55% decrease
\[ R^2 = 0.96 \]
\[ y = -0.26x + 6.29 \]
NC 13-yr trendline: 52% decrease
\[ R^2 = 0.96 \]
\[ y = -0.26x + 6.54 \]
Figure 7.2 ii. HIV Disease:
Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2011 with projections to 2020

- ENC29 13-yr trendline: 41% decrease
  - $R^2 = 0.72$
  - $y = -0.26x + 8.13$

- RNC71 13-yr trendline: 56% decrease
  - $R^2 = 0.96$
  - $y = -0.27x + 6.23$

- NC 13-yr trendline: 54% decrease
  - $R^2 = 0.96$
  - $y = -0.27x + 6.52$

- US 11-yr trendline: 44% decrease
  - $R^2 = 0.97$
  - $y = -0.23x + 5.71$

1999 ENC29 rate is 31% greater than RNC71
2011 ENC29 rate is 68% greater than RNC71

<table>
<thead>
<tr>
<th>ENC29 13-yr trendline</th>
<th>RNC71 13-yr trendline</th>
<th>NC 13-yr trendline</th>
<th>US 11-yr trendline</th>
</tr>
</thead>
<tbody>
<tr>
<td>41% decrease</td>
<td>56% decrease</td>
<td>54% decrease</td>
<td>44% decrease</td>
</tr>
<tr>
<td>$R^2 = 0.72$</td>
<td>$R^2 = 0.96$</td>
<td>$R^2 = 0.96$</td>
<td>$R^2 = 0.97$</td>
</tr>
<tr>
<td>$y = -0.26x + 8.13$</td>
<td>$y = -0.27x + 6.23$</td>
<td>$y = -0.27x + 6.52$</td>
<td>$y = -0.23x + 5.71$</td>
</tr>
</tbody>
</table>
Figure 7.2 iii. HIV Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2011 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th>Race</th>
<th>NWM</th>
<th>WM</th>
<th>NWF</th>
<th>WF</th>
</tr>
</thead>
<tbody>
<tr>
<td>970% GT</td>
<td>91% LT</td>
<td>60% LT</td>
<td>98% LT</td>
<td></td>
</tr>
<tr>
<td>151% GT</td>
<td>77% LT</td>
<td></td>
<td>95% LT</td>
<td>NWM</td>
</tr>
<tr>
<td>4810% GT</td>
<td>359% GT</td>
<td>1860% GT</td>
<td></td>
<td>NWF</td>
</tr>
</tbody>
</table>

Comparison of Fitted Rates in 2011

<table>
<thead>
<tr>
<th>Race</th>
<th>NWM</th>
<th>WM</th>
<th>NWF</th>
<th>WF</th>
</tr>
</thead>
<tbody>
<tr>
<td>970% GT</td>
<td>919% GT</td>
<td>483% GT</td>
<td>63% LT</td>
<td>WM</td>
</tr>
<tr>
<td>151% GT</td>
<td>75% GT</td>
<td>83% LT</td>
<td>94% LT</td>
<td>NWF</td>
</tr>
<tr>
<td>4810% GT</td>
<td>2860% GT</td>
<td>174% GT</td>
<td>1497% GT</td>
<td>WF</td>
</tr>
</tbody>
</table>

- NWM 13-yr trendline: 51% decrease (R² = 0.74, y = -1.24x + 31.45)
- WM 13-yr trendline: 48% decrease (R² = 0.22, y = -0.11x + 2.94)
- NWF 13-yr trendline: 26% decrease (R² = 0.26, y = -0.25x + 12.55)
- WF 13-yr trendline: 2% decrease (R² = 0.00, y = 0.00x + 0.64)
Figure 7.2 iv. HIV Disease: Trends in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020.

NW 13-yr trendline
43% decrease
\( R^2 = 0.69 \)
\[ y = -0.69x + 20.96 \]

W 13-yr trendline
43% decrease
\( R^2 = 0.29 \)
\[ y = -0.06x + 1.81 \]

1999 non-White rate is 1060% greater than White
2011 non-White rate is 1068% greater than White
Figure 7.2 v. HIV Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2011 with projections to 2020

Racial Disparity

\[ R^2 = 0.03 \]
\[ y = 27.82x + 1,008.64 \]
### 8. Appendix

<table>
<thead>
<tr>
<th>Disease</th>
<th>ICD 10 Code</th>
<th>ICD 9 Code</th>
</tr>
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<tbody>
<tr>
<td>Diseases of Heart</td>
<td>I00-I09, I11, I13, I20-I51</td>
<td>390-398, 402, 404, 410-429</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>I60-I69</td>
<td>430-434, 436-438</td>
</tr>
<tr>
<td>Atherosclerosis</td>
<td>I70</td>
<td>440</td>
</tr>
<tr>
<td>Cancer - All Sites</td>
<td>C00-C97</td>
<td>140-208</td>
</tr>
<tr>
<td>Cancer - Lip, Oral Cavity, and Pharynx</td>
<td>C00-C14</td>
<td>140-149</td>
</tr>
<tr>
<td>Cancer - Stomach</td>
<td>C16</td>
<td>151</td>
</tr>
<tr>
<td>Cancer - Colon, Rectum, and Anus</td>
<td>C18-C21</td>
<td>153-154</td>
</tr>
<tr>
<td>Cancer - Liver</td>
<td>C22</td>
<td>155</td>
</tr>
<tr>
<td>Cancer - Pancreas</td>
<td>C25</td>
<td>157</td>
</tr>
<tr>
<td>Cancer - Larynx</td>
<td>C32</td>
<td>161</td>
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<tr>
<td>Cancer - Trachea, Bronchus, and Lung</td>
<td>C33-C34</td>
<td>162</td>
</tr>
<tr>
<td>Cancer - Malignant Melanoma of Skin</td>
<td>C43</td>
<td>172</td>
</tr>
<tr>
<td>Cancer - Breast</td>
<td>C50</td>
<td>174-175</td>
</tr>
<tr>
<td>Cancer - Cervix Uteri</td>
<td>C53</td>
<td>180</td>
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<tr>
<td>Cancer - Ovary</td>
<td>C56</td>
<td>183.0</td>
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<tr>
<td>Cancer - Prostate</td>
<td>C61</td>
<td>185</td>
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<tr>
<td>Cancer - Bladder</td>
<td>C67</td>
<td>188</td>
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<tr>
<td>Cancer - Brain</td>
<td>C71</td>
<td>190</td>
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<tr>
<td>Cancer - Non-Hodgkin's Lymphoma</td>
<td>C82-C85</td>
<td>200, 202</td>
</tr>
<tr>
<td>Cancer - Leukemia</td>
<td>C91-C95</td>
<td>204-208</td>
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<td>HIV Disease</td>
<td>B20-B24</td>
<td>042-044</td>
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<td>Septicemia</td>
<td>A40-A41</td>
<td>038</td>
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<td>Diabetes Mellitus</td>
<td>E10-E14</td>
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<tr>
<td>Pneumonia and Influenza</td>
<td>J10-J18</td>
<td>480-487</td>
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<tr>
<td>Chronic Lower Respiratory Diseases</td>
<td>J40-J47</td>
<td>490-494, 496</td>
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<tr>
<td>Chronic Liver Disease and Cirrhosis</td>
<td>K70, K73-K74</td>
<td>571</td>
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<tr>
<td>Nephritis, Nephrotic Syndrome, and Nephrosis</td>
<td>N00-N07, N17-N19, N25-N27</td>
<td>580-589</td>
</tr>
<tr>
<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>
<td>E810-E825</td>
</tr>
<tr>
<td>All Other Unintentional Injuries and Adverse Effects</td>
<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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<tr>
<td>Suicide</td>
<td>X60-X84, Y87.0</td>
<td>E950-E959</td>
</tr>
<tr>
<td>Homicide</td>
<td>X65-Y09, Y87.1</td>
<td>E960-E969</td>
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<tr>
<td>Legal Intervention</td>
<td>Y35, Y89.0</td>
<td>E970-E978</td>
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<tr>
<td>Alzheimer's Disease</td>
<td>G30</td>
<td>331.0</td>
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