Trends and Disparities in Mortality in Eastern North Carolina
Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1979-2014

A Resource for Healthy Communities

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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 North Carolina Health Data Explorer 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, State Center for Health Statistics, as part of the Community Health Assessment Process. Individual reports in ECU’s Health Indicator Series are custom made for the counties of North Carolina. Reports in this series will describe trends in mortality, including premature mortality for all causes of death, mortality (crude) and age-adjusted mortality for leading causes of death, and measures of race disparities or inequalities in mortality rate.

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

This report describes the leading contributors to mortality, provides a geographic context, and examines trends and inequalities over a 36-year period (1979-2014), as well as the most recent 16 year period (1999 to 2014). The report begins with data highlights, provided as an introduction to the data, rather than a summary of it. Readers are encouraged to draw their own conclusions from the data and pose new questions suggested by what they see. The following section presents both the overall and five leading contributors to mortality for the state by race and gender. In this section, pie charts describe the relative contribution of each of five leading contributors to the overall, general rate. These charts also make regional and demographic comparisons. The next section charts recent trends and disparities in mortality and provides projections to the year 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 41 counties located in the extreme east of North Carolina and approximates the coastal plain physiographic province of the state. It includes all counties east of I-95. This region is characterized by its rurality, poverty, and some of the highest mortality rates in the nation. The name of the region is abbreviated as ENC41 or ENC. The rest of North Carolina is the remaining 59 counties; abbreviated as RNC59 or RNC.
2. Data Highlights

Trends and Disparities in Mortality in Eastern North Carolina

The following highlights of mortality in the 41 counties of Eastern North Carolina (ENC41) describe current status and trends in the causes of death from major diseases and how they vary across different population groups. The graphs, charts, and tables paint a picture of the region’s health with a broad brush. The study of mortality in populations should include consideration of time and geographic space as well as underlying demographic, political-economic, and socio-cultural conditions. Readers are encouraged to think of these factors as they consider the data presented in this report, formulate their own questions about the causes of mortality, and think about strategies to reduce mortality in the population described.

Current Disparities in Mortality by Geography, Race, and Gender

In 2014, age-adjusted mortality rate for Eastern North Carolina is 860 deaths per 100,000. This rate is 5% 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 22% higher than the rate for White males. The non-White female rate is 12% higher than the rate for White females.

The five general leading causes of mortality in Eastern North Carolina (2014) are:
1. Disease of Heart
2. Cancer - Trachea, Bronchus, Lung
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 (2014) 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>Diseases of Heart</td>
<td>Cancer - All Sites</td>
</tr>
<tr>
<td>2nd</td>
<td>Diseases of Heart</td>
<td>Diseases of Heart</td>
<td>Cancer - All Sites</td>
<td>Diseases of Heart</td>
</tr>
<tr>
<td>3rd</td>
<td>Cerebrovascular Disease</td>
<td>Chronic Lower Respiratory Diseases</td>
<td>Cerebrovascular Disease</td>
<td>Chronic Lower Respiratory Diseases</td>
</tr>
<tr>
<td>4th</td>
<td>Diabetes Mellitus</td>
<td>All Other Unintentional Injuries and Adverse Effects</td>
<td>Diabetes Mellitus</td>
<td>Cerebrovascular Disease</td>
</tr>
<tr>
<td>5th</td>
<td>Chronic Lower Respiratory Diseases</td>
<td>Cerebrovascular Disease</td>
<td>Nephritis, Nephrotic Syndrome, and Nephrosis</td>
<td>Alzheimer’s Disease</td>
</tr>
</tbody>
</table>

Trends in Mortality from All Causes

- ENC’s all-cause mortality rate over the 16-year trend period is decreasing. ENC’s rate is not decreasing as quickly as NC and RNC, creating an increase in regional disparity.
- The age-adjusted, all-cause mortality rate for ENC is decreasing over the 36 year period. Over the 16-year period, the trend shows greater decrease, and suggests the ENC rate will converge with the RNC and NC rates. ENC’s fitted rate continues to remain 8% greater than the rate for RNC for 2014.
- The non-White male mortality rate remains higher than the other demographic groups but has had the greatest rate of decrease (30%) in the
16-year trend. Convergence of the non-White male rate with the White male rate is suggested in the near future.

- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 12% greater than the White rate, but the recent 16 year trend suggests they will converge.
- Over the recent 16 year period there is a 56% decrease in racial disparity, in a reliable trend.

Trends in Premature Mortality from All Causes of Death

- ENC’s premature mortality rate has decreased by 13% over the 16 year period since 1999. However, this trend is diverging slightly from both RNC and NC, whose premature mortality rates decreased by 15% and 14%, respectively.
- The age-adjusted premature mortality rate trend is also decreasing, but remains 23% higher than the RNC rate in 2014.
- The non-White male rate is significantly higher than the rates for any other demographic group, but also has the highest rate of decrease (slope of trend). White females have the lowest rate and also the lowest rate of decrease.
- The non-White rate remains 38% greater than the White rate.
- A recent decrease in the premature mortality rate for non-Whites and leveling of the rates for Whites suggests a reduction in racial disparity.

Diseases of the Heart

- ENC’s heart disease mortality rate trend is decreasing but not as quickly as the decrease for RNC and NC, resulting in an increased geographic disparity. In 1999, the fitted rate for ENC was 9% greater than RNC; by 2014 it was 17% greater than RNC.
- While ENC’s age-adjusted mortality rate is decreasing at a pace equal to RNC, the ENC fitted rate remains 19% greater than RNC in 2014.
- The non-White male rate remains the highest but convergence with the White male rate is suggested in the future. The non-White female rate remains slightly higher than the White female rate but is decreasing more quickly and is suggested to fall below White females in the future.
- While the non-White rate remains 9% greater than the rate for Whites, the 16-year trends for both are decreasing, and convergence is suggested in the future.
- While the 36-year trend suggests an increase in racial disparity, the moderately reliable 16-year trend line for racial disparity suggests a 41% decrease.

Cancer – Trachea, Bronchus, Lung

- While the 36-year trends for Cancer—TBL indicate that all mortality rates are continuing to increase, the 16-year trend line suggests a slight decrease in all three regions, although the trend line for ENC is unreliable.
- In 2014, the age-adjusted rate trend for ENC is 10% above the RNC rate and 24% above the US rate. During the period 1999-2014, the ENC rates have decreased at the same rate as NC.
- The mortality rates for males are decreasing. Female rates are increasing slightly, although the trends for females are unreliable. In 2014 the non-White male rate was the highest, but is decreasing the most quickly and will likely converge with the trend for White males in the next few years.
- The non-White mortality rate is consistently lower than the White rate. Both rates are decreasing over the 16 year period, but the non-White rate is decreasing more quickly.
- The 14-year trend for racial disparity shows decrease, but is not reliable.
Cerebrovascular Disease

- ENC’s cerebrovascular disease mortality trend line is decreasing in a similar trend to RNC and NC.
- While the ENC age-adjusted cerebrovascular disease mortality rate is 7% greater than the rate for the rest of the state, it is decreasing and converging on the RNC and NC rates. The Healthy People 2010 goal of less than 48 deaths per 100,000 was met in 2010, but the rate ticked up slightly to 50 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. The greatest relative improvement in cerebrovascular disease mortality over 16 years is by White females who experienced a 56% decrease. The non-White male rate is decreasing and converging with White males, but is still 52% greater in 2014.
- The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of whites but was still 40% greater than the White rate in 2014.
- The 16-year trend for racial disparity is unreliable.

Chronic Lower Respiratory Diseases

- CLRD mortality rates for ENC, RNC, and NC have leveled during the last 16 years. In 1999, the ENC trend was 1% less than RNC; in 2014 the ENC was 8% less than RNC.
- The 16-year CLRD age-adjusted rate for ENC is decreasing at a faster pace than the US rate. In 2014, the ENC rate trend was 8% less than RNC compared to 1999 when the ENC rate was 6% greater than RNC.
- Fitted rates for non-White males and White males have decreased over 16 years by 35% and 28%, respectively. The rate for White males remains the highest and although decreasing, is diverging from the non-White male rate. The 16-year trends for White females and non-White females have decreased by 13% and 9%, respectively.
- The 16-year White morality rates are greater than non-White rates and the rate of decline is less for Whites, leading to a divergence more favorable to non-Whites.
- There is a 29% decrease in the disparity between White rates and non-White rates in a reliable trend.

Diabetes Mellitus

- According to the 16-year trend, all diabetes mellitus mortality rates are decreasing but the rate of decline is less for ENC suggesting a divergence from RNC and NC. In 1999, the ENC trend was 37% greater than RNC; in 1999 ENC was 32% greater than RNC.
- The 16-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 24% for ENC. In 2014, the ENC age-adjusted diabetes mellitus rate trend remained 39% greater than RNC and 33% greater than the US.
- Rates for all subgroups are decreasing over the recent 16 year period. Rates for non-White males remain the highest. The rate for White males is decreasing the least (14% over 16 years).
- The non-White mortality rate trend decreased over 16 years by 27% but remain 128% greater than the White rate in 2014.
- The decreasing trend for racial disparity is moderately reliable and suggests a 13% decrease in racial disparity.

All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects is increasing in ENC (62% increase over 16 years). The trends for RNC and NC are also increasing and all are expected to converge in the near future.
- The age-adjusted mortality rate trend for ENC, RNC and NC are increasing. All three increased 35% or more over the 16 years.
The 16 year trends for White males and White females are increasing significantly (65% and 114% increase, respectively). Mortality rates for non-White males decreased 17% over 16 years. The trend for non-White females is relatively level, but not reliable.

White rates have increased 82% over the 16 year period. Non-White rates have dropped below white rates, but the trend is unreliable.

Between 1999 and 2014, racial disparity has decreased by 576%, eliminating the unfavorable disparity in relation to whites, and favoring non-Whites.

Alzheimer’s Disease

The Alzheimer’s mortality rate for ENC shows a 104% increase over the 16 year period. ENC’s rate of increase was larger than RNC (44%) and NC (56%) but the rate trend for ENC still remains 29% less than RNC.

In 2014, the age-adjusted rate trend for ENC is even with the US rate and has increased 66% over the 16 years. This is a larger increase than both RNC and NC (30% and 36% respectively), although those rates are higher.

The mortality rates for females, both White and non-White, are greater than that of non-White and White males in an the 16-year trend.

The non-White mortality rate for Alzheimer’s remains 2% less than the White mortality rate in 2014 but the 16-year trend suggests convergence in the near future.

The 16-year moderately-reliable trend suggests a future increase in disparity that favors whites.

Nephritis, Nephrotic Syndrome, and Nephrosis

Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 18% over 16 years. The other regions have also experienced the same increase during this time period, ENC rates were 14% greater than RNC in 2014.

With age-adjustment, ENC has flat lined in the unreliable 16 year trend.

The 16 year trends for non-White males and females are moderately reliable and continually above those for White males and females. The demographic group with the greatest rate of increase is White males, increasing 22% over 16 years.

In 2014, the non-White rate trend was 115% greater than the White rate, but is not reliable.

The trend for racial disparity is moderately reliable and suggests a 28% decrease in racial disparity.

Cancer - Colon, Rectum, Anus

Mortality rates due to colon, rectum, and anus cancer have decreased by 22% for ENC, which is less than the rates of decrease for RNC and NC. The rate trend for ENC was 8% greater than RNC in 2014.

With age-adjustment, ENC’s rate has decreased by 34%, which is relatively consistent with the rates of RNC, NC, and the US. In 2014, the ENC rate trend was 8% greater than RNC.

The 16 year trends for all demographic groups appear to be decreasing, although non-White males are decreasing at a slower rate then the others, and diverging from the others.

Non-White mortality rates decreased by 33% while the rate for Whites decreased by 36%. The 2014 non-White rate trend was 39% greater than the White rate trend.

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 16 year period. The ENC rate in 2016 is 10% less 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 9% 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 8% less than the White rate in 2014. Both are decreasing.
- The 16-year decreasing trend for racial disparity is unreliable.

Cancer – All Sites
- The cancer – all sites mortality rate trends for ENC have decreased slightly (3%) over 16 years. The RNC and NC rates have decreased more than ENC, causing these rates to diverge.
- The age-adjusted cancer – all sites mortality rates trends for ENC, RNC, NC and the US are all decreasing at about the same pace, although the ENC rate trend is 7% greater than RNC, and 11% greater than the US.
- The rates for non-White males has decreased 33% over 16 years, and is projected to converge with the rate for White males, which show a 21% decrease. The rates for White females and non-White females show a slight decrease and are converging.
- Both White and non-White cancer mortality trends are decreasing over the 16 year period, although the non-White rate remains higher. Non-White rates decreased 25% and White rates decreased 16%, suggesting future convergence.
- The moderately reliable 16-year trend for racial disparity shows a 63% decrease.

HIV Disease
- The fitted HIV mortality rate for ENC has been decreasing over the past 16 years, but was still 67% greater than RNC in 2014.
- The 16 year age-adjusted rate trend for ENC had a 58% decrease. The 2014 ENC rate is 74% greater than RNC.
- Non-White males continue to have the highest rates of age-adjusted mortality, but this rate has also decreased 67% in a 16-year reliable trend. The White male rate decreased 50% during that same period and the rate for non-White females decreased 49%. A convergence of the non-White male rate with other rates is expected in the near future.
- The 16-year non-White age-adjusted HIV mortality rate has decreased by 60% in a reliable trend. The age-adjusted mortality rate for Whites decreased by 48%, although the absolute rate for this group is much lower.
- In a moderately reliable trend, the 16-year period shows a 27% increase in racial disparity.
3. Methods, Interpretation, and References

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

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

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

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

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

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

Age-adjusted rates for both mortality and premature mortality have little intrinsic meaning, however, and can mask the burden and trends of mortality (or health event) that may be of local importance. A casual inspection of adjusted rates may divert attention from the actual health problems of a population and inappropriately guide interventions or resource allocation. Thus, it is important to consider the actual number of deaths (count data) in conjunction with the basic non-adjusted mortality rate first, and then use the adjusted rate only if one wishes to factor out age in understanding the pattern of mortality among populations and regions. For regions with larger populations the statistics presented here are for the year 2014. Smaller areas like counties will usually be aggregated into 5-year intervals (e.g., 2010 to 2014). A five-year interval is used because it provides a useful summary of the mortality experience while minimizing wide year-to-year fluctuations in the rate due to the effect of small numbers.

Interpreting the Pie Charts
Pie charts are provided as a visual representation of the burden of mortality. They depict the proportion of mortality accounted for by each of the leading contributors. (The leading causes of death are found in the table preceding the pie chart section.) The pie charts compare the relative levels of burden and proportions by region and demographic groups. Each regional and demographic set of pie charts is based on the observed mortality rate and the age-adjusted (expected) mortality rate.

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

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

Interpreting the Trend Figures
Four types of figures are used to show trends in mortality, for all causes combined, and for each of the ten leading causes in the region/county over a 36-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 36 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 2014) 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 ENC41’s age-adjusted mortality rate series for a selected cause of death. For chronic lower respiratory diseases (1979 to 2014), the 2005 expected or fitted age-adjusted rate is calculated to be 46.5 deaths per 100,000 people. The observed age-adjusted rate for 2005 is 47 deaths per 100,000 people. (The observed rates are the values found in the table that runs along the x-axis of the time series chart.) The numeric difference between the expected and observed rates for 2005 is .5—the model (the equation of the line) underestimates the observed value by .5 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 (R²) 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) R² approaches 0.0, when the variation is low, R² approaches 1.0. A low R² implies low reliability and a larger R² indicates that a greater degree of confidence can be placed in the trend line. The trend lines are generally unreliable when R² is less than 0.10, moderately reliable when R² is between 0.10 and 0.35, and most reliable when R² is equal to or greater than 0.35. Graphically, data points, data lines and trend lines are weighted according to their reliability and significance. The thinnest, trend lines are for those where R² is less than 0.10 and should be considered not reliable. The thickest lines are used for trends where the R² is equal to or greater than 0.35. In some cases, the trend lines do not fit the data well (i.e. small R²). 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 (1999-2014). 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 2014 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, ENC41’s age-adjusted fitted rate for chronic lower respiratory diseases in 1999 is 6% greater than (GT) RNC’s fitted rate. In 2014, ENC41’s fitted rate is 8% less than (LT) RNC’s fitted rate. The tables permit a quick assessment of trends calculated from observed time series data.

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

Several caveats are offered about the concepts of race, gender, and geography as they apply to the analysis of mortality patterns. While we do intend to bring attention to the stark racial inequalities in mortality across North Carolina, we do not mean to imply that this is a biological phenomenon. Other factors such as differences in socioeconomic status, educational attainment, occupation, and lifestyle probably account for the large racial gaps in mortality rates. Likewise, gender inequalities may have less to do with biological differences between men and women than with socially structured gender roles, health behaviors, occupational exposures, and use of health services. Finally, it is important to consider that county borders may not always be the most appropriate way to look at specific health problems. Few of our health care problems begin or end at political boundary lines and many of our health problems in North Carolina are common to large groups of counties. Counties and larger regions composed of counties are convenient units of data collection and readers should not jump to conclusions about health problems or possible solutions based solely on the way data appear when aggregated to this level. In some cases, data at multi-county, zip code, or minor civil division levels are a better way to understand problems and solutions. Similarly, as indicated in Healthy Carolinians 2020, consideration needs to be given to whether or not a county is characterized as rural or urban, as this can be an indication to the level of development and amount of resources available in a county.
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 ENC41 (2014), NC (2014), and US (2014). Mortality rate per 100,000 population.

ENC41

910 deaths/100,000

North Carolina

874 deaths/100,000

United States

824 deaths/100,000

Cancer - All Sites

Diabetes Mellitus

Diseases of Heart

Alzheimers Disease

Cerebrovascular Disease

All Other Unintentional Injuries and Adverse Effects

Chronic Lower Respiratory Diseases

All Other Deaths

2014 NC rate is 6% higher than 2009 US rate

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.1 ii. General leading causes of death for ENC41 (2014), NC (2014), and US (2014). Age-adjusted mortality rate per 100,000 population.

ENC41
- 860 deaths/100,000
- 23% Cancer - All Sites
- 22% Diseases of Heart
- 5% Cerebrovascular Disease
- 6% Chronic Lower Respiratory Diseases
- 4% All Other Unintentional Injuries and Adverse Effects
- 4% Other
- 40%

North Carolina
- 816 deaths/100,000
- 23% Cancer - All Sites
- 21% Diseases of Heart
- 5% Cerebrovascular Disease
- 6% Chronic Lower Respiratory Diseases
- 4% All Other Unintentional Injuries and Adverse Effects
- 4% Other
- 40%

United States
- 725 deaths/100,000
- 23% Cancer - All Sites
- 22% Diseases of Heart
- 6% Cerebrovascular Disease
- 5% Chronic Lower Respiratory Diseases
- 4% All Other Unintentional Injuries and Adverse Effects
- 4% Other
- 40%

2014 NC age-adjusted rate is 13% higher

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.2 i. General leading causes of death for ENC41 (2014) by race and gender. Mortality rate per 100,000 population.

- Non-White Males: 913 deaths/100,000
- White Males: 963 deaths/100,000

2014 ENC41 NWM rate is 5% lower than 2014 ENC41 WM rate

- Non-White Females: 804 deaths/100,000
- White Females: 914 deaths/100,000

2014 ENC41 NWF rate is 12% lower than 2014 ENC41 WF rate

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.2 ii. General leading causes of death for ENC41 (2014) by race and gender. Age-adjusted mortality rate per 100,000 population.

- **Non-White Males**: 24% Cancer - All Sites, 21% Diseases of Heart, 4% Cerebrovascular Disease, 5% Chronic Lower Respiratory Diseases, 5% Diabetes Mellitus, 5% Homocide, 2% Alzheimer’s Disease, 5% All Other Unintentional Injuries and Adverse Effects, 5% All Other Deaths.

- **White Males**: 25% Cancer - All Sites, 23% Diseases of Heart, 6% Cerebrovascular Disease, 5% Chronic Lower Respiratory Diseases, 5% Diabetes Mellitus, 6% Homocide, 2% Alzheimer’s Disease, 6% All Other Unintentional Injuries and Adverse Effects, 6% All Other Deaths.

- **Non-White Females**: 42% Cancer - All Sites, 6% Diseases of Heart, 6% Cerebrovascular Disease, 6% Chronic Lower Respiratory Diseases, 6% Diabetes Mellitus, 6% Homocide, 6% Alzheimer’s Disease, 6% All Other Unintentional Injuries and Adverse Effects, 6% All Other Deaths.

- **White Females**: 40% Cancer - All Sites, 21% Diseases of Heart, 7% Cerebrovascular Disease, 7% Chronic Lower Respiratory Diseases, 7% Diabetes Mellitus, 7% Homocide, 7% Alzheimer’s Disease, 7% All Other Unintentional Injuries and Adverse Effects, 7% All Other Deaths.

2014 ENC41 NWM age-adjusted rate is 22% higher than 2014 ENC41 WM age-adjusted rate.

1189 deaths/100,000

974 deaths/100,000

2014 ENC41 NWF age-adjusted rate is 12% higher than 2014 ENC41 WF age-adjusted rate.

776 deaths/100,000

696 deaths/100,000

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.3 i. General leading causes of death for ENC41 (2014) by race. Mortality rate per 100,000 population.

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.3 ii. General leading causes of death for ENC41 (2014) by race. Age-adjusted mortality rate per 100,000 population.

Non-White

- Cancer - All Sites: 23%
- Diseases of Heart: 5%
- Cerebrovascular Disease: 6%
- Diabetes Mellitus: 3%
- Chronic Lower Respiratory Diseases: 7%
- All Other Unintentional Injuries and Adverse Effects: 4%
- All Other Deaths: 5%

2014 ENC41 NW age-adjusted rate is 15% higher than 2014 ENC41 W age-adjusted rate

White

- Cancer - All Sites: 23%
- Diseases of Heart: 7%
- Cerebrovascular Disease: 4%
- Diabetes Mellitus: 5%
- Chronic Lower Respiratory Diseases: 7%
- All Other Unintentional Injuries and Adverse Effects: 5%
- All Other Deaths: 3%

943 deaths/100,000

821 deaths/100,000

Slices without percentages constitute less than 5% of the deaths within that chart.
5. Trends and Disparities in Mortality in ENC41: All Causes of Death and All Causes of Premature Mortality; 1979-2014
All Causes of Death

- ENC’s all-cause mortality rate over the 16-year trend period is decreasing. ENC’s rate is not decreasing as quickly as NC and RNC, creating an increase in regional disparity.

- The age-adjusted, all-cause mortality rate for ENC is decreasing over the 36 year period. Over the 16-year period, the trend shows greater decrease, and suggests the ENC rate will converge with the RNC and NC rates. ENC’s fitted rate continues to remain 8% greater than the rate for RNC for 2014.

- The non-White male mortality rate remains higher than the other demographic groups but has had the greatest rate of decrease (30%) in the 16-year trend. Convergence of the non-White male rate with the White male rate is suggested in the near future.

- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 12% greater than the White rate, but the recent 16 year trend suggests they will converge.

- Over the recent 16 year period there is a 56% decrease in racial disparity, in a reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 5.1 i. All Causes of Death:
Trends in mortality rates for ENC41, RNC59, and NC
1979-2014 with projections to 2020

ENC41 16-yr trendline
6% decrease
$y = -3.28x + 919.57$
R2 = 0.44

RNC59 16-yr trendline
7% decrease
$y = -3.77x + 871.79$
R2 = 0.33

NC 16-yr trendline
7% decrease
$y = -3.67x + 885.96$
R2 = 0.36

1999 ENC41 rate is 5% greater than RNC59
2014 ENC41 rate is 7% greater than RNC59

Comparison of Fitted Rates in 1999
ENC41 RNC59 NC
5% LT 4% LT ENC41
4% GT 2% LT NC

Comparison of Fitted Rates in 2014
ENC41 RNC59 NC
5% GT 2% LT RNC59
4% GT 2% LT NC
5% LT 4% LT ENC41
Figure 5.1 ii. All Causes of Death:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
20% decrease
R2 = 0.92
y = -12.67x + 1,016.83

RNC59 16-yr trendline
16% decrease
R2 = 0.86
y = -8.81x + 899.01

NC 16-yr trendline
17% decrease
R2 = 0.89
y = -9.94x + 932.98

US 16-yr trendline
20% decrease
R2 = 0.97
y = -11.18x + 888.81

1999 ENC41 rate is 13% greater than RNC59
2014 ENC41 rate is 8% greater than RNC59
Figure 5.1 iii. All Causes of Death:
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

<table>
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<th>NWM 16-yr trendline</th>
<th>WM 16-yr trendline</th>
<th>NWF 16-yr trendline</th>
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Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2014
Figure 5.1 iv. All Causes of Death:
Trends in age-adjusted mortality rates by race for ENC41,
1979-2014 with projections to 2020

NW 16-yr trendline
27% decrease
R² = 0.92
y = -19.96x + 1,192.99

W 16-yr trendline
17% decrease
R² = 0.87
y = -9.89x + 943.44

1999 non-White rate is 26% greater than White
2014 non-White rate is 12% greater than White
Figure 5.1 v. All Causes of Death:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
56% decrease
R2 = 0.63
y = -0.95x + 26.96
All Causes of Premature Mortality

- ENC’s premature mortality rate has decreased by 13% over the 16 year period since 1999. However, this trend is diverging slightly from both RNC and NC, whose premature mortality rates decreased by 15% and 14%, respectively.

- The age-adjusted premature mortality rate trend is also decreasing, but remains 23% higher than the RNC rate in 2014.

- The non-White male rate is significantly higher than the rates for any other demographic group, but also has the highest rate of decrease (slope of trend). White females have the lowest rate and also the lowest rate of decrease.

- The non-White rate remains 38% greater than the White rate.

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

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 5.2 i. All Causes of Premature Mortality:
Trends in premature mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
RNC59 16-yr trendline
NC 16-yr trendline

13% decrease 15% decrease 14% decrease
R2 = 0.81 R2 = 0.78 R2 = 0.82
y = -8.25x + 1,000.11 y = -7.67x + 835.76 y = -8.00x + 884.88

1999 ENC41 rate is 20% greater than RNC59
2014 ENC41 rate is 22% greater than RNC59

Comparison of Fitted Rates in 1999
Comparison of Fitted Rates in 2014

ENC41 RNC59 NC ENC41 RNC59 NC
16% LT 12% LT ENC41 18% LT 13% LT ENC41
20% GT 6% GT RNC59 22% GT 6% GT RNC59
13% GT 6% LT NC 15% GT 6% LT NC
Figure 5.2 ii. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

1999 ENC41 rate is 21% greater than RNC59
2014 ENC41 rate is 23% greater than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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<th>ENC41</th>
<th>RNC59</th>
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<td>3%</td>
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ENC41 16-yr trendline
RNC59 16-yr trendline
NC 16-yr trendline
US 16-yr trendline

19% decrease
20% decrease
20% decrease
17% decrease

y = -11.91x + 1,003.97
y = -10.47x + 829.38
y = -11.04x + 880.93
y = -8.11x + 776.93

R2 = 0.90
R2 = 0.88
R2 = 0.90
R2 = 0.94

1999 ENC41 rate is 21% greater than RNC59
2014 ENC41 rate is 23% greater than RNC59

19% LT
12% LT
23% LT
ENC41
14% LT
6% LT
12% LT
NC
29% GT
7% GT
13% GT
US
Figure 5.2 iii. All Causes of Premature Mortality: Trends in age-adjusted premature mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020
Figure 5.2 iv. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates by race for ENC41,
1979-2014 with projections to 2020

NW 16-yr trendline
29% decrease
R² = 0.85
y = -25.40x + 1,389.78

W 16-yr trendline
11% decrease
R² = 0.78
y = -5.75x + 815.87

1999 non-White rate is 70% greater than White
2014 non-White rate is 38% greater than White


Age-adjusted years of life lost per 10,000 population <75 years of age
Figure 5.2 v. All Causes of Premature Mortality: Measuring disparity in age-adjusted premature mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
49% decrease
R2 = 0.65
y = -2.17x + 71.18
Diseases of Heart

- ENC's heart disease mortality rate trend is decreasing but not as quickly as the decrease for RNC and NC, resulting in an increased geographic disparity. In 1999, the fitted rate for ENC was 9% greater than RNC; by 2014 it was 17% greater than RNC.

- While ENC's age-adjusted mortality rate is decreasing at a pace equal to RNC, the ENC fitted rate remains 19% greater than RNC in 2014.

- The non-White male rate remains the highest but convergence with the White male rate is suggested in the future. The non-White female rate remains slightly higher than the White female rate but is decreasing more quickly and is suggested to fall below White females in the future.

- While the non-White rate remains 9% greater than the rate for Whites, the 16-year trends for both are decreasing, and convergence is suggested in the future.

- While the 36-year trend suggests an increase in racial disparity, the moderately reliable 16-year trend line for racial disparity suggests a 41% decrease.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.1 i. Diseases of Heart:
Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
29% decrease
R2 = 0.87
y = -4.64x + 259.25

RNC59 16-yr trendline
34% decrease
R2 = 0.86
y = -5.12x + 238.77

NC 16-yr trendline
33% decrease
R2 = 0.87
y = -5.00x + 244.87

1999 ENC41 rate is 9% greater than RNC59
2014 ENC41 rate is 17% greater than RNC59

Comparison of Fitted Rates in 2014
ENC41 15% LT 10% LT ENC41
RNC59 17% GT 5% GT RNC59
NC 12% GT 5% LT NC

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

Mortality rate per 100,000 population
Figure 6.1 ii. Diseases of Heart:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
41% decrease
$R^2 = 0.94$
y = -7.42x + 290.46

RNC59 16-yr trendline
41% decrease
$R^2 = 0.94$
y = -6.33x + 245.88

NC 16-yr trendline
41% decrease
$R^2 = 0.94$
y = -6.64x + 258.49

US 16-yr trendline
42% decrease
$R^2 = 0.97$
y = -7.09x + 268.34

1999 ENC41 rate is 18% greater than RNC59
2014 ENC41 rate is 19% greater than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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</table>
Figure 6.1 iii. Diseases of Heart:
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2014

R2 = 0.85
y = -10.07x + 398.12

R2 = 0.92
y = -8.27x + 345.93

R2 = 0.93
y = -8.02x + 269.35

R2 = 0.93
y = -6.03x + 225.61
**Figure 6.1 iv. Diseases of Heart:**
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

- **NW 16-yr trendline:** 44% decrease
  - $R^2 = 0.92$
  - $y = -8.79x + 321.25$

- **W 16-yr trendline:** 40% decrease
  - $R^2 = 0.94$
  - $y = -7.00x + 278.54$

- 1999 non-White rate is 15% greater than White
- 2014 non-White rate is 9% greater than White
Figure 6.1 v. Diseases of Heart:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
41% decrease
$R^2 = 0.17$
$y = -0.40x + 15.75$
Cancer - Trachea, Bronchus, Lung

- While the 36-year trends for Cancer—TBL indicate that all mortality rates are continuing to increase, the 16-year trend line suggests a slight decrease in all three regions, although the trend line for ENC is unreliable.

- In 2014, the age-adjusted rate trend for ENC is 10% above the RNC rate and 24% above the US rate. During the period 1999-2014, the ENC rates have decreased at the same rate as NC.

- The mortality rates for males are decreasing. Female rates are increasing slightly, although the trends for females are unreliable. In 2014 the non-White male rate was the highest, but is decreasing the most quickly and will likely converge with the trend for White males in the next few years.

- The non-White mortality rate is consistently lower than the White rate. Both rates are decreasing over the 16 year period, but the non-White rate is decreasing more quickly.

- The 14-year trend for racial disparity shows decrease, but is not reliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.2 i. Cancer - Trachea, Bronchus, Lung:
Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
3% decrease
R^2 = 0.10
y = -0.13x + 63.47

RNC59 16-yr trendline
9% decrease
R^2 = 0.66
y = -0.36x + 60.16

NC 16-yr trendline
8% decrease
R^2 = 0.59
y = -0.30x + 61.15

1999 ENC41 rate is 6% greater than RNC59
2014 ENC41 rate is 12% greater than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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Report #2.203, February 2017
Health Systems Research and Development, Dept. of Public Health, ECU
Page 6.8
Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
19% decrease
R2 = 0.80
y = -0.81x + 67.13

RNC59 16-yr trendline
19% decrease
R2 = 0.85
y = -0.73x + 60.99

NC 16-yr trendline
19% decrease
R2 = 0.87
y = -0.75x + 62.78

US 16-yr trendline
26% decrease
R2 = 0.97
y = -0.94x + 58.40

1999 ENC41 rate is 10% greater than RNC59
2014 ENC41 rate is 10% greater than RNC59

Comparison of Fitted Rates in 1999
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Comparison of Fitted Rates in 2014
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Figure 6.2 iii. Cancer - Trachea, Bronchus, Lung: Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
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<tr>
<th>NWM 16-yr trendline</th>
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<tr>
<td>39% decrease</td>
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<td>R2 = 0.14</td>
<td>R2 = 0.01</td>
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<td>y = -2.87x + 119.19</td>
<td>y = -1.89x + 101.04</td>
<td>y = 0.21x + 27.24</td>
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Comparison of Fitted Rates in 2014

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<th>NWF 16-yr trendline</th>
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<th>NWM 16-yr trendline</th>
<th>WM 16-yr trendline</th>
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NWM 16-yr trendline
WM 16-yr trendline
NWF 16-yr trendline
WF 16-yr trendline

39% decrease 30% decrease 13% increase
R2 = 0.70 R2 = 0.85 R2 = 0.14 R2 = 0.01
y = -2.87x + 119.19 y = -1.89x + 101.04 y = 0.21x + 27.24 y = -0.06x + 46.10
Figure 6.2 iv. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

NW 16-yr trendline
23% decrease
R2 = 0.58
y = -0.89x + 62.15

W 16-yr trendline
18% decrease
R2 = 0.76
y = -0.77x + 68.82

1999 non-White rate is 10% less than White
2014 non-White rate is 15% less than White
Figure 6.2 v. Cancer - Trachea, Bronchus, Lung: Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity

\[ R^2 = 0.05 \]
\[ y = -0.40x - 11.35 \]
Cerebrovascular Disease

- ENC’s cerebrovascular disease mortality trend line is decreasing in a similar trend to RNC and NC.

- While the ENC age-adjusted cerebrovascular disease mortality rate is 7% greater than the rate for the rest of the state, it is decreasing and converging on the RNC and NC rates. The Healthy People 2010 goal of less than 48 deaths per 100,000 was met in 2010, but the rate has ticked up slightly to 50 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. The greatest relative improvement in cerebrovascular disease mortality over 16 years is by White females who experienced a 56% decrease. The non-White male rate is decreasing and converging with White males, but is still 52% greater in 2014.

- The cerebrovascular disease mortality rate for non-Whites is decreasing and converging with that of whites but was still 40% greater than the White rate in 2014.

- The 16-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 ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
42% decrease
R2 = 0.80
y = -1.91x + 72.38

RNC59 16-yr trendline
44% decrease
R2 = 0.86
y = -1.96x + 70.67

NC 16-yr trendline
44% decrease
R2 = 0.85
y = -1.95x + 71.18

1999 ENC41 rate is 2% greater than RNC59
2014 ENC41 rate is 6% greater than RNC59

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Figure 6.3 ii. Cerebrovascular Disease:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
53% decrease
R2 = 0.87
y = -2.74x + 82.53

RNC59 16-yr trendline
50% decrease
R2 = 0.91
y = -2.30x + 73.32

NC 16-yr trendline
51% decrease
R2 = 0.91
y = -2.42x + 75.97

US 16-yr trendline
48% decrease
R2 = 0.96
y = -1.90x + 62.94

1999 ENC41 rate is 13% greater than RNC59
2014 ENC41 rate is 7% greater than RNC59
Figure 6.3 iii. Cerebrovascular Disease: Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020.
Figure 6.3 iv. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

1999 non-White rate is 44% greater than White
2014 non-White rate is 40% greater than White

NW 16-yr trendline
54% decrease
y = -3.58x + 105.65
R² = 0.91

W 16-yr trendline
53% decrease
y = -2.43x + 73.55
R² = 0.83
Figure 6.3 v. Cerebrovascular Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity

\[ R^2 = 0.04 \]
\[ y = -0.44x + 46.15 \]
Chronic Lower Respiratory Diseases

- CLRD mortality rates for ENC, RNC, and NC have leveled during the last 16 years. In 1999, the ENC trend was 1% less than RNC; in 2014 the ENC was 8% less than RNC.

- The 16-year CLRD age-adjusted rate for ENC is decreasing at a faster pace than the US rate. In 2014, the ENC rate trend was 8% less than RNC compared to 1999 when the ENC rate was 6% greater than RNC.

- Fitted rates for non-White males and White males have decreased over 16 years by 35% and 28%, respectively. The rate for White males remains the highest and although decreasing, is diverging from the non-White male rate. The 16-year trends for White females and non-White females have decreased by 13% and 9%, respectively.

- The 16-year White mortality rates are greater than non-White rates and the rate of decline is less for Whites, leading to a divergence more favorable to non-Whites.

- There is a 29% decrease in the disparity between White rates and non-White rates in a reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.4 i. Chronic Lower Respiratory Diseases:
Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
9% increase
R2 = 0.20
y = 0.23x + 43.32

RNC59 16-yr trendline
16% increase
R2 = 0.51
y = 0.45x + 43.89

NC 16-yr trendline
14% increase
R2 = 0.49
y = 0.39x + 43.71

1999 ENC41 rate is 1% less than RNC59
2014 ENC41 rate is 8% less than RNC59

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

Comparison of Fitted Rates in 2014
ENC41 RNC59 NC
1% LT 1% GT ENC41

ENC41 16-yr trendline
9% increase
R2 = 0.20
y = 0.23x + 43.32

RNC59 16-yr trendline
16% increase
R2 = 0.51
y = 0.45x + 43.89

NC 16-yr trendline
14% increase
R2 = 0.49
y = 0.39x + 43.71

1999 ENC41 rate is 1% less than RNC59
2014 ENC41 rate is 8% less than RNC59

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

Comparison of Fitted Rates in 2014
ENC41 RNC59 NC
1% LT 1% GT ENC41
Figure 6.4 ii. Chronic Lower Respiratory Diseases: Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
9% decrease
R2 = 0.31
y = -0.28x + 48.41

RNC59 16-yr trendline
6% increase
R2 = 0.20
y = 0.17x + 45.59

NC 16-yr trendline
7% decrease
R2 = 0.02
y = 0.04x + 46.37

US 16-yr trendline
7% decrease
R2 = 0.47
y = -0.21x + 44.59

1999 ENC41 rate is 6% greater than RNC59
2014 ENC41 rate is 8% less than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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Figure 6.4 iii. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race and gender for ENC41,
1979-2014 with projections to 2020

NWM 16-yr trendline
35% decrease
R2 = 0.55
y = -1.35x + 62.48

WM 16-yr trendline
28% decrease
R2 = 0.71
y = -1.27x + 73.23

NWF 16-yr trendline
13% increase
R2 = 0.11
y = 0.15x + 18.05

WF 16-yr trendline
9% increase
R2 = 0.25
y = 0.25x + 43.17

Comparison of Fitted Rates in 1999
NWM WM NWF WF
17% GT 71% LT 31% LT 11% GT

Comparison of Fitted Rates in 2014
NWM WM NWF WF
29% GT 53% LT 11% GT 13% LT
Figure 6.4 iv. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

1999 non-White rate is 38% less than White
2014 non-White rate is 44% less than White

NW 16-yr trendline
R2 = 0.33
y = -0.36x + 33.40
17% decrease

W 16-yr trendline
R2 = 0.23
y = -0.26x + 53.97
8% decrease

Performing regression analysis on the white and non-white population groups:
- White population
  - Equation: y = -0.26x + 53.97
  - R-squared: 0.23
  - 8% decrease
- Non-white population
  - Equation: y = -0.36x + 33.40
  - R-squared: 0.33
  - 17% decrease
Figure 6.4 v. Chronic Lower Respiratory Diseases:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
29% decrease
$R^2 = 0.15$
$y = -1.12x - 62.53$
Diabetes Mellitus

- According to the 16-year trend, all diabetes mellitus mortality rates are decreasing but the rate of decline is less for ENC suggesting a divergence from RNC and NC. In 2014, the rate trend for ENC was 37% greater than RNC. In 1999 ENC was 32% greater than RNC.

- The 16-year trend for age-adjusted diabetes mellitus mortality rates shows a decrease of 24% for ENC. In 2014, the ENC age-adjusted diabetes mellitus rate trend remained 39% greater than RNC and 33% greater than the US.

- Rates for all subgroups are decreasing over the recent 16 year period. Rates for non-White males remain the highest. The rate for White males is decreasing the least (14% over 16 years).

- The non-White mortality rate trend decreased over 16 years by 27% but remain 128% greater than the White rate in 2014.

- The decreasing trend for racial disparity is moderately reliable and suggests a 13% decrease in racial disparity.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.5 i. Diabetes Mellitus:
Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

Comparison of Fitted Rates in 1999

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<tr>
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Comparison of Fitted Rates in 2014

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<tr>
<td>GT</td>
<td>37%</td>
<td>11%</td>
<td>RNC59</td>
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</tbody>
</table>

- ENC41 16-yr trendline: 9% decrease
  - $R^2 = 0.23$
  - $y = -0.19x + 32.56$
- RNC59 16-yr trendline: 13% decrease
  - $R^2 = 0.22$
  - $y = -0.20x + 24.65$
- NC 16-yr trendline: 12% decrease
  - $R^2 = 0.26$
  - $y = -0.21x + 27.01$

1999 ENC41 rate is 32% greater than RNC59
2014 ENC41 rate is 37% greater than RNC59

21% GT 9% LT NC
Figure 6.5 ii. Diabetes Mellitus:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020
Figure 6.5 iii. Diabetes Mellitus:
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

- NWM 16-yr trendline (15% decrease, R² = 0.24, y = -0.56x + 61.27)
- WM 16-yr trendline (14% decrease, R² = 0.27, y = -0.25x + 28.95)
- NWF 16-yr trendline (35% decrease, R² = 0.67, y = -1.34x + 61.60)
- WF 16-yr trendline (28% decrease, R² = 0.54, y = -0.39x + 22.27)

Comparison of Fitted Rates in 1999
- NWM: 52% LT, 1% GT
- WM: 110% GT, 22% LT
- NWF: 27% GT, 39% LT
- WF: 222% GT, 53% GT

Comparison of Fitted Rates in 2014
- NWM: 112% GT, 1% LT
- WM: 65% GT, 35% LT
- NWF: 27% GT, 39% LT
- WF: 177% GT, 53% GT
Figure 6.5 iv. Diabetes Mellitus:
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

NW 16-yr trendline
W 16-yr trendline

27% decrease  21% decrease

R2 = 0.65  R2 = 0.53

y = -1.06x + 62.09  y = -0.34x + 25.35

1999 non-White rate is 145% greater than White
2014 non-White rate is 128% greater than White
Figure 6.5 v. Diabetes Mellitus:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
13% decrease
R² = 0.10
y = -1.22x + 146.98
All Other Unintentional Injuries and Adverse Effects

- Mortality from unintentional injuries and adverse effects is increasing in ENC (62% increase over 16 years). The trends for RNC and NC are also increasing and all are expected to converge in the near future.

- The age-adjusted mortality rate trend for ENC, RNC and NC are increasing. All three increased 35% or more over the 16 years.

- The 16 year trends for White males and White females are increasing significantly (65% and 114% increase, respectively). Mortality rates for non-White males decreased 17% over 16 years. The trend for non-White females is relatively level, but not reliable.

- White rates have increased 82% over the 16 year period. Non-White rates have dropped below white rates, but the trend is unreliable.

- Between 1999 and 2014, racial disparity has decreased by 576%, 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 ENC41, RNC59, and NC, 1979-2014 with projections to 2020.

ENC41 16-yr trendline
62% increase
R2 = 0.88
y = 0.77x + 20.13

RNC59 16-yr trendline
42% increase
R2 = 0.83
y = 0.59x + 22.72

NC 16-yr trendline
47% increase
R2 = 0.90
y = 0.64x + 21.96

Comparison of Fitted Rates in 1999
ENC41 13% GT RNC59 9% GT ENC41
RNC59 11% LT ENC41
NC

Comparison of Fitted Rates in 2014
ENC41 1% LT RNC59 0% LT ENC41
RNC59 8% LT 3% GT ENC41
NC 0% LT 0% GT RNC59
NC

1999 ENC41 rate is 11% less than RNC59
2014 ENC41 rate is 1% greater than RNC59
Figure 6.6 ii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020.

- ENC41 16-yr trendline: 49% increase, $R^2 = 0.85$, $y = 0.67x + 21.64$
- RNC59 16-yr trendline: 35% increase, $R^2 = 0.76$, $y = 0.50x + 23.16$
- NC 16-yr trendline: 38% increase, $R^2 = 0.86$, $y = 0.55x + 22.78$
- US 16-yr trendline: 56% increase, $R^2 = 0.97$, $y = 0.67x + 19.01$

- 1999 ENC41 rate is 7% less than RNC59
- 2014 ENC41 rate is 3% greater than RNC59
Figure 6.6 iii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

- **NWM 16-yr trendline:** 17% decrease  
  \[ R^2 = 0.12 \]  
  \[ y = -0.41x + 37.47 \]

- **WM 16-yr trendline:** 65% increase  
  \[ R^2 = 0.87 \]  
  \[ y = 1.16x + 28.51 \]

- **NWF 16-yr trendline:** 114% increase  
  \[ R^2 = 0.01 \]  
  \[ y = 0.05x + 13.95 \]

- **WF 16-yr trendline:** 17% decrease  
  \[ R^2 = 0.90 \]  
  \[ y = 0.93x + 13.04 \]
Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

1999 non-White rate is 18% greater than White
2014 non-White rate is 40% less than White
Figure 6.6 v. All Other Unintentional Injuries and Adverse Effects: Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
576% decrease
R2 = 0.66
y = -5.38x + 14.97
Alzheimer’s Disease

- The Alzheimer’s mortality rate for ENC shows a 104% increase over the 16 year period. ENC’s rate of increase was larger than RNC (44%) and NC (56%) but the rate trend for ENC still remains 29% less than RNC.

- In 2014, the age-adjusted rate trend for ENC is even with the US rate and has increased 66% over the 16 years. This is a larger increase than both RNC and NC (30% and 36% respectively), although those rates are higher.

- The mortality rates for females, both White and non-White, are greater than that of non-White and White males in an the 16-year trend.

- The non-White mortality rate for Alzheimer’s remains 2% less than the White mortality rate in 2014 but the 16-year trend suggests convergence in the near future.

- The 16-year moderately-reliable trend suggests a future increase in disparity that favors whites.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.7 i. Alzheimer’s Disease:
Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
RNC59 16-yr trendline
NC 16-yr trendline

104% increase
44% increase
56% increase

R2 = 0.90
R2 = 0.83
R2 = 0.89

y = 0.80x + 12.26
y = 0.66x + 24.01
y = 0.71x + 20.52

1999 ENC41 rate is 49% less than RNC59
2014 ENC41 rate is 29% less than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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<td>22% LT</td>
<td>9% GT</td>
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Figure 6.7 ii. Alzheimer’s Disease:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline 66% increase
R2 = 0.81
y = 0.63x + 15.36

RNC59 16-yr trendline 30% increase
R2 = 0.60
y = 0.48x + 25.77

NC 16-yr trendline 36% increase
R2 = 0.72
y = 0.52x + 22.97

US 16-yr trendline 41% increase
R2 = 0.70
y = 0.48x + 18.65

1999 ENC41 rate is 40% less than RNC59
2014 ENC41 rate is 24% less than RNC59
Figure 6.7 iii. Alzheimer’s Disease:
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

NWM 16-yr trendline
130% increase
\[ R^2 = 0.56 \]
\[ y = 0.78x + 9.66 \]

WM 16-yr trendline
52% increase
\[ R^2 = 0.56 \]
\[ y = 0.43x + 13.23 \]

NWF 16-yr trendline
107% increase
\[ R^2 = 0.70 \]
\[ y = 0.86x + 12.88 \]

WF 16-yr trendline
56% increase
\[ R^2 = 0.73 \]
\[ y = 0.64x + 18.32 \]
Figure 6.7 iv. Alzheimer’s Disease:
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

1999 non-White rate is 28% less than White
2014 non-White rate is 2% less than White
Figure 6.7 v. Alzheimer’s Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
106% increase
R^2 = 0.43
y = 2.26x - 34.26
Nephritis, Nephrotic Syndrome, and Nephrosis

- Mortality due to nephritis, nephrotic syndrome, and nephrosis in ENC has increased by 18% over 16 years. The other regions have also experienced the same increase during this time period, ENC rates were 14% greater than RNC in 2014.
- With age-adjustment, ENC has flat lined in the unreliable 16 year trend.
- The 16 year trends for non-White males and females are moderately reliable and continually above those for White males and females. The demographic group with the greatest rate of increase is White males, increasing 22% over 16 years.
- In 2014, the non-White rate trend was 115% greater than the White rate, but is not reliable.
- The trend for racial disparity is moderately reliable and suggests a 28% decrease in racial disparity.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.8 i. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
18% increase
R2 = 0.34
y = 0.20x + 17.64

RNC59 16-yr trendline
18% increase
R2 = 0.44
y = 0.17x + 15.56

NC 16-yr trendline
18% increase
R2 = 0.43
y = 0.18x + 16.18

1999 ENC41 rate is 13% greater than RNC59
2014 ENC41 rate is 14% greater than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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Figure 6.8 ii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline  RNC59 16-yr trendline  NC 16-yr trendline  US 16-yr trendline

R2 = 0.00  R2 = 0.07  R2 = 0.04  R2 = 0.01
y = 0.01x + 19.82  y = 0.06x + 16.21  y = 0.05x + 17.24  y = -0.02x + 14.33

1999 ENC41 rate is 22% greater than RNC59
2014 ENC41 rate is 16% greater than RNC59

Comparison of Fitted Rates in 1999

ENC41  RNC59  NC  US  ENC41  RNC59  NC  US
18% LT  13% LT  28% LT  ENC41  14% LT  10% LT  29% LT  ENC41
22% GT  6% GT  12% LT  RNC59  16% GT  5% GT  18% LT  RNC59
15% GT  6% LT  17% LT  NC  11% GT  4% LT  22% LT  NC
38% GT  13% GT  20% GT  US  42% GT  22% GT  27% GT  US

Comparison of Fitted Rates in 2014

ENC41  RNC59  NC  US  ENC41  RNC59  NC  US
16% GT  10% LT  29% LT  ENC41  14% LT  10% LT  29% LT  ENC41
14% GT  6% GT  12% LT  RNC59  16% GT  5% GT  18% LT  RNC59
15% GT  6% LT  17% LT  NC  11% GT  4% LT  22% LT  NC
38% GT  13% GT  20% GT  US  42% GT  22% GT  27% GT  US
Figure 6.8 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

- NWM 16-yr trendline: R² = 0.02
- WM 16-yr trendline: R² = 0.21
- NWF 16-yr trendline: R² = 0.11
- WF 16-yr trendline: R² = 0.01

Comparison of fitted rates in 1999:
- NWM: 58% LT
- WM: 13% LT
- NWF: 22% LT
- WF: 47% LT

Comparison of fitted rates in 2014:
- NWM: 47% LT
- WM: 19% LT
- NWF: 37% LT
- WF: 54% LT

NWM: 16-yr trendline: y = -0.11x + 38.31
WM: 16-yr trendline: y = 0.22x + 16.03
NWF: 16-yr trendline: y = -0.23x + 33.27
WF: 16-yr trendline: y = -0.02x + 12.48
Figure 6.8 iv. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

1999 non-White rate is 152% greater than White
2014 non-White rate is 115% greater than White

NW 16-yr trendline
W 16-yr trendline

R² = 0.07
y = -0.17x + 35.04

R² = 0.08
y = 0.08x + 13.89
Figure 6.8 v. Nephritis, Nephrotic Syndrome, and Nephrosis:
Measuring disparity in age-adjusted mortality rates by race for ENC41,
1979-2014 with projections to 2020

Racial Disparity
28% decrease
R2 = 0.24
y = -2.71x + 154.72
Cancer - Colon, Rectum, Anus

- Mortality rates due to colon, rectum, and anus cancer have decreased by 22% for ENC, which is less than the rates of decrease for RNC and NC. The rate trend for ENC was 8% greater than RNC in 2014.

- With age-adjustment, ENC's rate has decreased by 34%, which is relatively consistent with the rates of RNC, NC, and the US. In 2014, the ENC rate trend was 8% greater than RNC.

- The 16 year trends for all demographic groups appear to be decreasing, although non-White males are decreasing at a slower rate than the others, and diverging from the others.

- Non-White mortality rates decreased by 33% while the rate for Whites decreased by 36%. The 2014 non-White rate trend was 39% greater than the White rate trend.

- 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 6.9i. Cancer - Colon, Rectum, Anus:
Trends in mortality rates for ENC41, RNC59, and NC,
1979-2014 with projections to 2020

ENC41 16-yr trendline
22% decrease
R2 = 0.71
y = -0.28x + 20.36

RNC59 16-yr trendline
25% decrease
R2 = 0.79
y = -0.30x + 19.53

NC 16-yr trendline
24% decrease
R2 = 0.84
y = -0.29x + 19.78

1999 ENC41 rate is 4% greater than RNC59
2014 ENC41 rate is 8% greater than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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Figure 6.9 ii. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
34% decrease
R2 = 0.89
y = -0.47x + 21.93

RNC59 16-yr trendline
33% decrease
R2 = 0.89
y = -0.41x + 19.90

NC 16-yr trendline
33% decrease
R2 = 0.93
y = -0.43x + 20.50

US 16-yr trendline
35% decrease
R2 = 0.99
y = -0.47x + 21.39

1999 ENC41 rate is 10% greater than RNC59
2014 ENC41 rate is 8% greater than RNC59

Comparison of Fitted Rates in 1999

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<tr>
<th>ENC41</th>
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Comparison of Fitted Rates in 2014

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</table>
Figure 6.9 iii. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

NWM 16-yr trendline
22% decrease
R2 = 0.33
y = -0.43x + 31.42

WM 16-yr trendline
40% decrease
R2 = 0.81
y = -0.63x + 25.40

NWF 16-yr trendline
42% decrease
R2 = 0.53
y = -0.64x + 24.07

WF 16-yr trendline
35% decrease
R2 = 0.82
y = -0.35x + 16.36

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th></th>
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<th>WM</th>
<th>NWF</th>
<th>WF</th>
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Comparison of Fitted Rates in 2014

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Age-adjusted mortality rates per 100,000 population
Figure 6.9 iv. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race for ENC41,
1979-2014 with projections to 2020

1999 non-White rate is 33% greater than White
2014 non-White rate is 39% greater than White
Figure 6.9 v. Cancer - Colon, Rectum, Anus:
Measuring disparity in age-adjusted mortality rates by race for ENC41,
1979-2014 with projections to 2020

Racial Disparity

$R^2 = 0.02$

$y = 0.35x + 33.44$
Pneumonia and Influenza

- The mortality rate trend for pneumonia and influenza for ENC, RNC and NC have all declined over the 16 year period. The ENC rate in 2016 is 10% less 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 9% 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 8% less than the White rate in 2014. Both are decreasing.

- The 16-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 ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
27% decrease
R2 = 0.52
y = -0.37x + 21.81

RNC59 16-yr trendline
29% decrease
R2 = 0.64
y = -0.45x + 24.80

NC 16-yr trendline
28% decrease
R2 = 0.64
y = -0.42x + 23.91

1999 ENC41 rate is 12% less than RNC59
2014 ENC41 rate is 10% less than RNC59

Comparison of Fitted Rates in 1999
ENC41 RNC59 NC ENC41 RNC59 NC
12% LT 14% GT 10% GT ENC41 11% GT 8% GT ENC41
9% LT 4% LT RNC59 10% LT 3% LT RNC59

Comparison of Fitted Rates in 2014
ENC41 RNC59 NC ENC41 RNC59 NC
12% LT 14% GT 10% GT ENC41 11% GT 8% GT ENC41
9% LT 4% GT RNC59 10% LT 3% LT RNC59

10% LT 7% LT 3% GT NC
Figure 6.10 ii. Pneumonia and Influenza:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
41% decrease
R2 = 0.74
y = -0.66x + 25.54

RNC59 16-yr trendline
36% decrease
R2 = 0.79
y = -0.59x + 25.97

NC 16-yr trendline
38% decrease
R2 = 0.81
y = -0.61x + 25.88

US 16-yr trendline
45% decrease
R2 = 0.91
y = -0.69x + 24.70

1999 ENC41 rate is 2% less than RNC59
2014 ENC41 rate is 8% less than RNC59

Comparison of Fitted Rates in 1999

<table>
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<tr>
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Comparison of Fitted Rates in 2014

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Figure 6.10 iii. Pneumonia and Influenza:
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
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Comparison of Fitted Rates in 2014

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<td>13% GT</td>
<td>16% GT</td>
<td>10% LT</td>
<td>13% GT</td>
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55% decrease
R² = 0.56
y = -1.20x + 34.81

43% decrease
R² = 0.75
y = -0.79x + 29.03

38% decrease
R² = 0.48
y = -0.49x + 20.82

39% decrease
R² = 0.69
y = -0.57x + 23.45

NWM 16-yr trendline
WM 16-yr trendline
NWF 16-yr trendline
WF 16-yr trendline

17% LT
40% LT
33% LT
2% GT
20% LT
12% LT
NWM

20% GT
28% LT
19% LT
WM

28% LT
22% LT
13% LT
NWF

24% GT
11% LT
WF

25% GT
28% GT
11% GT
NWF

13% GT
16% GT
10% LT
WF

Comparison of Fitted Rates in 1999

<table>
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<td>13% LT</td>
<td>11% LT</td>
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Comparison of Fitted Rates in 2014

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<tbody>
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<td>13% GT</td>
<td>16% GT</td>
<td>10% LT</td>
<td>13% GT</td>
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NWM 16-yr trendline
WM 16-yr trendline
NWF 16-yr trendline
WF 16-yr trendline

R² = 0.56
R² = 0.75
R² = 0.48
R² = 0.69

y = -1.20x + 34.81
y = -0.79x + 29.03
y = -0.49x + 20.82
y = -0.57x + 23.45
Figure 6.10 iv. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

1999 non-White rate is 1% greater than White
2014 non-White rate is 8% less than White

NW 16-yr trendline
46% decrease
$R^2 = 0.60$
y = -0.74x + 25.78

W 16-yr trendline
40% decrease
$R^2 = 0.76$
y = -0.64x + 25.54
Figure 6.10 v. Pneumonia and Influenza:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity

$R^2 = 0.05$

$y = -0.68x + 0.94$
7. Trends and Disparities in Mortality in ENC41:
   Cancer - All Sites and HIV Disease; 1979-2014
Cancer - All Sites

- The cancer – all sites mortality rate trends for ENC have decreased slightly (3%) over 16 years. The RNC and NC rates have decreased more than ENC, causing these rates to diverge.

- The age-adjusted cancer – all sites mortality rates trends for ENC, RNC, NC and the US are all decreasing at about the same pace, although the ENC rate trend is 7% greater than RNC, and 11% greater than the US.

- The rates for non-White males has decreased 33% over 16 years, and is projected to converge with the rate for White males, which show a 21% decrease. The rates for White females and non-White females show a slight decrease and are converging.

- Both White and non-White cancer mortality trends are decreasing over the 16 year period, although the non-White rate remains higher. Non-White rates decreased 25% and White rates decreased 16%, suggesting future convergence.

- The moderately reliable 16-year trend for racial disparity shows a 63% decrease.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 7.1 i. Cancer - All Sites:
Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
3% decrease
R2 = 0.17
y = -0.39x + 205.49

RNC59 16-yr trendline
6% decrease
R2 = 0.36
y = -0.79x + 196.29

NC 16-yr trendline
5% decrease
R2 = 0.37
y = -0.68x + 199.02

1999 ENC41 rate is 5% greater than RNC59
2014 ENC41 rate is 8% greater than RNC59

Comparison of Fitted Rates in 1999

ENC41 | RNC59 | NC
--- | --- | ---
4% LT | 3% LT | ENC41
5% GT | 1% GT | RNC59
3% GT | 1% LT | NC

Comparison of Fitted Rates in 2014

ENC41 | RNC59 | NC
--- | --- | ---
8% LT | 5% LT | ENC41
8% GT | 2% GT | RNC59
6% GT | 2% LT | NC
Figure 7.1 ii. Cancer - All Sites:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

- ENC41 16-yr trendline: 19% decrease
  - R² = 0.89
  - \( y = -2.62x + 221.03 \)

- RNC59 16-yr trendline: 16% decrease
  - R² = 0.90
  - \( y = -2.05x + 200.23 \)

- NC 16-yr trendline: 17% decrease
  - R² = 0.92
  - \( y = -2.22x + 206.27 \)

- US 16-yr trendline: 21% decrease
  - R² = 1.00
  - \( y = -2.72x + 204.18 \)

1999 ENC41 rate is 10% greater than RNC59
2014 ENC41 rate is 7% greater than RNC59
Figure 7.1 iii. Cancer - All Sites:
Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

NWM 16-yr trendline
33% decrease
R² = 0.78
y = -7.56x + 368.28

WM 16-yr trendline
21% decrease
R² = 0.90
y = -3.65x + 272.75

NWF 16-yr trendline
17% decrease
R² = 0.53
y = -1.99x + 183.45

WF 16-yr trendline
14% decrease
R² = 0.66
y = -1.43x + 168.41

Comparison of Fitted Rates in 1999

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<th>Race</th>
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<tr>
<td>WF</td>
<td>38%</td>
<td>49%</td>
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Comparison of Fitted Rates in 2014

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<td>60%</td>
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<tr>
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<tr>
<td>WF</td>
<td>42%</td>
<td>48%</td>
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</table>
Figure 7.1 iv. Cancer - All Sites:
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

1999 non-White rate is 19% greater than White
2014 non-White rate is 8% greater than White

NW 16-yr trendline
25% decrease
R2 = 0.76
y = -3.91x + 249.99

W 16-yr trendline
16% decrease
R2 = 0.90
y = -2.15x + 209.37
Figure 7.1 v. Cancer - All Sites:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
63% decrease
$R^2 = 0.32$
y = -0.78x + 19.85
HIV Disease

- The fitted HIV mortality rate for ENC has been decreasing over the past 16 years, but was still 67% greater than RNC in 2014.
- The 16 year age-adjusted rate trend for ENC had a 58% decrease. The 2014 ENC rate is 74% greater than RNC.
- Non-White males continue to have the highest rates of age-adjusted mortality, but this rate has also decreased 67% in a 16-year reliable trend. The White male rate decreased 50% during that same period and the rate for non-White females decreased 49%. A convergence of the non-White male rate with other rates is expected in the near future.
- The 16-year non-White age-adjusted HIV mortality rate has decreased by 60% in a reliable trend. The age-adjusted mortality rate for Whites decreased by 48%, although the absolute rate for this group is much lower.
- In a moderately reliable trend, the 16-year period shows a 27% increase in racial disparity.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 7.2 i. HIV Disease:
Trends in mortality rates for ENC41, RNC59, and NC, 1979-2014 with projections to 2020

ENC41 16-yr trendline
55% decrease
R2 = 0.81
y = -0.26x + 7.43

RNC59 16-yr trendline
70% decrease
R2 = 0.97
y = -0.27x + 6.19

NC 16-yr trendline
65% decrease
R2 = 0.98
y = -0.27x + 6.56

1999 ENC41 rate is 20% greater than RNC59
2014 ENC41 rate is 67% greater than RNC59

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2014

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<tr>
<td>GT</td>
<td>40%</td>
<td>16%</td>
<td>RNC59</td>
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55% decrease
70% decrease
65% decrease
Figure 7.2 ii. HIV Disease:
Trends in age-adjusted mortality rates for ENC41, RNC59, NC, and US, 1979-2014 with projections to 2020

ENC41 16-yr trendline
58% decrease
R² = 0.84
y = -0.28x + 7.68

RNC59 16-yr trendline
71% decrease
R² = 0.98
y = -0.27x + 6.08

NC 16-yr trendline
67% decrease
R² = 0.98
y = -0.27x + 6.54

US 16-yr trendline
68% decrease
R² = 0.98
y = -0.25x + 5.84

1999 ENC41 rate is 26% greater than RNC59
2014 ENC41 rate is 74% greater than RNC59

Comparison of Fitted Rates in 1999
Comparison of Fitted Rates in 2014
Figure 7.2 iii. HIV Disease: Trends in age-adjusted mortality rates by race and gender for ENC41, 1979-2014 with projections to 2020

- NWM 16-yr trendline: 67% decrease, $R^2 = 0.87$, $y = -1.22x + 29.27$
- WM 16-yr trendline: 50% decrease, $R^2 = 0.58$, $y = -0.10x + 3.10$
- NWF 16-yr trendline: 49% decrease, $R^2 = 0.52$, $y = -0.36x + 11.66$
- WF 16-yr trendline: 35% decrease, $R^2 = 0.10$, $y = -0.02x + 0.80$

Comparison of Fitted Rates in 1999
- NWM 843% GT, 89% LT
- WM 276% GT, 60% LT
- NWF 270% GT, 97% LT
- WF 74% GT, 93% LT

Comparison of Fitted Rates in 2014
- NWM 569% GT, 85% LT
- WM 284% GT, 43% LT
- NWF 284% GT, 95% LT
- WF 1943% GT, 91% LT
Figure 7.2 iv. HIV Disease:
Trends in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

- 1999 non-White rate is 893% greater than White
- 2014 non-White rate is 688% greater than White

60% decrease
$R^2 = 0.82$
y = -0.74x + 19.52

48% decrease
$R^2 = 0.66$
y = -0.06x + 1.97
Figure 7.2 v. HIV Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC41, 1979-2014 with projections to 2020

Racial Disparity
27% decrease
$R^2 = 0.14$
$y = -15.75x + 943.94$
## 8. Appendix

<table>
<thead>
<tr>
<th>Disease</th>
<th>ICD 10 Code</th>
<th>ICD 9 Code</th>
</tr>
</thead>
<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>
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<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>
</tr>
<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>189</td>
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<tr>
<td>Cancer - Non-Hodgkin's Lymphoma</td>
<td>C82-C85</td>
<td>200, 202</td>
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<tr>
<td>Cancer - Leukemia</td>
<td>C91-C95</td>
<td>204-208</td>
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<tr>
<td>HIV Disease</td>
<td>B20-B24</td>
<td>042-044</td>
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<tr>
<td>Septicemia</td>
<td>A40-A41</td>
<td>038</td>
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<tr>
<td>Diabetes Mellitus</td>
<td>E10-E14</td>
<td>250</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>
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<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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<td>Suicide</td>
<td>X60-X84, Y87.0</td>
<td>E950-E959</td>
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<tr>
<td>Homicide</td>
<td>X85-Y09, Y87.1</td>
<td>E960-E969</td>
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<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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