Trends and Disparities in Mortality in Eastern North Carolina

Total Deaths, Premature Mortality and Deaths for Ten Leading Causes; 1979-2015

A Resource for Healthy Communities

Health Indicator Series - Report #2.201
October 2018
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1. Introduction

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

Report Series #2 of the series focuses attention on two 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 37-year period (1979-2015), as well as the most recent 17 year period (1999 to 2015). 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 29 counties located in the extreme east of North Carolina and approximates the coastal plain physiographic province of the state. It includes the northern counties east of I-95. This region is characterized by its rurality, poverty, and some of the highest mortality rates in the nation. The name of the region is abbreviated as ENC29 or ENC. The rest of North Carolina is the remaining 71 counties; abbreviated as RNC71 or RNC.*
2. Data Highlights

Trends and Disparities in Mortality in Eastern North Carolina

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

Current Disparities in Mortality by Geography, Race, and Gender

In 2015, age-adjusted mortality rate for Eastern North Carolina is 832 deaths per 100,000. This rate is 5% higher than the state rate. Within Eastern North Carolina, the non-White rate is 20% higher than the White rate. The non-White male rate is 31% higher than the rate for White males. The non-White female rate is 13% higher than the rate for White females.

The five general leading causes of mortality in Eastern North Carolina (2015) are:
1. Cancer - All Sites
2. Diseases of Heart
3. Cerebrovascular Disease
4. Chronic Lower Respiratory Diseases
5. Diabetes Mellitus

The five general leading causes of mortality in Eastern North Carolina by race and gender (2015) 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>
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</thead>
<tbody>
<tr>
<td>1st Cancer - All Sites</td>
<td>Cancer - All Sites</td>
<td>Cancer - All Sites</td>
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</tr>
<tr>
<td>2nd Diseases of Heart</td>
<td>Diseases of Heart</td>
<td>Diseases of Heart</td>
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</tr>
<tr>
<td>3rd Cerebrovascular Disease</td>
<td>Chronic Lower Respiratory Disease</td>
<td>Cerebrovascular Disease</td>
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</tr>
<tr>
<td>4th Diabetes Mellitus</td>
<td>All Other Unintentional Injuries and Adverse Effects</td>
<td>Diabetes Mellitus</td>
<td>Chronic Lower Respiratory Disease</td>
<td></td>
</tr>
<tr>
<td>5th Chronic Lower Respiratory Disease</td>
<td>Cerebrovascular Disease</td>
<td>Alzheimer's Disease</td>
<td>Alzheimer's Disease</td>
<td></td>
</tr>
</tbody>
</table>

Trends in Mortality from All Causes
- The 37 year ENC trend line shows all cause mortality rates are increasing. The 17 year trend line shows ENC’s rate is decreasing but is still higher than NC and RNC. All three have gone up in the most recent three years.
- The age-adjusted, all-cause mortality rate trend for ENC has been decreasing over the 37 year period. The 17-year trend shows greater decrease and suggests the ENC rate will converge with the RNC and NC rates. ENC’s rate remains 6% greater than the rate for RNC.
The non-White male mortality rate trend remains higher than other demographic groups but has had the greatest rate of decrease (34%) in the 17-year trend. Convergence of non-White males with White males and non-White females with White females is suggested in the future.

The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 12% greater than the White rate, but the recent 17-year trend suggests they will converge in the future.

Over the recent 17-year period there is a drop in racial disparity.

Trends in Premature Mortality from All Causes of Death

ENC’s premature mortality rate trend has decreased by 15% over the 17 year period since 1999. This decline is similar to RNC and NC, but ENC remains about 17% higher.

The age-adjusted premature mortality rate trend for ENC is also decreasing, but remains 17% higher than the RNC rate in 2015.

The non-White male rate trend is significantly higher than any other demographic group, but also has the highest rate of decrease (35% over 17 years). White females have the lowest rate and also the lowest rate of decrease (8% over 17 years).

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

The 17 year trend for racial disparity shows a 54% decrease, in a reliable trend.

Diseases of the Heart

ENC’s 17-year mortality rate trend is decreasing, as are the rates for RNC and NC, although ENC remains well above the others.

While ENC’s age-adjusted mortality rate trend is decreasing at a pace similar to RNC, the ENC rate remains 11% greater than RNC in 2015.

The non-White male rate trend remains slightly higher than the White male trend. They are both decreasing.

The non-White rate trend remains 9% greater than for Whites, but the 17-year trends for both are decreasing, and convergence is suggested in the future.

The 17-year trend line for racial disparity is decreasing in a moderately reliable trend.

Cancer – Trachea, Bronchus, Lung

The 17-year trend line for Cancer—TBL for ENC is 15% greater than RNC. The trend is moderately reliable.

In 2015, the age-adjusted rate trend for ENC is 6% above the RNC rate and 19% above the US rate. The 17-year trend lines suggest that the ENC rate is decreasing a bit more quickly, suggesting convergence with RNC and NC in the future.

The mortality rate trends for males are decreasing. Non-White males continue to have the highest rate, however the 17-year trend line suggests White males will have a higher rate than non-White males in the near future. The trend for White females is decreasing and is moderately reliable. The trend for non-White females is not reliable.

The non-White mortality rate trend for this cancer is consistently lower than the White rate. Both trends are decreasing over the 17-year period, but non-White is decreasing more quickly.

The moderately reliable 17-year trend for racial disparity shows a steep decrease.
Cerebrovascular Disease
- ENC’s cerebrovascular disease mortality trend line is decreasing but is 22% greater than RNC in 2015.
- The ENC age-adjusted cerebrovascular disease mortality rate trend is decreasing and converging with the RNC and NC rates. It remains 11% greater than the RNC trend.
- Non-White males have the highest mortality rate for cerebrovascular disease but the rate trend continues to decrease and converge with the other demographic groups. Over the 17-year period the trend has decreased by about 50% for all demographic groups.
- The cerebrovascular disease mortality rate trend for non-Whites is decreasing and converging with that of whites but is still 45% greater than Whites in 2015.
- The 17-year trend for racial disparity is unreliable.

Chronic Lower Respiratory Diseases
- The 37 year ENC trend for CLRD mortality is increasing. The 17-year trend for ENC is moderately reliable.
- The 17-year CLRD age-adjusted rate trend for ENC is decreasing. The rate for ENC is lower than the rates for RNC and NC.
- Fitted rates for non-White males and White males have decreased over 17 years by 36% and 32%, respectively. White male rates remain the highest. The 17-year trend for White females and non-White females are unreliable.
- The 17-year White mortality rate trend is higher than the non-White trend, although both are declining. The non-White rate is 45% less than the White rate in 2015.
- The disparity trend between the White and non-White rate is unreliable.

Diabetes Mellitus
- The 17-year trend for diabetes mellitus mortality is decreasing for RNC and NC. The trend for ENC is higher, but it is not reliable.
- The 17-year trend for age-adjusted diabetes mellitus mortality shows a decrease of 20% for ENC. In 2015, the ENC age-adjusted rate trend remains 37% greater than RNC and 38% greater than the US.
- The non-White male and non-White female 17-year trends are decreasing more quickly than their White counterparts, but the non-White male rate is not reliable. The White female rate is decreasing slightly. The White male rate is also unreliable.
- The non-White mortality rate trend decreased 25% over 17 years but remains 123% greater than the White rate.
- The 17-year trend for racial disparity is not reliable.

All Other Unintentional Injuries and Adverse Effects
- The mortality rate trend for unintentional injuries and adverse effects is increasing in ENC (49% over 17 years). The trends for RNC and NC are also increasing.
- The age-adjusted mortality rate trends for ENC, RNC, NC, and the US are all increasing. During the last 17 years, ENC has increased 35%, although it is 3% below RNC in 2015.
- The trends for White males and White females are both increasing (50% and 89% respectively over the 17-year period). The mortality rate trend for non-White males decreased 23% over 17 years. The trend for non-White females is not reliable.
- The White rate trend has increased 64% over the 17-year period. The non-White rate trend has dropped below the White but it is not reliable.
Over the last 17 years, racial disparity has decreased in a reliable trend, eliminating the unfavorable disparity in relation to Whites and favoring non-whites.

Alzheimer’s Disease
- The Alzheimer’s mortality rate trend for ENC shows a 84% increase over the 17 year period. ENC’s rate of increase was larger than RNC and NC but the rate for ENC is 18% less than RNC.
- In 2015, the age-adjusted rate trend for ENC is 6% below the US rate, but has increased 38% over the 17-year period. The ENC rate is 24% less than RNC.
- The 17-year mortality rate trends for White and non-White females are greater than White males and non-White males. Rate trends for all demographic groups are increasing but non-White males are increasing the most and will soon converge with non-White females.
- The non-White mortality rate trend line for Alzheimer’s remains 4% less than the White mortality rate trend in 2015 but the 17-year trend is increasing for both and suggests convergence.
- The 17-year moderately-reliable trend suggests an increase in disparity that favors whites.

Pneumonia and Influenza
- The mortality rate trend for pneumonia and influenza for ENC, RNC and NC have all declined over the 17 year period. The ENC rate in 2015 is 8% higher than the RNC rate.
- The age-adjusted mortality rate trends for all NC regions are similar and are decreasing at about the same pace. The ENC rate is 22% 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 14% less than the White rate in 2015. Both are decreasing.
- The 17-year decreasing trend for racial disparity is unreliable.

Cancer - Colon, Rectum, Anus
- The 17-year rate trends for colon cancer for ENC, RNC and NC have all declined over the period. In 2015 ENC’s rate was 18% greater than RNC.
- The age-adjusted mortality rate trend for colon cancer for ENC has declined 39% over the 17-year period. The ENC rate is the highest (10% greater than RNC) but is projected to converge with the NC and RNC trends.
- The non-White male mortality rate trend is the highest of the demographic groups and is decreasing the most slowly. White males and non-White females are 39% and 46% less than non-White males, respectively. White females have the lowest rate trend.
- The non-White rate in 2015 is 43% greater than the White rate, but both are declining.
- The trend for racial disparity is unreliable.
Nephritis, Nephrotic Syndrome, and Nephrosis
- The mortality rate trend for nephritis, nephrotic syndrome, and nephrosis in ENC is unreliable. The rate trends for RNC and NC have increased. In 2015 ENC’s rate is 13% greater than RNC.
- With age-adjustment, ENC is 6% greater than RNC, and 30% greater than the US rate trend. The ENC rate trend is moderately reliable. The other trends are not reliable.
- The 17 year trend for non-White males is the highest. The trends for White males and White females are flat. The trend for non-White females is declining and is the only trend that is reliable.
- In 2015, the non-White rate was 122% greater than the White rate. The White rate is flat but is unreliable, the non-White rate is decreasing.
- The racial disparity trend is decreasing, the trend is moderately reliable.

Cancer – All Sites
- The cancer – all sites mortality rate trend for ENC has decreased slightly (4%) over 17 years. The RNC and NC rates are lower, and have decreased more than ENC.
- The age-adjusted cancer – all sites mortality rate trend for ENC, NC and RNC are all decreasing, although the ENC rate is 8% greater than the RNC rate.
- The rate trend is decreasing for all groups. The rate for non-White males is the highest but is decreasing the most. White and non-White females show smaller decreases.
- Both White and non-White cancer mortality trends are decreasing over the 17 year period. The Non-White rate decreased 30% and the White rate decreased 20%. The non-White rate remains 10% greater than the White rate in 2015, but they are converging.
- The moderately reliable 17-year trend for racial disparity shows a 62% decrease.

HIV Disease
- The fitted HIV mortality rates for ENC have been decreasing over the past 17 years, but are still 56% greater than RNC in 2015.
- The age-adjusted rate trend for ENC, RNC and the US are all decreasing. The ENC rate is 63% greater than RNC in 2015.
- Non-White males continue to have the highest rates of age-adjusted mortality, but these rates have also decreased 73% in a 17-year reliable trend. Non-White females have the second highest rate, but it has also declined over the 17-year period. The rate for White males is lower but has also decreased. The White female rate is not reliable.
- The 17-year age-adjusted HIV mortality rates have decreased for both Whites and non-Whites by 49% and 69% respectively. The non-White rate is still 720% greater than the White rate.
- The trend for racial disparity is unreliable.
3. Methods, Interpretation, and References

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

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

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 2015. Smaller areas like counties will usually be aggregated into 5-year intervals (e.g., 2011 to 2015). 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 37-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 37 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 2015) to provide a general idea about where mortality trends are heading.

The equation of the line allows the user to calculate an expected or fitted rate for any given year, x. For example, in figure 6.4 ii the year 2005 is the 7th year in the series, so 7 would be substituted for x in the equation of the line derived from ENC29’s age-adjusted mortality rate series for a selected cause of death. For chronic lower respiratory diseases (1999 to 2015), the 2005 expected or fitted age-adjusted rate is calculated to be a little more than 45 deaths per 100,000 people. The observed age-adjusted rate for 2005 is 48 deaths per 100,000 people. (The observed rates are the values found in the table that runs along the x-axis of the time series chart.) The numeric difference between the expected and observed rates for 2005 is 2.5—the model (the equation of the line) underestimates the observed value by 2.5 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 (R^2) are provided to indicate how well the fitted line predicts or explains the observed rates. When variation in the observed rates is relatively high (the fitted trend line does not correspond well to the observed trend line) R^2 approaches 0.0, when the variation is low, R^2 approaches 1.0. A low R^2 implies low reliability and a larger R^2 indicates that a greater degree of confidence can be placed in the trend line. The trend lines are generally unreliable when R^2 is less than 0.10, moderately reliable when R^2 is between 0.10 and 0.35, and most reliable when R^2 is equal to or greater than 0.35. Graphically, trend lines are weighted according to their reliability and significance. The thinnest trend lines are for those where R^2 is less than 0.10 and should be considered not reliable. The thickest lines are used for trends where the R^2 is equal to or greater than 0.35. In some cases, the trend lines do not fit the data well (i.e. small R^2). In other words, the presentation of a trend line does
not necessarily indicate a linear trend in the data line. In several instances a non-linear trend may be present. It should be noted that the linear trend modeling undertaken here is a major simplification of real world processes. These processes are dynamical in nature and can be modeled and fitted with certain limitations and assumptions. Time series of epidemic infectious disease mortality rates typically exhibit a curvilinear pattern. A marked curvilinear pattern is seen in the mortality series for HIV/AIDS mortality, general cancer mortality, and several others which can be approximated into at least two sequential linear segments. Each segment is joined to another in the sequence at a point in time or year. In this series (#2), we begin to explore alternative methods for examining trends that show discontinuities and reversals within the set of time series observations, particularly within the mortality time series for HIV/AIDS.

Percent change provides a measure of the estimated change in mortality over the most recent seventeen year period (1999-2015). 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 2015 tables compare the fitted rates calculated for the beginning and end of the observed time series in terms of percent difference. Returning to figure 6.4 ii, ENC29’s age-adjusted fitted rate for chronic lower respiratory diseases in 1999 is 4% greater than (GT) RNC’s fitted rate. In 2015, ENC29’s fitted rate is 11% less than (LT) RNC’s fitted rate. The tables permit a quick assessment of trends calculated from observed time series data.

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

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


Cited References

4. Current Disparities in Mortality by Geography, Race and Gender, and Race: Total and Five Leading Causes of Death
Figure 4.1 i. General leading causes of death for ENC29 (2015), NC (2015), and US (2014). Mortality rate per 100,000 population.

2015 NC rate is 8% higher than 2014 US rate

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.1 ii. General leading causes of death for ENC29 (2015), NC (2015), and US (2014). Age-adjusted mortality rate per 100,000 population.

ENC29

- Cancer - All Sites: 42%
- Diseases of Heart: 22%
- Cerebrovascular Disease: 6%
- Chronic Lower Respiratory Diseases: 5%
- All Other Deaths: 4%

832 deaths/100,000

North Carolina

- Cancer - All Sites: 42%
- Diseases of Heart: 22%
- Cerebrovascular Disease: 6%
- Chronic Lower Respiratory Diseases: 5%
- All Other Deaths: 4%

790 deaths/100,000

United States

- Cancer - All Sites: 42%
- Diseases of Heart: 22%
- Cerebrovascular Disease: 6%
- Chronic Lower Respiratory Diseases: 5%
- All Other Deaths: 4%

725 deaths/100,000

2015 NC age-adjusted rate is 9% higher than 2014 US age-adjusted rate

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.2 i. General leading causes of death for ENC29 (2015) by race and gender. Mortality rate per 100,000 population.

2015 ENC29 NWM rate is 4% higher than 2015 ENC29 WM rate

2015 ENC29 NWF rate is 8% lower than 2015 ENC29 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 ENC29 (2015) by race and gender. Age-adjusted mortality rate per 100,000 population.

Non-White Males

2015 ENC29 NWM age-adjusted rate is 31% higher than 2015 ENC29 WM age-adjusted rate

1199 deaths/100,000

- Diseases of Heart: 22%
- Cancer - All Sites: 4%
- Cerebrovascular Disease: 5%
- Chronic Lower Respiratory Diseases: 6%
- Diabetes Mellitus: 4%
- Alzheimers Disease: 42%
- All Other Unintentional Injuries and Adverse Effects: 2%
- All Other Deaths: 1%

Non-White Females

2015 ENC29 NWF age-adjusted rate is 13% higher than 2015 ENC29 WF age-adjusted rate

749 deaths/100,000

- Diseases of Heart: 21%
- Cancer - All Sites: 4%
- Cerebrovascular Disease: 6%
- Chronic Lower Respiratory Diseases: 5%
- Diabetes Mellitus: 4%
- Alzheimers Disease: 41%
- All Other Unintentional Injuries and Adverse Effects: 2%
- All Other Deaths: 1%

White Males

915 deaths/100,000

- Diseases of Heart: 25%
- Cancer - All Sites: 4%
- Cerebrovascular Disease: 5%
- Chronic Lower Respiratory Diseases: 6%
- Diabetes Mellitus: 4%
- Alzheimers Disease: 37%
- All Other Unintentional Injuries and Adverse Effects: 2%
- All Other Deaths: 1%

White Females

665 deaths/100,000

- Diseases of Heart: 23%
- Cancer - All Sites: 4%
- Cerebrovascular Disease: 5%
- Chronic Lower Respiratory Diseases: 6%
- Diabetes Mellitus: 4%
- Alzheimers Disease: 41%
- All Other Unintentional Injuries and Adverse Effects: 2%
- All Other Deaths: 1%

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.3 i. General leading causes of death for ENC29 (2015) by race. Mortality rate per 100,000 population.

Slices without percentages constitute less than 5% of the deaths within that chart.
Figure 4.3 ii. General leading causes of death for ENC29 (2015) by race. Age-adjusted mortality rate per 100,000 population.

2015 ENC29 NW age-adjusted rate is 20% higher than 2015 ENC29 W age-adjusted rate

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<td>4%</td>
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<tr>
<td>All Other Unintentional Injuries and Adverse Effects</td>
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<tr>
<td>All Other Deaths</td>
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Slices without percentages constitute less than 5% of the deaths within that chart.
All Causes of Death

- The 37 year ENC trend line shows all cause mortality rates are increasing. The 17 year trend line shows ENC’s rate is decreasing but is still higher than NC and RNC. All three have gone up in the most recent three years.

- The age-adjusted, all-cause mortality rate trend for ENC has been decreasing over the 37 year period. The 17-year trend shows greater decrease and suggests the ENC rate will converge with the RNC and NC rates. ENC’s rate remains 6% greater than the rate for RNC.

- The non-White male mortality rate trend remains higher than other demographic groups but has had the greatest rate of decrease (34%) in the 17-year trend. Convergence of non-White males with White males and non-White females with White females is suggested in the future.

- The trends for all-cause mortality rates for both non-Whites and Whites are decreasing. The non-White rate is 12% greater than the White rate, but the recent 17-year trend suggests they will converge in the future.

- Over the recent 17-year period there is a drop in racial disparity.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 5.1 i. All Causes of Death:
Trends in mortality rates for ENC29, RNC71, and NC
1979-2015 with projections to 2020

ENC29 17-yr trendline: 6% decrease
R = 0.33
y = -3.17x + 976.39

RNC71 17-yr trendline: 5% decrease
R = 0.21
y = -2.64x + 862.83

NC 17-yr trendline: 5% decrease
R = 0.25
y = -2.83x + 880.67

1999 ENC29 rate is 13% greater than RNC71
2015 ENC29 rate is 13% greater than RNC71
Figure 5.1 ii. All Causes of Death:

ENC29 17-yr trendline
24% decrease
$y = -14.61x + 1,039.16$
$R^2 = 0.95$

RNC71 17-yr trendline
18% decrease
$y = -9.61x + 916.06$
$R^2 = 0.94$

NC 17-yr trendline
19% decrease
$y = -10.44x + 935.33$
$R^2 = 0.95$

US 16-yr trendline
20% decrease
$y = -11.18x + 888.81$
$R^2 = 0.97$

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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Table 5.1: Comparison of Fitted Rates in 1999 and 2015

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<td>WF</td>
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Figure 5.1 iii. All Causes of Death:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

- NWM 17-yr trendline: 34% decrease, $R^2 = 0.86$, $y = -31.49x + 1,591.50$
- WM 17-yr trendline: 24% decrease, $R^2 = 0.94$, $y = -16.14x + 1,165.07$
- NWF 17-yr trendline: 29% decrease, $R^2 = 0.89$, $y = -17.00x + 989.09$
- WF 17-yr trendline: 19% decrease, $R^2 = 0.89$, $y = -9.23x + 804.74$
Figure 5.1 iv. All Causes of Death:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

1999 non-White rate is 27% greater than White
2015 non-White rate is 12% greater than White

NW 17-yr trendline
31% decrease
R2 = 0.89
y = -22.10x + 1,222.42

W 17-yr trendline
21% decrease
R2 = 0.93
y = -11.74x + 960.82

650 750 850 950 1050 1150 1250 1350 1450
Age-adjusted mortality rate per 100,000 population

79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20

1999 non-White rate is 27% greater than White
2015 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 ENC29, 1979-2015 with projections to 2020

Racial Disparity
57% decrease
R² = 0.48
y = -0.94x + 27.84
All Causes of Premature Mortality

- ENC's premature mortality rate trend has decreased by 15% over the 17 year period since 1999. This decline is similar to RNC and NC, but ENC remains about 17% higher.

- The age-adjusted premature mortality rate trend for ENC is also decreasing, but remains 17% higher than the RNC rate in 2015.

- The non-White male rate trend is significantly higher than any other demographic group, but also has the highest rate of decrease (35% over 17 years). White females have the lowest rate and also the lowest rate of decrease (8% over 17 years).

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

- The 17 year trend for racial disparity shows a 54% decrease, in a reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 5.2 i. All Causes of Premature Mortality: Trends in premature mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

ENC29 17-yr trendline
15% decrease
R2 = 0.66
y = -8.77x + 1,011.40

RNC71 17-yr trendline
14% decrease
R2 = 0.79
y = -7.12x + 857.63

NC 17-yr trendline
14% decrease
R2 = 0.80
y = -7.52x + 881.76

1999 ENC29 rate is 18% greater than RNC71
2015 ENC29 rate is 17% greater than RNC71

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2015
Figure 5.2 ii. All Causes of Premature Mortality:

ENC29 17-yr trendline
RNC71 17-yr trendline
NC 17-yr trendline
US 16-yr trendline

1999 ENC29 rate is 18% greater than RNC71
2015 ENC29 rate is 17% greater than RNC71

ENC29
RNC71
NC
US

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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<td>7%</td>
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Figure 5.2 iii. All Causes of Premature Mortality: Trends in age-adjusted premature mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020
Figure 5.2 iv. All Causes of Premature Mortality:
Trends in age-adjusted premature mortality rates by race for ENC29, 1979-2015 with projections to 2020

NW 17-yr trendline
W 17-yr trendline
33% decrease 12% decrease
R2 = 0.79 R2 = 0.60
\( y = -27.41x + 1,425.24 \) \( y = -5.69x + 805.28 \)

1999 non-White rate is 77% greater than White
2015 non-White rate is 38% greater than White
Figure 5.2 v. All Causes of Premature Mortality: Measuring disparity in age-adjusted premature mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity
54% decrease

$R^2 = 0.59$

$y = -2.48x + 78.28$
Diseases of Heart

- ENC’s 17-year mortality rate trend is decreasing, as are the rates for RNC and NC, although ENC remains well above the others.

- While ENC’s age-adjusted mortality rate trend is decreasing at a pace equal to RNC, the ENC rate remains 11% greater than RNC in 2015.

- The non-White male rate trend remains slightly higher than the White male trend. They are both decreasing.

- The non-White rate trend remains 9% greater than for Whites, but the 17-year trends for both are decreasing, and convergence is suggested in the future.

- The 17-year trend line for racial disparity is decreasing in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.1 i. Diseases of Heart:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

- ENC29 17-yr trendline: 29% decrease, $y = -4.62x + 270.22$, $R^2 = 0.87$
- RNC71 17-yr trendline: 33% decrease, $y = -4.58x + 237.32$, $R^2 = 0.83$
- NC 17-yr trendline: 32% decrease, $y = -4.62x + 242.50$, $R^2 = 0.84$

1999 ENC29 rate is 14% greater than RNC71
2015 ENC29 rate is 20% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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Figure 6.1 ii. Diseases of Heart:

ENC29 17-yr trendline
45% decrease
R2 = 0.95
y = -7.56x + 288.56

RNC71 17-yr trendline
43% decrease
R2 = 0.95
y = -6.33x + 251.98

NC 17-yr trendline
43% decrease
R2 = 0.95
y = -6.53x + 257.69

US 16-yr trendline
42% decrease
R2 = 0.97
y = -7.09x + 268.34

1999 ENC29 rate is 15% greater than RNC71
2015 ENC29 rate is 11% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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1999 ENC29 rate is 15% greater than RNC71
2015 ENC29 rate is 11% greater than RNC71
Figure 6.1 iii. Diseases of Heart:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

- NWM 17-yr trendline: 44% decrease, R² = 0.87, y = -10.58x + 404.49
- WM 17-yr trendline: 44% decrease, R² = 0.94, y = -9.02x + 352.02
- NWF 17-yr trendline: 51% decrease, R² = 0.92, y = -7.96x + 263.16
- WF 17-yr trendline: 46% decrease, R² = 0.90, y = -5.92x + 219.94

Comparison of Fitted Rates in 1999
- NWM 15% GT: 13% LT
- WM 54% GT: 34% LT
- NWF 84% GT: 60% LT
- WF

Comparison of Fitted Rates in 2015
- NWM 15% GT: 12% LT
- WM 54% GT: 34% GT
- NWF 84% GT: 60% GT
- WF

Report #2.201, October 2018
Health Systems Research and Development, Dept. of Public Health, ECU
Figure 6.1 iv. Diseases of Heart:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

1999 non-White rate is 15% greater than White
2015 non-White rate is 9% greater than White

NW 17-yr trendline
R² = 0.92
y = -8.89x + 318.82

W 17-yr trendline
R² = 0.93
y = -7.14x + 276.54

47% decrease
44% decrease

1999 non-White rate is 15% greater than White
2015 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 ENC29, 1979-2015 with projections to 2020

Racial Disparity
45% decrease
R2 = 0.10
y = -0.42x + 16.09
Cancer - Trachea, Bronchus, Lung

- The 17-year trend line for Cancer—TBL for ENC is 15% greater than RNC. The trend is moderately reliable.

- In 2015, the age-adjusted rate trend for ENC is 6% above the RNC rate and 19% above the US rate. The 17-year trend lines suggest that the ENC rate is decreasing more quickly, suggesting convergence with RNC and NC in the future.

- The mortality rate trends for males are decreasing. Non-White males continue to have the highest rate, however the 17-year trend line suggests White males will have a higher rate than non-White males in the near future. The trend for White females is decreasing and is moderately reliable. The trend for non-White females is not reliable.

- The non-White mortality rate trend for this cancer is consistently lower than the White rate. Both trends are decreasing over the 17-year period, but non-White is decreasing more quickly.

- The moderately reliable 17-year trend for racial disparity shows a steep decrease.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.2 i. Cancer - Trachea, Bronchus, Lung:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2015 with projections to 2020

ENC29 17-yr trendline
RNC71 17-yr trendline
NC 17-yr trendline

7% decrease
10% decrease
10% decrease

R2 = 0.20
R2 = 0.74
R2 = 0.71

y = -0.28x + 67.14
y = -0.36x + 60.43
y = -0.36x + 61.50

1999 ENC29 rate is 11% greater than RNC71
2015 ENC29 rate is 15% greater than RNC71

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

Comparison of Fitted Rates in 2015
ENC29 | RNC71 | NC
---|---|---
15% GT | 2% GT | RNC71
12% LT | 2% LT | NC
Figure 6.2 ii. Cancer - Trachea, Bronchus, Lung:

ENC29 17-yr trendline
27% decrease
R2 = 0.80
y = -1.09x + 68.84

RNC71 17-yr trendline
24% decrease
R2 = 0.87
y = -0.88x + 62.73

NC 17-yr trendline
24% decrease
R2 = 0.88
y = -0.91x + 63.70

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

1999 ENC29 rate is 10% greater than RNC71
2015 ENC29 rate is 6% greater than RNC71

Comparison of Fitted Rates in 1999
ENC29 RNC71 NC US ENC29 RNC71 NC US
9% LT 7% LT 15% LT ENC29 5% LT 5% LT 16% LT ENC29
10% GT 2% GT 7% LT RNC71 6% GT 1% GT 11% LT RNC71
8% GT 2% LT 8% LT NC 5% GT 1% LT 12% LT NC
18% GT 7% GT 9% GT US 19% GT 12% GT 13% GT US

Comparison of Fitted Rates in 2015
ENC29 RNC71 NC US ENC29 RNC71 NC US
9% LT 7% LT 15% LT ENC29 5% LT 5% LT 16% LT ENC29
10% GT 2% GT 7% LT RNC71 6% GT 1% GT 11% LT RNC71
8% GT 2% LT 8% LT NC 5% GT 1% LT 12% LT NC
18% GT 7% GT 9% GT US 19% GT 12% GT 13% GT US
Figure 6.2 iii. Cancer - Trachea, Bronchus, Lung: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

- NWM 17-yr trendline: 48% decrease
  - $R^2 = 0.76$
  - $y = -3.68x + 130.59$

- WM 17-yr trendline: 34% decrease
  - $R^2 = 0.79$
  - $y = -2.03x + 101.03$

- NWF 17-yr trendline: 11% decrease
  - $R^2 = 0.02$
  - $y = -0.11x + 28.60$

- WF 17-yr trendline: 11% decrease
  - $R^2 = 0.15$
  - $y = -0.31x + 47.38$
Figure 6.2 iv. Cancer - Trachea, Bronchus, Lung:
Trends in age-adjusted mortality rates by race for ENC29,
1979-2015 with projections to 2020

NW 17-yr trendline
W 17-yr trendline
36% decrease
R2 = 0.73
y = -1.40x + 67.04
23% decrease
R2 = 0.72
y = -0.95x + 69.38

1999 non-White rate is 3% less than White
2015 non-White rate is 18% less than White
Figure 6.2 v. Cancer - Trachea, Bronchus, Lung: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity
693% decrease
R2 = 0.29
y = -1.13x - 2.77
Cerebrovascular Disease

- ENC’s cerebrovascular disease mortality trend line is decreasing but is 22% greater than RNC in 2015.
- The ENC age-adjusted cerebrovascular disease mortality rate trend is decreasing and converging with the RNC and NC rates. It remains 11% greater than the RNC trend.
- Non-Whites have the highest mortality rate for cerebrovascular disease but the rate trend continues to decrease and converge with the other demographic groups. Over the 17-year period the trend has decreased by about 50% for all demographic groups.
- The cerebrovascular disease mortality rate trend for non-Whites is decreasing and converging with that of whites but is still 45% greater than Whites in 2015.
- The 17-year trend for racial disparity is unreliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.3 i.  Cerebrovascular Disease:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

ENC29 17-yr trendline 38% decrease
R2 = 0.72
y = -1.75x + 77.76

RNC71 17-yr trendline 43% decrease
R2 = 0.79
y = -1.73x + 68.41

NC 17-yr trendline 43% decrease
R2 = 0.82
y = -1.77x + 70.27

1999 ENC29 rate is 14% greater than RNC71
2015 ENC29 rate is 22% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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</tbody>
</table>
Figure 6.3 ii. Cerebrovascular Disease:

- ENC29 17-yr trendline: 53% decrease
  \[ R^2 = 0.86 \]
  \[ y = -2.63x + 84.22 \]

- RNC71 17-yr trendline: 51% decrease
  \[ R^2 = 0.90 \]
  \[ y = -2.22x + 73.43 \]

- NC 17-yr trendline: 52% decrease
  \[ R^2 = 0.91 \]
  \[ y = -2.29x + 75.17 \]

- US 16-yr trendline: 48% decrease
  \[ R^2 = 0.96 \]
  \[ y = -1.90x + 62.94 \]

1999 ENC29 rate is 15% greater than RNC71
2015 ENC29 rate is 11% greater than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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Figure 6.3 iii. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

<table>
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<tr>
<th>Race</th>
<th>17-yr trendline</th>
<th>Percentage Decrease</th>
<th>R²</th>
<th>Equation</th>
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<tbody>
<tr>
<td>NWM</td>
<td>53% decrease</td>
<td>0.78</td>
<td>y = -3.76x + 120.85</td>
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<tr>
<td>WM</td>
<td>54% decrease</td>
<td>0.83</td>
<td>y = -2.37x + 74.56</td>
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<tr>
<td>NWF</td>
<td>55% decrease</td>
<td>0.89</td>
<td>y = -3.26x + 99.94</td>
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<tr>
<td>WF</td>
<td>52% decrease</td>
<td>0.79</td>
<td>y = -2.17x + 71.63</td>
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</table>
Figure 6.3 iv. Cerebrovascular Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

 Northwest (NW) trendline: 53% decrease
\[ y = -3.41x + 108.21 \]
R\(^2\) = 0.88

White (W) trendline: 53% decrease
\[ y = -2.34x + 74.46 \]
R\(^2\) = 0.82

1999 non-White rate is 45% greater than White
2015 non-White rate is 45% greater than White
Figure 6.3 v. Cerebrovascular Disease: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity

\[ R^2 = 0.01 \]
\[ y = -0.16x + 47.09 \]
Chronic Lower Respiratory Diseases

- The 37-year ENC trend for CLRD mortality is increasing. The 17-year trend for ENC is moderately reliable.
- The 17-year CLRD age-adjusted rate trend for ENC is decreasing. The rate for ENC is lower than the rates for RNC and NC.
- Fitted rates for non-White males and White males have decreased over 17 years by 36% and 32%, respectively. White male rates remain the highest. The 17-year trend for White females and non-White females are unreliable.
- The 17-year White mortality rate trend is higher than the non-White trend, although both are declining. The non-White rate is 45% less than the White rate in 2015.
- The disparity trend between the White and non-White rate 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 6.4 i. Chronic Lower Respiratory Diseases: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

ENC29 17-yr trendline
7% increase
R2 = 0.14
y = 0.19x + 45.36

RNC71 17-yr trendline
17% increase
R2 = 0.59
y = 0.43x + 43.34

NC 17-yr trendline
15% increase
R2 = 0.55
y = 0.40x + 43.65

ENC29 1999 rate is 5% greater than RNC71
2015 ENC29 rate is 4% less than RNC71

Comparison of Fitted Rates in 1999

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<tr>
<th>ENC29</th>
<th>RNC71</th>
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<td>5% GT</td>
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Comparison of Fitted Rates in 2015

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Figure 6.4 ii. Chronic Lower Respiratory Diseases:

ENC29 17-yr trendline
RNC71 17-yr trendline
NC 17-yr trendline
US 16-yr trendline

15% decrease
R2 = 0.53
y = -0.43x + 48.47
7% decrease
R2 = 0.00
y = 0.01x + 46.65
R2 = 0.04
y = -0.06x + 46.93
R2 = 0.47
y = -0.21x + 44.59

1999 ENC29 rate is 4% greater than RNC71
2015 ENC29 rate is 11% less than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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<td>12%</td>
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</table>
Figure 6.4 iii. Chronic Lower Respiratory Diseases:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

- NWM 17-yr trendline: 36% decrease
  - R² = 0.42
  - \( y = -1.27x + 60.55 \)

- WM 17-yr trendline: 32% decrease
  - R² = 0.69
  - \( y = -1.37x + 74.08 \)

- NWF 17-yr trendline
  - R² = 0.00
  - \( y = 0.02x + 18.35 \)

- WF 17-yr trendline
  - R² = 0.00
  - \( y = -0.03x + 44.26 \)

Comparison of Fitted Rates in 1999

- NWM: 22% GT, 70% LT
- WM: 27% GT, 5% LT
- NWF: 141% GT, 9% LT
- WF: 37% GT, 67% LT

Comparison of Fitted Rates in 2015

- NWM: 30% GT, 54% LT, 9% GT
- WM: 115% GT, 135% GT, 16% LT
- NWF: 8% LT, 19% GT, 57% LT
- WF: 37% GT, 67% LT
Figure 6.4 iv. Chronic Lower Respiratory Diseases: Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

1999 non-White rate is 40% less than White
2015 non-White rate is 45% less than White

NW 17-yr trendline
21% decrease
R2 = 0.30
y = -0.40x + 32.73

W 17-yr trendline
14% decrease
R2 = 0.51
y = -0.45x + 54.67
Figure 6.4 v. Chronic Lower Respiratory Diseases: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity

\[ R^2 = 0.07 \]

\[ y = -0.96x - 67.45 \]
Diabetes Mellitus

- The 17-year trend for diabetes mellitus mortality is decreasing for RNC and NC. The trend for ENC is higher, but is not reliable.

- The 17-year trend for age-adjusted diabetes mellitus mortality shows a decrease of 20% for ENC. In 2015, the ENC age-adjusted rate trend remains 37% greater than RNC and 38% greater than the US.

- The non-White male and non-White female 17-year trends are decreasing more quickly than their White counterparts, but the non-White male rate is not reliable. The White female rate is decreasing slightly. The White male rate is also unreliable.

- The non-White mortality rate trend decreased 25% over 17 years but remains 123% greater than the White rate.

- The 17-year trend for racial disparity is not reliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.5 i. Diabetes Mellitus: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020.

ENC29 17-yr trendline
ENC29 17-yr trendline
ENC29 17-yr trendline
RNC71 17-yr trendline
RNC71 17-yr trendline
RNC71 17-yr trendline
NC 17-yr trendline
NC 17-yr trendline
NC 17-yr trendline

1999 ENC29 rate is 29% greater than RNC71
2015 ENC29 rate is 46% greater than RNC71

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<td>2015</td>
<td>4% LT</td>
<td>5% GT</td>
<td>RNC71</td>
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Comparison of Fitted Rates in 1999

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ENC29 17-yr trendline
ENC29 17-yr trendline
ENC29 17-yr trendline
RNC71 17-yr trendline
RNC71 17-yr trendline
RNC71 17-yr trendline
NC 17-yr trendline
NC 17-yr trendline
NC 17-yr trendline

11% decrease
9% decrease
R2 = 0.00
R2 = 0.17
y = 0.02x + 32.93

19% LT
27% LT
ENC29

5% GT
6% GT
NC
Figure 6.5 ii. Diabetes Mellitus:

ENC29 17-yr trendline
20% decrease
R2 = 0.52
y = -0.41x + 34.83

RNC71 17-yr trendline
25% decrease
R2 = 0.59
y = -0.39x + 26.87

NC 17-yr trendline
24% decrease
R2 = 0.63
y = -0.40x + 28.12

US 16-yr trendline
23% decrease
R2 = 0.85
y = -0.37x + 26.38

1999 ENC29 rate is 30% greater than RNC71
2015 ENC29 rate is 37% greater than RNC71
Figure 6.5 iii. Diabetes Mellitus: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020.

- **NWM** 17-yr trendline: \(y = -0.48x + 60.99\) with a \(R^2 = 0.09\) and a 33% decrease.
- **WM** 17-yr trendline: \(y = -0.09x + 27.46\) with a \(R^2 = 0.04\) and a 27% decrease.
- **NWF** 17-yr trendline: \(y = -1.13x + 58.89\) with a \(R^2 = 0.55\) and a 55% LT.
- **WF** 17-yr trendline: \(y = -0.34x + 21.86\) with a \(R^2 = 0.41\) and a 3% LT.
Figure 6.5 iv. Diabetes Mellitus:

1999 non-White rate is 146% greater than White
2015 non-White rate is 123% greater than White

NW 17-yr trendline
25% decrease
R² = 0.45
y = -0.88x + 60.30

W 17-yr trendline
17% decrease
R² = 0.36
y = -0.24x + 24.49
Figure 6.5 v. Diabetes Mellitus:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity

$R^2 = 0.08$

$y = -1.51x + 148.41$
All Other Unintentional Injuries and Adverse Effects

- The mortality rate trend for unintentional injuries and adverse effects is increasing in ENC (49% over 17 years). The trends for RNC and NC are also increasing.

- The age-adjusted mortality rate trends for ENC, RNC, NC, and the US are all increasing. During the last 17 years, ENC has increased 35%, although it is 3% below RNC in 2015.

- The trends for White males and White females are both increasing (50% and 89% respectively over the 17-year period). The mortality rate trend for non-White males decreased 23% over 17 years. The trend for non-White females is not reliable.

- The White rate trend has increased 64% over the 17-year period. The non-White rate trend has dropped below the White but it is not reliable.

- Over the last 17 years, racial disparity has decreased in a reliable trend, eliminating the unfavorable disparity in relation to Whites and favoring non-whites.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.6 i. All Other Unintentional Injuries and Adverse Effects: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

ENC29 17-yr trendline: 49% increase
R2 = 0.76
y = 0.63x + 21.94

RNC71 17-yr trendline: 52% increase
R2 = 0.90
y = 0.67x + 21.83

NC 17-yr trendline: 51% increase
R2 = 0.90
y = 0.66x + 21.85

1999 ENC29 rate is the same as RNC71
2015 ENC29 rate is 2% less than RNC71

Comparison of Fitted Rates in 1999
<table>
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<th>ENC29</th>
<th>RNC71</th>
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Comparison of Fitted Rates in 2015
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<tbody>
<tr>
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<td>1% GT</td>
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</table>

0% GT | 0% LT | ENC29

0% LT | 0% LT | NC
Figure 6.6 ii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2015 with projections to 2020

ENC29 17-yr trendline
35% increase
R2 = 0.65
y = 0.48x + 23.04

RNC71 17-yr trendline
42% increase
R2 = 0.85
y = 0.56x + 22.72

NC 17-yr trendline
40% increase
R2 = 0.86
y = 0.54x + 22.79

US 16-yr trendline
56% increase
R2 = 0.97
y = 0.67x + 19.01

1999 ENC29 rate is 1% greater than RNC71
2015 ENC29 rate is 3% less than RNC71

Comparison of Fitted Rates in 2015

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<td>21% LT</td>
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Figure 6.6 iii. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020.

- **NWM 17-yr trendline**
  - 23% decrease
  - $R^2 = 0.12$
  - $y = -0.55x + 40.08$
  - 25% LT

- **WM 17-yr trendline**
  - 50% increase
  - $R^2 = 0.64$
  - $y = 0.89x + 30.17$
  - 66% LT

- **NWF 17-yr trendline**
  - 89% increase
  - $R^2 = 0.01$
  - $y = -0.05x + 13.49$
  - 63% LT

- **WF 17-yr trendline**
  - 197% GT
  - $R^2 = 0.85$
  - $y = 0.76x + 14.67$
  - 14% LT

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**Comparison of Fitted Rates in 1999**
- NWM: 25% LT, WM: 66% LT, NWF: 63% LT, WF: 63% LT
- NWM: 33% GT, WM: 55% LT, NWF: 51% LT, WF: 51% LT
- NWM: 197% GT, WM: 124% GT, NWF: 9% GT, WF: 9% GT
- NWM: 173% GT, WM: 106% GT, NWF: 8% LT, WF: 8% LT

**Comparison of Fitted Rates in 2015**
- NWM: 42% GT, WM: 59% LT, NWF: 14% LT, WF: 14% LT
- NWM: 36% LT, WM: 71% LT, NWF: 40% LT, WF: 40% LT
- NWM: 146% GT, WM: 251% GT, NWF: 112% GT, WF: 112% GT
- NWM: 16% GT, WM: 65% GT, NWF: 53% LT, WF: 53% LT
Figure 6.6 iv. All Other Unintentional Injuries and Adverse Effects: Trends in age-adjusted mortality rates by race for ENC29, 1979-201 with projections to 2020.

1999 non-White rate is 11% greater than White
2015 non-White rate is 42% less than White

NW 17-yr trendline
W 17-yr trendline

64% increase

R² = 0.09
y = -0.27x + 24.79

R² = 0.84
y = 0.83x + 22.23
Figure 6.6 v. All Other Unintentional Injuries and Adverse Effects: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity
1003% decrease
\[ R^2 = 0.49 \]
\[ y = -4.95x + 8.40 \]
Alzheimer’s Disease

- The Alzheimer’s mortality rate trend for ENC shows a 84% increase over the 17 year period. ENC’s rate of increase was larger than RNC and NC but the rate for ENC is 18% less than RNC.

- In 2015, the age-adjusted rate trend for ENC is 6% below the US rate, but has increased 38% over the 17-year period. The ENC rate is 24% less than RNC.

- The 17-year mortality rate trends for White and non-White females are greater than White males and non-White males. Rate trends for all demographic groups are increasing but non-White males are increasing the most and will soon converge with non-White females.

- The non-White mortality rate trend line for Alzheimer’s remains 4% less than the White mortality rate in 2015 but the 17-year trend is increasing for both and suggests convergence.

- The 17-year moderately-reliable trend suggests an increase in disparity that favors whites.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.7 i. Alzheimer’s Disease:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

ENC29 17-yr trendline 84% increase
R2 = 0.83
y = 0.76x + 15.32

RNC71 17-yr trendline 65% increase
R2 = 0.83
y = 0.80x + 20.87

NC 17-yr trendline 68% increase
R2 = 0.85
y = 0.80x + 19.99

1999 ENC29 rate is 27% less than RNC71
2015 ENC29 rate is 18% less than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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<td>16% LT</td>
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Figure 6.7 ii. Alzheimer’s Disease:

ENC29 17-yr trendline
38% increase
R2 = 0.54
y = 0.41x + 18.12

RNC71 17-yr trendline
40% increase
R2 = 0.67
y = 0.55x + 23.71

NC 17-yr trendline
40% increase
R2 = 0.70
y = 0.53x + 22.85

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

1999 ENC29 rate is 24% less than RNC71
2015 ENC29 rate is 24% less than RNC71

Comparison of Fitted Rates in 1999

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Comparison of Fitted Rates in 2015

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<td>6% LT</td>
<td>24% GT</td>
<td>19% GT</td>
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Figure 6.7 iii. Alzheimer’s Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2015
Figure 6.7 iv. Alzheimer’s Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

1999 non-White rate is 38% less than White
2015 non-White rate is 4% less than White
Figure 6.7 v. Alzheimer’s Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2015 with projections to 2020

Racial Disparity
101% increase
R2 = 0.45
y = 3.12x - 52.7

Percentage difference - non-White to White

79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20

0 32 0 4 -3 -60 -11 -62 -39 -12 -24 -93 -49 -6 10 -82 1 -5 -66 -40 -31 -41 -38 -87 -38 -6 -20 -29 -39 -31 -21 -24 4 -24 -4 -9 20

% difference
Pneumonia and Influenza

- The mortality rate trend for pneumonia and influenza for ENC, RNC and NC have all declined over the 17 year period. The ENC rate in 2015 is 8% higher than the RNC rate.

- The age-adjusted mortality rate trends for all NC regions are similar and are decreasing at about the same pace. The ENC rate is 22% 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 14% less than the White rate in 2015. Both are decreasing.

- The 17-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 6.8 i. Pneumonia and Influenza:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

- ENC29 17-yr trendline: 20% decrease, $R^2 = 0.38$, $y = -0.28x + 23.69$
- RNC71 17-yr trendline: 26% decrease, $R^2 = 0.50$, $y = -0.36x + 23.41$
- NC 17-yr trendline: 25% decrease, $R^2 = 0.51$, $y = -0.35x + 23.45$

1999 ENC29 rate is 1% greater than RNC71
2015 ENC29 rate is 8% greater than RNC71

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<td>1% LT</td>
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<tr>
<td>NC</td>
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</tr>
</tbody>
</table>
Figure 6.8 ii. Pneumonia and Influenza:

ENC29 17-yr trendline
39% decrease
R2 = 0.75
y = -0.60x + 26.21

RNC71 17-yr trendline
38% decrease
R2 = 0.77
y = -0.57x + 25.52

NC 17-yr trendline
38% decrease
R2 = 0.79
y = -0.57x + 25.63

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

1999 ENC29 rate is 3% greater than RNC71
2015 ENC29 rate is 1% greater than RNC71

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2015

Report #2.201, October 2018
Health Systems Research and Development, Dept. of Public Health, ECU
Figure 6.8 iii. Pneumonia and Influenza:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

NWM 17-yr trendline
47% decrease
R2 = 0.31
y = -0.90x + 32.72

WM 17-yr trendline
45% decrease
R2 = 0.85
y = -0.82x + 31.47

NWF 17-yr trendline
43% decrease
R2 = 0.52
y = -0.55x + 21.77

WF 17-yr trendline
34% decrease
R2 = 0.57
y = -0.47x + 23.77

Comparison of Fitted Rates in 1999
Comparison of Fitted Rates in 2015
Figure 6.8 iv. Pneumonia and Influenza: Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

- NW 17-yr trendline
  - 45% decrease
  - $R^2 = 0.54$
  - $y = -0.68x + 25.73$

- W 17-yr trendline
  - 37% decrease
  - $R^2 = 0.76$
  - $y = -0.58x + 26.49$

1999 non-White rate is 3% less than White
2015 non-White rate is 14% less than White
Figure 6.8 v. Pneumonia and Influenza: Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020
Cancer - Colon, Rectum, Anus

- The 17-year rate trends for colon cancer for ENC, RNC and NC have all declined over the period. In 2015 ENC’s rate was 18% greater than RNC.

- The age-adjusted mortality rate trend for colon cancer for ENC has declined 39% over the 17-year period. The ENC rate is the highest (10% greater than RNC) but is projected to converge with the NC and RNC trends.

- The non-White male mortality rate trend is the highest of the demographic groups and is decreasing the most slowly. White males and non-White females are about 39% and 46% less than non-White males, respectively. White females have the lowest rate trend.

- The non-White rate in 2015 is 43% greater than the White rate, but both are declining.

- 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 $R^2 < 0.10$. 
Trends and Disparities in Mortality in Eastern North Carolina-29 Counties

Figure 6.9 i. Cancer - Colon, Rectum, Anus:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

ENC29 17-yr trendline
RNC71 17-yr trendline
NC 17-yr trendline

24% decrease
22% decrease
23% decrease

R2 = 0.65
R2 = 0.76
R2 = 0.78

y = -0.33x + 22.88
y = -0.25x + 18.98
y = -0.26x + 19.59

Comparison of Fitted Rates in 1999

ENC29 17% LT
RNC71 14% LT
NC

Comparison of Fitted Rates in 2015

ENC29 15% LT
RNC71 13% LT
NC

1999 ENC29 rate is 21% greater than RNC71
2015 ENC29 rate is 18% greater than RNC71

Report #2.201, October 2018
Health Systems Research and Development, Dept. of Public Health, ECU
Figure 6.9 ii. Cancer - Colon, Rectum, Anus:

ENC29 17-yr trendline
39% decrease
R² = 0.86
y = -0.55x + 23.67

RNC71 17-yr trendline
34% decrease
R² = 0.92
y = -0.40x + 19.85

NC 17-yr trendline
35% decrease
R² = 0.93
y = -0.42x + 20.45

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

1999 ENC29 rate is 19% greater than RNC71
2015 ENC29 rate is 10% greater than RNC71
Figure 6.9 iii. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

NWM 17-yr trendline
27% decrease
R2 = 0.34
y = -0.55x + 35.17

WM 17-yr trendline
43% decrease
R2 = 0.73
y = -0.67x + 26.86

NWF 17-yr trendline
48% decrease
R2 = 0.53
y = -0.72x + 25.76

WF 17-yr trendline
41% decrease
R2 = 0.82
y = -0.42x + 17.38

Comparison of Fitted Rates in 1999

NWM WM NWF WF
24% LT 27% LT 31% LT 51% LT
31% GT 4% GT 35% GT 51% GT
102% GT 55% GT 48% GT 24% GT

Comparison of Fitted Rates in 2015

NWM WM NWF WF
39% LT 46% LT 59% LT 31% LT
64% GT 11% LT 33% LT 4% GT
147% GT 50% GT 33% GT 4% GT

Report #2.201, October 2018
Figure 6.9 iv. Cancer - Colon, Rectum, Anus:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

1999 non-White rate is 36% greater than White
2015 non-White rate is 43% greater than White

NW 17-yr trendline
38% decrease
R² = 0.69
y = -0.65x + 29.21

W 17-yr trendline
41% decrease
R² = 0.85
y = -0.52x + 21.41

1999 non-White rate is 36% greater than White
2015 non-White rate is 43% greater than White
Figure 6.9 v. Cancer - Colon, Rectum, Anus:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity

$R^2 = 0.01$
y = 0.31x + 37.04

Percentage difference - non-White to White

% difference

-25 0 25 50 75 100 125

79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20

% difference

-3 12 15 -5 16 -14 24 22 15 16 8 14 46 23 8 12 35 43 74 36 20 57 39 45 13 58 26 46 46 38 35 43 63 27 37 46 37
Nephritis, Nephrotic Syndrome, and Nephrosis

- The mortality rate trend for nephritis, nephrotic syndrome, and nephrosis in ENC is unreliable. The rate trends for RNC and NC have increased. In 2015 ENC’s rate is 13% greater than RNC.

- With age-adjustment, ENC is 6% greater than RNC, and 30% greater than the US rate trend. The ENC trend is moderately reliable. The other trends are not reliable.

- The 17 year trend for non-White males is the highest. The trends for White males and White females are flat. The trend for non-White females is declining and is the only trend that is reliable.

- In 2015, the non-White rate was 122% greater than the White rate. The White rate is flat but is unreliable, the non-White rate is decreasing.

- The racial disparity trend is decreasing, in a moderately reliable trend.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 6.10 i. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020.

ENC29 17-yr trendline: 11% decrease
\[ R^2 = 0.11 \]
\[ y = -0.13x + 20.34 \]

RNC71 17-yr trendline
\[ R^2 = 0.00 \]
\[ y = 0.01x + 17.09 \]

NC 17-yr trendline
\[ R^2 = 0.00 \]
\[ y = -0.01x + 17.59 \]

US 16-yr trendline
\[ R^2 = 0.01 \]
\[ y = -0.02x + 14.33 \]

1999 ENC29 rate is 19% greater than RNC71
2015 ENC29 rate is 6% greater than RNC71

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2015
Figure 6.10 iii. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020.

- **NWM 17-yr trendline**
  - $R^2 = 0.01$
  - $y = -0.09x + 37.87$

- **WM 17-yr trendline**
  - $R^2 = 0.00$
  - $y = -0.02x + 16.91$

- **NWF 17-yr trendline**
  - $R^2 = 0.39$
  - $y = -0.56x + 35.06$

- **WF 17-yr trendline**
  - $R^2 = 0.03$
  - $y = -0.06x + 12.04$

**Comparison of Fitted Rates in 1999**

<table>
<thead>
<tr>
<th>Race</th>
<th>LT</th>
<th>GT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWM</td>
<td>55%</td>
<td>124%</td>
</tr>
<tr>
<td>WM</td>
<td>7%</td>
<td>107%</td>
</tr>
<tr>
<td>NWF</td>
<td>68%</td>
<td>29%</td>
</tr>
<tr>
<td>WF</td>
<td></td>
<td>66%</td>
</tr>
</tbody>
</table>

**Comparison of Fitted Rates in 2015**

<table>
<thead>
<tr>
<th>Race</th>
<th>LT</th>
<th>GT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWM</td>
<td>54%</td>
<td>119%</td>
</tr>
<tr>
<td>WM</td>
<td>28%</td>
<td>57%</td>
</tr>
<tr>
<td>NWF</td>
<td>69%</td>
<td>33%</td>
</tr>
<tr>
<td>WF</td>
<td></td>
<td>57%</td>
</tr>
</tbody>
</table>

**Notes:**
- 27% decrease
- LT: Lower Trend, GT: Greater Trend
- NWM, WM, NWF, WF represent different racial/ethnic groups.
Figure 6.10 iv. Nephritis, Nephrotic Syndrome, and Nephrosis: Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

18% decrease
R2 = 0.19
y = -0.39x + 36.00

1999 non-White rate is 158% greater than White
2015 non-White rate is 122% greater than White
Figure 6.10 v. Nephritis, Nephrotic Syndrome, and Nephrosis:
Measuring disparity in age-adjusted mortality rates by race for ENC29,
1979-2015 with projections to 2020

Racial Disparity
27% decrease
$R^2 = 0.14$
y = -2.64x + 163.49
7. Trends and Disparities in Mortality in ENC29: Cancer - All Sites and HIV Disease; 1979-2015
The cancer – all sites mortality rate trend for ENC has decreased slightly (4%) over 17 years. The RNC and NC rates are lower, and have decreased more than ENC.

The age-adjusted cancer – all sites mortality rate trend for ENC, NC and RNC are all decreasing, although the ENC rate is 8% greater than the RNC rate.

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

Both White and non-White cancer mortality trends are decreasing over the 17 year period. The Non-White rate decreased 30% and the White rate decreased 20%. The non-White rate remains 10% greater than the White rate in 2015, but they are converging.

The moderately reliable 17-year trend for racial disparity shows a 62% decrease.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 7.1 i. Cancer - All Sites:
Trends in mortality rates for ENC29, RNC71, and NC,
1979-2015 with projections to 2020

ENC29 17-yr trendline
RNC71 17-yr trendline
NC 17-yr trendline

4% decrease
R2 = 0.17
y = -0.46x + 219.79

6% decrease
R2 = 0.41
y = -0.69x + 195.07

6% decrease
R2 = 0.45
y = -0.68x + 198.96

1999 ENC29 rate is 13% greater than RNC71
2015 ENC29 rate is 15% greater than RNC71

Comparison of Fitted Rates in 1999

ENC29: 11% LT
RNC71: 9% LT
NC: ENC29

Comparison of Fitted Rates in 2015

ENC29: 13% GT
RNC71: 2% GT
NC: RNC71
Figure 7.1 ii. Cancer - All Sites: Trends in age-adjusted mortality rates for ENC29, RNC71, NC, and US, 1979-2015 with projections to 2020
Figure 7.1 iii. Cancer - All Sites:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

<table>
<thead>
<tr>
<th>Race</th>
<th>Trendline</th>
<th>LT</th>
<th>GT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWM</td>
<td>30%</td>
<td>42%</td>
<td>102%</td>
</tr>
<tr>
<td>WM</td>
<td>51%</td>
<td>38%</td>
<td>42%</td>
</tr>
<tr>
<td>NWF</td>
<td>56%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>WF</td>
<td>38%</td>
<td>8%</td>
<td>78%</td>
</tr>
</tbody>
</table>

Comparison of Fitted Rates in 1999

Comparison of Fitted Rates in 2015

R2 = 0.80
y = -8.81x + 393.06

R2 = 0.89
y = -4.05x + 276.76

R2 = 0.66
y = -2.56x + 194.30

R2 = 0.78
y = -1.96x + 172.82
Figure 7.1 iv. Cancer - All Sites:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

1999 non-White rate is 25% greater than White
2015 non-White rate is 10% greater than White

R2 = 0.81
y = -4.74x + 265.72

R2 = 0.92
y = -2.55x + 213.11

NW 17-yr trendline
W 17-yr trendline
30% decrease
20% decrease
Figure 7.1 v. Cancer - All Sites:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity
62% decrease
R² = 0.33
y = -0.92x + 25.37
HIV Disease

- The fitted HIV mortality rates for ENC have been decreasing over the past 17 years, but are still 56% greater than RNC in 2015.

- The age-adjusted rate trend for ENC, RNC and the US are all decreasing. The ENC rate is 63% greater than RNC in 2015.

- Non-White males continue to have the highest rates of age-adjusted mortality, but these rates have also decreased 73% in a 17-year reliable trend. Non-White females have the second highest rate, but it has also declined over the 17-year period. The rate for White males is lower but has also decreased. The White female rate is not reliable.

- The 17-year age-adjusted HIV mortality rates have decreased for both Whites and non-Whites by 49% and 69% respectively. The non-White rate is still 720% greater than the White rate.

- The trend for racial disparity is unreliable.

Unless otherwise noted, trends are considered reliable if $R^2 \geq 0.35$, moderately reliable if $0.35 > R^2 \geq 0.10$, and unreliable if $R^2 < 0.10$. 
Figure 7.2 i. HIV Disease:
Trends in mortality rates for ENC29, RNC71, and NC, 1979-2015 with projections to 2020

Mortality rate per 100,000 population

ENC29 17-yr trendline: 62% decrease
R2 = 0.83
y = -0.30x + 8.18

RNC71 17-yr trendline: 69% decrease
R2 = 0.97
y = -0.25x + 6.23

NC 17-yr trendline: 68% decrease
R2 = 0.98
y = -0.26x + 6.53

1999 ENC29 rate is 31% greater than RNC71
2015 ENC29 rate is 56% greater than RNC71

Comparison of Fitted Rates in 1999

<table>
<thead>
<tr>
<th></th>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
</tr>
</thead>
</table>
| 24% LT   | 31% GT| 5% GT | ENC29
| 20% LT   | 5% GT | RNC71 |

Comparison of Fitted Rates in 2015

<table>
<thead>
<tr>
<th></th>
<th>ENC29</th>
<th>RNC71</th>
<th>NC</th>
</tr>
</thead>
</table>
| 36% LT   | 56% GT| 8% GT | RNC71
| 31% LT   | 44% GT| 7% LT | NC  |
Figure 7.2 ii. HIV Disease:

ENC29 17-yr trendline
65% decrease
R2 = 0.87
y = -0.32x + 8.48

RNC71 17-yr trendline
71% decrease
R2 = 0.97
y = -0.26x + 6.16

NC 17-yr trendline
70% decrease
R2 = 0.98
y = -0.27x + 6.50

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

1999 ENC29 rate is 38% greater than RNC71
2015 ENC29 rate is 63% greater than RNC71

Comparison of Fitted Rates in 1999
ENC29 RNC71 NC US ENC29 RNC71 NC US
27% LT 23% LT 31% LT ENC29 39% LT 34% LT 44% LT ENC29
38% GT 6% GT 5% GT RNC71 63% GT 8% GT 9% LT RNC71
30% GT 5% LT 10% LT NC 50% GT 8% LT 16% LT NC
45% GT 5% GT 11% GT US 79% GT 10% GT 19% GT US

Comparison of Fitted Rates in 2015
ENC29 RNC71 NC US ENC29 RNC71 NC US
27% LT 23% LT 31% LT ENC29 39% LT 34% LT 44% LT ENC29
38% GT 6% GT 5% GT RNC71 63% GT 8% GT 9% LT RNC71
30% GT 5% LT 10% LT NC 50% GT 8% LT 16% LT NC
45% GT 5% GT 11% GT US 79% GT 10% GT 19% GT US
Figure 7.2 iii. HIV Disease:
Trends in age-adjusted mortality rates by race and gender for ENC29, 1979-2015 with projections to 2020

- NWM 17-yr trendline
  - 73% decrease
  - $R^2 = 0.86$
  - $y = -1.38x + 32.14$
- WM 17-yr trendline
  - 52% decrease
  - $R^2 = 0.28$
  - $y = -0.09x + 2.82$
- NWF 17-yr trendline
  - 62% decrease
  - $R^2 = 0.65$
  - $y = -0.51x + 13.92$
- WF 17-yr trendline
  - 73% decrease
  - $R^2 = 0.04$
  - $y = -0.01x + 0.69$

Comparison of Fitted Rates in 1999:

- NWM 91% LT
- WM 57% LT
- NWF 98% LT
- WF 104% GT

Comparison of Fitted Rates in 2015:

- NWM 86% LT
- WM 42% LT
- NWF 95% LT
- WF 603% GT
Figure 7.2 iv. HIV Disease:
Trends in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

NW 17-yr trendline
69% decrease
R2 = 0.85
y = -0.89x + 22.01

W 17-yr trendline
49% decrease
R2 = 0.38
y = -0.05x + 1.76

1999 non-White rate is 1152% greater than White
2015 non-White rate is 720% greater than White
Figure 7.2 v. HIV Disease:
Measuring disparity in age-adjusted mortality rates by race for ENC29, 1979-2015 with projections to 2020

Racial Disparity

\[ R^2 = 0.05 \]
\[ y = -25.37x + 1,291.33 \]
## 8. Appendix

<table>
<thead>
<tr>
<th>Disease</th>
<th>ICD 10 Code</th>
<th>ICD 9 Code</th>
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<tbody>
<tr>
<td>Diseases of Heart</td>
<td>I00-I09, I11, I13, I20-I51</td>
<td>390-398, 402, 404, 410-429</td>
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<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>
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<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>
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<tr>
<td>Cancer - Larynx</td>
<td>C32</td>
<td>161</td>
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<tr>
<td>Cancer - Trachea, Bronchus, and Lung</td>
<td>C33-C34</td>
<td>162</td>
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<tr>
<td>Cancer - Malignant Melanoma of Skin</td>
<td>C43</td>
<td>172</td>
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<tr>
<td>Cancer - Breast</td>
<td>C50</td>
<td>174-175</td>
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<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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<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>
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<tr>
<td>Cancer - Non-Hodgkin's Lymphoma</td>
<td>C82-C85</td>
<td>200, 202</td>
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<td>Cancer - Leukemia</td>
<td>C91-C95</td>
<td>204-208</td>
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<td>HIV Disease</td>
<td>B20-B24</td>
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<td>Septicemia</td>
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<td>038</td>
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<td>Diabetes Mellitus</td>
<td>E10-E14</td>
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<tr>
<td>Pneumonia and Influenza</td>
<td>J10-J18</td>
<td>480-487</td>
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<td>Chronic Lower Respiratory Diseases</td>
<td>J40-J47</td>
<td>490-494, 496</td>
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<td>Chronic Liver Disease and Cirrhosis</td>
<td>K70, K73-K74</td>
<td>571</td>
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<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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<tr>
<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>
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