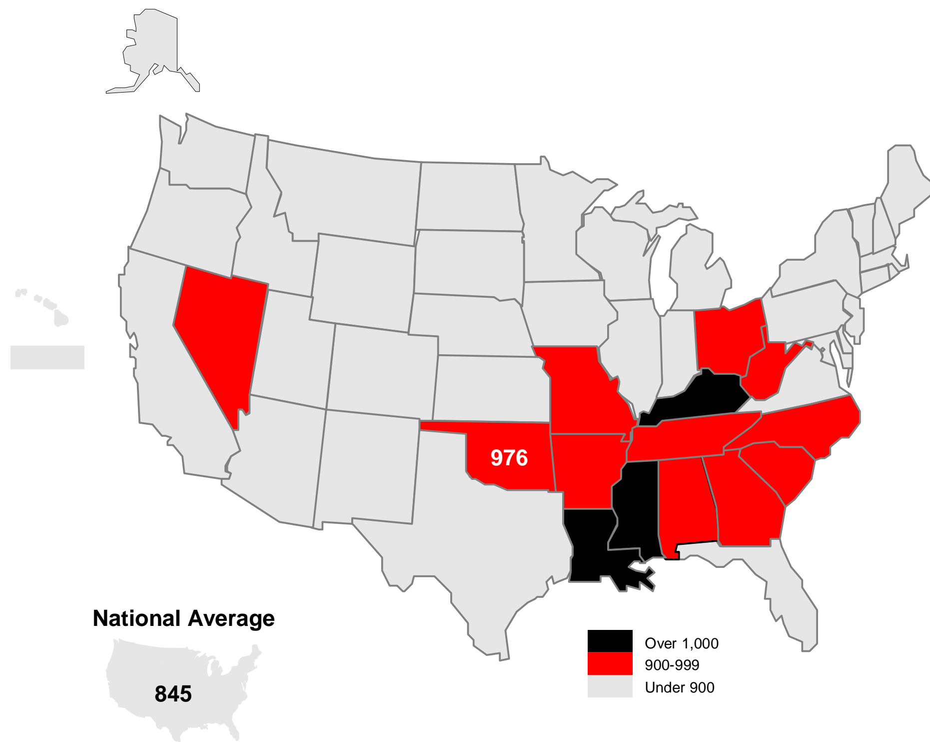
**A HEALTH POLICY ANALYSIS**

# Causes of Premature Death

A SUPPLEMENT TO BASELINE RESEARCH SUPPORTING A REGIONAL STRATEGIC PLAN
[COVER MAP DISPLAYS 2002 DATA]

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# EXECUTIVE SUMMARY

**PURPOSE**
The accompanying analysis focuses upon the health status of Oklahomans. The premise is that age-adjusted death rates (AADR) are the single most descriptive single measure of health status in that it perfectly measures premature death – that is the total absence of health. The AADR may also be called a "premature death rate". This study is a follow-up to a previously released analysis that noted the departure of Oklahoma from declining AADRs observed nationally. It places Oklahoma (and sub-state regions) trends in perspective with the nation.

**FINDINGS**
The nation's health has steadily improved between 1979 and 2003. During that time the national AADR declined over 16%. Many states experienced a parallel decline. Almost a dozen states mirrored the national decline until the early 1990's – then ceased to improve. Most were in the southeast. Oklahoma is the only state to actually worsen since 1990. While there are statistical differences, sub-state regions in Oklahoma each followed a similar trend line. The Tulsa and Oklahoma City urban areas have slightly worse rates than suburban and rural areas; and southeastern Oklahoma has rates worse than the northwestern counties. But each has contributed to the lack of the relative progress of Oklahoma.

**The statistical reasons for this lack of progress have been calculated. On a statewide basis, heart disease is the major contributing factor followed by respiratory disease. Between the two, 75% of the difference between Oklahoma and the nation can be explained.**

Statistically, Oklahoma performs as a geographical appendage of the Deep South. The trends and data for Oklahoma most resemble Arkansas, Louisiana and Mississippi – and are contrary to Texas, New Mexico and Colorado. In other words, Oklahoma (behaviorally) is a southern state – not a western or southwestern one. The Oklahoma health has much more in common with peoples to the south and east – than to those to the north and west.

**The effects of out-migration on the AADR are easily overlooked – and are beyond the control of the public health or health care system interventions. Oklahoma is the only state west of the Mississippi River to lose a Congressional seat in 2000. That out-migration of presumably healthier Oklahomans (less likely to die prematurely) has surely caused the AADR to arithmetically rise.**

**SUMMARY**
There are four primary determinants of health. They are access to services, genetics, environment and individual behaviors. It is thought that there any differences in genetics, access or environment are not likely to explain the signal lack of progress of Oklahoma – or its poor position relative to all other states. Poverty status and income levels also are not primary causes of health status – but are contributory inasmuch as they may describe and proscribe behaviors and personal environment.

The fundamental cause of these negative health data seems to be cultural health values and beliefs that are ingrained in the behaviors of Oklahomans. Those behaviors contribute significantly to premature death from heart and respiratory disease. The recommended treatment for this "diagnosis" will take lots of time before it begins to work – perhaps a generation. In the meanwhile, the Oklahoma public health establishment must address the health education and behavior modification issues, while the Oklahoma health care systems will be required to deal with the intermediate consequences. Overall, a final challenge is to "grow" the population with healthier Oklahomans. This is as much an economic development issue as anything else.

# SUPPLEMENTAL REPORT
## TULSA MSA HEALTH POLICY ANALYSIS

**INTRODUCTION**
The OU Center for Health Policy completed a broad assessment of the Tulsa region with emphasis upon health status, safety net infrastructure, hospital utilization and health insurance status. That 160 page study is at the center's website. [1] The signature finding of the study is the lack of progress in the decline of age-adjusted death rates in the metro area and in Oklahoma. The most often asked question was "what happened in the 1990's?" This was the year that Tulsa and Oklahoma departed from the national downward trend and AADR actually worsened. That question is the genesis of this report and analysis. The University of Oklahoma College of Public Health offered a summer course in Research Methods in Health Administration during the Summer semester 2005. The academic premise of the class was to examine "why" the death rates changed direction and why they worsened.

The students involved in that research were Sylvia August, MD; Barbara Volz; Melanie Maxwell; Mallory Van Horn; Terri Salisbury and Shane Ryan. Dr. August focused upon children's health; Ms. Salisbury analyzed 13 counties in both NW and SE Oklahoma; Ms. Van Horn analyzed Oklahoma County and central Oklahoma region; and Ms. Volz, Ms. Maxwell and Mr. Ryan examined the Tulsa region. Their data was used by Bina Patel and Michael Lapolla to provide a better understanding and appropriate context of the Tulsa region and Oklahoma.

**PURPOSE**
This report serves as a supplement to the major health policy analysis of the Tulsa Metropolitan Statistical Area (MSA) conducted in the early part of 2005. The purpose of this report is to present a more in-depth analysis of mortality and health status in the Tulsa MSA as well as various other regions of Oklahoma—including the Oklahoma City MSA and the counties that comprise the northwest and southeast quadrants of the state. The analysis primarily examines some of the major disease categories—heart disease, cancer, and respiratory disease, for example, that contribute to elevated levels of mortality in the MSA and the various other regions of the state. Specific causes of death, such as diabetes, that also substantially contribute to mortality in the Tulsa MSA and other areas of the state are also examined in this analysis. Mortality in each region is considered in the context of the other regions in the state, the state of Oklahoma, and the nation. Lastly, an examination of mortality among children ages 0 to 14 in the Tulsa MSA region is also presented.

It should also be noted that the smaller the geographical area, the greater the year-to-year variation in mortality rates. Thus, a grouping of juxtaposed counties may provide a better representation of the mortality condition in a given area or region versus that of a single county. With that said, the Tulsa MSA might be a more adequate representation of the health status and mortality conditions that exist in the region rather than to focus upon Tulsa County alone. The same can be said for Oklahoma MSA and its respective Oklahoma County.

**DATA**
State-based mortality data was obtained from the Oklahoma Department of Health, using their web-based vital statistics query system to retrieve age-adjusted death rates[2] for select geographic areas within the state, by year (from 1980 to 2003) and specific cause of death.[3] The Centers for Disease Control and Prevention (CDC) was also used as a major source for national, state, and county mortality data from their National Center for Health Statistics (NCHS) and CDC Wonder websites.

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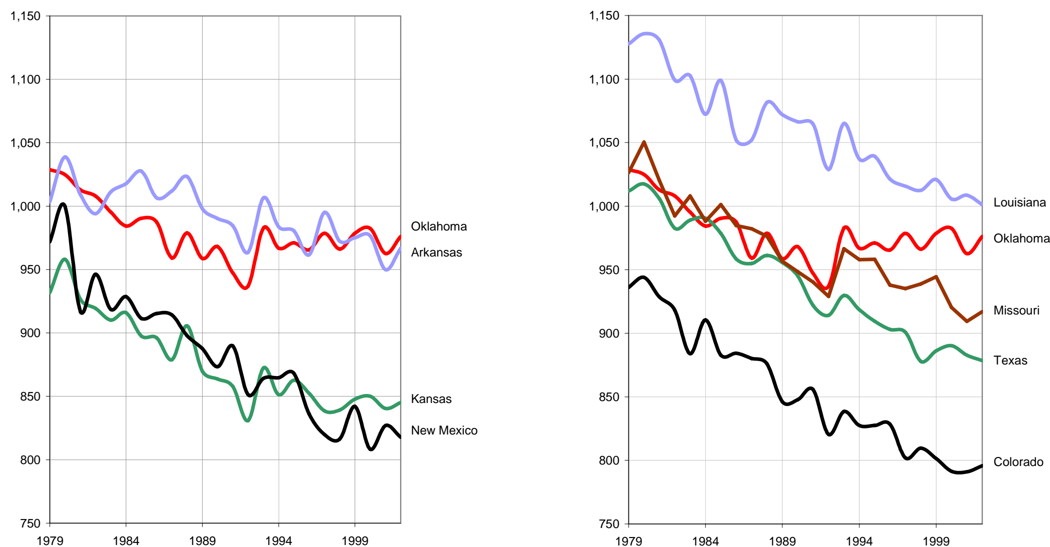
[1] *www.coph.ouhsc.edu/coph/HealthPolicyCenter/Web/library.html*
[2] *Any reference to a "rate(s)" or "mortality rate(s)" refers to "age-adjusted death rate(s)." Rates are per 100,000 population.*
[3] *See Appendix: International Classification of Disease (ICD) for an explanation of cause of death classification.*

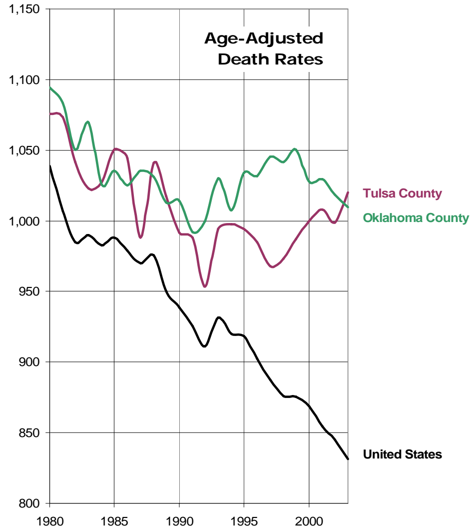
## FINDINGS

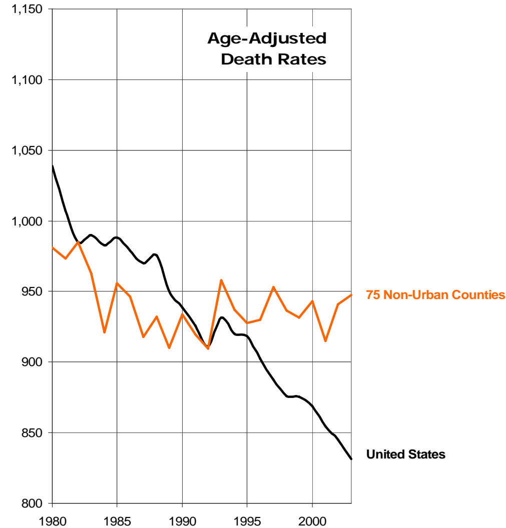
The overall findings are:

- The Tulsa and Oklahoma City MSA regions generally mirror the state data, primarily because over half of all Oklahomans will live in these two areas.
- The SE region of Oklahoma has much higher AADR than the NE region
- The regional states of Colorado, New Mexico, Texas, Kansas and Missouri all had much lower AADR than Oklahoma and Arkansas; and these states have experienced a steady decline since 1979 – while Oklahoma and Arkansas quit making progress in 1993 and have essentially made no progress since.
- Within Oklahoma, the AADR are lower (better) as one is north and west; coincidentally, within the 8 state regions, state rates are lower (better) as one is north and west.
- The primary reason why Oklahoma AADR are departing and worsening from national trends is simply heart disease; premature deaths from heart disease account for over 60% of the observed difference with national and regional trends.
- Rural areas of Oklahoma have lower (better) AADR than urban areas.

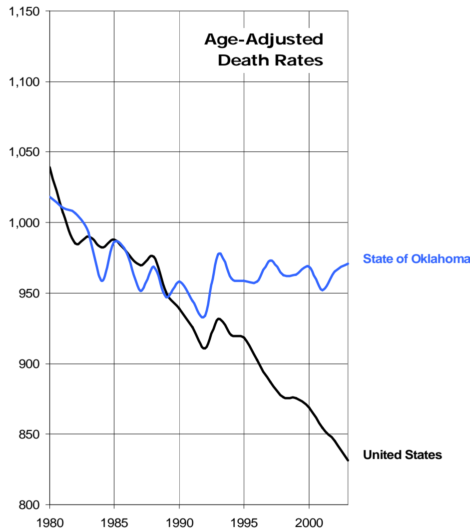


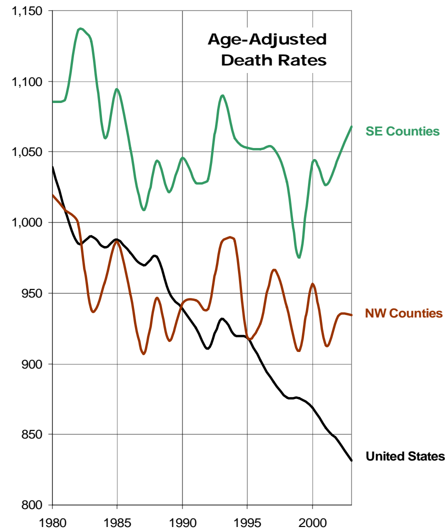
## URBAN CORE COUNTIES
## COMPARED TO OTHER 75 COUNTIES IN OKLAHOMA




## REGIONAL VARIATIONS IN OKLAHOMA
### SOUTHEAST AND NORTHWEST



**What Happened?**
Heart disease "happened". And out-migration "happened". But they did not happen overnight or suddenly. The processes leading to death from heart diseases – and decisions to leave Oklahoma – build over a long period of time. And they involve many complex life factors. Health care impacts only some.

The following table indicates the differential in overall mortality between the various geographic areas of Oklahoma compared to national rates in year 2003. The table also presents the point difference in mortality between these areas and the nation for certain specific disease categories and sub-categories (including the percent that each disease category contributes to overall mortality in these areas).

**DIFFERENTIALS FROM NATIONAL AVERAGE [2003]**

Interpreting this table: This table shows point difference in age-adjusted death rates compared to the national average. The age-adjusted death rate in Tulsa County was 188.9 points higher than the national average of 831.2; and the AADR for heart disease in Tulsa County was 91.3 points higher that the national average of 305.8.

| Cause | BENCHMARKS | | TULSA | | OKLAHOMA CITY | | REGIONS | |
|---|---|---|---|---|---|---|---|---|
| | United States | State of Oklahoma | Tulsa County | Tulsa Metropolitan | Oklahoma County | OKC Metropolitan | NW OK Counties | SE OK Counties |
| TOTAL | 831.2 | +139.8 | +188.9 | 171.2 | +178.3 | +150.5 | +103.1 | +236.6 |
| **Heart** | **305.8** | **+84.8** | **+91.3** | **87.7** | **+109.6** | **+105.6** | **+74.9** | **+134.0** |
| Cancer | 189.3 | +9.2 | +19.9 | 16.1 | +1.1 | +5.7 | -7.3 | +31.8 |
| Respiratory | 65.3 | **+19.2** | **+20.3** | **22.2** | **+20.7** | **+19.0** | **+27.7** | **+27.1** |
| Diabetes | 25.2 | +4.5 | -0.3 | 2.8 | +0.7 | +1.1 | **+11.1** | **+11.3** |
| All Other | 245.6 | +22.1 | **+57.7** | **42.4** | **+46.2** | +19.1 | +3.3 | +32.4 |

**PERCENTAGE OF VARIANCE FROM NATIONAL AVERAGES [2003]**

Interpreting this table: This table shows percentage differences in age-adjusted death rates compared to the national average. It indicates that premature deaths from heart disease in Tulsa County are 30% higher than the national average; and 28% higher statewide in Oklahoma.

| Cause | BENCHMARKS | | TULSA | | OKLAHOMA CITY | | REGIONS | |
|---|---|---|---|---|---|---|---|---|
| | United States | State of Oklahoma | Tulsa County | Tulsa Metropolitan | Oklahoma County | OKC Metropolitan | NW OK Counties | SE OK Counties |
| TOTAL | 831.2 | 17% | 23% | 21% | 21% | 18% | 12% | 28% |
| **Heart** | 305.8 | **28%** | **30%** | **29%** | **36%** | **35%** | **24%** | **44%** |
| Cancer | 189.3 | 5% | 11% | 9% | 1% | 3% | -4% | 17% |
| Respiratory | 65.3 | **29%** | **31%** | **34%** | **32%** | **29%** | **42%** | **42%** |
| Diabetes | 25.2 | 18% | -1% | 11% | 3% | 4% | 44% | 45% |
| All Other | 245.6 | 9% | **23%** | **17%** | **19%** | 8% | 1% | 13% |

Heart disease is the most significant contributing factor – and indicator – of Oklahoma's poor health status. Death rates for heart disease are worse in the metro areas and southeast Oklahoma; respiratory disease rates are much higher than the national average in all parts of Oklahoma.

While cancer is the second most significant contributor to premature death, the rates are slightly higher than the national average.

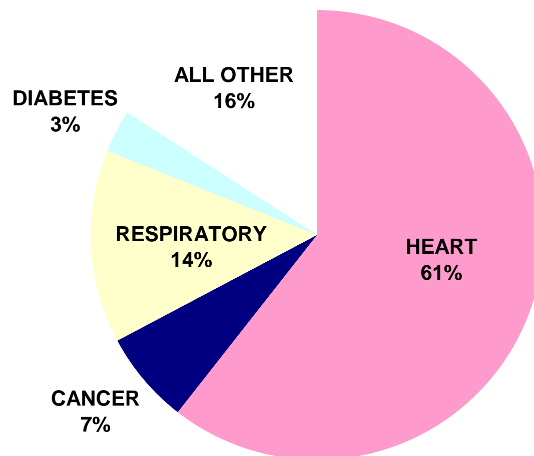
**COMPONENTS OF VARIANCE FROM NATIONAL AVERAGE [2003]**

Interpreting this table: This table displays the degree to which certain causes explain the difference between Oklahoma's death rates and that of the nation. This table differs in purpose from the preceding ones.

In Oklahoma, deaths from heart disease account for 61% of the overall difference between the national and state overall premature death rates. In other words, if heart disease death rates in Oklahoma were at the national average – the difference between the national and state total rates would be reduced by 61%. The chart below graphically depicts that narrative.

| Cause | BENCHMARKS | | TULSA | | OKLAHOMA CITY | | REGIONS | |
|---|---|---|---|---|---|---|---|---|
| | United States | State of Oklahoma | Tulsa County | Tulsa Metropolitan | Oklahoma County | OKC Metropolitan | NW OK Counties | SE OK Counties |
| TOTAL | 831.2 | +139.8 | +188.9 | +171.2 | +178.3 | +150.5 | +103.1 | +236.6 |
| **Heart** | **305.8** | **61%** | **48%** | **51%** | **61%** | **70%** | **73%** | **57%** |
| Cancer | 189.3 | 7% | 11% | 9% | 1% | 4% | -7% | 13% |
| Respiratory | 65.3 | 14% | 11% | 13% | 12% | 13% | 27% | 11% |
| Diabetes | 25.2 | 3% | 0% | 2% | 0% | 1% | 11% | 5% |
| All Other | 245.6 | 16% | 31% | 25% | 26% | 13% | 3% | 14% |
| | | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

**"WHAT HAPPENED?"**
**STATE OF OKLAHOMA**




## Population Changes

It is not uncommon for analysts to presume that all health related indicators are caused by – or may be changed by – health policies or dollars expended for more health care services.

If the concern is a premature death rate that is increasing – or not decreasing enough – there is another demographic dynamic. It is called out-migration.

Consider the formula for an age-adjusted death rate. Simply speaking, the numerator will be deaths – but the denominator will be the general population. Simply stated, even if the total deaths do not change – but the population declines – the death rate worsens even though the number of deaths is unchanged.

So – what happened in the 1990's? It is likely that there has been a steady out-migration from Oklahoma that began in the late 1980s or early 1990s. That out-migration was likely composed of healthy individuals – individuals less likely to die prematurely – seeking opportunity elsewhere.

What evidence is there that such an out-migration occurred? Out-migration statistics are extraordinarily difficult to gather. But several demographic facts are known. The census is taken every 10 years. Congressional seats are recalculated after each census to reflect population gains/losses. In the decade of the 1990's, Oklahoma was the only state west of the Mississippi River to lose a congressional seat. This is an extraordinary observation in that Oklahoma only had six seats in 1990. Therefore – some of the "what happened in the 1990's" must be due to out-migration of healthy people. The extent to which it contributes to the worsening of the premature death rates is speculative.

**CURRENT POLICY & PROGRESS**

The current policy and progress of Oklahoma is a complex issue. It is known that:

- the rate of improvement of the state's age-adjusted death rate is among the worst in the nation.
- funding for public health services is at or above the national average.
- Oklahoma has a significant number of people without health insurance
- health behaviors among Oklahomans are not the best nor are they the worst.

Regardless of WHY – we do know that poor health status does manifest itself in premature death from heart and respiratory diseases, and at a rate far worse than the national average. Knowing this is helpful as policy makers may work backwards to effectively change the outcome over time.

In order to address the widening gap between overall mortality between the state and the nation—and even to begin to dissect the growing disparity in heart disease mortality between state and nation requires an examination of the core issues that contribute to this disparity. One of these core issues, which is certain to influence the state and the nation's long-term health and mortality outlook, is the growing trend in obesity. Factors such as physical inactivity and poor diet and nutrition contribute to the upsurge in obesity. According to *F as in Fat: How Obesity Policies are Failing in America, 2005*, Oklahoma ranked 14th in the nation in highest rate of adult obesity at about 24%—almost one in four people. It ranked 22nd in the nation in highest rate of obese and overweight adults combined at 60%.[4]

Once California set the precedence in 1988 with its anti-tobacco legislation, other states were soon to follow with the passage of similar anti-tobacco measures such as banning smoking in public venues like restaurants and bars. California's smoking rates have decreased 33% since they initiated this state-wide program.[5] The state has also experienced a decrease in their age-adjusted death rates for coronary heart disease from 2000 to 2003. Oklahoma ranked seventh in the nation in smoking rates.[6] The recent passage of anti-tobacco legislation in Oklahoma may not see reductions in mortality in the immediacy, but the future impacts can be far-reaching.

Perhaps the most surprising disparity is evident in the area of diabetes. Until about 1997, Oklahoma was actually below the national average in diabetes mortality. While there is a high prevalence of diabetes among Native Americans—a significant population in Oklahoma, the data does not appear to reflect this correlation for Oklahomans. However, the increased prevalence of adult onset Type II diabetes may have markedly fueled the upward trend in diabetes mortality, both at a national and state level in the past decade.

If mortality were a matter of a single problem or solution, the reality might be very different today; it is rather many factors and conditions that simultaneously oppose or affect the overall health and mortality status of the state and its region.

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[4] *Trust for America's Health, http://healthyamericans.org/reports/obesity2005/release.php?StateID=OK*
[5] *www.applications.dhs.ca.gov/pressreleases/store/pressreleases/05-16.html*
[6] *www.statehealthfacts.org/cgibin/healthfacts.cgi?action=compare&category=Health+Status&subcategory=Smoking&topic=Smoking+Rate*

## OPTIONS & INTERVENTIONS

Major diseases can have multiple causative and contributing factors. Public health interventions and resources should not be limited in focus; rather a collective or multiple focus on all the major contributors to mortality in a given geographical area may be a more effective approach. These interventions are crucial to any community and can be a means to address major health problems afflicting a community. Successful public health interventions inform the public about the seriousness or magnitude of their local health issues and the actions or solutions necessary to resolve those issues.

### Effective Public Awareness

Effective public awareness campaigning at the state and local level is crucial to targeting areas in need of intervention.

### Rural/ Community Health Clinics

A lack of access to healthcare services, whether due to a lack of practitioners or a lack of resources (community- or individual-based) contributes to delayed diagnosis and treatment for specific disease conditions. Rural or community health clinics that utilize paraprofessionals (nurse practitioners or physician assistants) and sliding-scale fee schedules could help fill the critical health resource needs of such areas as well as address limitations in health services that are predominant in rural areas. Licensed nurses could perform disease screenings, make referrals, and provide preventive education to at-risk persons.

### Youth Risk Behavior Survey (YRBS)

The Youth Risk Behavior Survey (YRBS) could be better utilized locally to provide public health officials and the community with a risk assessment of the youth in their area.

### Prevention Measures

Prevention is a generations long process. Measures that could impact the mortality rates in a given area may include community partnerships, coalitions, and health programs and projects. Community partnerships and coalitions could be another means of reaching people at the local level with information and messages about prevention as well as a way to assist with acquiring human and material resources for community health programs and projects—which may include health screenings, prevention and health maintenance programs.

## CONCLUSIONS

The apparent problems and deficiencies that exist in the health status and mortality of residents of major regions in the state are multidimensional. Perhaps lifestyle, behaviors, and attitudes or proximity and access to health care services or socioeconomic factors such as income and education level play some role in the health condition/status and outcomes of residents. Whatever the case may be, the health status and mortality of a population can be can be influenced by initiatives in public health policy. If the state of Oklahoma is to reverse its adverse national health ranking and depart from the grim path it appears to following, then implementation of effective policy - however resistant the public may be to it - will need to force a more positive reality and future outlook for the state and its residents.

A major focus of this analysis appeared to be on heart disease, which accounted for the greatest proportion of deaths in the Tulsa MSA, the state and its other respective regions. While the nation continued on a downward or positive trendline for heart disease, the state and its various regions were on a much less dramatic decline. Although this analysis focused on the major disease categories, there may be specific causes of death within each disease category that perhaps account for the bulk of mortality in their respective categories. Thus, an in-depth survey of specific causes of death would warrant further analysis.

## APPENDIX A
## DETAILED FINDINGS

The mortality outlook for the Tulsa MSA, Oklahoma City (OKC) MSA, and the northwest and southeast regions of the state at times appears grim. Yet, it can be influenced and affected by local or statewide policy efforts focused on specific disease categories that significantly impact the health and mortality of each of these regions. For example, the major contributors to mortality in the Tulsa region, in order of greatest magnitude, are heart disease, chronic lung disease (under respiratory disease) and diabetes. All of these disease conditions are significantly perpetuated by behavior and lifestyle factors, and thus are potentially highly preventable. Mere changes and improvements to lifestyle and behavior, in and of themselves, can significantly impact health outcomes in any of the major disease categories. Thus, efforts and strategies focused on behavior change and lifestyle reconditioning can potentially produce long-term benefits for the population in any of these regions. Obviously, greater attention to prevention of morbidity in the present can potentially avert or delay preventable and premature mortality in the future.

The findings of this analysis were broken down into sections pertaining to key geographic areas in the state: Tulsa MSA, Oklahoma City (OKC) MSA, a comparison of Tulsa and OKC MSAs, Northwest Oklahoma and Southeast Oklahoma, a comparison of Oklahoma and the nation, and finally a study of childhood mortality in the Tulsa MSA.

**Tulsa MSA**

The fact is the nation continues to see significant improvements in its overall health outcomes and disease mortality while Tulsa MSA and the state have not for over a decade. Prior to the early 1990s, Tulsa County and the MSA appeared to parallel the nation in the rate of decline in overall mortality. Since then however, the Tulsa region departed from the national downward trend and actually began to worsen. This departure from the national trend has continued and has significant implications for policy in the state and the MSA region.

Another stark reality is that heart disease remains the number one cause of death in Tulsa County and the MSA, despite a significant reduction in the proportion of total deaths due to heart disease in this region. In 1980, heart disease was responsible for over half (52% and 53%, respectively) of all mortality in Tulsa County and the MSA. In 2003, the percentage dropped to 39% in both areas of the region. However, in 2003, the MSA's rate was also 29% higher than the national average in heart disease mortality.

Some additional key findings for this area were as follows:

- Okmulgee, Creek, and Pawnee counties had the highest total mortality rates in the MSA.

- One in five deaths in the region was due to cancer; however, although cancer mortality rates fluctuated wildly at these geographic levels, the rates have not changed much over time.

- In 2003, the MSA's mortality rate for respiratory disease was over one-third higher than the national rate—an increase reflected by greater chronic lung disease deaths, especially in Creek, Okmulgee, Pawnee, and Tulsa counties.

- Since about 1996, diabetes rates in the MSA have been consistently higher than in the nation. In 1980, the rate was actually 30% lower than the national average, and then in 2003, the rate increased to 11% more than the national average.

**Oklahoma City MSA**
Oklahoma County and OKC MSA also experienced a negative digression in health status and mortality very similar to that reflected by Tulsa County and MSA. From about 1990 to 2002, total mortality rates in Oklahoma County consistently hovered above the other geographies in the state and were well above national rates for those years. The total mortality in the OKC MSA was about 2% above the national norm in 1980, but increased to about 18% above the national average in 2003.

In 2003, the MSA's heart disease mortality rate was over one-third higher than the national average—in 1980, the rate was hardly noticeable at 1.5% higher than the national rate. Cancer mortality rates have been on the decline for both the county and the MSA through the 1990s and into recent years. In 2003, the county's rate was *at* the national average. However, just as in the Tulsa region, cancer accounts for one in five deaths in the OKC region as well. Diabetes mortality in both Oklahoma County and the MSA mostly remained below the national average from 1980 to about 1997, after which rates took a departure to exceed the national average. Respiratory disease related mortality in the MSA was only about 1% higher than the national norm in 1980, then in 2003, the MSA's rate increased to more than 29% higher than the national average.

**Tulsa & Oklahoma City MSAs**
The total mortality trendlines for the OKC and Tulsa MSAs paralleled each other from 1980 to 2003; both MSAs actually saw mostly similar *trends* in total mortality. Yet, over the last decade, total mortality rates for OKC MSA have mostly been higher than Tulsa MSA. From about 1995 to 2002, OKC MSA saw higher total mortality than Tulsa MSA, and then in 2003, Tulsa MSA actually saw a sharp rise in its total mortality rate over OKC MSA (1002 vs. 982). Some key findings for the various disease categories in this region were as follows:

- Since about 1996, heart disease mortality rates in OKC MSA remained slightly higher than Tulsa MSA. Prior to that—from 1980 to the mid-1990s, OKC MSA actually fared better than Tulsa MSA in this regard. Since 2001, rates stabilized for the OKC region and were actually declining for the Tulsa region.

- Cancer mortality rates fluctuated wildly at the county level from 1980 to 2003. Since 1999, rates for Tulsa MSA were consistently higher than OKC MSA.

- Respiratory disease mortality saw a very sharp spike from 2002 to 2003 for the state and both metro regions compared to the nation. Tulsa MSA had the greatest increase and highest mortality in 2003 of all comparative regions—state, Tulsa County, Oklahoma County, and OKC MSA. Before 2003, however, OKC MSA's trendline hovered above the Tulsa MSA trendline.

- Diabetes has been on a subtle rise in the nation, the state and sub-state regions since 1980. In 2003, Tulsa and Oklahoma counties hovered around the national average, while the MSAs and the state were above the national norm. From 1999 to 2002, diabetes mortality was on a decline for Tulsa MSA. Then in 2003, there was an upturn and the rate was higher than that of OKC MSA. The OKC region appeared to be on a decline since 2001.

The following are key findings for year 2002 and 2003 for reported health risk behaviors in the two major metro areas of the state. County and metro area rates for various health risk behaviors are comparative to the national median.

In 2002…

- Diabetes in the state and both MSAs was at or below the national median.
- Current smoking, physical inactivity, and the percentage of adults reporting general health as fair or poor was higher in the state and both MSAs.
- The state was slightly above the norm in obesity, but both MSAs were lower.

In 2003…

- Diabetes in the state was at the national norm and lower in the MSAs; rates were lower in the OKC region compared to the Tulsa region.
- Current smoking was still higher in all three geographies; however, rates in the OKC region were higher than in the Tulsa region.
- Physical inactivity was still significantly higher in all three areas; although, Tulsa County's rate was only slightly higher than the average.
- Those reporting health status as fair or poor was lower in OKC MSA; Tulsa MSA and the state rates were higher than the norm.
- Obesity saw a hike—higher in the state and OKC MSA, but at the national average for Tulsa MSA; obesity was greater than average in Oklahoma County and less than the average in Tulsa County.

**NW & SE Oklahoma**

From 1980 to 2003, total mortality in the NW region of the state was consistently much lower than mortality in the SE region—1,019 vs. 1,085 respectively in 1980 to 934 vs. 1,068 respectively in 2003. There were nine counties in the NW quadrant that had the lowest total mortality rates compared to the SE, the state and the nation, while only two counties in the SE quadrant had better total mortality than the state—albeit worse than the nation.

The NW counties had lower mortality rates for cancer, stroke, and diabetes compared to the SE counties, the state and the nation; they also had less mortality due to heart disease, yet more due to accidents, than the state and the SE counties. SE counties fared worst in suicide, heart disease, respiratory disease, cancer, and total mortality compared to the NW counties, state, and nation. They did, however, fare better than the state and the nation in terms of stroke and diabetes mortality.

Although on a decline, heart disease related mortality in the SE region still remained higher than that of the NW counties, the state and the nation. In recent years, heart disease mortality was lower in the NW region comparative to the state, with the exception of Major and Harper counties. Harper and Dewey counties in the NW and Sequoyah in the SE showed higher rates for cerebrovascular disease than the state average. Respiratory disease mortality rose in both the NW and SE regions of the state from 1980 to 2003, although higher rates were more prominent in the SE region through most of the 1990s. In the past decade, diabetes mortality also rose dramatically in both regions of the state, although there was some fluctuation in the rates for the NW region. The SE counties mostly fared better in diabetes mortality than the NW region over time.

Harper County—in the NW quadrant of the state, presented as an anomaly—it is surrounded by much better-faring counties, yet was ranked as one of the worst counties in Oklahoma in terms of health status and mortality.

**Oklahoma & the US**

National rates and trends serve as the ultimate benchmark for states and local areas to strive to improve their shortfalls in areas of health and mortality. To simply study counties and MSAs without considering their mortality conditions in the context of the nation and the state would be futile. In 1980, total mortality in the state was actually below the national average—at 1018 and 1039, respectively. Then in 2003 the state rate increased to 17% above the national average.

Since the early 1990s, heart disease mortality in Oklahoma has been on a very shallow decline comparative to the steep national decline. In about 1997, cancer mortality in the state exceeded the national average for the first time since 1980 and has remained at or above the national average ever since. Since 1980, Oklahoma and its regions mostly remained at or below the national average for diabetes mortality, until about 1997—when there was a dramatic shift in mortality to above-average rates for all major Oklahoma geographies. Respiratory disease mortality in the state and the various regions hovered above the national average since about 1981.

**Childhood Mortality in Tulsa MSA**

The fact is children's death rates have dropped dramatically since 1980 and children are now simply dying less often than before. Mortality among children age 0 to 14 declined for the Tulsa region (County and MSA) and the state over time. This is most likely due to certain improvements and developments in health services, technology, and access to care. However, conditions in the perinatal period, congenital anomalies, motor vehicle accidents and all other accidents were most attributable for any deaths in this age group.

Accidental injuries—specifically motor vehicle accidents (MVA), were the leading cause of death in children age 1 to 14 in Oklahoma and the nation, followed by other unintentional injuries. Fires, burns and drowning were also the most common causes (other than MVA) of unintentional injuries leading to death in children in this age group. Tulsa County and the MSA as a whole have childhood injury death rates that are below the state rate; however, Creek, Okmulgee, Osage, and Pawnee have rates above the state rate.[7]

This analysis also found that at the state and Tulsa County level, the most common causes of death among children age 1 to 14 were: 1) motor vehicle accidents, 2) other unintentional accidents, 3) congenital anomalies, and 4) malignant neoplasms; whereas for infants younger than one, the common causes were: 1) perinatal conditions, 2) congenital anomalies, and 3) injuries. During the observation period, the mortality rate among children (0 to 14) decreased by over 40% in the state and by about one-third in the Tulsa region.

Children in Oklahoma are much less likely to die in childhood now than they were only over two decades ago. However, evaluating children's overall health requires an assessment of multiple health and social factors. To better assess their health requires a developmental perspective with implications for health (physical and mental) in subsequent stages of life. Death rate by itself is not enough to assess the health condition of children in a community. Other contributing factors such as the environment and social, physical, and emotional health and well-being need to be considered in order to maintain the low death rate among children.

[7] *Oklahoma State Health of Department; website: www.health.ok.gov*

**Appendix B**
**TULSA MSA**
*Tulsa MSA includes Tulsa, Creek, Osage, Okmulgee, Pawnee, Rogers, and Wagoner counties.*

Prior to the early 1990s, Tulsa County and the MSA appeared to mimic the nation in the rate of decline in overall mortality. However, since then, the Tulsa region digressed from the nation's positive trendline, and instead continued on a negative path in overall mortality. This divergence from the national trend has since maintained and has significant implications for policy in the state and the MSA region; the nation continues to see positive improvements in its overall health outcomes and disease mortality, whereas Tulsa MSA and the state of Oklahoma have not for over a decade.

For the most part, total mortality rates were consistently higher for Tulsa MSA compared to the national rates over time. The total mortality rate in the MSA was only 1.8% higher than that of the nation in 1980, whereas in 2003, the MSA's rate increased to 20.6% higher than the national rate. Furthermore, Tulsa County's total mortality trendline—although remaining slightly above that of the MSA, continued to parallel the MSA's trendline over time. Among the counties in the MSA with the highest total mortality rates were Okmulgee, Creek, and Pawnee counties; the counties with rates below the state's average and similar to the national average were Osage, Wagoner, and Rogers counties. Creek, Okmulgee and Pawnee counties—with higher total mortality rates, also skewed the overall MSA's mortality rates for diabetes, chronic lung disease, and heart disease.

According to the data, there were four major determinants or contributors to poor health outcomes and subsequent mortality in the Tulsa MSA region—heart disease, respiratory disease, diabetes, and cancer.

**Heart Disease**
From 1980 to 2003, age-adjusted death rates for heart disease for Tulsa County and the MSA were consistently higher than the national rates—Tulsa County even maintained slightly higher rates than the MSA all along the way. Fortunately, heart disease mortality in the County, MSA and the nation has been on a progressive decline. However, even though the national and MSA trendlines both continue to decline, the national decline is far more dramatic than the MSA's decline in heart disease mortality. Around the early 1990s, the MSA's trend appeared to lose its downward momentum to where in recent years the decline has just been ever so slight. In 2003, there was a 29% difference between the MSA and the nation in their heart disease mortality rates—the MSA's rate was 29% higher than the national average.

During the same period—from 1980 to 2003, heart disease related deaths accounted for the greatest proportion of mortality among Tulsans. The rates declined significantly in the region and the state since 1980, yet the trend was far less prominent than the national decline in heart disease mortality. In 1980, 52% of overall mortality in Tulsa County was attributable to heart disease, whereas in 2003, about 39% of deaths were related to heart disease—a 13% decrease in heart disease mortality from 1980 to 2003. *The proportions were similar for Tulsa MSA (53% and 39% respectively), Oklahoma (52% and 40% respectively), and the US (52% and about 37% respectively).*

Thus, heart disease remains the number one cause of death in Tulsa County and the MSA. With that said, state and local policymakers should administer concerted efforts to impact heart disease and overall mortality in the region as well as the state, beginning with well-informed and appropriately targeted policy. If efforts are ill-directed, the sharp contrast in heart disease related mortality and resulting total mortality between the MSA and the nation will continue to intensify.

**Respiratory Disease**
For the most part, respiratory disease mortality rates for Tulsa County and the MSA were higher comparative to national rates. From 1980 to 2003, there was a rise in deaths related to respiratory disease both in Tulsa County and the MSA. In 2003, the mortality rate for respiratory disease was 34% higher in the Tulsa MSA than in the nation. In 1980, over 5% of overall mortality was attributable to respiratory related deaths, whereas in 2003, over 8% of deaths were related to respiratory disease in Tulsa County. *The proportions were similar for Tulsa MSA (5% and about 9% respectively), Oklahoma (about 6% and about 9% respectively), and the US (about 6% and about 8% respectively).* The increase in respiratory related mortality appears to reflect an increase in deaths due to chronic lung disease. Creek, Okmulgee, Pawnee, and Tulsa counties all had higher mortality rates due to chronic lung disease compared to the MSA's norm.

**Diabetes**
Since 1980, the national trendline in diabetes mortality hovered above the state, MSA and County trendlines for diabetes related deaths. Then in about 1996, the trend in diabetes mortality in Tulsa County, MSA and the state surpassed the national trend. Since about 1996, diabetes rates for Tulsa MSA have been consistently higher than the national rates. In the MSA, the rate was 30% lower than the national average in 1980, and in 2003, the rate was 11% higher than the national average. The good news, however, is that the percentage of adults who reported being told by their doctor that they have diabetes was lower in the state and MSAs compared to the national average (SMART BRFSS). Although the change is minute, there was a rise in diabetes related mortality from 1980 to 2003—about 1% to over 2% respectively for Tulsa County, over 1% to about 3% for Tulsa MSA, 1.5% to 3% for Oklahoma, and about 2% to 3% for US.

Creek and Okmulgee counties had the highest rates for diabetes in the MSA; however, even counties with lower overall mortality, such as Wagoner County, presented a sharp increase in diabetes related deaths. Diabetes falls under the "General" causes of death category, and is primarily accountable for the increase in rates for this major disease category from 1980 to 2003. The projected rise in mortality due to diabetes could mark the onset of another major contributor to overall mortality in Oklahoma—heart disease currently being the primary contributor.

**Cancer**
From 1980 to 2003, there appears to be only a slight change or no significant change in cancer mortality rates for Tulsa County and the MSA over time. The rates for both county and MSA consistently hovered above the national rates during this period. Actually, cancer deaths seemed to be decreasing slightly in Tulsa County, although rates fluctuated sporadically during this period. Counties in the MSA, such as Creek and Okmulgee, where the mortality rates were generally higher, appeared to also have higher rates of cancer-related mortality. When comparing the regional rates to national rates, the difference becomes more apparent. In 1980, Tulsa MSA's rate was only 1.7% higher than the national average, whereas in 2003, the MSA's rate was 8.5% higher than the national average. Cancer does however account for about 20% of total mortality in the county and the MSA—no doubt a significant proportion of mortality to warrant focused policy efforts.

## Appendix C
## OKLAHOMA CITY MSA

*The OKC MSA includes Canadian, Cleveland, Grady, Lincoln, Logan, McClain, and Oklahoma counties.*

The apparent divergence in health status and mortality that is reflected in the trendlines of Tulsa County and MSA is also paralleled by Oklahoma County and OKC MSA. From about 1990 to 2002, a graphical representation of the data showed that total mortality rates in Oklahoma County consistently hovered above the other geographies in the state and were well above national rates for those years. The total mortality rate in the OKC MSA was about 2% above the national norm in 1980, but increased to about 18% above the national rate in 2003. Just as was the case in the Tulsa MSA, there were some major contributors to mortality in the OKC MSA region.

### Heart Disease

Since 1980, heart disease mortality in the OKC MSA had always been higher than the national average. However, the rate of departure of the MSA's trendline from the national trendline increased significantly in the early 1990s. From 1993 to 2003, while national heart disease mortality steadily declined, the MSA saw more gradual declines and even a leveling off of mortality rates in recent years. In 1980, the MSA's heart disease mortality rate was only about 1.5% higher than the national rate, whereas in 2003, its rate was 34.5% higher than the national average.

### Cancer

Cancer mortality rates, although more sporadic in the 1980s for Oklahoma County, has been on the decline for both the county and the MSA through the 1990s and into recent years. In 2003, the county's rate was ***at*** the national average. The county's rate decreased from 223 in 1980 to 190 in 2003; the MSA too decreased from 209 to 195, respectively. The MSA went from being less than 1% higher than the national rate in 1980 to 3% higher in 2003.

### Diabetes

Diabetes mortality in both the Oklahoma County and the MSA had remained below the national average, for the most part, from 1980 to about 1997—at which time, rates exceeded the national rates. In 2003, both the county and MSA were slightly above the national average of 25.5, at 25.9 and 26.3, respectively. The rate in the MSA was about 13% lower than the national norm in 1980, and was over 4% higher than the national average in 2003.

### Respiratory Disease

Respiratory disease has been on the rise in Oklahoma County and its MSA since 1980. In 1980, the rate of respiratory disease related mortality in the MSA was only about 1% higher than the national norm; however, in 2003, the rate in the MSA was over 29% higher than the national average for mortality in this category. The trend for Oklahoma County was similar to the MSA for this same time period.

## Appendix D
## METROPOLITAN AREAS

In terms of total mortality, the *trendlines* for OKC MSA and Tulsa MSA appeared to parallel each other from 1980 to 2003. For the most part, both MSAs saw similar *trends* in total mortality. From about 1995 to 2002, OKC MSA saw higher total mortality than Tulsa MSA. In 2003, however, Tulsa MSA actually saw a sharp rise in total mortality with a rate of about 1002 compared to OKC MSA, which remained steady at a rate of about 982. Over the last decade, with the exception of 1994 and 2003, the rates for OKC MSA have been higher than Tulsa MSA.

The differential between mortality rates for the two major metro areas in the state—Tulsa MSA and OKC MSA, compared to the nation could be attributed to certain major disease contributors to the negative trend—such as heart disease, diabetes, respiratory disease, and cancer.

- Since about 1996, rates for **heart disease** mortality in OKC MSA remained slightly higher than those for Tulsa MSA. Although, prior to that—from 1980 to the mid-1990s, OKC MSA actually fared better, for the most part, than Tulsa MSA in heart disease mortality. However, in the case of Oklahoma County and its respective MSA, the rates appeared to have stabilized since 2001, whereas Tulsa County and its respective MSA were declining at the same slope (although at significantly higher rates) as the nation since 2001.

- Mortality rates for **cancer** appeared to fluctuate wildly at the county level from 1980 to 2003, however, at the MSA and state level, the trend was more comprehensible. Since 1999, cancer mortality rates in the MSA were consistently higher than OKC MSA rates. For the most part, the OKC MSA trendline hovered below the Tulsa MSA trendline for cancer mortality. In recent years, since about 1999, both Oklahoma County and MSA had rates below Tulsa County and MSA.

- Compared to the nation, **respiratory disease** mortality saw a very sharp spike from 2002 to 2003 for the state, both metro counties, and the MSAs. Comparatively, Tulsa MSA had the greatest increase and highest mortality in 2003 of all said regions. Prior to that year though, OKC MSA's trendline hovered above the Tulsa MSA trendline. Over the last decade, however, Oklahoma County and its MSA maintained rates above those of Tulsa County and its MSA.

- **Diabetes** has been on a subtle rise in the nation, the state and the various geographies since 1980. In 2003, Tulsa County and Oklahoma County hovered around the national average, while the MSAs and the state were higher than the national norm. From 1999 to 2002, diabetes mortality was on a decline for Tulsa MSA. Then in 2003, there was an upturn and the rate was higher than that of OKC MSA. The trendlines for Oklahoma County and OKC MSA appeared to be on a decline since 2001. Although the rates for all the areas fluctuated dramatically, 2003 showed rates for Tulsa and Oklahoma counties closest to the national norm.

**Health Risk Behaviors & Mortality**
According to SMART BRFSS (Selected Metropolitan/Micropolitan Area Risk Trends from the Behavioral Risk Factor Surveillance System), the percentage of adults in Oklahoma that reported select ***health risks*** in 2002 and 2003 are represented in the following tables:

**Table 1: Reported Health Risks (Percent), Year 2002**

| | US Median | OK (±95 % CI) | OKC MSA (±95 % CI) | Tulsa MSA (±95 % CI) |
|---|---|---|---|---|
| **Health status** | 14.7 | 17.7 (±1.0) | 15.0 (±1.8) | 15.7 (±2.2) |
| **Exercise** | 24.4 | 30.6 (±1.4) | 29.0 (±2.4) | 28.6 (±2.7) |
| **Diabetes** | 6.7 | 6.7 (±0.6) | 5.9 (±1.2) | 5.8 (±1.2) |
| **Current smoking** | 23.0 | 26.6 (±1.4) | 24.9 (±2.4) | 25.3 (±2.7) |
| **Obesity** | 22.2 | 22.9 (±1.2) | 21.7 (±2.2) | 21.3 (±2.5) |

**Table 2: Reported Health Risks (Percent), Year 2003**

| | US Median | OK (±95 % CI) | OK MSA (±95 % CI) | Tulsa MSA (±95 % CI) | Tulsa Co (±95 % CI) | OK Co (±95 % CI) |
|---|---|---|---|---|---|---|
| **Health status** | 15.0 | 17.8 (±1.0) | 13.5 (±1.5) | 16.5 (±1.9) | 16.4 (±2.5) | 13.6 (±2.0) |
| **Exercise** | 23.1 | 30.4 (±1.2) | 28.3 (±2.1) | 28.6 (±2.5) | 24.6 (±2.8) | 29.6 (±2.9) |
| **Diabetes** | 7.2 | 7.2 (±0.6) | 5.9 (±1.0) | 6.9 (±1.2) | 6.5 (±1.4) | 5.6 (±1.2) |
| **Current smoking** | 22.0 | 25.1 (±1.2) | 24.2 (±2.2) | 23.3 (±2.4) | 22.7 (±2.9) | 24.5 (±2.8) |
| **Obesity** | 22.8 | 24.4 (±1.2) | 23.2 (±2.1) | 22.8 (±2.4) | 21.2 (±2.8) | 24.3 (±2.7) |

**Defined health risks:**
Health status – percent of adults reporting general health as fair or poor
Exercise – percent adults reporting doing no leisure time exercise or physical activity in the past 30 days
Diabetes – percent of adults told by doctor they have diabetes
Current smoking – percent of adults reporting having smoked at least 100 cigarettes in their lifetime and currently smoke
Obesity – percent of adults reporting Body Mass Index greater than or equal to 30.0

**In 2002…**

- **Diabetes** in the state and both MSAs was reported **at or below** the national median.
- **Current smoking** was reportedly **higher** in all three geographies—state, Tulsa MSA and OKC MSA, versus the national rate.
- **Physical inactivity** was significantly **higher** than the national norm in the state and both MSAs.
- The percentage of adults reporting **general health as fair or poor** was **higher** in the state and MSAs compared to the national rate.
- Although the state was just a little bit above the norm in **obesity**, both MSAs were **lower.**

**In 2003…**

- **Diabetes** in the state was at the national norm and lower in the MSAs; diabetes rates are lower in Oklahoma County and its MSA compared to Tulsa County and its MSA.

- **Current smoking** was still **higher** in all three geographies compared to the national rate; although, current smoking was reportedly greater in Oklahoma County and MSA versus Tulsa County and MSA.

- **Physical inactivity** was still **significantly higher** in all three areas versus the national norm; since Tulsa County's rate is only slightly higher than the national rate, it can be assumed that the surrounding counties in the MSA are responsible for raising the rate of physical inactivity in the MSA compared to the national rate.

- Those reporting **health status as fair or poor** was **lower** than the national norm in OKC MSA; Tulsa MSA and the state rates were **higher** than the national norm.

- **Obesity** saw a hike—**higher** in the state and OKC MSA versus the national rate, but at the national norm for Tulsa MSA; obesity was greater than the national norm in Oklahoma County and less than the national norm in Tulsa County.

## Appendix E
## NORTHWEST & SOUTHEAST OKLAHOMA

*The northwest (NW) counties included in this analysis were Alfalfa, Beaver, Blaine, Cimarron, Custer, Dewey, Ellis, Harper, Major, Roger Mills, Texas, Woods, and Woodward. The southeast (SE) counties were Atoka, Bryan, Choctaw, Coal, Haskell, Hughes, Latimer, Leflore, McCurtain, McIntosh, Pittsburg, Pushmataha, and Sequoyah.*

From 1980 to 2003, the **total mortality** trendline for the 13 NW counties was consistently much lower than the trendline for the 13 SE counties. Total mortality in the NW quadrant of the state decreased from a rate of 1019 in 1980 to a rate of 934 in 2003; the SE quadrant saw a significantly smaller decrease in the rate from 1085 to 1068, respectively. The nine counties that had the lowest total mortality rates were in the NW quadrant. In the SE quadrant, there were two counties that had better total mortality than the state, but worse than the nation. The remainder of the SE counties had rates lower than the state and the nation.

For the NW counties, mortality rates were lower for cancer, stroke, and diabetes compared to the SE counties, the state and the nation; they also had less mortality due to heart disease and total mortality than the state and the SE counties. The NW counties, however, did have greater mortality due to accidents compared to the state and the SE counties. Although the SE counties fared worse than the NW counties, the state and the nation in suicide, heart disease, respiratory disease, cancer, and total mortality, they did, however, fare better in terms of stroke and diabetes mortality—which were lower comparative to the state and the nation.

Although **heart disease** was on a decline in the SE counties of Oklahoma, the trendline for heart disease related mortality in this region of the state still hovered above that of the NW counties, the state and the nation. In recent years, heart disease mortality was lower in the NW region comparative to the state; however, Major and Harper counties in the NW region showed higher rates of heart disease mortality compared to the state. While mortality related specifically to cerebrovascular disease in both the NW and SE counties was lower than the state average, the NW counties of Harper and Dewey and the SE county of Sequoyah had higher rates than the state average.

**Respiratory disease** mortality rose in both the NW and SE regions of the state from 1980 to 2003, although higher rates were more prominent in the SE region through most of the 1990s. In the past decade, **diabetes mortality** also rose dramatically in both the NW and SE regions of the state, although there was some fluctuation in the rates for the NW region. For the most part, the SE region counties did appear to fare better in diabetes mortality than the NW region of the state between 1980 and 2003.

Of note, Harper County, although surrounded by other better-faring counties, was ranked as one of the worst counties in Oklahoma in terms of health status and mortality. Heart disease mortality in Harper County was higher comparative to the state average. Mortality specifically due to stroke and accidents (not including motor vehicle accidents) were significantly higher than the state average in this county. Mortality due to accidents was significantly higher in both NW and SE regions comparative to the state, however, more so in the NW region.

*Higher-than-average mortality rates in the counties in the northwest quadrant could be attributable to:*

- *High-fat diets, physical inactivity and obesity*
- *Farming, recreational activities (four-wheeling, use of all-terrain vehicles) and the oilfield industry*
- *Tobacco use, chemicals used in farming or the oilfield, and genetics*
- *Lack of and/or difficult access to medical care*

## Appendix F
## OKLAHOMA & THE NATION

National rates and trends serve as the ultimate benchmark for states and local areas to strive to improve their shortfalls in areas of health and mortality. A simple study of the counties and MSAs would be insufficient without considering their mortality conditions in the context of the nation and the state. Since 1980, total mortality in the state was actually below the national average—at 1018 and 1039, respectively. However, in 2003 the state rate increased to 17% above the national average. The following points describe the mortality conditions pertaining to each major disease category at the national and state level from 1980 to 2003.

- **Heart disease** mortality has been on a much greater decline at the national level than evident at the state and local levels. Since the early 1990s, Oklahoma's rate of heart disease mortality has been on a very shallow decline comparative to the national decline.

- Since about 1990, national **cancer** mortality has been decreasing. In about 1997, cancer mortality in the state exceeded the national average for the first time since 1980 and has remained at or above the national average ever since.

- Since 1980, Oklahoma and its regions, for the most part, consistently remained at or below the national average for **diabetes** mortality, until about 1997—when there was a dramatic shift in mortality to above-average rates for all major Oklahoma geographies. The state appears to maintain an upward trend in diabetes mortality, while both MSAs and metro counties fluctuate dramatically. Perhaps too the influence on diabetes mortality in the state is more rural than urban.

- **Respiratory disease** mortality in the state and the various regions hovered above the national average since about 1981. The national rate in 2003 was about 65, while the state rate was about 85. Rates for respiratory disease related mortality was about the same in 1980 for both the state and the nation.

## Alabama - Florida

| | AL | AK | AZ | AR | CA | CO | CN | DE | DC | FL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 1,085.9 | 1,051.9 | 936.0 | **1,003.5** | 964.2 | **936.1** | 952.2 | 1,061.0 | 1,203.7 | 939.9 |
| 1980 | 1,101.6 | 1,096.2 | 977.2 | **1,038.8** | 995.6 | **944.0** | 982.5 | 1,074.4 | 1,272.2 | 966.7 |
| 1981 | 1,076.0 | 1,065.1 | 923.9 | **1,009.1** | 958.1 | **928.6** | 940.1 | 1,062.2 | 1,236.9 | 956.6 |
| 1982 | 1,039.7 | 1,039.2 | 916.6 | **994.0** | 953.9 | **918.2** | 921.3 | 1,039.3 | 1,183.2 | 914.8 |
| 1983 | 1,039.5 | 986.6 | 902.3 | **1,011.2** | 933.2 | **883.9** | 921.4 | 1,005.0 | 1,180.3 | 918.4 |
| 1984 | 1,051.3 | 983.4 | 915.0 | **1,017.8** | 945.5 | **910.5** | 927.4 | 993.7 | 1,171.3 | 902.2 |
| 1985 | 1,066.3 | 986.8 | 899.7 | **1,027.6** | 953.7 | **882.8** | 922.0 | 1,046.6 | 1,195.8 | 916.8 |
| 1986 | 1,051.5 | 1,025.9 | 888.9 | **1,006.5** | 929.9 | **884.3** | 907.7 | 1,049.5 | 1,237.9 | 903.6 |
| 1987 | 1,030.6 | 972.2 | 898.8 | **1,011.9** | 939.2 | **880.2** | 901.0 | 1,025.3 | 1,252.1 | 900.1 |
| 1988 | 1,057.2 | 935.7 | 888.0 | **1,023.4** | 947.1 | **876.0** | 898.7 | 1,023.9 | 1,288.6 | 899.1 |
| 1989 | 1,036.9 | 944.0 | 871.4 | **997.9** | 929.1 | **846.1** | 874.0 | 1,016.1 | 1,282.6 | 881.1 |
| 1990 | 1,034.1 | 940.4 | 870.3 | **990.3** | 904.3 | **847.8** | 846.4 | 986.5 | 1,238.7 | 868.9 |
| 1991 | 1,023.7 | 912.0 | 847.0 | **984.5** | 883.5 | **855.7** | 840.4 | 977.3 | 1,210.8 | 846.6 |
| 1992 | 986.9 | 895.5 | 846.4 | **963.5** | 867.9 | **820.4** | 834.9 | 955.3 | 1,222.6 | 844.8 |
| 1993 | 1,016.2 | 904.2 | 867.1 | **1,006.5** | 874.6 | **838.4** | 844.9 | 958.3 | 1,246.9 | 861.0 |
| 1994 | 1,008.2 | 916.6 | 846.8 | **983.7** | 870.4 | **827.5** | 840.5 | 963.5 | 1,266.3 | 849.0 |
| 1995 | 1,007.6 | 908.5 | 833.6 | **980.5** | 853.6 | **827.5** | 832.5 | 925.1 | 1,228.0 | 851.9 |
| 1996 | 1,002.9 | 894.5 | 829.4 | **961.6** | 835.8 | **828.5** | 822.5 | 929.9 | 1,190.3 | 825.0 |
| 1997 | 998.9 | 859.4 | 807.5 | **995.1** | 822.5 | **801.9** | 806.3 | 907.7 | 1,110.8 | 806.3 |
| 1998 | 1,001.0 | 817.3 | 805.3 | **972.3** | 813.3 | **809.6** | 802.4 | 890.9 | 1,089.8 | 803.9 |
| 1999 | 1,008.5 | 838.3 | 818.0 | **975.1** | 801.8 | **801.5** | 783.1 | 881.2 | 1,083.9 | 812.3 |
| 2000 | 1,003.9 | 868.5 | 809.5 | **976.6** | 787.2 | **791.4** | 792.9 | 896.1 | 1,058.3 | 806.9 |
| 2001 | 993.4 | 824.9 | 790.0 | **949.9** | 775.8 | **791.0** | 767.6 | 896.5 | 1,044.0 | 801.5 |
| 2002 | 999.9 | 794.1 | 800.5 | **966.9** | 758.1 | **795.7** | 760.3 | 840.9 | 1,027.4 | 787.8 |
| Change | 7.9% | 24.5% | 14.5% | **3.6%** | 21.4% | **15.0%** | 20.2% | 20.7% | 14.6% | 16.2% |

## Georgia - Maine

| | GA | HI | ID | IL | IN | IA | KS | KY | LA | ME |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 1,090.0 | 802.4 | 907.2 | 1,070.8 | 1,049.9 | 925.2 | **931.8** | 1,078.4 | **1,127.6** | 998.2 |
| 1980 | 1,097.6 | 803.1 | 946.7 | 1,071.1 | 1,055.3 | 924.8 | **958.1** | 1,110.3 | **1,135.6** | 1,031.7 |
| 1981 | 1,083.6 | 775.0 | 942.3 | 1,044.9 | 1,033.7 | 904.9 | **926.5** | 1,073.0 | **1,130.6** | 972.8 |
| 1982 | 1,041.5 | 775.4 | 923.8 | 1,017.9 | 1,005.1 | 892.0 | **919.4** | 1,047.4 | **1,099.2** | 962.3 |
| 1983 | 1,066.5 | 785.1 | 944.5 | 1,029.9 | 1,018.5 | 904.0 | **910.2** | 1,072.1 | **1,102.6** | 988.7 |
| 1984 | 1,051.0 | 781.2 | 923.4 | 1,004.3 | 994.7 | 878.4 | **916.0** | 1,040.1 | **1,072.3** | 965.6 |
| 1985 | 1,074.9 | 779.4 | 892.1 | 1,007.6 | 997.4 | 901.2 | **897.5** | 1,068.7 | **1,098.9** | 1,001.6 |
| 1986 | 1,066.2 | 753.6 | 903.6 | 1,008.6 | 1,006.2 | 869.8 | **896.2** | 1,053.7 | **1,052.0** | 976.3 |
| 1987 | 1,054.8 | 768.0 | 885.8 | 987.0 | 981.6 | 870.5 | **878.9** | 1,033.8 | **1,052.0** | 965.4 |
| 1988 | 1,062.7 | 726.7 | 913.1 | 1,007.5 | 993.0 | 880.5 | **905.6** | 1,052.5 | **1,081.7** | 971.2 |
| 1989 | 1,051.5 | 750.5 | 862.4 | 978.2 | 960.5 | 855.0 | **869.8** | 1,035.1 | **1,072.0** | 926.3 |
| 1990 | 1,026.5 | 759.6 | 845.9 | 968.3 | 960.9 | 838.5 | **863.7** | 1,017.9 | **1,066.4** | 913.7 |
| 1991 | 1,009.9 | 729.8 | 840.5 | 958.3 | 947.9 | 841.4 | **857.7** | 1,004.0 | **1,064.6** | 902.1 |
| 1992 | 982.5 | 719.0 | 831.5 | 924.4 | 929.2 | 807.3 | **830.8** | 981.1 | **1,028.8** | 878.8 |
| 1993 | 1,014.1 | 735.5 | 860.2 | 957.4 | 957.5 | 837.9 | **872.4** | 1,017.5 | **1,065.1** | 906.0 |
| 1994 | 993.0 | 712.1 | 837.8 | 947.8 | 947.7 | 825.4 | **851.3** | 1,013.5 | **1,037.1** | 891.5 |
| 1995 | 997.1 | 717.3 | 818.6 | 947.2 | 949.0 | 824.8 | **862.7** | 999.2 | **1,039.3** | 885.5 |
| 1996 | 977.8 | 724.2 | 814.1 | 917.3 | 929.5 | 812.2 | **852.3** | 986.2 | **1,021.3** | 870.6 |
| 1997 | 964.7 | 696.0 | 814.9 | 880.3 | 920.2 | 799.5 | **838.5** | 994.3 | **1,015.7** | 875.2 |
| 1998 | 956.3 | 692.7 | 806.5 | 882.1 | 913.5 | 810.1 | **839.2** | 977.4 | **1,012.5** | 874.4 |
| 1999 | 964.2 | 687.9 | 825.0 | 904.5 | 934.4 | 806.2 | **847.8** | 1,003.7 | **1,021.0** | 865.8 |
| 2000 | 979.8 | 674.4 | 809.0 | 882.3 | 929.2 | 794.5 | **850.1** | 998.0 | **1,005.6** | 859.3 |
| 2001 | 960.9 | 652.3 | 795.6 | 856.8 | 908.0 | 775.3 | **840.4** | 992.2 | **1,008.6** | 844.7 |
| 2002 | 953.4 | 659.6 | 785.7 | 855.8 | 898.4 | 773.3 | **845.1** | 1,000.6 | **1,001.1** | 848.3 |
| Change | 12.5% | 17.8% | 13.4% | 20.1% | 14.4% | 16.4% | **9.3%** | 7.2% | **11.2%** | 15.0% |

## Missouri – New Hampshire

| | MD | MA | MI | MN | MS | MO | MT | NE | NV | NH |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 1,048.3 | 967.3 | 1,044.8 | 887.7 | 1,101.4 | **1,026.5** | 1,001.7 | 927.7 | 1,077.2 | 983.8 |
| 1980 | 1,079.1 | 1,015.8 | 1,054.2 | 910.5 | 1,124.8 | **1,050.5** | 1,014.9 | 932.9 | 1,100.7 | 987.8 |
| 1981 | 1,044.8 | 960.3 | 1,044.9 | 873.9 | 1,093.1 | **1,020.2** | 1,007.7 | 924.4 | 1,022.1 | 967.6 |
| 1982 | 1,025.4 | 945.5 | 1,030.1 | 864.0 | 1,067.0 | **992.3** | 970.4 | 912.7 | 1,070.5 | 931.8 |
| 1983 | 1,036.3 | 957.9 | 1,030.0 | 879.2 | 1,083.3 | **1,008.0** | 962.8 | 910.3 | 1,031.7 | 961.9 |
| 1984 | 1,025.7 | 964.0 | 1,014.1 | 859.8 | 1,070.8 | **988.2** | 945.9 | 894.7 | 1,040.5 | 946.6 |
| 1985 | 1,033.8 | 957.9 | 1,027.8 | 878.1 | 1,091.9 | **1,001.3** | 937.5 | 904.6 | 1,067.0 | 979.4 |
| 1986 | 1,031.7 | 954.8 | 1,035.5 | 874.4 | 1,069.1 | **984.7** | 927.8 | 885.9 | 1,032.7 | 970.9 |
| 1987 | 1,026.7 | 941.7 | 1,009.3 | 848.8 | 1,066.3 | **982.2** | 894.3 | 889.5 | 1,032.6 | 929.5 |
| 1988 | 1,026.5 | 950.0 | 1,004.7 | 859.3 | 1,063.9 | **976.3** | 903.9 | 882.9 | 1,044.0 | 952.3 |
| 1989 | 995.9 | 897.0 | 969.9 | 821.2 | 1,078.8 | **956.7** | 884.5 | 874.9 | 995.5 | 897.6 |
| 1990 | 986.4 | 880.9 | 960.6 | 824.7 | 1,057.7 | **948.4** | 888.2 | 867.9 | 1,021.4 | 895.4 |
| 1991 | 955.2 | 863.1 | 951.4 | 817.6 | 1,059.9 | **940.3** | 881.8 | 850.2 | 985.0 | 862.2 |
| 1992 | 941.8 | 864.3 | 921.7 | 798.6 | 1,025.2 | **929.0** | 868.1 | 835.9 | 961.0 | 853.1 |
| 1993 | 957.8 | 879.0 | 947.6 | 814.9 | 1,058.8 | **966.5** | 895.7 | 846.2 | 984.4 | 865.1 |
| 1994 | 952.4 | 858.5 | 938.0 | 803.3 | 1,059.8 | **957.9** | 858.1 | 836.6 | 974.3 | 852.6 |
| 1995 | 950.7 | 855.3 | 931.6 | 812.7 | 1,051.8 | **958.2** | 868.2 | 838.5 | 963.2 | 860.4 |
| 1996 | 934.0 | 841.1 | 916.0 | 793.7 | 1,024.1 | **937.9** | 857.2 | 843.4 | 953.4 | 854.8 |
| 1997 | 914.7 | 820.5 | 899.4 | 775.1 | 1,042.9 | **935.1** | 849.8 | 826.8 | 916.2 | 843.3 |
| 1998 | 900.6 | 817.1 | 905.9 | 768.5 | 1,041.7 | **938.8** | 857.3 | 816.2 | 933.7 | 827.4 |
| 1999 | 906.7 | 813.8 | 916.1 | 784.3 | 1,042.9 | **944.5** | 857.4 | 829.8 | 935.7 | 815.5 |
| 2000 | 908.2 | 817.6 | 903.8 | 760.4 | 1,050.9 | **920.3** | 843.1 | 794.1 | 918.1 | 815.2 |
| 2001 | 880.8 | 803.8 | 877.1 | 742.7 | 1,025.5 | **909.4** | 837.6 | 793.0 | 921.6 | 799.2 |
| 2002 | 861.9 | 796.1 | 875.8 | 743.8 | 1,037.3 | **917.1** | 846.3 | 814.6 | 919.1 | 781.4 |
| Change | 17.8% | 17.7% | 16.2% | 16.2% | 5.8% | **10.7%** | 15.5% | 12.2% | 14.7% | 20.6% |

## New Jersey – Rhode Island

| | NJ | **NM** | NY | NC | ND | OH | **OK** | OR | PA | RI |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 1,033.4 | **972.0** | 1,032.4 | 1,039.5 | 915.3 | 1,063.3 | **1,028.7** | 950.1 | 1,061.9 | 989.0 |
| 1980 | 1,074.6 | **999.9** | 1,079.9 | 1,055.9 | 942.7 | 1,092.8 | **1,024.9** | 965.3 | 1,106.5 | 1,004.4 |
| 1981 | 1,024.2 | **916.9** | 1,037.1 | 1,042.3 | 894.3 | 1,049.0 | **1,012.8** | 937.4 | 1,053.7 | 971.1 |
| 1982 | 1,008.9 | **946.4** | 1,020.4 | 999.4 | 868.9 | 1,012.3 | **1,008.0** | 909.4 | 1,024.4 | 928.8 |
| 1983 | 1,017.3 | **918.6** | 1,025.8 | 1,011.3 | 887.4 | 1,033.4 | **995.3** | 929.5 | 1,033.4 | 949.6 |
| 1984 | 1,006.4 | **928.6** | 1,022.9 | 999.7 | 869.8 | 1,014.8 | **984.3** | 935.6 | 1,024.9 | 949.4 |
| 1985 | 1,013.4 | **911.5** | 1,021.4 | 1,012.8 | 874.0 | 1,025.6 | **990.4** | 949.2 | 1,028.1 | 955.8 |
| 1986 | 1,008.7 | **915.3** | 1,020.9 | 1,018.5 | 809.0 | 1,020.8 | **987.5** | 907.4 | 1,018.9 | 949.1 |
| 1987 | 1,002.0 | **914.3** | 1,011.4 | 1,004.1 | 827.7 | 1,001.3 | **959.1** | 922.8 | 1,014.5 | 935.0 |
| 1988 | 1,007.0 | **897.9** | 1,022.0 | 1,024.1 | 843.5 | 999.5 | **978.8** | 922.1 | 1,008.0 | 927.1 |
| 1989 | 970.4 | **887.6** | 988.6 | 992.3 | 813.6 | 968.3 | **958.7** | 904.0 | 977.5 | 900.1 |
| 1990 | 949.9 | **873.4** | 970.1 | 975.3 | 832.6 | 963.9 | **968.1** | 897.3 | 956.2 | 893.7 |
| 1991 | 929.5 | **889.7** | 950.6 | 966.0 | 798.9 | 954.1 | **947.2** | 859.6 | 940.2 | 865.8 |
| 1992 | 917.1 | **851.3** | 933.9 | 951.0 | 801.1 | 928.0 | **937.0** | 859.5 | 930.3 | 857.0 |
| 1993 | 925.3 | **864.3** | 952.9 | 969.6 | 808.7 | 947.9 | **982.8** | 897.4 | 938.3 | 877.5 |
| 1994 | 905.6 | **864.7** | 931.5 | 954.6 | 808.3 | 941.5 | **966.8** | 869.1 | 939.2 | 835.6 |
| 1995 | 913.0 | **868.1** | 921.1 | 953.6 | 809.1 | 954.4 | **971.0** | 872.7 | 924.8 | 846.0 |
| 1996 | 886.1 | **836.1** | 891.7 | 948.9 | 804.9 | 936.0 | **965.5** | 873.3 | 922.5 | 822.2 |
| 1997 | 860.8 | **819.9** | 852.3 | 920.9 | 785.9 | 927.6 | **978.6** | 852.2 | 903.9 | 840.5 |
| 1998 | 839.5 | **816.3** | 830.0 | 926.5 | 782.6 | 920.2 | **966.1** | 850.2 | 880.7 | 808.9 |
| 1999 | 853.3 | **842.0** | 832.9 | 932.6 | 796.6 | 933.7 | **978.6** | 837.4 | 896.0 | 807.4 |
| 2000 | 852.2 | **808.3** | 813.1 | 951.7 | 761.8 | 923.0 | **982.5** | 830.7 | 891.6 | 823.6 |
| 2001 | 833.9 | **827.0** | 801.9 | 913.3 | 774.0 | 906.2 | **962.6** | 825.2 | 871.5 | 808.5 |
| 2002 | 811.2 | **817.7** | 783.3 | 907.5 | 748.3 | 907.8 | **976.2** | 832.6 | 863.5 | 813.3 |
| Change | 21.5% | **15.9%** | 24.1% | 12.7% | 18.2% | 14.6% | **5.1%** | 12.4% | 18.7% | 17.8% |

## South Carolina - Wyoming

| | SC | SD | TN | TX | UT | VT | VA | WA | WV | WI | WY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 1,098.0 | 935.9 | 1,030.1 | **1,011.9** | 918.7 | 965.5 | 1,040.8 | 939.5 | 1,106.9 | 945.8 | 1,010.5 |
| 1980 | 1,108.5 | 959.4 | 1,067.6 | **1,017.5** | 926.6 | 1,040.0 | 1,071.3 | 961.2 | 1,106.8 | 972.7 | 1,042.2 |
| 1981 | 1,089.3 | 925.2 | 1,035.1 | **1,005.9** | 910.7 | 966.4 | 1,032.3 | 932.9 | 1,079.7 | 943.5 | 979.0 |
| 1982 | 1,042.0 | 934.9 | 1,009.9 | **982.6** | 904.7 | 984.2 | 999.3 | 921.0 | 1,059.4 | 922.4 | 957.2 |
| 1983 | 1,067.9 | 929.0 | 1,025.6 | **989.0** | 884.3 | 993.6 | 1,021.4 | 912.0 | 1,065.3 | 925.7 | 935.6 |
| 1984 | 1,047.7 | 907.0 | 1,024.2 | **990.5** | 913.3 | 968.8 | 1,007.6 | 923.8 | 1,045.1 | 912.6 | 940.2 |
| 1985 | 1,054.6 | 903.3 | 1,027.3 | **978.5** | 896.2 | 981.6 | 1,008.4 | 921.9 | 1,050.8 | 910.4 | 959.0 |
| 1986 | 1,069.8 | 892.2 | 1,033.5 | **958.5** | 864.8 | 991.2 | 1,012.0 | 893.5 | 1,066.7 | 912.8 | 931.4 |
| 1987 | 1,052.5 | 893.0 | 1,029.7 | **954.9** | 858.9 | 978.9 | 990.9 | 890.5 | 1,053.2 | 900.2 | 882.7 |
| 1988 | 1,062.3 | 871.1 | 1,033.3 | **961.3** | 852.4 | 941.4 | 989.1 | 900.6 | 1,049.6 | 906.2 | 926.3 |
| 1989 | 1,042.2 | 858.1 | 1,009.7 | **955.6** | 826.8 | 914.2 | 956.0 | 873.3 | 1,030.5 | 879.3 | 918.1 |
| 1990 | 1,025.5 | 824.3 | 1,016.7 | **945.1** | 809.1 | 911.6 | 962.1 | 876.1 | 1,017.9 | 879.3 | 898.8 |
| 1991 | 996.9 | 849.3 | 988.2 | **921.9** | 806.7 | 881.0 | 951.7 | 845.3 | 1,030.7 | 866.0 | 856.6 |
| 1992 | 989.2 | 851.4 | 972.1 | **914.1** | 788.2 | 905.9 | 933.1 | 843.6 | 1,006.3 | 832.3 | 862.7 |
| 1993 | 1,008.8 | 850.6 | 1,006.1 | **929.8** | 808.6 | 916.4 | 950.8 | 873.8 | 1,029.7 | 860.0 | 896.8 |
| 1994 | 991.5 | 830.6 | 1,012.0 | **918.6** | 775.7 | 866.9 | 939.7 | 837.3 | 1,006.8 | 848.6 | 866.4 |
| 1995 | 1,005.0 | 842.5 | 1,005.0 | **909.5** | 786.5 | 878.7 | 930.6 | 831.2 | 1,001.5 | 845.9 | 900.4 |
| 1996 | 992.9 | 821.1 | 986.1 | **903.0** | 774.5 | 844.0 | 918.6 | 839.4 | 1,002.7 | 836.0 | 853.0 |
| 1997 | 953.9 | 816.2 | 990.7 | **900.8** | 786.5 | 858.3 | 905.2 | 804.5 | 1,019.5 | 819.0 | 869.4 |
| 1998 | 964.5 | 810.2 | 986.7 | **877.8** | 783.7 | 821.5 | 896.5 | 807.9 | 1,004.6 | 827.6 | 875.0 |
| 1999 | 973.1 | 807.7 | 980.0 | **886.1** | 781.3 | 812.7 | 889.2 | 814.9 | 1,011.9 | 831.1 | 895.3 |
| 2000 | 979.7 | 805.6 | 996.2 | **890.2** | 788.2 | 821.7 | 889.7 | 804.3 | 1,010.7 | 819.9 | 851.6 |
| 2001 | 942.1 | 785.3 | 975.2 | **882.7** | 779.4 | 812.1 | 862.8 | 793.0 | 996.1 | 805.9 | 854.4 |
| 2002 | 949.5 | 771.7 | 985.3 | **878.4** | 785.8 | 774.2 | 855.6 | 784.4 | 991.7 | 799.3 | 868.0 |
| Change | 13.5% | 17.5% | 4.3% | **13.2%** | 14.5% | 19.8% | 17.8% | 16.5% | 10.4% | 15.5% | 14.1% |

## Appendix G
## CHILDHOOD MORTALITY IN TULSA MSA

There was a dramatic reduction in the death rates for children age 0 to 14 for Tulsa County, Tulsa MSA, and the state from 1980 to 2003 attributable to certain improvements and developments. However, conditions in the perinatal period, congenital anomalies, motor vehicle accidents and all other accidents were most attributable for deaths among children in this age group. The fact is children's death rates have dropped dramatically since 1980 and children are now dying much less than before.

Accidental injuries were the leading cause of death in children age 1 to 14 in Oklahoma and the nation, specifically motor vehicle accidents (MVA), followed by other unintentional injuries. Fires, burns and drowning were also the most common causes (other than MVA) of unintentional injuries leading to death in children in this age group. Tulsa County and the MSA as a whole have childhood injury deaths rates that are below the state rate; however, Creek, Okmulgee, Osage, and Pawnee have rates above the state rate.[8]

**Perinatal Problems**

Deaths due to perinatal problems and congenital anomalies affect infants (less than 1 year of age) almost exclusively in contrast with the 1 to 14 year old population, with whom MVA and other unintentional injuries are the most common causes of death. The decrease in deaths due to perinatal problems is explained by technological advances in neonatal medicine: ventilators, parental nutrition, new medication delivery systems, broad spectrum antibiotics to treat neonatal infections, and use of artificial pulmonary surfactant to prevent and treat respiratory distress syndrome in premature infants. The regionalization of perinatal services and the presence of better trained physicians and neonatal nurses have also contributed to this positive trend in the infant mortality rate. Adequate prenatal care has also been recognized as an important factor in the health of the neonate.

Advances in the prenatal diagnosis of severe central nervous system defects, selective termination of affected pregnancies and improved surgical treatment and management of other structural anomalies have helped reduce the mortality of children due to congenital defects. There is also more awareness of the importance of folic acid supplementation to prevent spinal cord defects.

Infant mortality is related to a variety of socioeconomic, environmental and health care factors. Some experts have considered it to be a fairly sensitive indicator of general health levels in a population. The most interesting aspect of the national infant mortality rate is that although it has consistently declined over the years, the death rate for black infants has consistently remained about double the death rate for white infants.[9]

A study by David Kessner found that with infectious diseases under control, adequacy of health care was strongly and consistently associated with infant birth weight and survival. Even more, his work concluded that there is a consistent association between social classes measured by educational attainment of the mothers and infant birth weight.[10]

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*[8] Oklahoma State Health of Department; website: www.health.ok.gov*
*[9] Jonas & Kovner. Health Care Delivery in the United States. Springer Publishing Company. 1999*
*[10] Kessner, D.M. and Col; Infant Death: An Analysis by Maternal Risk and Health Care, Washington DC: Institute of Medicine, National Academy of Sciences, 1973.*

**Child Safety**

The first mandatory state child restraint law was implemented in Tennessee in 1978. By 1985, all 50 states and the District of Columbia had adopted child restraint laws that are standard or primary and mandate that young children be secured in car seats. While these laws have increased restraint usage there is still room for improvement as some states (Texas and Utah) permit children as young as 2 years to be restrained in a safety belt if the child is in the rear seat, while other states have no restraint requirements for the rear seat (Indiana, Mississippi, Ohio, and South Carolina).[11]

In Oklahoma, the child restrain law requires that all children 0 to 3 years of age be buckled in a car seat, children 4 to 5 years of age are required to use a car seat or seat belt (safety belt laws rather that child restraint laws). However, car seat use in Oklahoma is only 54%. The National Highway Traffic Safety Administration currently recommends that all children who have outgrown child safety seats should be restrained in booster seats until they are at least 8 years old, unless they are 57 inches tall. Not all states are reinforcing this recommendation.[12]

Overall, seat belts, car seats, bicycle and motorcycle helmets, smoke alarms, fire sprinkler systems, and four-sided pool fencing are good preventive strategies that have significantly contributed to reduce the likelihood of unintentional injuries and possibly death among children.

**Intervention & Policy**

A key intervention in the improvement of children's mortality rate has to include efforts towards the reduction in the incidence of low birth weight and preterm babies. This will be especially important in reducing racial/ethnic disparities in the health of infants. Black infants are more than twice as likely to die as white infants. This ratio has increased in recent decades.[13]

1. Prevention of unintended pregnancies is paramount. These pregnancies constitute about 50% of all pregnancies in the nation. They are associated with inadequate prenatal care and unhealthy lifestyle factors (smoking, drinking alcohol, unsafe sex and poor nutrition) that negatively affect the mother and health of the fetus, increasing the risk of prematurity, low birth weight and congenital anomalies. Prevention of unintended pregnancies among teenagers in particular, should also be given high priority. Strategies should include education about contraception and access to effective family planning services.

2. There should be improvements in the prenatal care coverage, especially among Black women and women without health insurance or Medicaid coverage. Efforts should focus on providing women with early access to high-quality care throughout pregnancy, labor and delivery.

Another important intervention towards decreasing childhood mortality, is related to reduction of child occupant injuries. In Oklahoma, children older than 3 years of age should be subject to child restrain laws rather than seat belt laws until they are 8 years old unless they are 57 inches tall as per the National Highway Traffic Safety Administration recommendation.

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*[11] Wiston and Durbin; Buckle up is not enough: Enhancing protection of the restrained child; JAMA, 1999; 281: 2070 – 2072.*
*[12] Durbin et al.; Belt positioning Booster Seats and Reductions in Risk of Injury Among Children; JAMA, 2003; 289:2835 – 2840.*
*[13] CDC; website: www.cdc.com*

**Children's Health**

Death rates in and of themselves are not enough to assess the health condition of children in a community. It is imperative to be able to assess the developmental process and the biological, environmental, social and physical pathways that interact and influence children's health. Mental health is also an extremely important aspect of child health and well-being that should be assessed early in a child's life. It is a critical component of children's learning and general health and well-being and any onset of issues should be identified early, particularly in children with special healthcare needs, children of fragmented families, and children of parents with mental health and/or substance abuse problems.

The Oklahoma Kids Count Partnership, a project of the Oklahoma Institute for Child Advocacy (OICA), presents a profile of the status of children and youth in Oklahoma. They identify seven benchmarks that are quantifiable measures that help determine child, family and community well-being: low birthweight, infant mortality, births to young teens, child abuse and neglect, child deaths, high school dropouts, violent crime arrests.[14]

The Federal Interagency Forum on Child and Family Statistics has published America's Children: Key National Indicators of Well-Being. This report includes information on a set of 25 key indicators of child well-being grouped in four sections: economic security, health, behavior and social environment and education.[15]

Children in Oklahoma are much less likely to die in childhood now than they were only over two decades ago. However, evaluating children's overall health requires an assessment of multiple health and social factors. To better assess their health requires a developmental perspective with implications for health (physical and mental) in subsequent stages of life. The major conclusions drawn from this analysis were:

- The most common causes of death at the state and Tulsa County level for children age 1 to 14 were: 1) motor vehicle accidents, 2) other unintentional accidents, 3) congenital anomalies, and 4) malignant neoplasms.
- The most common causes of death at the state and Tulsa County level for infants younger than 1 year of age were: 1) perinatal conditions, 2) congenital anomalies, and 3) injuries.
- *During the period of observation (1980 – 2003) the death rate of children age 0 to 14 decreased by 42% in the state of Oklahoma, by 33% in Tulsa County and by 35% in Tulsa MSA.*
- The positive trend in the children's death rate is due mainly to improvements in prenatal care for pregnant women, providing earlier detection and management of problems. Also, technological progress in the care of sick infants and children—particularly newborns that are premature and/or have congenital malformations, national regulations regarding proper restrain of infants and children, and more public awareness of accident prevention have all contributed to the decline in child death rates.

Death rate by itself is not enough to assess the health condition of children in a community. There are other contributing factors, such as environmental, social, physical, and emotional health factors, that need to be considered in order to maintain the low death rate among children.

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[14] *Department of Health and Human Services: Report of the surgeon General's Conference on Children's Mental Health; website: www.surgeongeneral.gov/topics/cmh/childrenport.htm.*

[15] *Oklahoma KIDS COUNT Fact Book 2004. America's Children in Brief: Key National Indicators of Well-Being.*

**Appendix H**
**International Classification of Disease (ICD)**
(Source: Oklahoma State Department of Health)

Deaths that occurred between 1980 -1998 were classified using the ICD-9, while deaths that occurred between 1999 and 2003 on were classified using ICD-10. The Oklahoma State Department of Health (OSDH) uses several tabulation lists that have been established by the National Center for Health Statistics (NCHS) for the general analysis of mortality statistics. This analysis uses lists of 34 and 39 selected causes of death, ICD-9 and ICD-10 respectively—the standard lists that have been used by OSDH in past Annual Oklahoma Health Statistics Reports.

**ICD-9 (1980 - 1998)**

| Major Category | Select Causes of Death | Classification Code |
|---|---|---|
| Cardiovascular Disease | Rheumatic fever and rheumatic heart disease | (390-398) |
| | Hypertensive heart disease with or without renal disease | (402,404) |
| | Ischemic heart disease | (410-414) |
| | Other heart diseases | (415-429) |
| | Hypertension with or without renal disease | (401,403) |
| | Cerebrovascular diseases | (430-438) |
| | Atherosclerosis | (440) |
| | Other diseases of arteries, arterioles, & capillaries | (441-448) |
| Cancer | Malignant neoplasms of digestive organs & peritoneum | (150-159) |
| | Malignant neoplasms of respiratory & intrathoracic organs | (160-165) |
| | Malignant neoplasm of breast | (174-175) |
| | Malignant neoplasms of genital organs | (179-187) |
| | Malignant neoplasms of urinary organs | (188-189) |
| | Leukemia | (204-208) |
| | Other malignant neoplasms | (140-149, 170-173, 190-203) |
| Diabetes | Diabetes mellitus | (250) |
| Respiratory Disease | Tuberculosis | (010-018) |
| | Pneumonia & influenza | (480-487) |
| | Chronic obstructive pulmonary diseases & allied conditions | (490-496) |

## ICD-10 (1999 – 2003)

| Major Category | Select Causes of Death | Classification Code |
|---|---|---|
| **Cardiovascular Disease** | Hypertensive heart disease with or without renal disease | I11,I13 |
| | Ischemic heart diseases | I20-I25 |
| | Other diseases of heart | I00-I09,I26-I51 |
| | Essential (primary) hypertension & hypertensive renal disease | I10,I12 |
| | Cerebrovascular diseases | I60-I69 |
| | Atherosclerosis | I70 |
| | Other diseases of circulatory system | I71-I78 |
| **Cancer** | Malignant neoplasm of stomach | C16 |
| | Malignant neoplasms of colon, rectum & anus | C18-C21 |
| | Malignant neoplasm of pancreas | C25 |
| | Malignant neoplasms of trachea, bronchus & lung | C33-C34 |
| | Malignant neoplasm of breast | C50 |
| | Malignant neoplasms of cervix uteri, corpus uteri & ovary | C53-C56 |
| | Malignant neoplasm of prostate | C61 |
| | Malignant neoplasms of urinary tract | C64-C68 |
| | Non-Hodgkin's lymphoma | C82-C85 |
| | Leukemia | C91-C95 |
| | Other malignant neoplasms | C00-C15, C17, C22-C24, C26-C32, C37-C49, C51-C52, C57-C60, C62-C63, C69-C81, C88, C90, C96-C97 |
| **Diabetes** | Diabetes mellitus | E10-E14 |
| **Respiratory Disease** | Tuberculosis | A16-A19 |
| | Influenza & pneumonia | J10-J18 |
| | Chronic lower respiratory diseases | J40-J47 |

**Appendix I**
**Age-Adjusted Death Rates per Disease Category, Geography and Year**
(Sources: Oklahoma State Department of Health, CDC Wonder)

## HEART DISEASE
**AGE ADJUSTED DEATH RATES**

| | TULSA | | OKLAHOMA CITY | | REGIONS | | NATIONAL | |
|---|---|---|---|---|---|---|---|---|
| | COUNTY | METRO | COUNTY | METRO | NW | SE | OK | US |
| 1980 | 562.5 | 560.4 | 547.9 | 549.1 | 515.5 | 574.0 | 528.5 | 541.2 |
| 1981 | 546.3 | 544.5 | 524.6 | 519.5 | 486.2 | 573.3 | 510.0 | 517.4 |
| 1982 | 518.7 | 517.4 | 517.3 | 519.5 | 459.6 | 575.8 | 507.2 | 502.7 |
| 1983 | 518.4 | 521.1 | 527.1 | 521.1 | 466.4 | 594.1 | 503.2 | 499.1 |
| 1984 | 499.2 | 488.8 | 499.8 | 492.2 | 439.0 | 531.6 | 474.5 | 485.2 |
| 1985 | 527.0 | 511.6 | 490.7 | 492.2 | 471.3 | 555.4 | 491.8 | 478.4 |
| 1986 | 485.7 | 487.4 | 470.7 | 466.2 | 453.4 | 525.6 | 473.4 | 464.2 |
| 1987 | 489.4 | 480.5 | 473.4 | 452.0 | 436.2 | 491.1 | 456.5 | 453.1 |
| 1988 | 498.2 | 490.7 | 472.4 | 474.6 | 460.2 | 491.7 | 461.4 | 448.4 |
| 1989 | 465.4 | 462.0 | 446.0 | 441.4 | 438.9 | 502.4 | 443.4 | 423.1 |
| 1990 | 463.3 | 460.4 | 447.7 | 434.7 | 447.4 | 493.7 | 443.0 | 410.6 |
| 1991 | 450.6 | 441.5 | 437.3 | 432.0 | 425.0 | 470.6 | 426.7 | 399.9 |
| 1992 | 422.2 | 421.6 | 435.3 | 433.9 | 443.1 | 475.3 | 421.3 | 390.6 |
| 1993 | 429.5 | 443.7 | 423.7 | 419.7 | 486.6 | 486.5 | 433.0 | 396.0 |
| 1994 | 426.0 | 430.1 | 425.1 | 415.8 | 458.6 | 462.1 | 418.7 | 385.5 |
| 1995 | 442.3 | 432.8 | 435.4 | 423.5 | 443.2 | 485.5 | 419.3 | 382.6 |
| 1996 | 425.2 | 428.8 | 450.7 | 438.3 | 450.6 | 471.2 | 422.3 | 373.8 |
| 1997 | 410.1 | 420.2 | 437.1 | 418.8 | 429.0 | 462.0 | 415.1 | 364.4 |
| 1998 | 405.3 | 404.1 | 428.1 | 419.0 | 411.8 | 446.9 | 407.6 | 353.6 |
| 1999 | 409.8 | 414.5 | 436.2 | 422.4 | 378.2 | 428.3 | 405.9 | 349.3 |
| 2000 | 408.9 | 409.7 | 419.7 | 420.7 | 409.2 | 442.4 | 405.8 | 339.7 |
| 2001 | 417.0 | 404.5 | 415.4 | 407.8 | 365.0 | 433.3 | 387.5 | 326.5 |
| 2002 | 404.9 | 399.4 | 414.8 | 409.1 | 381.9 | 434.0 | 393.0 | 317.4 |
| 2003 | 397.1 | 393.5 | 415.4 | 411.4 | 380.7 | 439.8 | 390.6 | 305.8 |

## CANCER
### AGE ADJUSTED DEATH RATES

| | TULSA | | OKLAHOMA CITY | | REGIONS | | NATIONAL | |
|---|---|---|---|---|---|---|---|---|
| | COUNTY | METRO | COUNTY | METRO | NW | SE | OK | US |
| 1980 | 217.9 | 211.4 | 223.4 | 209.1 | 169.6 | 191.7 | 192.0 | 207.9 |
| 1981 | 221.6 | 209.5 | 228.5 | 209.6 | 177.1 | 207.3 | 197.1 | 206.4 |
| 1982 | 228.2 | 213.4 | 200.6 | 198.8 | 185.9 | 220.5 | 197.5 | 208.3 |
| 1983 | 208.4 | 198.3 | 226.4 | 215.5 | 164.4 | 222.3 | 199.3 | 209.1 |
| 1984 | 230.2 | 215.2 | 212.5 | 202.8 | 200.8 | 214.3 | 199.1 | 210.8 |
| 1985 | 225.5 | 214.1 | 227.1 | 209.2 | 174.1 | 214.0 | 198.8 | 211.3 |
| 1986 | 242.0 | 227.6 | 218.5 | 209.0 | 184.2 | 207.2 | 204.4 | 211.5 |
| 1987 | 210.9 | 206.4 | 227.7 | 218.2 | 175.3 | 219.6 | 205.8 | 211.7 |
| 1988 | 224.7 | 216.9 | 223.6 | 213.4 | 179.2 | 218.3 | 204.0 | 212.5 |
| 1989 | 229.5 | 218.7 | 238.1 | 222.1 | 207.3 | 215.6 | 210.4 | 214.2 |
| 1990 | 220.0 | 215.9 | 225.4 | 216.1 | 178.8 | 233.3 | 209.0 | 216.0 |
| 1991 | 218.0 | 219.9 | 229.1 | 216.6 | 207.7 | 236.5 | 212.7 | 215.8 |
| 1992 | 214.1 | 216.5 | 224.9 | 213.0 | 198.0 | 227.5 | 208.4 | 214.3 |
| 1993 | 230.8 | 224.9 | 221.0 | 219.8 | 182.7 | 255.2 | 214.0 | 214.6 |
| 1994 | 230.4 | 220.3 | 227.4 | 219.6 | 190.7 | 222.1 | 210.5 | 213.1 |
| 1995 | 216.4 | 215.1 | 218.4 | 214.3 | 189.5 | 223.3 | 208.1 | 211.7 |
| 1996 | 214.3 | 211.7 | 216.3 | 209.5 | 168.2 | 233.9 | 206.6 | 208.7 |
| 1997 | 224.4 | 224.7 | 214.0 | 206.4 | 209.3 | 226.0 | 208.1 | 205.7 |
| 1998 | 213.1 | 208.3 | 218.8 | 211.3 | 199.2 | 214.7 | 202.4 | 202.4 |
| 1999 | 221.8 | 218.2 | 205.5 | 207.0 | 180.9 | 202.1 | 202.9 | 200.8 |
| 2000 | 218.5 | 217.9 | 201.9 | 202.5 | 211.9 | 229.3 | 204.1 | 199.6 |
| 2001 | 223.3 | 215.1 | 207.1 | 204.9 | 191.9 | 218.4 | 203.9 | 196.0 |
| 2002 | 209.6 | 211.9 | 204.0 | 204.1 | 184.2 | 215.2 | 203.6 | 193.5 |
| 2003 | 209.2 | 205.4 | 190.4 | 195.0 | 182.0 | 221.1 | 198.5 | 189.3 |

## RESPIRATORY DISEASE
### AGE ADJUSTED DEATH RATES

| | TULSA | | OKLAHOMA CITY | | REGIONS | | NATIONAL | |
|---|---|---|---|---|---|---|---|---|
| | COUNTY | METRO | COUNTY | METRO | NW | SE | OK | US |
| 1980 | 56.7 | 54.6 | 62.1 | 61.2 | 69.8 | 67.8 | 59.5 | 60.7 |
| 1981 | 64.3 | 61.8 | 64.7 | 63.5 | 74.8 | 60.2 | 61.3 | 60.0 |
| 1982 | 61.0 | 61.5 | 66.7 | 60.7 | 72.0 | 66.9 | 59.5 | 56.5 |
| 1983 | 76.7 | 72.4 | 68.6 | 64.6 | 66.4 | 72.0 | 66.4 | 62.3 |
| 1984 | 70.7 | 69.1 | 74.5 | 71.9 | 73.3 | 77.2 | 67.5 | 63.8 |
| 1985 | 73.3 | 68.4 | 72.5 | 75.6 | 86.4 | 76.8 | 71.7 | 69.8 |
| 1986 | 75.4 | 75.1 | 70.4 | 67.1 | 85.2 | 78.3 | 71.0 | 70.4 |
| 1987 | 73.3 | 68.0 | 79.1 | 79.4 | 64.9 | 76.6 | 72.4 | 69.6 |
| 1988 | 81.1 | 76.8 | 84.1 | 83.9 | 74.0 | 90.0 | 78.4 | 74.6 |
| 1989 | 89.7 | 84.0 | 80.3 | 82.2 | 87.9 | 83.9 | 79.7 | 73.4 |
| 1990 | 85.6 | 87.1 | 89.1 | 89.0 | 74.0 | 83.4 | 82.9 | 74.8 |
| 1991 | 87.1 | 82.1 | 79.9 | 80.7 | 74.1 | 79.9 | 79.6 | 73.6 |
| 1992 | 89.0 | 83.6 | 85.5 | 84.0 | 81.0 | 86.0 | 80.8 | 71.7 |
| 1993 | 90.9 | 85.7 | 95.5 | 93.8 | 81.9 | 97.3 | 87.8 | 76.9 |
| 1994 | 82.9 | 80.2 | 92.3 | 87.0 | 83.9 | 105.8 | 87.7 | 75.1 |
| 1995 | 89.7 | 86.4 | 79.2 | 83.5 | 69.5 | 97.8 | 84.9 | 74.8 |
| 1996 | 85.1 | 79.3 | 85.1 | 87.2 | 83.3 | 100.8 | 84.4 | 74.7 |
| 1997 | 75.1 | 74.5 | 92.1 | 89.6 | 86.8 | 99.5 | 86.4 | 75.5 |
| 1998 | 85.0 | 84.7 | 90.1 | 87.5 | 81.8 | 94.3 | 87.6 | 77.0 |
| 1999 | 72.8 | 76.5 | 82.4 | 80.4 | 82.4 | 78.5 | 76.9 | 69.2 |
| 2000 | 74.2 | 73.6 | 78.5 | 82.6 | 82.8 | 79.7 | 78.9 | 68.2 |
| 2001 | 76.3 | 74.2 | 79.6 | 77.2 | 90.6 | 90.2 | 77.7 | 66.0 |
| 2002 | 76.7 | 73.6 | 78.8 | 77.5 | 86.3 | 86.8 | 79.0 | 66.4 |
| 2003 | 85.6 | 87.5 | 86.0 | 84.3 | 93.0 | 92.4 | 84.5 | 65.3 |

## DIABETES
**AGE ADJUSTED DEATH RATES**

| | TULSA | | OKLAHOMA CITY | | REGIONS | | NATIONAL | |
|---|---|---|---|---|---|---|---|---|
| | COUNTY | METRO | COUNTY | METRO | NW | SE | OK | US |
| 1980 | 10.1 | 12.6 | 16.6 | 15.8 | 20.6 | 16.1 | 15.1 | 18.1 |
| 1981 | 15.9 | 17.5 | 15.3 | 15.3 | 23.6 | 23.5 | 17.1 | 17.6 |
| 1982 | 11.4 | 14.4 | 17.1 | 15.6 | 19.0 | 19.5 | 16.9 | 17.2 |
| 1983 | 10.6 | 13.0 | 16.2 | 14.4 | 23.1 | 19.6 | 16.0 | 17.6 |
| 1984 | 11.3 | 13.7 | 16.0 | 15.1 | 22.2 | 15.6 | 14.0 | 17.2 |
| 1985 | 16.0 | 14.9 | 14.9 | 14.2 | 16.2 | 15.0 | 14.3 | 17.4 |
| 1986 | 14.4 | 12.9 | 19.4 | 18.6 | 22.2 | 21.1 | 16.2 | 17.2 |
| 1987 | 12.2 | 12.6 | 14.6 | 14.1 | 22.6 | 16.4 | 15.2 | 17.4 |
| 1988 | 18.3 | 18.3 | 20.6 | 18.0 | 20.6 | 18.2 | 17.6 | 18.0 |
| 1989 | 16.8 | 17.1 | 13.6 | 12.6 | 14.0 | 15.8 | 15.4 | 20.5 |
| 1990 | 12.0 | 13.8 | 16.4 | 14.3 | 18.7 | 16.9 | 16.0 | 20.7 |
| 1991 | 16.5 | 18.1 | 17.6 | 16.0 | 15.6 | 18.1 | 17.2 | 20.7 |
| 1992 | 21.0 | 18.9 | 17.8 | 16.9 | 21.2 | 18.2 | 17.7 | 20.8 |
| 1993 | 19.8 | 18.5 | 23.4 | 21.4 | 17.4 | 14.6 | 18.9 | 22.0 |
| 1994 | 21.4 | 20.6 | 18.7 | 16.8 | 27.9 | 22.2 | 18.8 | 22.7 |
| 1995 | 15.6 | 18.8 | 18.2 | 17.6 | 20.1 | 17.5 | 18.6 | 23.4 |
| 1996 | 23.6 | 23.0 | 19.4 | 18.7 | 20.6 | 20.2 | 20.9 | 24.0 |
| 1997 | 25.1 | 26.7 | 31.8 | 28.6 | 21.1 | 27.0 | 26.6 | 24.0 |
| 1998 | 26.2 | 26.5 | 29.9 | 27.6 | 23.0 | 27.3 | 26.3 | 24.2 |
| 1999 | 28.0 | 30.7 | 26.2 | 25.3 | 28.5 | 26.5 | 27.1 | 25.0 |
| 2000 | 29.6 | 29.3 | 24.3 | 26.4 | 29.0 | 26.0 | 26.8 | 25.0 |
| 2001 | 27.5 | 27.9 | 30.7 | 28.6 | 20.9 | 29.7 | 28.9 | 25.3 |
| 2002 | 22.7 | 26.1 | 30.2 | 27.3 | 25.8 | 32.1 | 28.7 | 25.4 |
| 2003 | 24.9 | 28.0 | 25.9 | 26.3 | 36.3 | 36.5 | 29.7 | 25.2 |

## ALL OTHER CAUSES
### AGE ADJUSTED DEATH RATES

| | TULSA | | OKLAHOMA CITY | | REGIONS | | NATIONAL | |
|---|---|---|---|---|---|---|---|---|
| | COUNTY | METRO | COUNTY | METRO | NW | SE | OK | US |
| 1980 | 228.6 | 219.0 | 244.6 | 225.9 | 243.9 | 235.8 | 223.0 | 211.2 |
| 1981 | 225.5 | 220.8 | 250.3 | 230.8 | 246.9 | 224.1 | 225.3 | 205.7 |
| 1982 | 222.5 | 215.2 | 248.8 | 229.7 | 262.5 | 253.5 | 225.7 | 200.3 |
| 1983 | 208.6 | 202.6 | 231.6 | 214.5 | 218.3 | 219.8 | 208.2 | 201.9 |
| 1984 | 216.1 | 207.6 | 222.9 | 205.9 | 222.0 | 221.2 | 203.4 | 205.5 |
| 1985 | 208.7 | 207.8 | 230.5 | 211.8 | 238.1 | 233.1 | 209.8 | 211.2 |
| 1986 | 227.0 | 218.4 | 246.3 | 221.0 | 204.5 | 220.2 | 212.6 | 215.3 |
| 1987 | 202.6 | 194.8 | 240.7 | 220.5 | 208.0 | 205.1 | 201.9 | 218.2 |
| 1988 | 218.8 | 211.6 | 230.6 | 213.2 | 212.6 | 225.5 | 207.3 | 222.2 |
| 1989 | 216.1 | 208.6 | 234.7 | 213.3 | 168.0 | 203.9 | 198.3 | 219.3 |
| 1990 | 210.6 | 207.1 | 235.3 | 215.6 | 223.9 | 218.7 | 207.4 | 216.6 |
| 1991 | 215.9 | 215.5 | 228.0 | 214.8 | 222.5 | 222.9 | 208.2 | 215.5 |
| 1992 | 207.3 | 203.0 | 236.3 | 214.2 | 195.4 | 224.2 | 205.7 | 213.5 |
| 1993 | 223.0 | 216.8 | 266.3 | 237.5 | 217.4 | 235.9 | 224.0 | 222.0 |
| 1994 | 237.1 | 233.2 | 243.8 | 221.0 | 225.6 | 247.5 | 224.7 | 223.8 |
| 1995 | 230.3 | 225.8 | 282.7 | 255.5 | 196.9 | 228.7 | 227.9 | 226.0 |
| 1996 | 236.6 | 229.0 | 260.3 | 236.6 | 205.6 | 226.0 | 224.2 | 221.2 |
| 1997 | 233.1 | 229.1 | 270.6 | 252.6 | 220.2 | 237.8 | 237.0 | 217.7 |
| 1998 | 243.8 | 231.2 | 274.8 | 254.9 | 224.2 | 245.4 | 238.7 | 218.6 |
| 1999 | 254.6 | 250.5 | 300.3 | 267.1 | 239.0 | 240.1 | 250.4 | 231.3 |
| 2000 | 268.5 | 254.1 | 303.4 | 268.6 | 223.7 | 265.3 | 252.8 | 236.5 |
| 2001 | 264.1 | 258.2 | 296.6 | 265.7 | 244.4 | 254.7 | 254.2 | 240.7 |
| 2002 | 284.5 | 267.7 | 290.5 | 263.6 | 255.8 | 277.9 | 260.9 | 242.6 |
| 2003 | 303.3 | 288.0 | 291.8 | 264.7 | 242.3 | 278.0 | 267.7 | 245.6 |

## Appendix J
## Mortality in Other States
(Source: United Health Foundation)[16]

According to the United Health Foundation's (UHF) State Health Rankings Report (2004 Edition)—Hawaii (1) and Minnesota (1) ranked first or best in terms of ***cardiovascular deaths***, while Mississippi (49) and Oklahoma (49) ranked last or worst.

> "*Cardiovascular Deaths is measured using a three-year average, age- and race-adjusted death rate due to heart disease, strokes and other cardiovascular disease. The effect of cardiovascular disease on health was measured using mortality data due to the improved accuracy of the data and the ability to adjust for age and race. This measure replaces the previous heart disease measure, Heart Deaths, and enlarges the scope of deaths included in the measure, thus counteracting some of the narrowing in scope when the risk for heart disease was altered to the prevalence of obesity, a change also occurring in this Edition."*
>
> *"The use of mortality data may not reflect the full impact of cardiovascular disease. Data also do not reflect new procedures to treat heart disease and prolong the useful lives of patients."*

The same UHF report ranked Hawaii (1) and North Dakota (1) first or best in terms of ***total mortality***, and Kentucky (49) and West Virginia (50) last or worst. Oklahoma ranked 47th in total mortality.

> *"Total Mortality is an accurate, reliable measure of the effects of poor health. The mortality rate is age- and race-adjusted and is an average of the most recent three years of data."*

According to the same report…

> *"Oklahoma is 40th this year; it was 45th in 2003. Oklahoma's strengths are strong support for public health with 9.4 percent of the state health budget allocated to public health and a low rate of motor vehicle deaths at 1.4 deaths per 100,000,000 miles driven. Challenges include a high rate of deaths from cardiovascular disease at 411.6 deaths per 100,000 population, a high rate of uninsured population at 20.4 percent, low access to adequate prenatal care with 67.6 percent of pregnant women receiving adequate prenatal care and a high total mortality rate at 984.7 deaths per 100,000 population. Oklahoma is 35th for the combined measures of risk factors and 44th for the combined measures of outcomes, indicating that the state may improve its relative healthiness in future years if it continues to focus on reducing health risk factors. Health disparities among racial groups are present but not as great as in most other states.*
>
> *In the past year, the percentage of children in poverty declined from 21.4 percent to 17.0 percent of persons under age 18, and the incidence of infectious disease decreased from 19.9 to 15.9 cases per 100,000 population. The prevalence of obesity increased from 22.9 percent to 24.4 percent of the population, and the rate of uninsured population increased from 17.3 percent to 20.4 percent.*
>
> *Since 1990, the incidence of infectious disease has decreased from 34.9 to 15.9 cases per 100,000 population, the rate of cancer deaths has increased from 197.8 to 215.4 deaths per 100,000 population and the premature death rate has increased from 8,551 to 8,828 years of potential life lost before age 75 per 100,000 population.*

[16] *Source: http://www.unitedhealthfoundation.org/shr/State%20Health%202004.pdf*

## Appendix K
## Age-Adjusted Death Rates, 2000- 2002 (average)
(Source: CDC Wonder)

| State Name | Age-Adjusted Death Rate* |
|---|---|
| DC | 1,043.1 |
| Mississippi | 1,037.9 |
| Louisiana | 1,005.0 |
| West Virginia | 999.4 |
| Alabama | 999.0 |
| Kentucky | 996.9 |
| Tennessee | 985.5 |
| **Oklahoma** | **973.8** |
| Georgia | 964.5 |
| Arkansas | 964.4 |
| South Carolina | 956.8 |
| North Carolina | 923.7 |
| Nevada | 919.7 |
| Missouri | 915.6 |
| Ohio | 912.2 |
| Indiana | 911.7 |
| Michigan | 885.3 |
| Texas | 883.7 |
| Maryland | 883.1 |
| Delaware | 877.1 |
| Pennsylvania | 875.3 |
| Virginia | 869.0 |
| Illinois | 864.8 |
| Wyoming | 858.0 |
| Maine | 850.6 |
| Kansas | 845.1 |
| Montana | 842.4 |

| State Name | Age-Adjusted Death Rate* |
|---|---|
| New Jersey | 832.1 |
| Oregon | 829.4 |
| Alaska | 827.5 |
| New Mexico | 817.7 |
| Rhode Island | 815.0 |
| Wisconsin | 808.2 |
| Massachusetts | 805.7 |
| Vermont | 802.4 |
| Nebraska | 800.6 |
| Arizona | 799.9 |
| New York | 799.2 |
| Florida | 798.6 |
| New Hampshire | 798.2 |
| Idaho | 796.5 |
| Washington | 793.6 |
| Colorado | 792.7 |
| South Dakota | 787.3 |
| Utah | 784.4 |
| Iowa | 780.9 |
| Connecticut | 773.4 |
| California | 773.3 |
| North Dakota | 761.3 |
| Minnesota | 748.8 |
| Hawaii | 662.0 |

*Rates are per 100,000 population and calculated using 2000 standard population; cause of death specified by ICD-10 codes A00-Z99.

**Appendix L**
**Age Adjusted Death Rates for Oklahoma 1980-2003**

| | NATIONAL | | TULSA | | OKLAHOMA CITY | | REGIONAL | |
|---|---|---|---|---|---|---|---|---|
| | US | OK | COUNTY | METRO | COUNTY | METRO | NW | SE |
| 1980 | 1,039.1 | 1,018.1 | 1,075.8 | 1,058.0 | 1,094.6 | 1,061.1 | 1,019.4 | 1,085.4 |
| 1981 | 1,007.1 | 1,010.8 | 1,073.6 | 1,054.1 | 1,083.4 | 1,038.7 | 1,008.6 | 1,088.4 |
| 1982 | 985.0 | 1,006.8 | 1,041.8 | 1,021.9 | 1,050.5 | 1,024.3 | 999.0 | 1,136.2 |
| 1983 | 990.0 | 993.1 | 1,022.7 | 1,007.4 | 1,069.9 | 1,030.1 | 938.6 | 1,127.8 |
| 1984 | 982.5 | 958.5 | 1,027.5 | 994.4 | 1,025.7 | 987.9 | 957.3 | 1,059.9 |
| 1985 | 988.1 | 986.4 | 1,050.5 | 1,016.8 | 1,035.7 | 1,003.0 | 986.1 | 1,094.3 |
| 1986 | 978.6 | 977.6 | 1,044.5 | 1,021.4 | 1,025.3 | 981.9 | 949.5 | 1,052.4 |
| 1987 | 970.0 | 951.8 | 988.4 | 962.3 | 1,035.5 | 984.2 | 907.0 | 1,008.8 |
| 1988 | 975.7 | 968.7 | 1,041.1 | 1,014.3 | 1,031.3 | 1,003.1 | 946.6 | 1,043.7 |
| 1989 | 950.5 | 947.2 | 1,017.5 | 990.4 | 1,012.7 | 971.6 | 916.1 | 1,021.6 |
| 1990 | 938.7 | 958.3 | 991.5 | 984.3 | 1,013.9 | 969.7 | 942.8 | 1,046.0 |
| 1991 | 925.5 | 944.4 | 988.1 | 977.1 | 991.9 | 960.1 | 944.9 | 1,028.0 |
| 1992 | 910.9 | 933.9 | 953.6 | 943.6 | 999.8 | 962.0 | 938.7 | 1,031.2 |
| 1993 | 931.5 | 977.7 | 994.0 | 989.6 | 1,029.9 | 992.2 | 986.0 | 1,089.5 |
| 1994 | 920.2 | 960.4 | 997.8 | 984.4 | 1,007.3 | 960.2 | 986.7 | 1,059.7 |
| 1995 | 918.5 | 958.8 | 994.3 | 978.9 | 1,033.9 | 994.4 | 919.2 | 1,052.8 |
| 1996 | 902.4 | 958.4 | 984.8 | 971.8 | 1,031.8 | 990.3 | 928.3 | 1,052.1 |
| 1997 | 887.3 | 973.2 | 967.8 | 975.2 | 1,045.6 | 996.0 | 966.4 | 1,052.3 |
| 1998 | 875.8 | 962.6 | 973.4 | 954.8 | 1,041.7 | 1,000.3 | 940.0 | 1,028.6 |
| 1999 | 875.6 | 963.2 | 987.0 | 990.4 | 1,050.6 | 1,002.2 | 909.0 | 975.5 |
| 2000 | 869.0 | 968.4 | 999.7 | 984.6 | 1,027.8 | 1,000.8 | 956.6 | 1,042.7 |
| 2001 | 854.5 | 952.2 | 1,008.2 | 979.9 | 1,029.4 | 984.2 | 912.8 | 1,026.3 |
| 2002 | 845.3 | 965.2 | 998.4 | 978.7 | 1,018.3 | 981.6 | 934.0 | 1,046.0 |
| 2003 | 831.2 | 971.0 | 1,020.1 | 1,002.4 | 1,009.5 | 981.7 | 934.3 | 1,067.8 |

**Appendix M**
**Age Adjusted Death Rates**
**Regional States 1979-2002**

| | US | OK | LA | AR | MO | KS | CO | NM | TX |
|---|---|---|---|---|---|---|---|---|---|
| 1979 | 1,010.6 | 1,028.7 | 1,127.6 | 1,003.5 | 1,026.5 | 931.8 | 936.1 | 972.0 | 1,011.9 |
| 1980 | 1,038.7 | 1,024.9 | 1,135.6 | 1,038.8 | 1,050.5 | 958.1 | 944.0 | 999.9 | 1,017.5 |
| 1981 | 1,007.0 | 1,012.8 | 1,130.6 | 1,009.1 | 1,020.2 | 926.5 | 928.6 | 916.9 | 1,005.9 |
| 1982 | 984.9 | 1,008.0 | 1,099.2 | 994.0 | 992.3 | 919.4 | 918.2 | 946.4 | 982.6 |
| 1983 | 990.0 | 995.3 | 1,102.6 | 1,011.2 | 1,008.0 | 910.2 | 883.9 | 918.6 | 989.0 |
| 1984 | 982.1 | 984.3 | 1,072.3 | 1,017.8 | 988.2 | 916.0 | 910.5 | 928.6 | 990.5 |
| 1985 | 987.8 | 990.4 | 1,098.9 | 1,027.6 | 1,001.3 | 897.5 | 882.8 | 911.5 | 978.5 |
| 1986 | 978.4 | 987.5 | 1,052.0 | 1,006.5 | 984.7 | 896.2 | 884.3 | 915.3 | 958.5 |
| 1987 | 969.6 | 959.1 | 1,052.0 | 1,011.9 | 982.2 | 878.9 | 880.2 | 914.3 | 954.9 |
| 1988 | 975.1 | 978.8 | 1,081.7 | 1,023.4 | 976.3 | 905.6 | 876.0 | 897.9 | 961.3 |
| 1989 | 949.9 | 958.7 | 1,072.0 | 997.9 | 956.7 | 869.8 | 846.1 | 887.6 | 955.6 |
| 1990 | 938.0 | 968.1 | 1,066.4 | 990.3 | 948.4 | 863.7 | 847.8 | 873.4 | 945.1 |
| 1991 | 921.9 | 947.2 | 1,064.6 | 984.5 | 940.3 | 857.7 | 855.7 | 889.7 | 921.9 |
| 1992 | 905.3 | 937.0 | 1,028.8 | 963.5 | 929.0 | 830.8 | 820.4 | 851.3 | 914.1 |
| 1993 | 925.8 | 982.8 | 1,065.1 | 1,006.5 | 966.5 | 872.4 | 838.4 | 864.3 | 929.8 |
| 1994 | 913.2 | 966.8 | 1,037.1 | 983.7 | 957.9 | 851.3 | 827.5 | 864.7 | 918.6 |
| 1995 | 909.5 | 971.0 | 1,039.3 | 980.5 | 958.2 | 862.7 | 827.5 | 868.1 | 909.5 |
| 1996 | 893.7 | 965.5 | 1,021.3 | 961.6 | 937.9 | 852.3 | 828.5 | 836.1 | 903.0 |
| 1997 | 877.7 | 978.6 | 1,015.7 | 995.1 | 935.1 | 838.5 | 801.9 | 819.9 | 900.8 |
| 1998 | 870.1 | 966.1 | 1,012.5 | 972.3 | 938.8 | 839.2 | 809.6 | 816.3 | 877.8 |
| 1999 | 875.2 | 978.6 | 1,021.0 | 975.1 | 944.5 | 847.8 | 801.5 | 842.0 | 886.1 |
| 2000 | 868.3 | 982.5 | 1,005.6 | 976.6 | 920.3 | 850.1 | 791.4 | 808.3 | 890.2 |
| 2001 | 854.5 | 962.6 | 1,008.6 | 949.9 | 909.4 | 840.4 | 791.0 | 827.0 | 882.7 |
| 2002 | 845.3 | 976.2 | 1,001.1 | 966.9 | 917.1 | 845.1 | 795.7 | 817.7 | 878.4 |
| CHANGE | 16.4% | 5.1% | 11.2% | 3.6% | 10.7% | 9.3% | 15.0% | 15.9% | 13.2% |