



OBESITY, CARDIOVASCULAR DISEASE & DIABETES

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OBESITY, CARDIOVASCULAR DISEASE & DIABETES



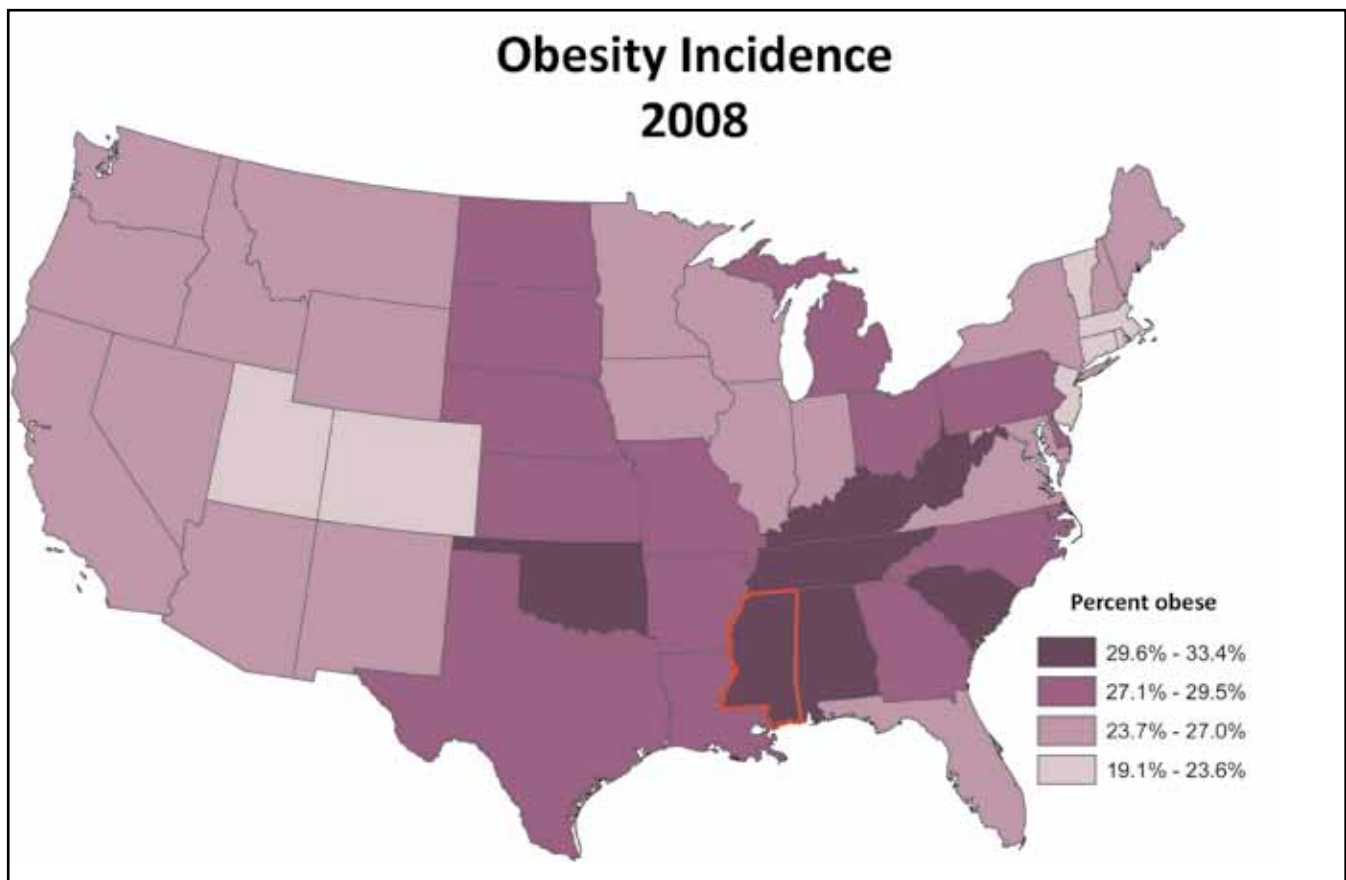
Since 1900, with the exception of one year, cardiovascular disease has been the greatest cause of mortality in America.

While cardiovascular disease mortality is declining, it remains our nation's leading cause of death, and Mississippians are dying of coronary heart disease and stroke at even greater rates than the nation. Meanwhile, incidence of obesity and diabetes is on the rise (American Heart Association (AHA), 2009b). 75% of diabetics die of heart or blood vessel disease, diabetes is currently the sixth leading cause of death in America, and obesity is deeply intertwined with both cardiovascular disease and diabetes (AHA, 2009b; Mayo Clinic Health Manager, 2009a). These interrelated difficulties cost our nation hundreds of billions of dollars in both direct expenses as well as indirect expenses such as work missed and years of productivity lost.

OBESITY

HEALTHY WEIGHT

The Body Mass Index (BMI) measure uses height and weight to calculate adult body fat composition. Healthy People 2010 designates individuals with a BMI under 18.5 as underweight, individuals with a BMI of 25 or higher as overweight, and individuals with a BMI of 30 or higher as obese. People at 'healthy weight' fall between BMIs of 18.5 and 24.9. It is important to note that while these cutpoints are currently used by Healthy People, they are not absolute. Some arguments have been made for variations in definitions of 'healthy weight' for different groups.



Source: CDC, Behavioral Risk Factor Surveillance System (BRFSS), Prevalence and Trends Data, 2008

Individuals with a Body Mass Index (BMI) of **30 or higher** are generally designated as **obese**.

Mississippi, the Nation, and Healthy People 2010

Using the 1998 rate of 42% of adults (aged 20 years and older) at healthy weight as a baseline, Healthy People calls for 60% of adults to attain a healthy weight by 2010. Unfortunately by 2007, the percent of US adults attaining healthy weight had actually declined (to 37.9%) (DHHS, Healthy People 2010, n.d.).

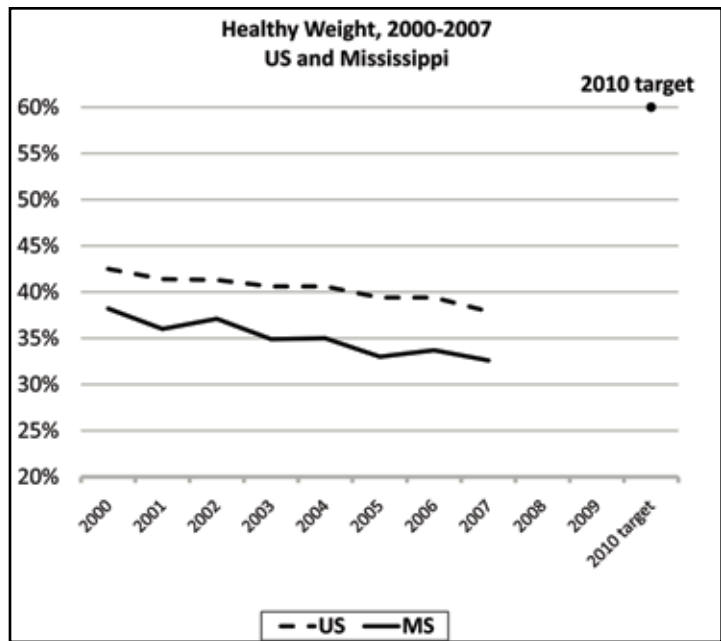
Similarly, the proportion of individuals at a healthy weight in Mississippi dropped (from 38.2% in 2000 to 32.6% in 2007).

Neither MS nor the US is moving towards the Healthy People target. Moreover, **the disparity between MS and the US rose** from 4% fewer Mississippians at healthy weight in 2000 to 5% fewer in 2007.

Mississippians: How Have We Compared?

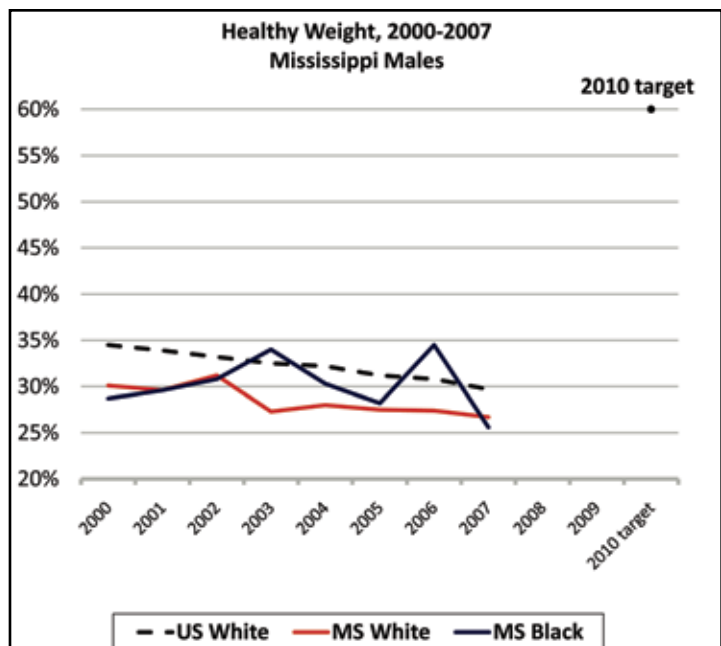
From 2000 to 2007, the number of white males in the US at a healthy weight decreased by 4.8% (from 34.5% to 29.7%). In Mississippi, the number of white males at a healthy weight declined by 3.4% (from 30.1% to 26.7%). Because this decline was less rapid, **the healthy weight disparity between white males in MS and the US actually fell.**

Black Mississippi males saw a similar overall drop in healthy weight achievement (from 28.7% to 25.6%) and thus saw a similar reduction in disparity. In fact, rates of healthy weight among black males in Mississippi actually exceeded US white male rates twice over the observed period but dropped again in the last observed year.

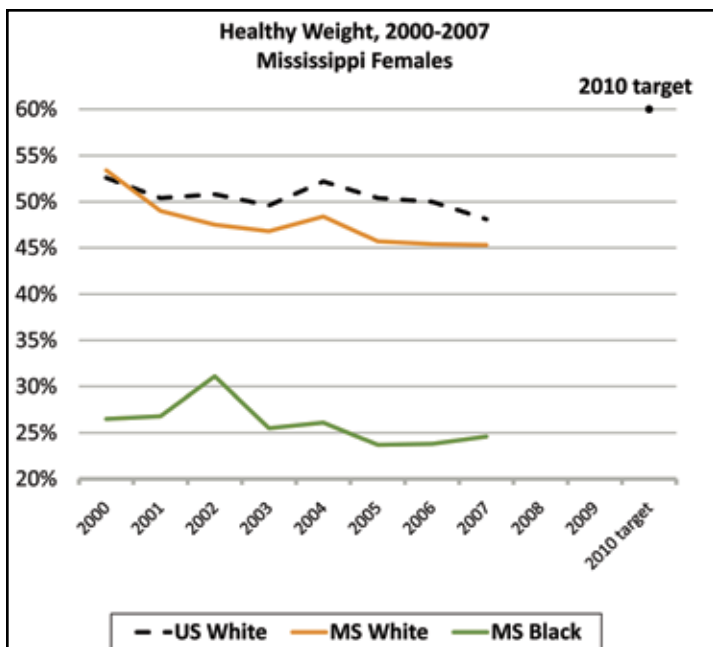


Source: CDC, Behavioral Risk Factor Surveillance System Survey Data (BRFSS), n.d.b

5% more Mississippians would have achieved healthy weight in 2007 if we achieved like the nation.



Source: CDC, BRFSS, n.d.b



Source: CDC, BRFSS, n.d.b

Healthy Weight	2000	2007
US white male	34.5%	29.7%
MS white male	30.1%	26.7%
MS black male	28.7%	25.6%
US white female	52.6%	48.1%
MS white female	53.4%	43.5%
MS black female	26.5%	24.6%

Because we were not equal...
3% fewer white males in Mississippi
3% fewer white females in Mississippi
4% fewer black males in Mississippi
24% fewer black females in Mississippi
...were at a healthy weight in 2007.

NOTE: In tables, red data represent a worsening rate or percentage over the observed time period. Green data represent an improvement in rate or percentage.

NOTE: Measurements of equality employ national white data as the standard for comparison.

White females across the US and in Mississippi saw much higher rates of healthy weight than males both black and white. However, rates among these groups also dropped. Healthy weight among white females in the US dropped less sharply (from 52.6% in 2000 to 48.1% in 2007) than among white MS females (53.4% to 45.3%), creating a previously unseen disparity.

Rates of healthy weight among black females are hugely disparate in comparison to white US females as well as white MS females. In fact, black females fall (from 26.5% to 24.6%) behind all male groups as well.

Rates of healthy weight among black and white males in Mississippi are similar. Disparity between white males in the US and (both black and white) males in Mississippi is decreasing. Unfortunately, the reduction in disparities is not a result of improved health status (i.e. greater rates of healthy weight) but rather results from worsening health of US males.

While white females achieve healthy weight at much higher levels than men, healthy weight also declined among females. Moreover, disparity rose between white females in Mississippi and across the US.

This rise in disparity did not occur for black females, but this is small comfort when rates of healthy weight among black females are almost half those seen for white females across the nation. 3 out of every 4 black females in Mississippi failed to achieve a healthy weight in 2007.

OBESITY

Obesity stems from a combination of hereditary and environmental sources. Commonly recognized risk factors for obesity include family history, age, smoking cessation, socioeconomic issues, and genetics

(Mayo Clinic Health Manager, 2009a).

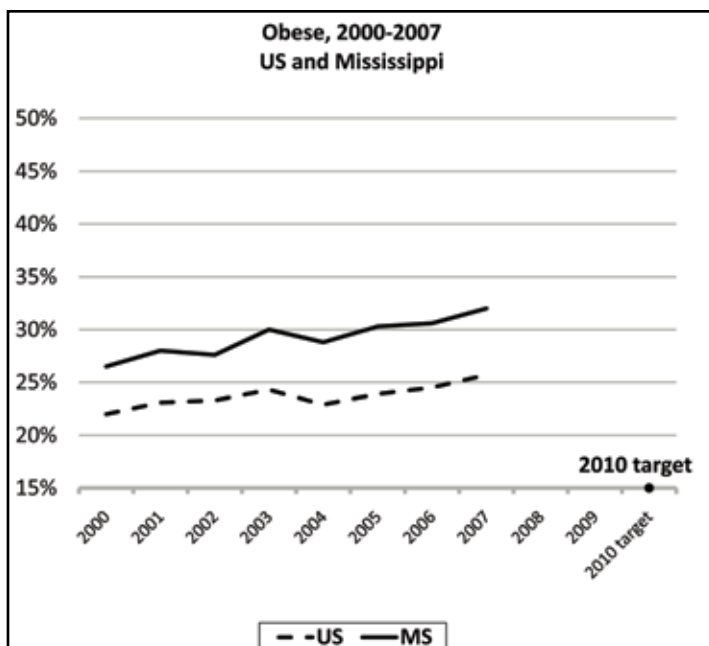
Conditions of overweight and obesity correlate with increased risks for coronary heart disease, type 2 diabetes, cancers, high blood pressure, high cholesterol, stroke, liver and gallbladder disease, respiratory difficulties, osteoarthritis, and gynecological difficulties (CDC, 2009a). The obesity epidemic is growing rapidly.

Mississippi, the Nation, and Healthy People 2010

Using the 1998 national rate of 23% as a baseline, Healthy People calls for reduction of obesity among adults to 15% by 2010. Unfortunately, obesity in the US has risen (to 25.7% by 2007).

In Mississippi, prevalence of obesity was even higher overall and rose more rapidly (from 26.5% in 2000 to 32% in 2007).

Both MS and the nation are moving away from the Healthy People target.

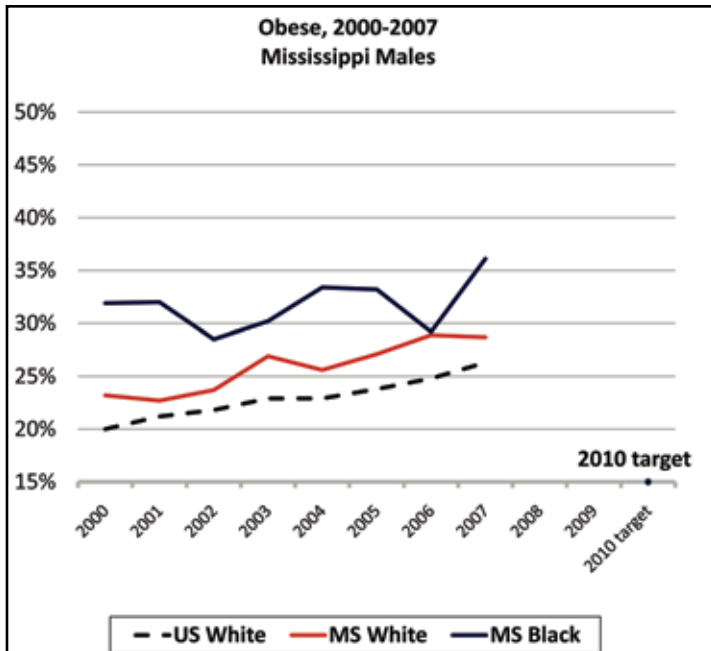


Source: CDC, BRFSS, n.d.b

If Mississippi achieved at national levels in 2007, **6% fewer Mississippians** would have suffered obesity and its accompanying risks.

“In 2000, the total cost of obesity in the United States was estimated to be \$117 billion—\$61 billion for direct medical costs and \$56 billion for indirect costs”

(CDC, 2008, The Cost of Obesity and Chronic Diseases section).



Source: CDC, BRFSS, n.d.b

Mississippians: How Have We Compared?

Rates of obesity between US and MS white males show a steady rise from 2000 to 2007 (from 20.0% and 23.2%, respectively, to 26.3% and 28.7%, respectively). While seeing a smaller rise in rates over the observed period (from 31.9% in 2000 to 36.1% in 2007), black males in Mississippi are much more likely to be obese.

More than **1 in every 3** black men in Mississippi suffered from obesity in 2007.

More than **1 in 4** black males in Mississippi in 2007 would have avoided obesity and its accompanying health risks if we had achieved like national whites.

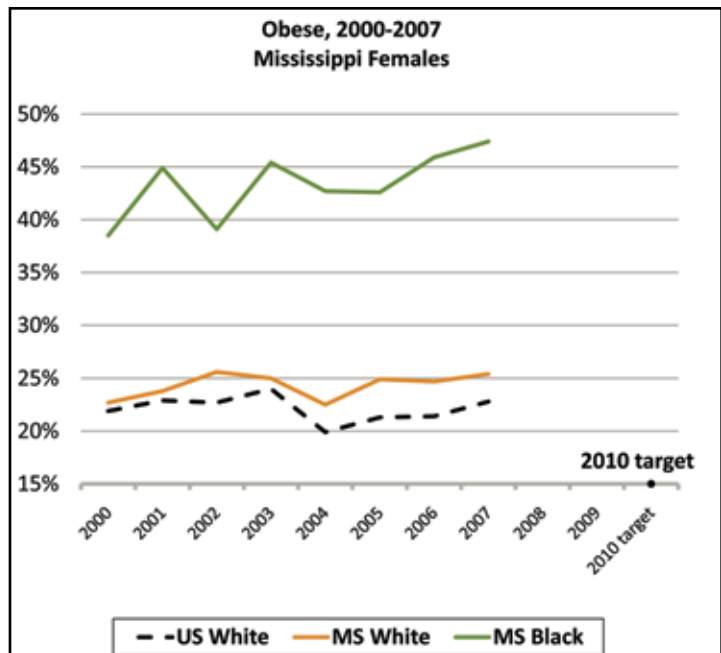
Obese	2000	2007
US white male	20.0%	26.0%
MS white male	23.2%	28.7%
MS black male	31.9%	36.1%
US white female	21.9%	22.8%
MS white female	22.7%	25.4%
MS black female	38.5%	47.4%

While disparities exist between various groups for many health indicators, by and large the health of Americans, including Mississippians, is improving overall thanks to improvements in prevention, treatment, and other factors.

Obesity, however, stands out, in that it is a health condition that is worsening for the entire country, with Mississippi leading the nation in this disturbing trend.

In 2000, white females in MS and the US suffered from obesity at similar rates compared to their male counterparts. However, since then **obesity prevalence has remained fairly static for white women** (moving from 21.9% to 22.8% from 2000 to 2007 for white US women and from 22.7% to 25.4% for white MS women). As a result, obesity for white women is now lower than that for white men.

In contrast, **obesity rates among black females in Mississippi have remained much higher than the rates of their male counterparts, and these rates are on the rise** (from 38.5% in 2000 to 47.4% in 2007). As with healthy weight achievement, black MS women perform worse than all other groups.



Source: CDC, BRFSS, n.d.b

Because we were not equal...
3% more white females in Mississippi
2% more white males in Mississippi
10% more black males in Mississippi
25% more black females in Mississippi
...were obese in 2007.

Obesity rose more rapidly among white men compared to white women from 2000 to 2007. In contrast, obesity for black women in Mississippi rose at double the rate seen for black males.

The shocking levels of obesity found among black women in Mississippi represent, by far, the largest disparity found in our entire study. As of 2007, almost half of all black women in Mississippi were obese.

Black Mississippi women were more than twice as likely to be obese compared to white women across the nation. Health disparities of this unusual magnitude are indicative of a profound health issue facing our state.

OBESITY & MORTALITY

Mississippi, the Nation, and Healthy People 2010

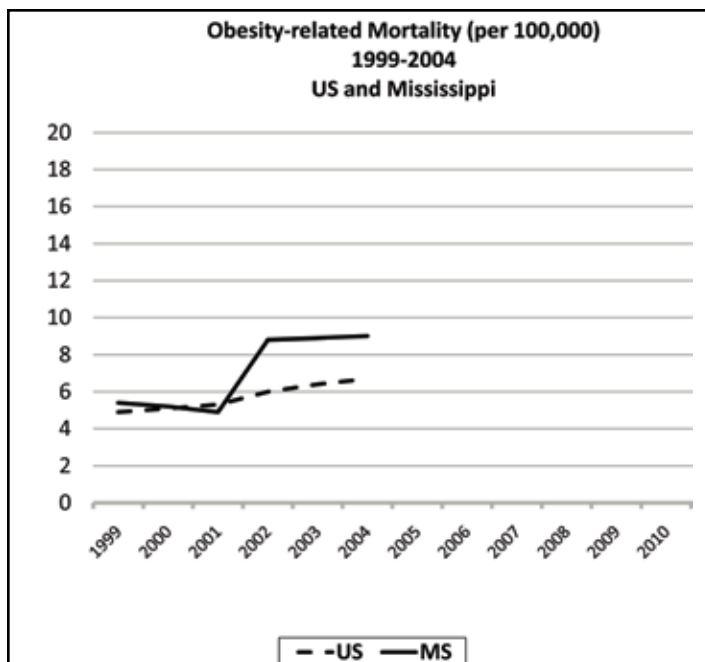
Data on mortality with obesity as the underlying cause is rarely reliable. Obesity is more reliably listed as one of multiple causes of death. Healthy People 2010 calls for reduction of obesity-related mortality by 2010; unfortunately, **rates of obesity-related mortality are increasing across the United States and Mississippi.**

From 1999 to 2004, US deaths related to obesity (as defined by the CDC Multiple Cause of Death file) rose (from 4.9 per 100,000 to 6.7 per 100,000). **In Mississippi, the rate of deaths related to obesity grew even more rapidly** (from 5.4 to 9 per 100,000), **the disparity between MS and the US more than quadrupling** from 0.5 to 2.3 per 100,000 excess deaths.

Mississippians: How Have We Compared?

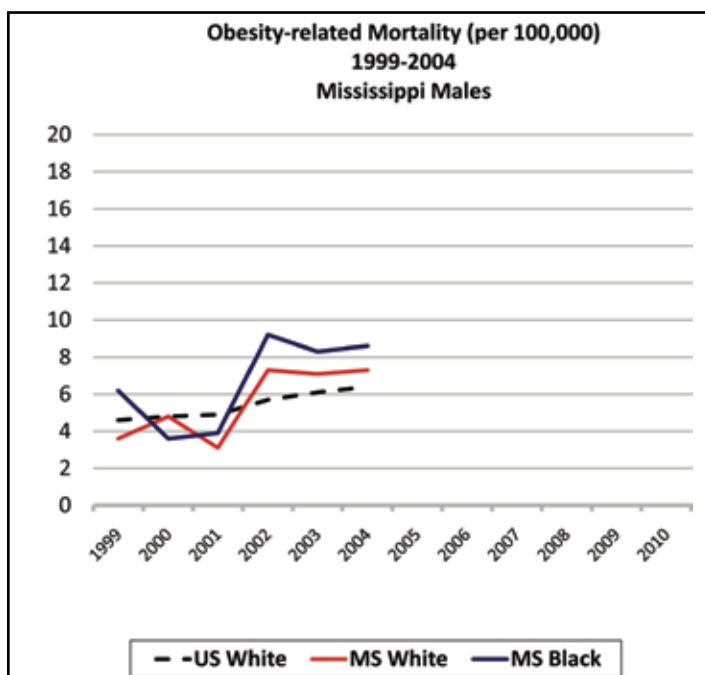
As with obesity prevalence, **obesity-related mortality is on the rise for all groups, with black females suffering the most.** From 1999 to 2004, white males in Mississippi saw mortality increase more rapidly (3.6 to 7.3 per 100,000) than mortality among white males across the nation (4.6 to 6.4 per 100,000); as a result, white Mississippi males lost the advantage they held in 1999.

While rising more slowly, mortality remained much higher among black males in Mississippi (from 6.2 per 100,000 deaths to 8.6 in 2004).



Source: CDC, Compressed Mortality Data, n.d.c

The disparity between Mississippi and the US for obesity-related deaths **more than quadrupled** from 1999 to 2004.



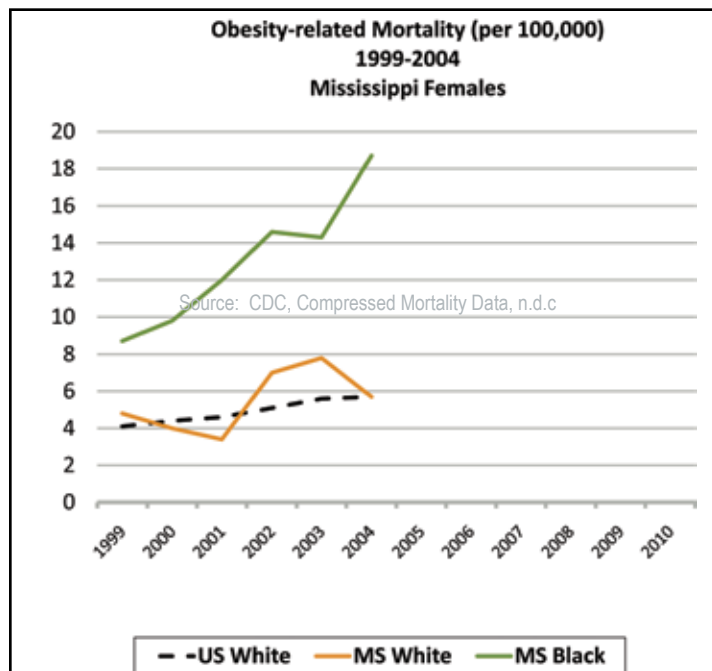
Source: CDC, Compressed Mortality Data, n.d.c

In 1999, white males in Mississippi actually performed better in obesity-related mortality than their national counterparts. However, by 2004, 0.9 per 100,000 more white males in Mississippi died of obesity-related causes.

1 in 4 obesity-related deaths among black males in Mississippi in 2004 would have been averted if Mississippi had achieved white national rates.

White female rates of obesity-related mortality were similar to male rates.

From 1999 to 2004, rates for white females rose in the US (from 4.1 to 5.7 per 100,000) and in Mississippi (4.8 to 5.7 per 100,000). Note that while the white MS female rate is identical to the white US rate in 2004, the previous two years each saw more than 7 per 100,000 deaths in Mississippi – 1.3 per 100,000 more deaths for white MS females compared to the nation. Meanwhile, **the rate of obesity-related mortality for black females in Mississippi more than doubled from 1999 to 2004**, skyrocketing from 8.7 per 100,000 to 18.7 per 100,000 – more than triple the white US female rate.



Obesity-Related Mortality (per 100,000)	1999	2004
US white male	4.6	6.4
MS white male	3.6	7.3
MS black male	6.2	8.6
US white female	4.1	5.7
MS white female	4.8	5.7
MS black female	8.7	18.7

Black females in Mississippi suffer the worst in terms of obesity-related mortality, and rates are skyrocketing.

More than **2 out of every 3** obesity-related deaths among black females in Mississippi would have been averted if Mississippi had achieved white national rates in 2004.

Because we were not equal...
0.9 in 100,000 more white males in Mississippi
2.2 in 100,000 more black males in Mississippi
13 in 100,000 more black females in Mississippi
...died due to obesity in 2004.



CONTEXTS & CONSEQUENCES

PROVIDING HEALTHY OPTIONS: Overcoming the “Center Aisle Phenomenon” Among Low-income Families

Will we have food for our next meal? Through the establishment of food programs to prevent hunger amongst the poor, the government has addressed a once-overwhelming fear for low-income families. **Food subsidies allow families who might otherwise go hungry to put food on the table.** However, with little instruction on how to stretch that money to create healthy meals, many families feel they must resort to “the center aisles” or fall short in their ability to feed their family. **The center-aisle phenomenon describes over-utilization of foods located in the center aisle of the grocery store, such as pre-made meals, boxes, and canned goods, due to perception of these foods as the least expensive and easiest to prepare.** Unfortunately, many of these foods contain high amounts of added sodium and sugars and are typically higher in calories than home-cooked alternatives.

In response to the developing obesity epidemic, a public push to help people pursue healthier eating choices has risen in recent years. One such approach is Linda Watson’s innovative shopping and cooking program, known as Cook for Good. Watson developed this plan after hearing policy makers argue that greater subsidies are necessary for people to eat healthily on government support. Using only those resources a family of four could obtain with current government subsidies, she is developing a series of cookbooks that allow healthy eating. These books encourage utilization of low cost alternatives to the center aisles, such as healthy in-season vegetables and fruits, as well as the heroes of the center aisle: beans, rice, and whole grains. **Providing healthy and economic consumption plans, such as Cook for Good, to families on government subsidies would promote healthy lifestyles and combat obesity at all income levels** (Watson, n.d.).

RISK FACTOR: EXERCISE

Mississippi, the Nation, and Healthy People 2010

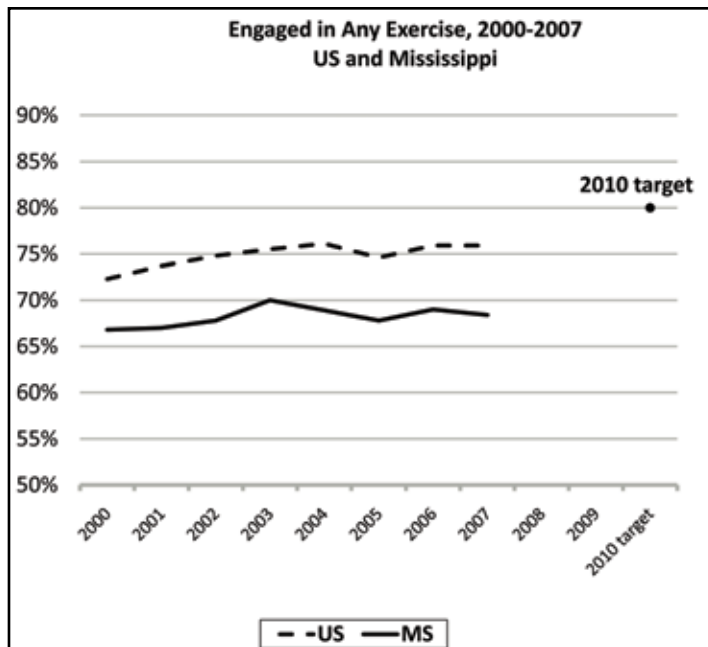
Using the 1997 US rate of 60% adult engagement in physical activity as a baseline, Healthy People seeks engagement in any type of physical exercise by 80% of adults by 2010. From 2000 to 2007, physical activity by US adults rose slightly (from 72.3% to 75.9%). These percentages are solid improvements over the 1997 baseline, but **the US may not reach the Healthy People goal by 2010.**

From 2000 to 2007, Mississippi engagement fluctuated (around 67%) but remained largely unchanged overall (at 68.4% in 2007). **Mississippi is not progressing toward the Healthy People goal.**

Mississippians: How Have We Compared?

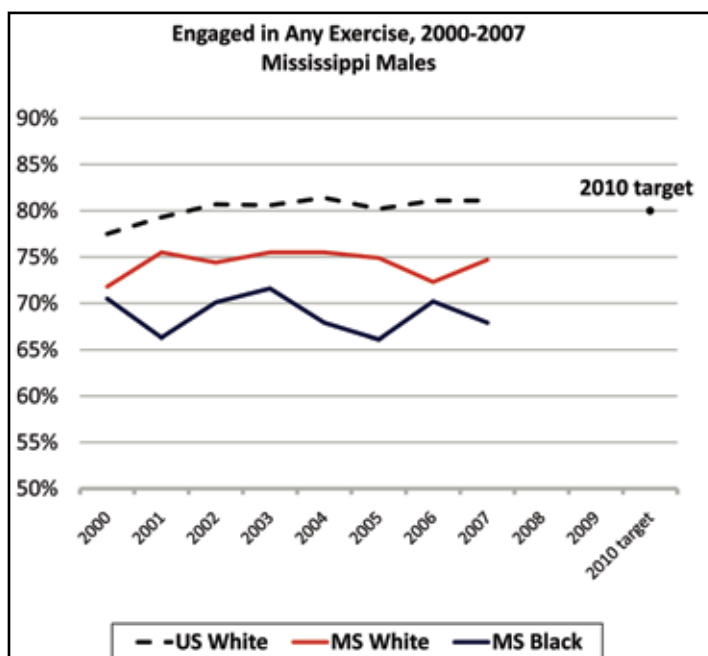
From 2000 to 2007, white male engagement in physical activity rose (from 77.5% to 81.1%) in the US. Meanwhile, white male engagement in Mississippi remained fairly stable (fluctuating between 72% and 76%, and at 74.7% in 2007). As a result, **the disparity between white males in Mississippi and the US has grown.**

Black males in Mississippi performed even more poorly, with similarly static rates of physical activity (fluctuating between 70% and 66%, and at 67.9% in 2007).



Source: CDC, BRFSS, n.d.b

8% fewer Mississippians engaged in physical activity compared to the nation in 2007.

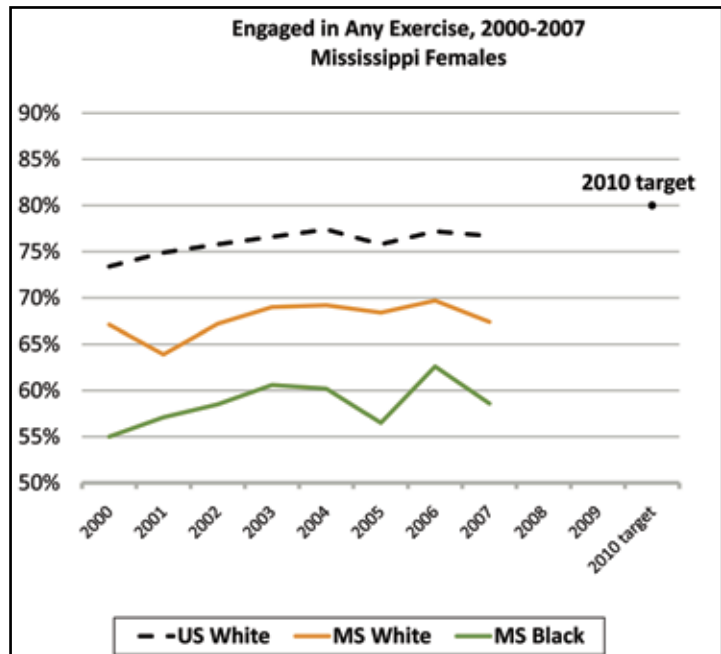


Source: CDC, BRFSS, n.d.b

“In 2000, health care costs associated with physical inactivity topped \$76 billion. If 10% of adults began a regular walking program, \$5.6 billion in heart disease costs could be saved” (CDC, 2008).

Females engaged in physical activity at lower levels than males. However, as with white US males from 2000 to 2007, the percent of white US females engaging in physical activity rose by 3.3% (from 73.4% to 76.7%). **White Mississippi females, like their male counterparts, saw fairly stable levels of physical activity** (at 67.1% in 2000 and 67.4% in 2007).

Meanwhile, **engagement in physical activity by black females in Mississippi, while rising, was the lowest among all groups** (rising from 54.9% in 2000 to 58.6% in 2007).



Source: CDC, BRFSS, n.d. b

Black females in Mississippi lag significantly in achievement of healthy weight and appropriate levels of physical activity and suffer obesity and obesity-related mortality at much greater levels, compared to all other groups investigated here.

However, all of the female groups investigated (white US women, white MS women, and black MS women) lagged behind men in exercise levels.

The question of why black women in Mississippi suffer so much more with regards to problems of weight must be addressed to improve the health of Mississippi as a whole.

Any Exercise	2000	2007
US white male	77.5%	81.1%
MS white male	71.8%	74.7%
MS black male	70.2%	67.9%
US white female	73.4%	76.7%
MS white female	67.1%	67.4%
MS black female	54.9%	58.6%

Because we were not equal...
6% fewer white males in Mississippi
9% fewer white females in Mississippi
13% fewer black males in Mississippi
18% fewer black females in Mississippi
...exercised in 2007.



CONTEXTS & CONSEQUENCES

EXERCISE & DIET

Exercise provides a multitude of general health benefits – bettering bone and muscle strength, blood pressure levels, mental health, and mood. Exercise also reduces the risk of cardiovascular disease, diabetes, and some cancers.

However, **the role of exercise in combating obesity is complicated, with diet playing a larger role in weight loss than exercise**. A study released in January 2009 compared African American women in metropolitan Chicago (averaging 184 pounds) with women in rural Nigeria (averaging 127 pounds). Unexpectedly, the Nigerian women did not differ in physical activity (calorie expenditure through exercise). Instead, the difference in diet between the two groups seemed to be the source of their differing weights (Ebersole, et al., 2008; LiveScience Staff, 2009).

While exercise does burn calories, people who exercise tend to eat more to compensate for this loss. “Evidence is beginning to accumulate that dietary intake may be more important than energy expenditure level. Weight loss is not likely to happen without dietary restraint” (MedicineWorld.org, n.d., as cited from Obesity, para. 10, 2009).

However, a study from University of Alabama Birmingham (UAB) strongly supports the idea that **exercise is imperative for a certain type of fat loss—visceral fat loss** (UAB Media Relations, 2009). Body fat exists in two forms: subcutaneous fat, the layer of fat below the skin that contributes to the appearance of obesity; and visceral fat, the fat that lies beneath muscles, surrounding organs, which is invisible to the naked eye and only detectable by MRI. The liver metabolizes visceral fat to create blood cholesterol. Visceral fat puts individuals at risk for developing diabetes type 2 and heart disease and has been associated with colorectal and breast cancer (Harvard Health Publications, 2006).

The UAB study compared 45 Caucasian and 52 African-American women, randomly separated into three groups – two exercise groups (aerobic training and resistance training) and one no-exercise group. Every woman participated in an 800 calorie-a-day diet, and average weight loss for the group was 24 pounds. Total fat, subcutaneous fat, and visceral fat were measured for each participant. Then, diet restraints were lifted and the two exercise groups were asked to continue exercising 40 minutes, twice a week for one year. A year later, subjects were divided into those who maintained aerobic exercise, those who stopped aerobic exercise, those who maintained their resistance training, those who stopped resistance training, and those who were never placed on an exercise regimen. Those who continued exercising had experienced modest overall weight regain, but absolutely no regain of visceral fat. Those who stopped exercising or who never exercised saw a 33% visceral fat increase (UAB Media Relations, 2009).

Hence, **while studies find that diet is more effective in weight loss overall, exercise remains extremely important for control of visceral fat and thus holds important implications for the control of blood cholesterol, depression, diabetes type 2, and cardiovascular disease – the most damaging consequences of obesity on health.**

The National Weight Control Registry (NWCR) was created to track individuals who have lost significant weight and kept it off, with the goal of identifying important factors in weight loss and maintenance. 98% of individuals tracked had modified their food intake, while 94% increased their physical activity (National Weight Control Registry, n.d.).

HEART DISEASE & STROKE

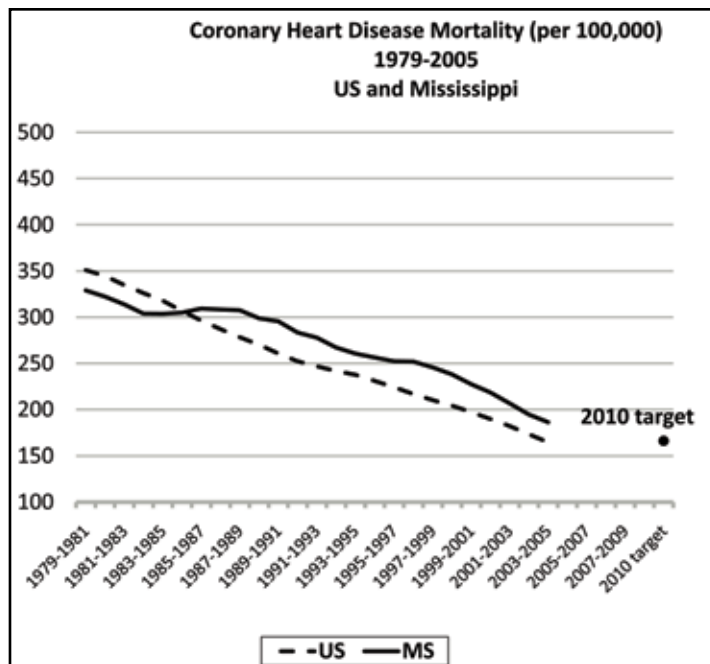
CORONARY HEART DISEASE MORTALITY

Coronary Heart Disease occurs when buildups of plaque (composed of fatty substances such as cholesterol) in the coronary arteries block blood flow to the heart, which can in turn result in a heart attack (CDC, 2009d). **Coronary heart disease (CHD) is the leading cause of death for men and women in the United States.**

Mississippi, the Nation, and Healthy People 2010

Using the 1998 US rate of 208 CHD deaths per 100,000 as a baseline, Healthy People calls for reduction of coronary heart disease mortality to 166 deaths per 100,000 by 2010. **The US achieved the Healthy People CHD goal in 2004 and 2005** (with mortality falling to 156.4 per 100,000 in 2005).

While national rates of coronary heart disease mortality have declined consistently since 1979, Mississippi CHD mortality only began a steady decline in the late 1980s. Based on recent trends (with a rate of 186 per 100,000 in 2005), **Mississippi might achieve the Healthy People 2010 goal.** Unfortunately, Mississippians, who originally achieved lower CHD mortality than the nation, suffered nearly 30 excess CHD deaths per 100,000 compared to the nation in 2005.



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

Risk factors for coronary heart disease include high blood cholesterol levels, high blood pressure, diabetes, tobacco use, diets high in saturated fats and cholesterol, physical inactivity, obesity, and excessive alcohol consumption (CDC, 2009c).

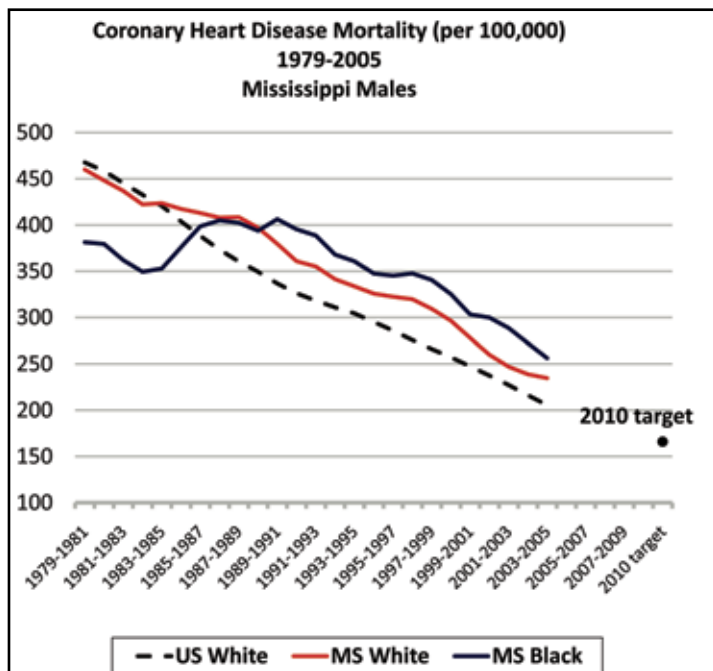
“The estimated direct and indirect 2009 cost of CHD is \$165.4 billion”

(American Heart Association (AHA), 2009b, p. 13).

CHD mortality has reduced consistently in Mississippi in recent years. However, rates are still higher than those seen across the nation. Disparities between Mississippi and the nation have actually narrowed slightly in recent years.

“The burden of heart disease and stroke cannot be measured by death statistics alone. The cost of heart disease and stroke in the United States, including health care expenditures and lost productivity from deaths and disability, is projected to be more than \$475 billion in 2009. As the U.S. population ages, the economic impact of cardiovascular diseases on our nation’s health care system will become even greater”

(National Center for Chronic Disease Prevention and Health Promotion, 2009, p. 2).



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

Males and females in Mississippi are seeing a rising disparity in CHD mortality compared to white US rates. Black females in Mississippi are the exception to this rule, with less disparity in 2005 compared to previous years.

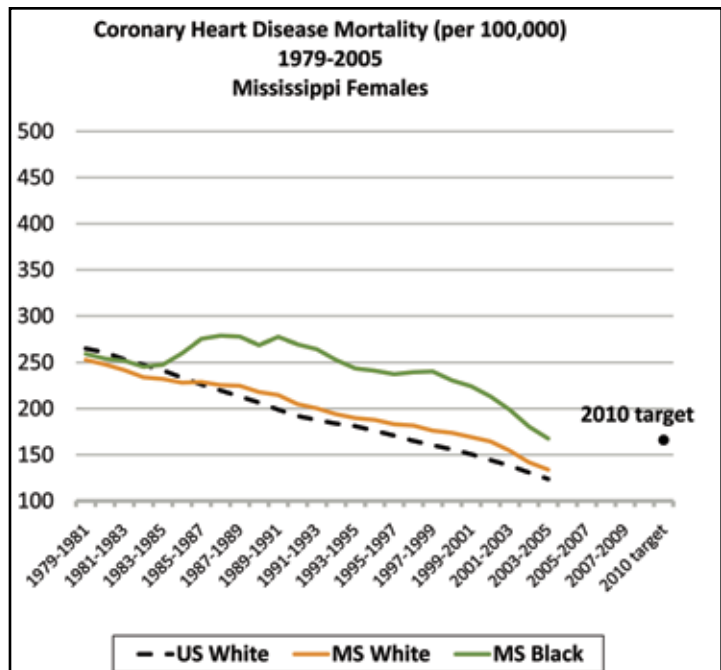
However **black Mississippians**, both male and female, see the **highest overall rates of CHD mortality**. 1 in 4 CHD deaths among black Mississippians would have been averted if Mississippi had achieved white national rates.

Mississippians: How Have We Compared?

From 1979 to 2005, white males across the US have seen a steady decline in CHD mortality (from 471.1 to 196 deaths per 100,000). White males in Mississippi also saw a decline in CHD mortality. However the decline (from 463.5 per 100,000 to 230.2 per 100,000) was not as steady or rapid, and white MS males lost the 7.6 per 100,000 advantage they initially held over white US males.

Black Mississippi males (with a rate of 357.2 per 100,000) started with an exponentially larger advantage of 113.9 per 100,000 over their white national counterparts. However, **rates of mortality for black MS males, which actually rose in the late 1980s, fell more slowly than and soon exceeded national white rates** (rates for black MS males at 262 per 100,000 in 2005).

Females experienced lower rates of CHD mortality but in similar patterns. Rates for white US females fell (from 264.6 to 117.2 per 100,000) from 1979 to 2005. A slower rate of improvement among white MS females compared to the nation resulted in a loss of an early advantage of 12.5 per 100,000 (with mortality among white MS females dropping from 252.1 in 1979 to 134 per 100,000). Black female CHD mortality rates rose in the late 1980s, and, overall from 1979 to 2005, CHD mortality among black females saw a comparatively slow decline (267.1 to 166.2 per 100,000).



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

“African American adults are less likely to be diagnosed with coronary heart disease, however they are more likely to die from heart disease”

(OMH, n.d., Heart Disease and African Americans section, para. 1).

Coronary Heart Disease Mortality (per 100,000)	1979	2005
US white male	471.1	196.0
MS white male	463.5	230.2
MS black male	357.2	262.0
US white female	264.6	117.2
MS white female	252.1	134.0
MS black female	267.1	166.2

Because we were not equal...
153 more white females in Mississippi
280 more black females in Mississippi
301 more white males in Mississippi
335 more black males in Mississippi
...died of coronary heart disease in 2005.



CONTEXTS & CONSEQUENCES

HEART DISEASE

Heart disease can be divided into two categories, ischemic and non-ischemic. Ischemic heart disease is “the term given to heart problems caused by narrowed heart arteries” (AMA, 2010b, What is ischemic heart disease section, para. 1). Blocked arteries result in less blood and oxygen reaching the heart and can lead to heart attack. **Coronary heart disease is an ischemic heart disease,** caused by “the narrowing of the coronary arteries due to fatty buildups of plaque” and frequently produces chest pain and heart attacks (AHA, 2010a, Coronary Heart Disease section, para. 1).

Non-ischemic heart disease is not related to poor arterial blood circulation and may take several forms, the most common of which is dilated cardiomyopathy, where a weakening of the muscle walls in a pumping chamber of the heart leads to decreased ability to pump blood. This condition “frequently [results] if fluid builds up in the legs, feet, ankles, lungs, and other organs” (AHA, 2010) and is termed congestive heart failure (MetroHealth System, 2009, What is Dilated Cardiomyopathy section).

High blood pressure and diabetes are major contributors to congestive heart failure (AHA, 2010a). 19% of all congestive heart failure patients suffer from diabetes, and diabetes patients are two to eight times more likely to experience congestive heart failure (Kannel, 2000). The survival rate for heart failure victims is only 35% (Bleumink et al., 2004). **As rates of high blood pressure and diabetes rise, we can expect to see rising rates of non-ischemic heart disease.**

The Jackson Heart Study (JHS) was established to investigate higher rates of cardiovascular disease among African Americans. The study, a collaboration between three academic institutions (Jackson State University, Tougaloo College, and the University of Mississippi Medical Center), the Jackson, Mississippi, community, and the National Institutes of Health is “the largest single-site, prospective, epidemiologic investigation of cardiovascular disease among African Americans ever undertaken” (National Institutes of Health (NIH), n.d.a).

Participants are adult African Americans between aged 35 to 84 years. An initial exam of participants involves a physical exam and obtains at medical history, blood/urine analytes, and information on “physical activity; stress, coping and spirituality; racism and discrimination; socioeconomic position; and access to health care” (National Institutes of Health (NIH), n.d.b, para 1). The study then monitors the health of participants through yearly telephone interviews. The applications for this rich data set are wide ranging. However, the major objective of this study is to identify factors influencing the incidence and severity of CVD in African Americans, particularly with regards to aspects of CVD related to high blood pressure (NIH, n.d.a).

STROKE MORTALITY

Strokes result from damage to parts of the brain, via blockage of blood supply or bursting of blood vessels in or near to the brain (CDC, 2007). **Stroke is the third leading cause of death in the United States.**

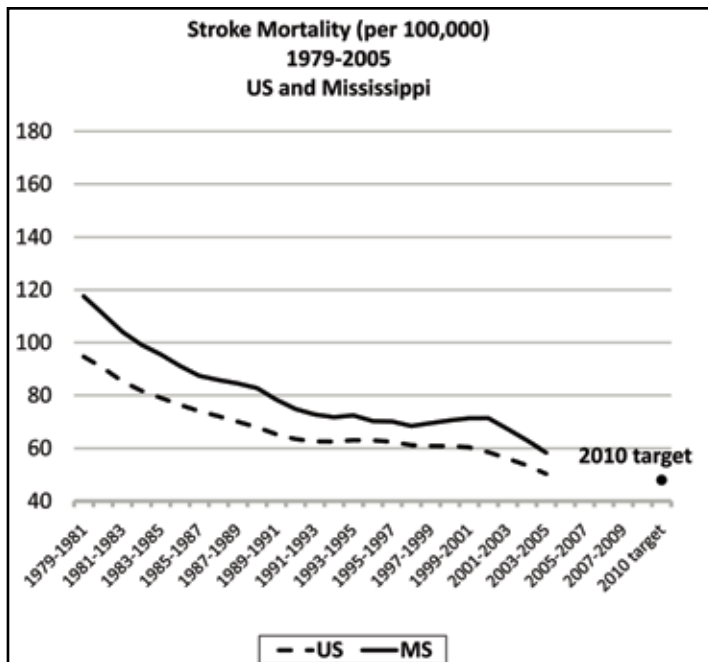
Mississippi, the Nation, and Healthy People 2010

Using the 1998 US rate of 60 stroke deaths per 100,000 as a baseline, Healthy People calls for reduction of stroke deaths to 48 per 100,000 by 2010. **By 2005, the US had met this goal** (with a stroke mortality rate of 46.9 per 100,000).

In Mississippi, rates of stroke mortality were higher but also declined (68.3 deaths in 1998 reducing to 55.5 per 100,000 in 2005). **If current trends continue, Mississippi should also achieve the Healthy People goal by 2010.**

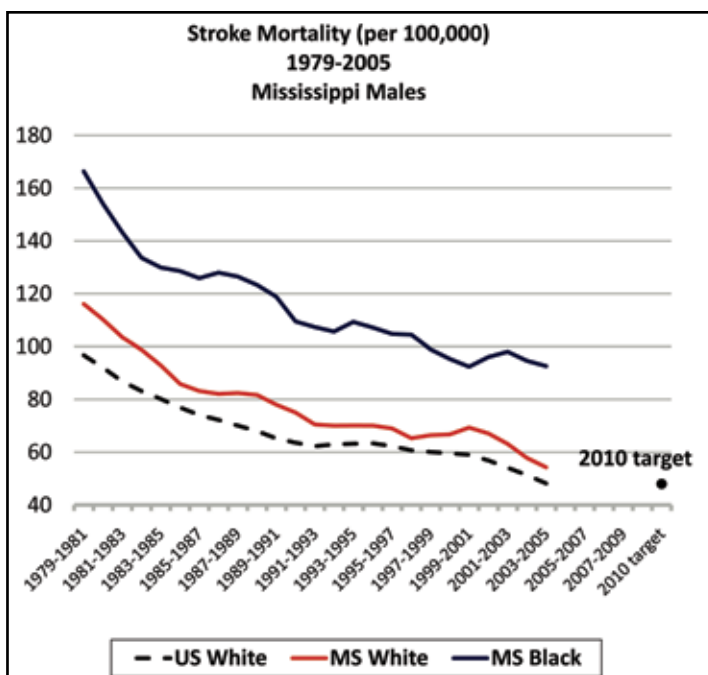
Mississippians: How Have We Compared?

From 1979 to 2005, mortality among white males across the US declined (from 100.2 to 44.7 deaths per 100,000), while mortality for white males in Mississippi declined even more sharply (from 120.4 to 53.4 per 100,000). **These trends represent reducing disparity between white males across the US and in Mississippi**, from 20.2 per 100,000 excess stroke deaths in Mississippi in 1979 to only 8.7 per 100,000 excess stroke deaths in 2005.



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

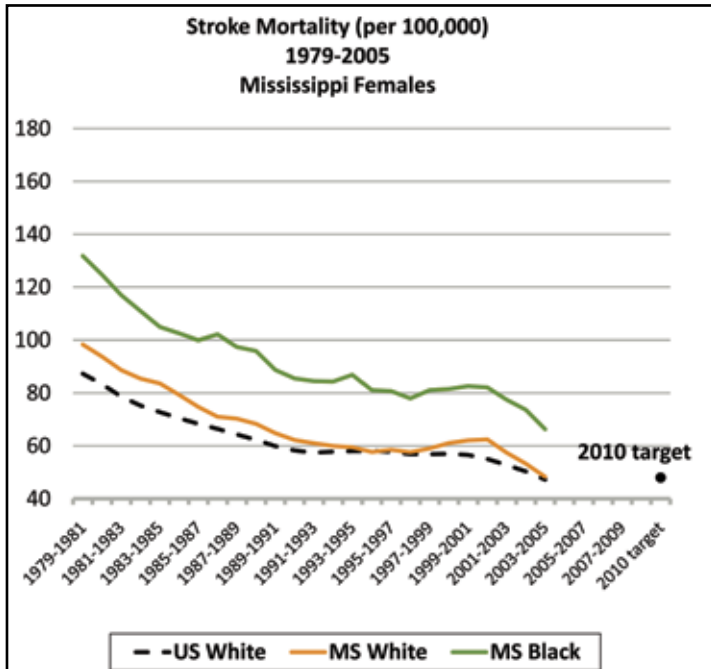
1 in 2 deaths from strokes among black males in Mississippi and 1 in 6 deaths among white males in Mississippi could have been averted if we were equal.



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

Approximately 50% of stroke deaths and 25% of coronary heart disease deaths for black MS males would be eliminated if there were no disparities.

Rates of stroke mortality for black males in Mississippi, while also dropping, are significantly worse at 174.2 per 100,000 in 1979 and at 91.8 per 100,000 in 2005. In 2005, black males in Mississippi died at a rate more than double the rate at which white US males died.



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

Stroke Mortality (per 100,000)	1979	2005
US white male	100.2	44.7
MS white male	120.4	53.4
MS black male	174.2	91.8
US white female	89.8	44.0
MS white female	102.4	45.2
MS black female	138.7	57.4

White females perform similarly to their male counterparts with regards to stroke mortality, though at slightly lower levels. Stroke mortality for white females across the US declined from (89.8 in 1979 to 44 per 100,000 in 2005). Meanwhile, stroke mortality for white MS females fell even more quickly (from 102.4 to 45.2 per 100,000), meeting national rates. Similar to patterns among males, rates for black females were significantly higher (dropping from 138.7 to 57.4 per 100,000).

Disparity between white MS females and white females across the nation has all but disappeared. In contrast, roughly **1 in 4 deaths** among black females in Mississippi could have been averted in 2005 if we were equal.

Because we were not equal...
11 more white females in Mississippi
76 more black females in Mississippi
77 more white males in Mississippi
239 more black males in Mississippi
...died of stroke in 2005.

“The estimated direct and indirect cost of stroke for 2010 is \$73.3 billion”

(AHA, 2010c, p. 17).

Risk factors for stroke include high blood pressure, heart disease, irregular heartbeat, diabetes, tobacco use, and family history of stroke. Knowing the symptoms of stroke, calling for medical help right away, and getting to a hospital as quickly as possible are crucial to avoiding the most damaging consequences of a stroke; however, the best treatment is prevention (CDC, n.d.a). Stroke survivors can suffer from severe disabilities such as paralysis and speech and emotional difficulties (CDC, n.d.b).

RISK FACTOR: HIGH BLOOD PRESSURE

Blood pressure refers to two measurements, the force of blood in the arteries when the heart beats and then when the heart is at rest. Persons with high blood pressure are at higher risk for coronary heart disease and stroke (AHA, 2009) as well as congestive heart failure and kidney disease (CDC, 2009d).

Mississippians: How Have We Compared?

Between 2001 and 2007, 7% more Mississippians (at 33%) reported high blood pressure compared to individuals across the US (at 26%).

Black Mississippians were particularly high risk. While white males across the US and in Mississippi suffered from high blood pressure at an average rate of 28% and 30%, respectively, 35% of black males in Mississippi suffered high blood pressure. **Black females in Mississippi were at highest risk.** While white females across the US and in Mississippi suffered from high blood pressure at a rate of 26% and 30%, respectively, 42% of black females in Mississippi suffered high blood pressure.

On average from 2001 to 2007, **1 in 3 Mississippians** suffered from high blood pressure. More than **1 in 5 cases** of high blood pressure would have been averted in Mississippi if we had achieved like the nation.

People who are over the age of 35, African American, obese, or heavy drinkers are at risk for high blood pressure, as are women on birth control pills and persons with a family history of blood pressure

(American Heart Association, 2009).

Among **black males** in Mississippi, **1 in 5 cases** of high blood pressure would have been averted if Mississippi had achieved white national rates. More than **1 in 3 cases** among **black females** in Mississippi would have been averted.

High Blood Pressure	Average 2001, 2003, 2005, 2007
US white male	28%
MS white male	30%
MS black male	35%
US white female	26%
MS white female	30%
MS black female	42%

Because we were not equal...
3% more white males in Mississippi
4% more white females in Mississippi
7% more black males in Mississippi
16% more black females in Mississippi
...suffered from high blood pressure on average between 2001 and 2007.

In 2006, high blood pressure engendered 44,879 million office visits. When estimates include indirect as well as direct costs, high blood pressure cost the country \$63.5 billion in 2006 and is predicted to cost \$73.4 billion in 2009

(CDC, 2007b; AHA, 2009).

“Although African American adults are 40% more likely to have high blood pressure, they are 10% less likely than their non-Hispanic White counterparts to have their blood pressure under control”

(OMHD, n.d., Heart Disease and African Americans section, para. 1).

RISK FACTOR: HIGH BLOOD CHOLESTEROL

Cholesterol is an essential component of the body. However, when too much cholesterol accumulates in the blood, it can build up as fatty deposits in blood vessels. These blockages can lead to heart attack or stroke (Mayo Clinic Health Manager, 2008).

Mississippians: How Have We Compared?

Between 2001 and 2007, approximately 35% of individuals across the United States reported diagnoses of high blood cholesterol.

Mississippi achieved at the same level as the nation.

White males in Mississippi performed 1% better than white males across the US (37%), and **black males in MS bettered white US males by 7%**. Black females in Mississippi also outperformed whites, with 2% fewer black females (at 32%) diagnosed with high blood cholesterol compared to white US females (at 34%).

However, **3% more white females** (at 37%) in MS suffered high blood cholesterol in comparison to their national counterparts.

“High cholesterol (hypercholesterolemia) is largely preventable and treatable. A healthy diet, regular exercise and sometimes medication can go a long way toward reducing high cholesterol”

(Mayo Clinic Health Manager, 2008, Definition section, para. 3).

High Blood Cholesterol	Average 2001, 2003, 2005, 2007
US white male	37%
MS white male	36%
MS black male	30%
US white female	34%
MS white female	37%
MS black female	32%

Cholesterol Screening	Average 2001, 2003, 2005, 2007
US white male	74%
MS white male	72%
MS black male	64%
US white female	77%
MS white female	74%
MS black female	70%

Because we were not equal...
4% more white females in Mississippi
...suffered from high blood cholesterol on average between 2001 and 2007.

NOTE: Blood pressure and cholesterol levels are self-reported measures obtained from the Behavioral Risk Factor Surveillance System, and thus are subject to the variations and errors associated with self-reported data.

White and black Mississippi males performed better with regards to blood cholesterol levels compared to whites across the nation. Black females in Mississippi also outperformed their white national counterparts.

However, white females in Mississippi suffered high blood cholesterol at higher levels than their national counterparts.

While African Americans are more likely to die of cardiovascular disease, they are less likely to see high levels of total blood cholesterol. Thus, total blood cholesterol is not as sensitive as an indicator of risk in this population (AMA, 2008).



CHOLESTEROL SCREENING

While Mississippians reported equal or better rates for high blood cholesterol, disparities in screening may result in under-reporting of high blood cholesterol. Overall, Mississippians are pursuing blood cholesterol screenings at rates slightly lower than the United States. From 2001 to 2007, 2% fewer Mississippians (with a rate of 71%) had their blood cholesterol checked at least once in the preceding 5 years compared to the United States (with a rate of 73%).

Compared to white males across the US (at 74%), **2% fewer white males in Mississippi** (at 72%) **and 10% fewer black males in Mississippi** (at only 64%) achieved recommended blood cholesterol screening on average between 2001 and 2007. Compared to white females across the US (at 77%), **3% fewer white females in Mississippi** (at 74%) **and 7% fewer black females** (at 70%) **achieved recommended blood cholesterol screening.**

In all groups, Mississippians saw lower rates of screening than their national counterparts. This brings the better performance of Mississippi males and black Mississippi females in cholesterol levels under question. Meanwhile, white females in Mississippi may be doing even worse than previously thought.

DIABETES

In persons afflicted with diabetes, the body does not produce or use insulin correctly, resulting in an inability for the cells of the body to uptake sugar from the bloodstream.

Diabetes falls into two categories, type 1 and type 2. Type 1 diabetes is typically diagnosed in childhood or young adulthood and arises from a lack of production of insulin. 5-10% of Americans with diabetes have type 1 diabetes. Type 2 diabetes, by far the most common, can result from a failure in insulin production or insulin-sensing by the cell (insulin resistance) (American Diabetes Association (ADA), n.d.).

Type 2 diabetes is typically diagnosed in adults over age 40; however, early onset of type 2 diabetes has been emerging in higher and higher numbers (AHA, 2010d). Diabetes increases risk for cardiovascular disease, nerve damage, kidney damage, eye damage, foot damage, skin and mouth infections, osteoporosis, Alzheimer's disease, and hearing problems; 75% of diabetics die of heart or blood vessel disease (Mayo Clinic Health Manager, 2009b).

“In 2007, the direct (\$116 billion) and indirect (\$58 billion) cost attributable to diabetes was \$174 billion”

(AHA, 2010c).

Risk factors for type 2 diabetes include overweight and obesity, lack of physical activity, family history, race, and age

(Mayo Clinic Health Manager, 2009b).



DIABETES DIAGNOSIS

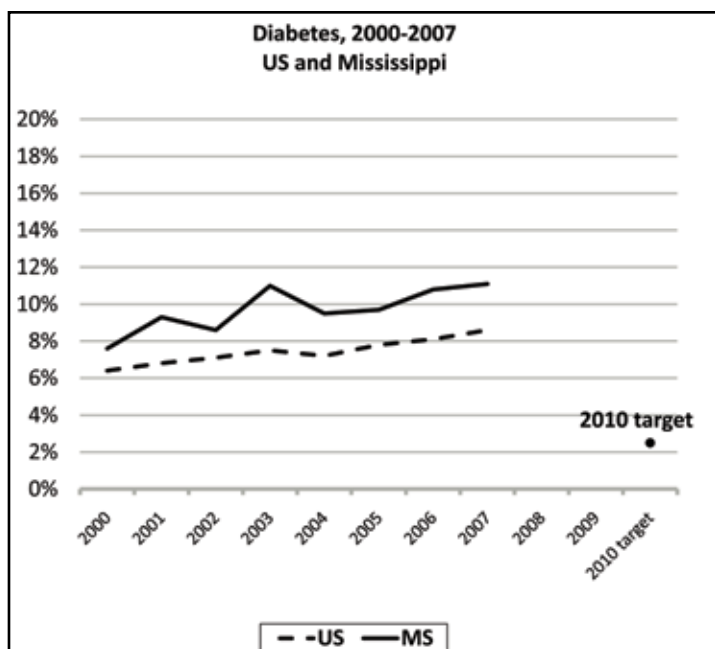
Mississippi, the Nation, and Healthy People 2010

Using the 1997 diagnosis rate of 40 per 1,000 or 4% as a baseline, Healthy People sets a goal of 25 diagnoses per 1,000, or 2.5%, for 2010. Unfortunately, from 2000 to 2007, the rate of diabetes diagnosis increased across the US (from 6% of the population to nearly 9%).

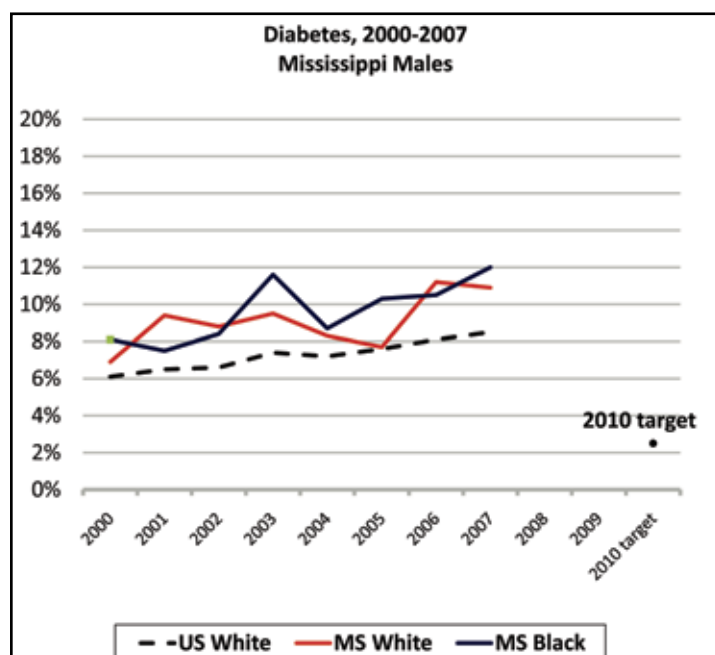
In Mississippi, the rate of diagnosis was higher overall and rose at a similar speed (from 8% to 11%). **With diabetes on the rise, both Mississippi and the nation are moving away from the Healthy People goal.**

Mississippians: How Have We Compared?

Among males in Mississippi, there appears to be minimal racial disparity with regards to diabetes diagnosis. From 2001 to 2007, 2% more white males in Mississippi (with a rate of 9%) had been diagnosed with diabetes compared to white males across the nation (with a rate of 6%). 3% more black males in Mississippi (with a rate of 10%) were diagnosed.



Source: CDC, BRFSS, n.d.b

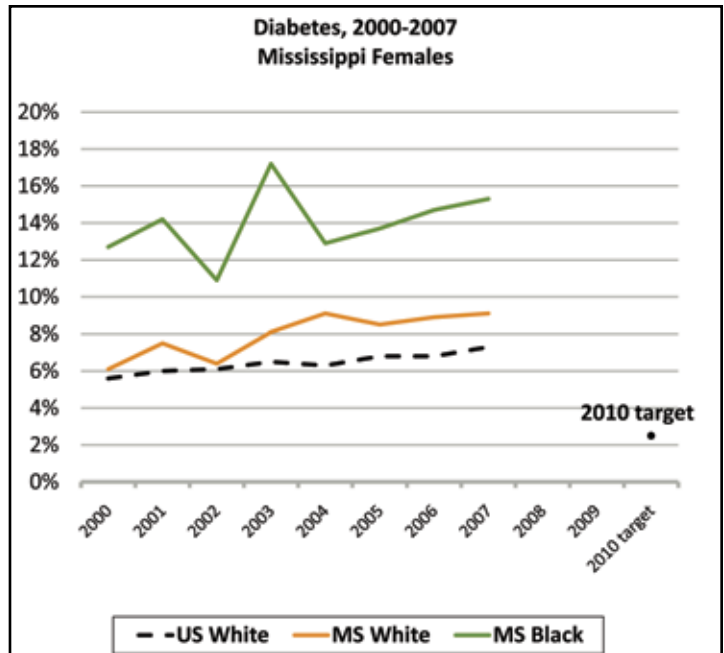


Source: CDC, BRFSS, n.d.b

Nearly **1 in 3** diabetes diagnoses among **black males in Mississippi** and more than **1 in 5** diabetes diagnoses among **white males in Mississippi** would have been averted if we had achieved like our white national counterparts.

Similarly, white females in Mississippi saw rates 2% higher than white females across the nation (at 6%). **However, black females in Mississippi saw much higher rates of diagnosis.** From 2001 to 2007, an average of 8% more black females were diagnosed with diabetes (at a rate of 14%) compared to national whites.

Half of diabetes diagnoses among black females in Mississippi would have been averted if we achieved like the nation.



Source: CDC, BRFSS, n.d.b

Diabetes	Average 2000-2007
US white male	7%
MS white male	9%
MS black male	10%
US white female	7%
MS white female	8%
MS black female	14%

Because we were not equal...
1% more white females in Mississippi
2% more white males in Mississippi
3% more black males in Mississippi
7% more black females in Mississippi
... were diagnosed with diabetes from 2000-2007.

DIABETES CONTROL & PREVENTION

Mississippi, the Nation, and Healthy People 2010

Increased education efforts as well as preventive screenings can greatly reduce the impact of diabetes on individuals. Unfortunately, based on self reported data, Mississippians diagnosed with diabetes are less likely to receive diabetes education or preventive screenings. **Mississippians** (with an average of 44% of diabetics having received diabetes education between 2002 and 2006) **were approximately 10% less likely to received diabetes education than their national counterparts** (with an average of 53%).

Diabetes can cause severe damage to the retina as well as nerves, resulting in blindness, loss of feeling, deformations, and infections of the feet. Thus, diabetics should control blood sugar levels, receive yearly eye exams, and at least four foot check-ups a year (Mayo Clinic, 2009b; CDC, 2007c).

Diabetes can cause severe damage to the retina, resulting in blindness. Up to 45% of adults with diabetes suffer from some degree of diabetic retinopathy

(Mayo Clinic Health Manager, 2009b).

Diabetes	Average 2002, 2004, 2006
Diabetic Education	
US	53%
MS	44%

Because we were not equal...
9% fewer Mississippians received diabetic education
...from 2002-2006.

Mississippi's failures in preventative measures compared to the US put Mississippians at higher risk of diabetes complications and mortality.

The glycated hemoglobin test (A1C) provides an average estimate of an individual’s blood sugar levels over the past few months. (With an average of 66% of diabetics having received annual hemoglobin testing between 2002 and 2006) **8% fewer diabetic Mississippians received hemoglobin testing in comparison to the nation** (which saw an average of 73%).

(With an average of 61% of diabetic Mississippians receiving annual vision screening over the 2000 to 2006 period) **8% fewer diabetic Mississippians were screened for retinal damage in comparison to the nation** (which saw an average of 69%).

Mississippians saw the least disparity in foot checks. (With an average rate of 64% of diabetic Mississippians receiving annual foot checks over the 2000 to 2006 period) **2% fewer diabetic Mississippians were screened for foot complications compared to the US** (which saw an average of 67%).

Diabetes	Average 2000, 2002, 2004, 2006
Annual Hemoglobin Testing	
US	74%
MS	66%
Annual Vision Check	
US	68%
MS	63%
Annual Foot Check	
US	67%
MS	64%

Because we were not equal...
8% fewer Mississippians received annual hemoglobin testing
5% fewer Mississippians received annual vision checks
3% fewer Mississippians received annual foot checks
...on average between 2000 and 2006.



END-STAGE RENAL DISEASE

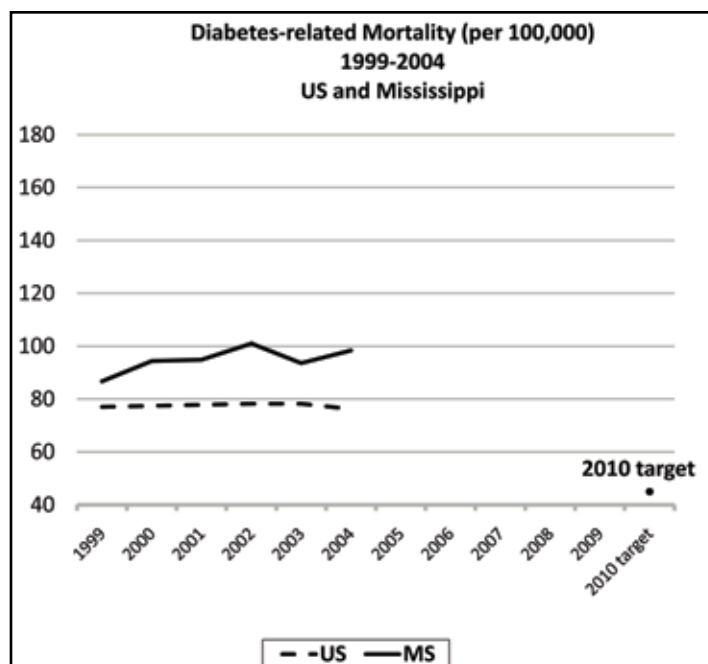
End-stage renal disease (ESRD), wherein the kidneys stop functioning normally, most commonly accompanies diabetes but is also commonly associated with high blood pressure. Cardiovascular disease is the leading cause of mortality among those who suffer from ESRD. Incidence of ESRD has increased by 40% over the last decade, and in 2005, ESRD cost the country \$33 billion (AHA, 2009b). Black diabetics are more than twice as likely to experience ESRD (Carter, Pugh, and Monterrosa, 1996).

DIABETES MORTALITY

Diabetes mortality has become an increasing concern in recent years as rates of diabetes grow alongside the obesity epidemic.

Mississippi, the Nation, and Healthy People 2010

Using the 1997 US rate of 75 diabetes-related deaths per 100,000 as a baseline, Healthy People calls for a reduction in diabetes-related mortality to 45 deaths per 100,000 by 2010. This measure includes mortality with diabetes as a primary factor as well as with diabetes as a contributing factor. From 1997 to 2004, US rates held largely steady (76.2 diabetes-related deaths per 100,000 in 2004), while Mississippi rates rose (from 86.7 deaths per 100,000 to 98.4 per 100,000). **Mississippi is moving away from the Healthy People target.**



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

The disparity between Mississippi and the US in diabetes-related mortality **more than doubled** from 1999 to 2004.

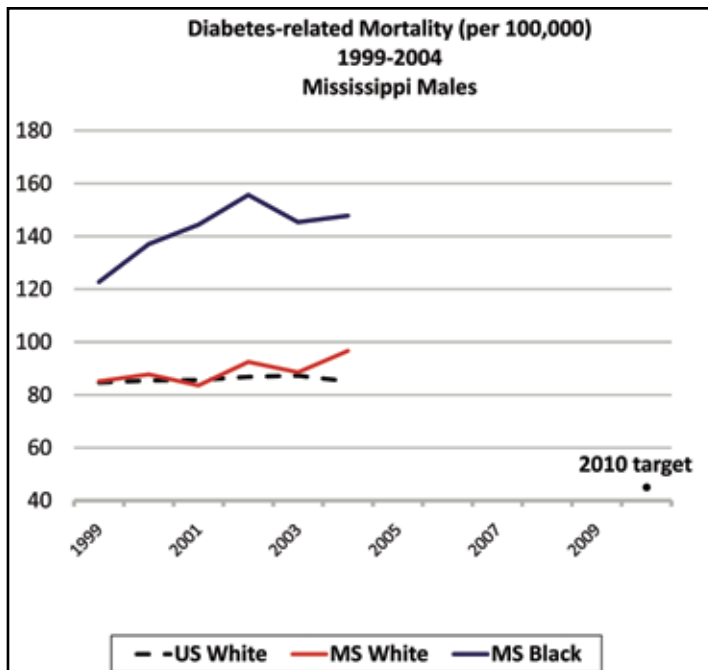
In 2004, **more than 1 in 5** diabetes-related deaths could have been averted if we had achieved like the nation.

As obesity and diabetes rates rise, with onset of diabetes among earlier and earlier age cohorts, the price of diabetes morbidity will rise. Diabetes mortality may rise not just as a result of rise in incidence of diabetes, but also as a reflection of reducing rates of cardiovascular disease mortality.

Mississippians: How Have We Compared?

Diabetes-related mortality disproportionately affects African Americans.

Diabetes-related mortality for white males across the US held relatively steady (at 84.7 per 100,000 in 1999 and at 85.2 deaths per 100,000 in 2004). Early in this period, white MS male rates of mortality (at 85.2 per 100,000 in 1999) tracked closely with rates for white US males. However, **rates among white males in Mississippi rose in the latter portion of the period** (to 96.7 per 100,000 by 2004). Meanwhile, **black males in Mississippi suffer from diabetes-related mortality at much greater rates, which are rising rapidly** (from 122.7 per 100,000 to 147.8 per 100,000).

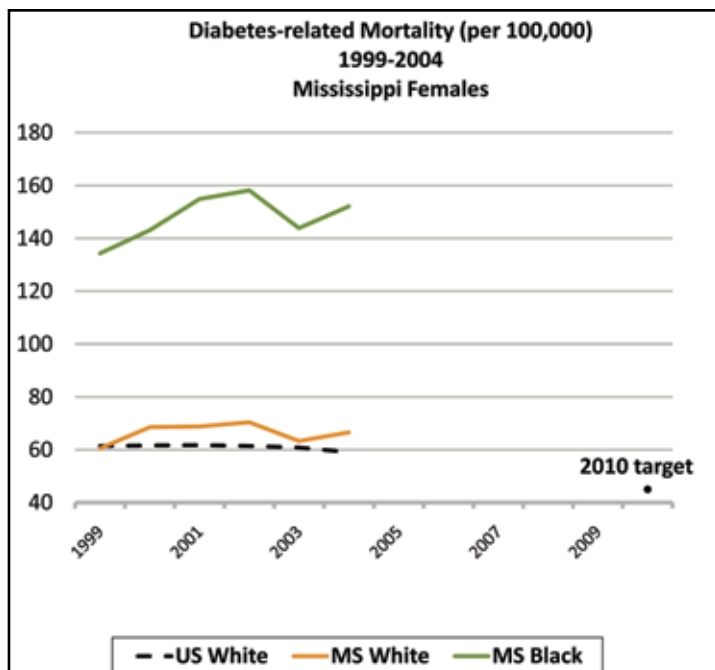


Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

Diabetes Mortality (per 100,000)	1999	2004
US white male	84.7	85.2
MS white male	85.2	96.7
MS black male	122.7	147.8
US white female	61.4	59.1
MS white female	60.5	66.6
MS black female	134.3	152.1

Higher rates of diabetes mortality among blacks and similar morbidity statistics point strongly to problems in access to care. End-stage renal disease, blindness (secondary to diabetes), and increased rates of amputation due to neuropathy are all more likely for a diabetic who is African American. Black diabetics are twice as likely to experience in-hospital mortality due to amputations

(Carter, Pugh, and Monterrosa, 1996).



Source: CDC, Compressed Mortality Data, n.d.c; n.d.d

Because we were not equal...

7.5 per 100,000 more white females in Mississippi

9.3 per 100,000 more black females in Mississippi

11.5 per 100,000 more white males in Mississippi

62.6 per 100,000 more black males in Mississippi

...died of diabetes in 2004.

White females perform better than their male counterparts in diabetes-related mortality while black females perform worse than their male counterparts. As a result, there is a large and growing disparity in diabetes-related mortality between white US females and black MS females, which exceeds the disparity seen between their male counterparts.

Rates for white females in the US and MS remained fairly stable over the 1999 to 2004 period (mortality falling slightly from 61.4 per 100,000 to 59.1 per 100,000 for white US females and mortality rising slightly from 60.5 per 100,000 to 66.6 per 100,000 for white MS females). Meanwhile, diabetes-related mortality, already extremely high among black MS females rose (from 134.3 deaths per 100,000, to 152.1 per 100,000), more than double the rate for white US females.

More than **1 in 3 cases** of diabetes-related mortality among **black males** would have been averted if they achieved like their white national counterparts.

Nearly **2 in 3 cases** among **black females** in Mississippi would have been averted.

REFERENCES

- American Heart Association. (2008). *Cholesterol Statistics*. Retrieved from <http://www.americanheart.org/presenter.jhtml?identifier=536>
- American Heart Association (AHA). (2008). *Cholesterol Statistics*. Retrieved from <http://www.americanheart.org/presenter.jhtml?identifier=536>
- American Heart Association (AHA). (2009, October 19, updated). *Understanding blood pressure readings*. Retrieved on November 11, 2009 from <http://www.americanheart.org/presenter.jhtml?identifier=2112>
- American Heart Association (AHA). (2009b). *Heart disease & stroke statistics: 2010 update at-a-glance*. Retrieved from <http://www.americanheart.org/downloadable/heart/1240250946756LS-1982%20Heart%20and%20Stroke%20Update.042009.pdf>
- American Heart Association (AHA). (2010a). *Cardiovascular disease statistics*. Retrieved March 8, 2010, from <http://www.americanheart.org/presenter.jhtml?identifier=4478>
- American Heart Association (AHA). (2010b). *Silent Ischemia and Ischemic Heart Disease*. Retrieved March 8, 2010, from <http://www.americanheart.org/presenter.jhtml?identifier=4720>
- American Heart Association (AHA). (2010c). *Heart disease & stroke statistics: 2010 update at-a-glance*. Retrieved from http://www.americanheart.org/downloadable/heart/1265665152970DS-3241%20HeartStrokeUpdate_2010.pdf
- American Heart Association (AHA). (2010d). *About Diabetes*. Retrieved from <http://www.americanheart.org/presenter.jhtml?identifier=3044757>
- American Diabetes Association. (n.d.). *Diabetes basics*. Retrieved on December 16, 2009, from <http://www.diabetes.org/diabetes-basics/>
- Bleumink, G. S., Knetsch, A. M., Sturkenboom, M. C., Straus, S. M., Hofman, A., Deckers, J. W., Witteman, J. C., & Stricker, B. H. (2004). Quantifying the heart failure epidemic: Prevalence, incidence rate, lifetime risk and prognosis of heart failure. The Rotterdam study. *European Heart Journal*, 25 (18), 1614-1619.
- Carter, J. S., Pugh, J. A., & Monterrosa, A. (1996, August). Non-insulin-dependent diabetes mellitus in minorities in the United States. *Annals of Internal Medicine*, 125(3), 221-232. Retrieved from <http://www.annals.org/content/125/3/221.full.pdf+html?sid=98c08542-32fd-48b2-a497-92659555cf5e>
- Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion. (2005). *Preventing obesity and chronic diseases through good nutrition and physical activity*. Retrieved from http://www.cdc.gov/chronicdisease/resources/publications/fact_sheets/obesity.htm

- Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion. (2007). *Take charge of your diabetes. 4th Edition*. Retrieved on January 22, 2010, from <http://www.cdc.gov/diabetes/pubs/pdf/tcyd.pdf>
- Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System (BRFSS). (2008). *Prevalence and trends data, overweight and obesity (BMI) – 2008*. Retrieved from <http://apps.nccd.cdc.gov/brfss/list.asp?cat=OB&yr=2008&qkey=4409&state=US>
- Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion. (2009a, updated). *Overweight and Obesity*. Retrieved on November 16, 2009, from <http://www.cdc.gov/obesity/index.html>
- Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion. (2009b, updated). *Heart disease*. Retrieved on November 10, 2009, from <http://www.cdc.gov/heartdisease/>
- Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion. (2009d, updated). *High blood pressure*. Retrieved on November 14, 2009, from <http://www.cdc.gov/stroke/>
- Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion. (n.d.a). *CDC facts: May is national awareness month*. Retrieved from <http://www.cdc.gov/Features/Stroke/>
- Centers for Disease Control and Prevention (CDC). (n.d.b). [Data file]. *Behavioral risk factor surveillance system survey (BRFSS) data, 2000-2007*. Accessed at http://www.cdc.gov/brfss/technical_infodata/surveydata.htm
- Centers for Disease Control and Prevention (CDC), National Center for Health Statistics. Compressed Mortality File 1999-2006. (n.d.c). [Data file]. *CDC WONDER on-line database, compiled from compressed mortality file 1999-2006 series 20 no. 2L, 2009*. Accessed from <http://wonder.cdc.gov/cmfi-icd10.html>
- Centers for Disease Control and Prevention (CDC), National Center for Health Statistics. Compressed Mortality File 1979-1998. (n.d.d). [Data file]. *CDC WONDER on-line database, compiled from compressed mortality file CMF 1968-1988, series 20, No. 2A, 2000 and CMF 1989-1998, series 20, No. 2E, 2003*. Accessed at <http://wonder.cdc.gov/cmfi-icd9.html>
- Ebersole, K. E., Dugas, L. R., Durazo-Arvizu, R. A., Adeyemo, A. A., Tayo, B. O., Omotade, O. O., Brieger, W. R., Schoeller, D. A., Cooper, R. S., & Luke, A. H. (2008). Energy expenditure and adiposity in Nigerian African-American women. *Obesity, 16(9)*, 2148-2154. doi: 10.1038/oby.2008.330
- Harvard Health Publications, Harvard Medical School. (2006). *Abdominal fat and what to do about it*. The Harvard Medical School Family Health Guide. Retrieved from <http://www.health.harvard.edu/fhg/updates/Abdominal-fat-and-what-to-do-about-it.shtml>
- Kannel, W. B. (2000, June). Incidence and Epidemiology of Heart Failure. *Heart Failure Reviews, 5 (2)*, 167-173. doi 10.1023/A:1009884820941
- LiveScience Staff. (2009, January 6). *Diet, not exercise, plays key role in weight loss*. MSNBC.com. Retrieved on November 2, 2009 from <http://www.msnbc.msn.com/id/28524942/>

- National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention. (2009c). *Heart disease and stroke prevention: Addressing the nation's leading killers*. Retrieved from <http://www.cdc.gov/nccdphp/publications/AAG/pdf/dhdsp.pdf>
- Mayo Clinic Health Manager. (2008). *High blood cholesterol*. Mayo Foundation for Medical Education and Research (MFMER). Retrieved on June 20, 2009 from <http://mayoclinic.com/health/high-blood-cholesterol/DS00178>
- Mayo Clinic Health Manager. (2009a). *Obesity*. Mayo Foundation for Medical Education and Research (MFMER). Retrieved on June 20, 2009, from <http://mayoclinic.com/health/obesity/DS00314>
- Mayo Clinic Health Manager. (2009b). *Diabetes*. Mayo Foundation for Medical Education and Research (MFMER). Retrieved on December 16, 2009, from <http://www.mayoclinic.com/health/diabetes/DS01121>
- MedicineWorld.org. (n.d.). *Link between physical inactivity and obesity*. Retrieved from <http://medicineworld.org/cancer/lead/1-2009/link-between-physical-inactivity-and-obesity.html>
- MetroHealth System. (2009). *Non-Ischemic Cardiomyopathy*. Case Western Reserve University. Retrieved March 8, 2010, from <http://www.metrohealth.org/body.cfm?id=1485>
- The National Weight Control Registry (NWCR). (n.d.). *Homepage NWCR facts*. Retrieved from <http://www.nwcr.ws/Research/default.htm>
- The National Weight Control Registry (NWCR). (n.d.). *The national weight control registry*. Retrieved from <http://www.nwcr.ws/default.htm>
- The Office of Minority Health (OMH), U.S. Department of Health and Human Services (DHHS). (n.d.). *Heart Disease and African Americans*. Retrieved from <http://minorityhealth.hhs.gov/templates/content.aspx?ID=3018>
- UAB Media Relations. (2009, October 28). *Exercise keeps dangerous visceral fat away a year after weight loss, finds UAB study*. Retrieved on November 2, 2009, from <http://main.uab.edu/Sites/MediaRelations/articles/70473/>
- Watson, L. (n.d.). *Cook for good: Save money, eat well, do good*. Retrieved from <http://www.cookforgood.com/about.html>