HealthStatisticsCenter
WEST VIRGINIA DEPARTMENT OF HEALTH AND HUMAN RESOURCES

HSC Statistical Brief No. 28
DIABETES AND HEALTH EQUITY IN WEST VIRGINIA: A REVIEW

EXECUTIVE SUMMARY

Diabetes, like so many other diseases, is tracked, measured and monitored in West Virginia and across the country through long established surveillance systems and vital statistics centers. On the other hand, health equity is difficult to define, let alone measure, track or monitor. Health equity or the lack thereof is not diagnosable by doctors; people are not asked if they 'have health equity' in surveys; and health equity is not listed as a cause of death on a death certificate. Yet, health equity affects us all; but as illustrated in the following pages, it does not affect us all in the same way.

While health equity does not lend its self to direct measurement, an overall picture of health equity can be developed through examination of the social determinants of health within a geographical area. This review analyzes diabetes and social determinants of health data to determine the level of health equity among those who have diabetes in West Virginia. Key findings include:

- People with diabetes make less money than people without diabetes
- People with diabetes have less education than people without diabetes
- More people with diabetes are unable to work than people without diabetes
- The prevalence of diabetes is higher in the southern coal fields and portions of the Mid-Ohio Valley region
- Often, counties with higher diabetes prevalence have lower income levels
- More people with diabetes have a personal doctor or health care provider than people without diabetes
- More people with diabetes receive an annual routine check-up than those who do not have diabetes
- A higher prevalence of people with diabetes report they have an impairment that limits their activities
- More people with diabetes use special medical equipment than people who do not have diabetes
- People with diabetes have higher levels of life dissatisfaction
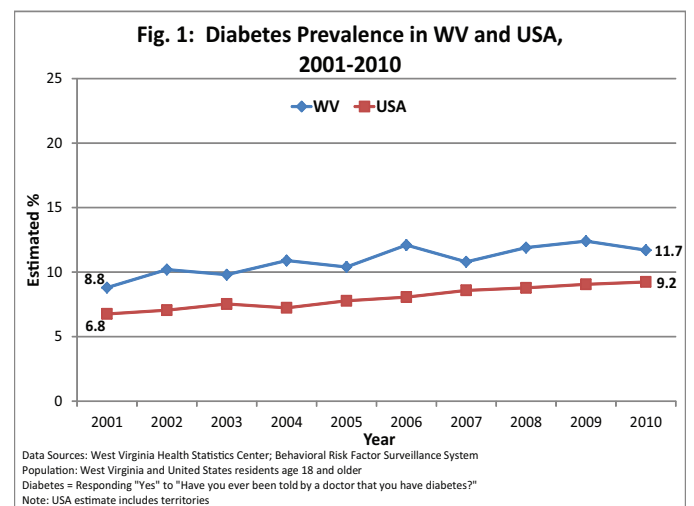
AN INTRODUCTION TO DIABETES

Diabetes mellitus, generally known simply as diabetes, is a chronic condition occurring when the body is unable to regulate glucose levels in the bloodstream. Glucose is the main sugar that comes from the foods we eat and the liquids we drink. It is most commonly derived from breads, cereals, dairy foods, fruits and some vegetables that contain carbohydrates in the forms of starches and sugars. Glucose is the simplest form of sugar and is essential in providing energy for cell growth and proper organ function.

Blood glucose levels are regulated by insulin, a hormone made in the pancreas. Insulin enables the body's cells to absorb and use glucose. If the pancreas does not produce any or enough insulin, or the body is unable to use the insulin, glucose will build up in the bloodstream.
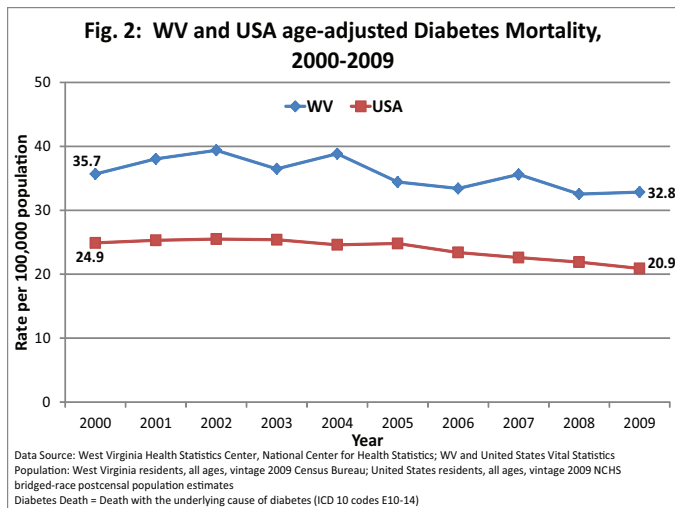
Over time, high blood glucose levels can cause damage to blood vessels and nerves, leading to an increased risk of heart attack, stroke, kidney failure, blindness and limb amputations. In fact, among adults in the United States, diabetes is the leading cause of kidney failure, non-traumatic lower-limb amputations and new cases of blindness.[1]

An estimated 25.8 million people (18.8 million diagnosed and 7 million undiagnosed) in the United States are affected by diabetes (National Diabetes Fact Sheet, 2011). In 2010, the estimated prevalence of diabetes in the US was 9.2%; in West Virginia the prevalence was 11.7%, one of the highest in the nation. Approximately 229,000 people

Fig. 1: Diabetes Prevalence in WV and USA, 2001-2010

Data Sources: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia and United States residents age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Note: USA estimate includes territories

in West Virginia have diabetes, of which over 62,000 are undiagnosed.[2]

Fig. 2: WV and USA age-adjusted Diabetes Mortality, 2000-2009

Data Source: West Virginia Health Statistics Center, National Center for Health Statistics; WV and United States Vital Statistics
Population: West Virginia residents, all ages, vintage 2009 Census Bureau; United States residents, all ages, vintage 2009 NCHS bridged-race postcensal population estimates
Diabetes Death = Death with the underlying cause of diabetes (ICD 10 codes E10-14)

West Virginia experienced significantly higher diabetes prevalence estimates in each of the ten years of data included in Figure 1. In addition, historically diabetes-related mortality rates have been significantly higher in West Virginia than countrywide rates (see Figure 2).

DEFINING HEALTH EQUITY

To define health equity, it is helpful to first understand health *in*equity. In a landmark paper, *The Concepts and Principles of Equity in Health*, Whitehead defined health inequity as differences in health that are unnecessary, avoidable, unfair and unjust.[3] Moreover, health inequities are disparities in health or health care that are systemic as well as avoidable. In Healthy People 2020, the U.S. Department of Health and Human Services 10 year national goals and objectives for health promotion and disease prevention, health equity is defined as the "attainment of the highest level of health for all people". Healthy People 2020 further states, "Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities."[4]

The Merriam-Webster Dictionary defines equity as *justice according to natural law or right; specifically: freedom from bias or favorites*. Equity means social justice and fairness. As written in *Defining Equity in Health*, an article by Braveman and Gruskin, equity is "an ethical concept, grounded in principals of distributive justice". Therefore, a commonly accepted definition of health equity is the absence of socially unjust or unfair health disparities.[5]

Now that a definition for health equity has been established, a way to measure it must also be determined. However, health equity in and of itself represents concepts of social justice and fairness; these concepts have different meanings and interpretations to different people at differ-

ent times and cannot be empirically measured. In spite of that, taking into account health equity's fundamental ties to social justice, it is possible to operationalize and measure health equity through the Social determinants of health (SDOH). According to the World Health Organization (WHO), the Social determinants of health are "the conditions in which people are born, grow, live, work and age, including the health system". Furthermore, "these circumstances are shaped by the distribution of money, power and resources at global, national and local levels, which are themselves influenced by policy choices". The WHO states that Social determinants of health are mostly responsible for health inequities in today's societies.[6]

The Social determinants of health are the social and economic conditions that influence individual and group differences in health status and outcomes. They are concerned with the distribution of resources among individuals and groups which are shaped by the forces of economics, social policies and politics. Additionally, they are risk factors determined by where one lives, works, and plays (such as the allocation of income, influence and power) rather than individual behavioral risk factors or genetics. Common Social determinants of health are: age; gender; race/ethnicity; education; income; employment or occupation; working conditions; geography; disability; access to health care; and social safety network.

The purpose of this review is to address health equity through different Social determinants of health as they relate to the burden of diabetes in West Virginia. The Social determinants of health that will be discussed include: gender, age, race, income, employment, education, geography, access to healthcare, disability and emotional support.

METHODS

This review relies upon the following data sources: WV Behavioral Risk Factor Surveillance System (BRFSS), US BRFSS, the WV Vital Registration Death Certificate Database, the National Center for Health Statistics, and the Census Bureau. Data, graphs, and tables have been produced through primary data analysis of data from the sources mentioned above. All prevalence estimates and rates have been produced using 95% confidence intervals (CI), ***see Appendix A***. Prevalence estimates or rates are considered to be statistically different from one another when the 95% confidence interval associated with the prevalence estimates or rates being compared do not overlap.

As a chronic disease, diabetes is more prevalent in older populations. Therefore age may be a confounding variable; if age has a relationship with the other variables being analyzed it could skew the results. During data analysis, when appropriate, age has been introduced as a third variable, also known as a control variable. In these cases, age is broken into two categories, older (age 65+) and younger (ages 18-64). If age controlled analysis does not

yield statistically different results from standard analysis, then it is reasonable to say there is not an age bias.
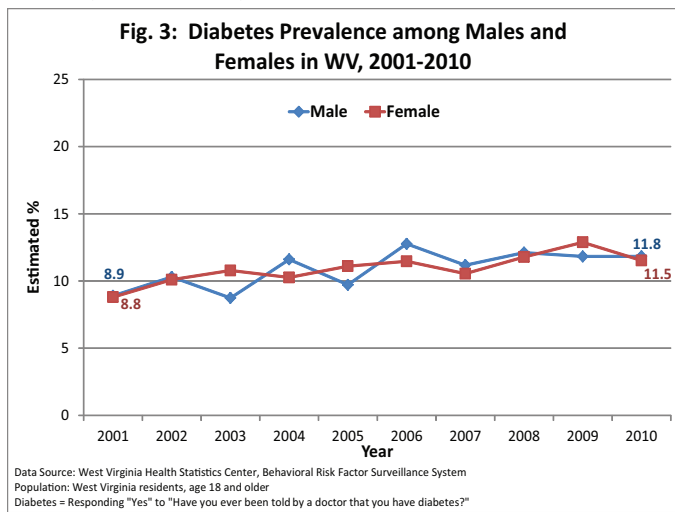
A limitation of the review is the number and type of West Virginia data sources being used. While BRFSS captures the prevalence of diabetes, it does not capture all of the social determinants of health. The surveillance system does not capture household living conditions, conditions in the community, workplace conditions or social safety networks. The Vital Registration Death Certificate Database is more limited than BRFSS in the number of social determinants of health variables captured. Additionally, causation and the direction of relationships between variables cannot be determined in this review.

However, even with these limitations, BRFSS and West Virginia vital death data are the most valid and reliable sources for measuring health equity as it relates to diabetes in the state. There are limitations inherit in every surveillance system. In BRFSS the primary limitations are: data is self-reported and individuals may not accurately recall past behavior; a telephone survey may not have the ability to reach all levels of the population; and breaking variables down into sub-categories during analysis may result in sample sizes of 50 or less, which are considered statistically unreliable.

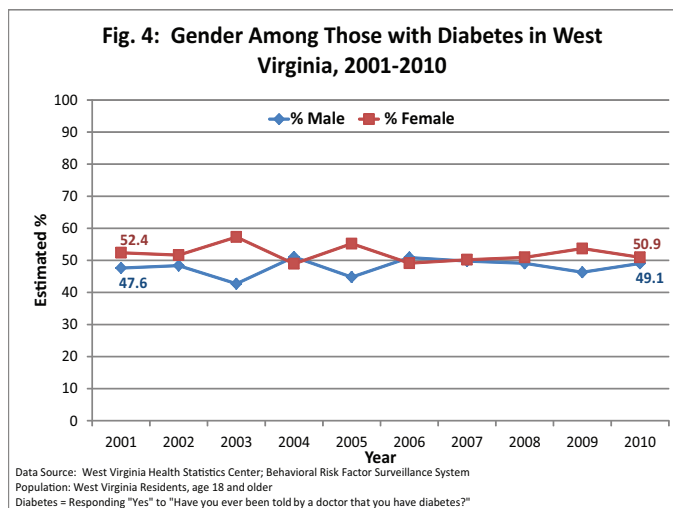Diabetes and Social Determinants of Health

Gender

The data indicate few statistical differences in the burden of diabetes as well as diabetes-related mortality among males and females. Between the years 2001-2010, there were no significant differences observed in diabetes prevalence among the sexes. In 2010, the diabetes prevalence among males was 11.8% (CI 10.2-13.4) and among females 11.5% (CI 10.3-12.8).

Fig. 3: Diabetes Prevalence among Males and Females in WV, 2001-2010

Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
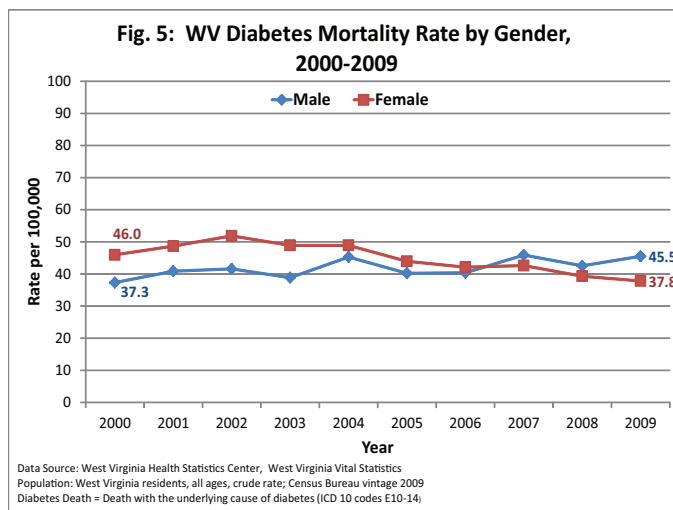Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"

When looking at gender distribution among those with diabetes, there was only one year between the years 2001-2010 that yielded a significant difference. In 2003 females represented a significantly higher proportion than males

among people who had been diagnosed with diabetes. In 2010, gender distribution among those with diabetes was relatively equal, males representing 49.1% (CI 44.7-53.4) and females 50.9% (CI 46.6-55.3).

Fig. 4: Gender Among Those with Diabetes in West Virginia, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia Residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"

Of analyses performed on gender and diabetes, mortality rates yielded the most significant results. In years 2000, 2002, and 2003, females experienced significantly higher diabetes mortality rates than males. However, that trend has not held over the years, as can be seen in Figure 5. In recent years females have had a lower mortality rate than males. In 2009 the diabetes mortality rate for males was 45.5 per 100,000 (CI 41.1-49.9) and females 37.8 per 100,000 (CI 33.9-41.8).

Fig. 5: WV Diabetes Mortality Rate by Gender, 2000-2009

Data Source: West Virginia Health Statistics Center, West Virginia Vital Statistics
Population: West Virginia residents, all ages, crude rate; Census Bureau vintage 2009
Diabetes Death = Death with the underlying cause of diabetes (ICD 10 codes E10-14)

Overall, especially when considering data after 2003, there is little difference in the burden of diabetes and diabetes-related mortality among the sexes.
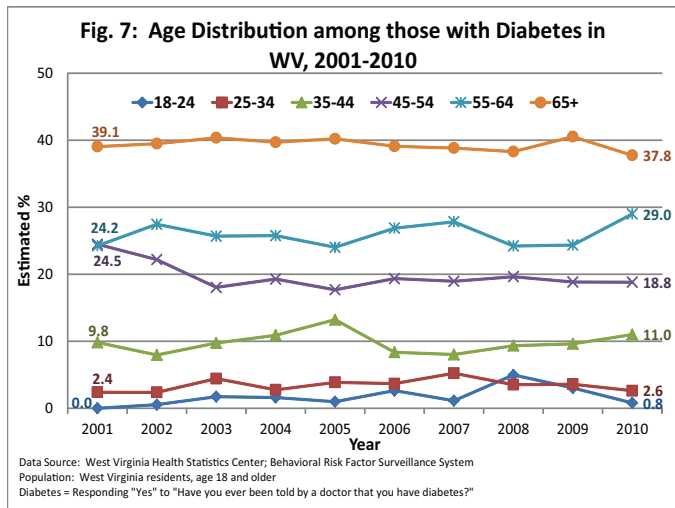
Age

The prevalence of many chronic diseases increases as people age. This is true for diabetes in West Virginia; as Figure 6 shows, the prevalence of diabetes rises with age. The figure also indicates that while there are upturns and downturns, the diabetes prevalence has increased among

each age category when comparing 2001 data to that of 2010. When comparing one age group to the age group above it (comparing ages 25-34 against 35-44 for example), there are intermittent differences. However, in 9 out of 10 years of data analyzed, there were significant differences in the burden of diabetes between the age groups of 45-54 and 55-64.

Fig. 6: WV Diabetes Prevalence by Age Group, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
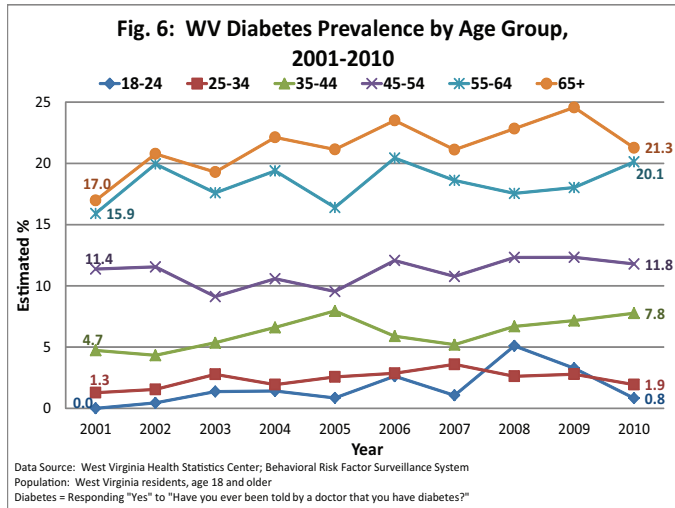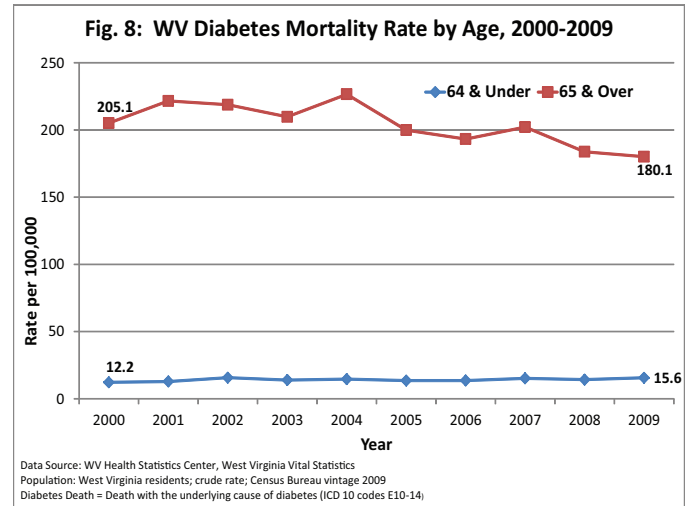
Among those diagnosed with diabetes, as age rises so does the burden of diabetes that age group carries. Between ages 25-34 and 34-44 there were significant increases in the burden of diabetes in 7 out of 10 years. For age groups 35-44 and 45-54 significant raises in the diabetes burden were observed in 8 out of 10 years. In every year out of 10 years of data, there was a significant gap between the diabetes burden carried by the 55-64 and the 65+ age groups.

Fig. 7: Age Distribution among those with Diabetes in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"

A significant age gap can also be seen in diabetes mortality rates. For those 65 and older the rate is significantly higher than for those 64 years of age and under in every year between 2000 and 2009.
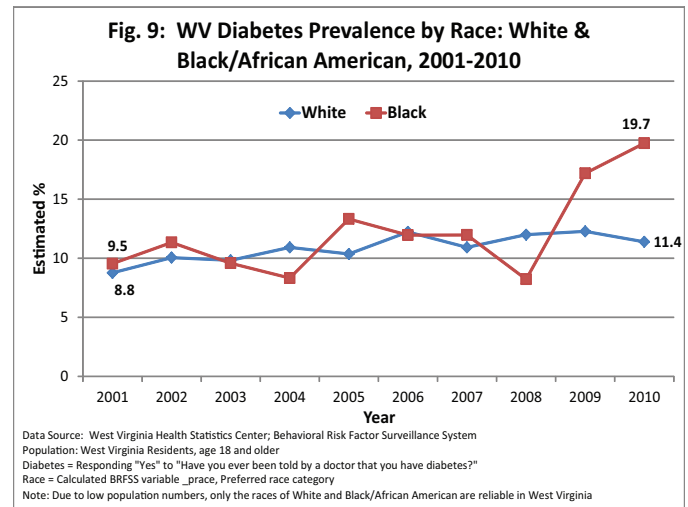
Overall, as can be expected with chronic disease, the burden and mortality rate of diabetes increases with age. Analysis of age and diabetes show the most differences oc-

curring between the age group that ends at 64 and the age group that includes people 65 years of age and older.

Fig. 8: WV Diabetes Mortality Rate by Age, 2000-2009

Data Source: WV Health Statistics Center, West Virginia Vital Statistics
Population: West Virginia residents; crude rate; Census Bureau vintage 2009
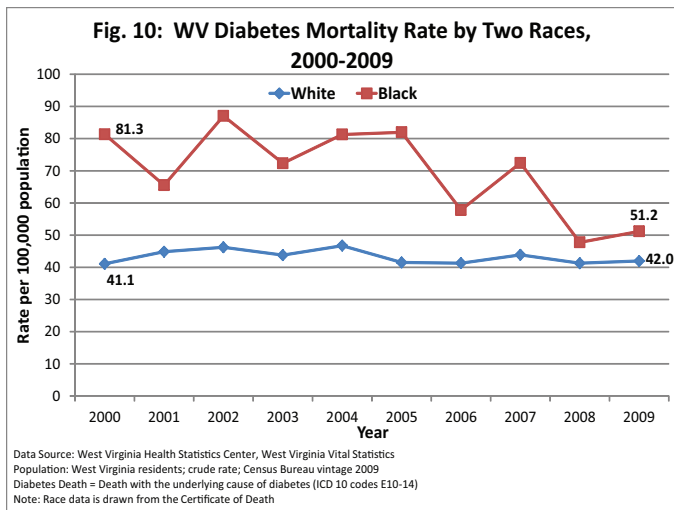Diabetes Death = Death with the underlying cause of diabetes (ICD 10 codes E10-14)

RACE

There are two primary racial groups in West Virginia, White/Caucasian and Black/African American. While there are people from many racial and ethnic backgrounds living in WV, for surveillance purposes the only groups with populations large enough for reliable data are Black and White. Between the years 2001 and 2010 there were no statistical differences observed in the burden of diabetes among African Americans and Caucasians. However, the diabetes prevalence has risen for both groups. In 2001 the prevalence for Whites was 8.8% (CI 7.6-9.9) and for African American 9.5% (CI 3.4-15.7); by 2010 the prevalence had risen to 11.4% (CI 10.4-12.4) and 19.7% (CI 10.7-28.8) respectively.

Fig. 9: WV Diabetes Prevalence by Race: White & Black/African American, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia Residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Race = Calculated BRFSS variable _prace, Preferred race category
Note: Due to low population numbers, only the races of White and Black/African American are reliable in West Virginia

African Americans in WV experienced significantly higher diabetes mortality rates than their Caucasian counterparts in 6 of the 10 years analyzed. While the trend has not been stable, in the most recent two years of data, the mortality rate gap has reduced dramatically. In 2000, the crude diabetes mortality rate for Whites was 41.1 per 100,000;
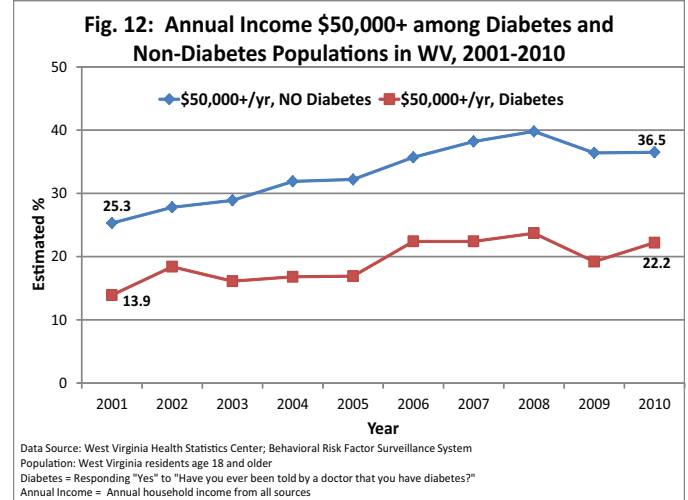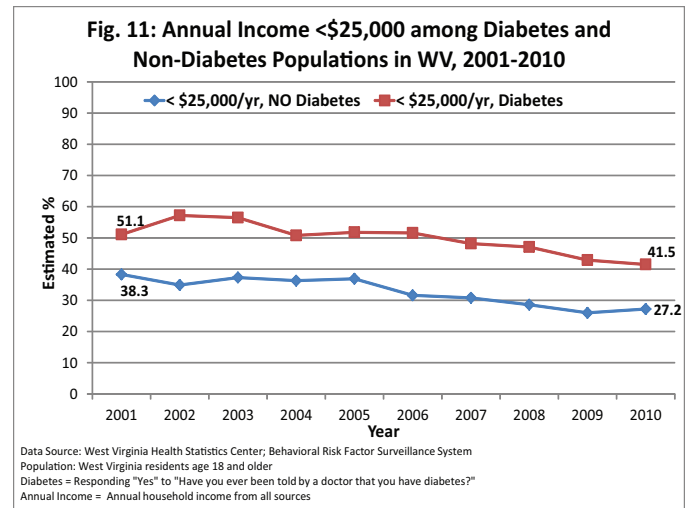
holding relatively stable in 2009 the rate was 42.0 per 100,000. However, for Blacks/African Americans the rate changed markedly between 2000 and 2009. In 2000, the diabetes mortality rate for Blacks was 81.3 per 100,000, almost double the rate for Caucasians. In 2009, the diabetes mortality rate for Blacks had dropped to 51.2 per 100,000.

Fig. 10: WV Diabetes Mortality Rate by Two Races, 2000-2009

Data Source: West Virginia Health Statistics Center, West Virginia Vital Statistics
Population: West Virginia residents; crude rate; Census Bureau vintage 2009
Diabetes Death = Death with the underlying cause of diabetes (ICD 10 codes E10-14)
Note: Race data is drawn from the Certificate of Death

Overall, while there is a gap in the prevalence of diabetes among Caucasians and African Americans, it is not statistically significant. It is more important to note that the burden of diabetes has risen over the years for both groups. Additionally, there is a historical disparity in the diabetes mortality rate between the two races. However, if the mortality rates for Blacks observed in 2008 and 2009 hold stable, the gap may be closing between Blacks and Whites.
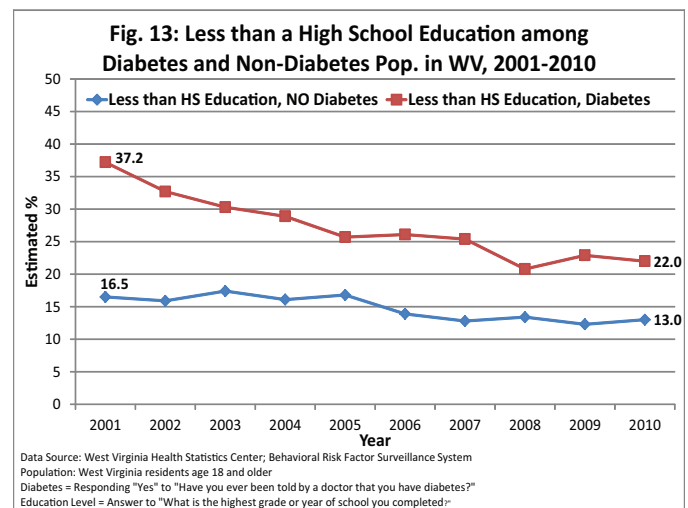
Income

To fully describe health equity and diabetes in West Virginia, it is necessary to compare and contrast certain social determinants of health among those who have diabetes verses those who do not have diabetes. Income is one such example. When examining annual household income among those with diabetes against those without diabetes there are significant differences. Each year of the 10 years of data presented here indicates significantly higher percentages of people with diabetes who have an annual household income of $25,000 or less a year than people who do not have diabetes (see Figure 11). Furthermore, over the same 10 year timeframe, each year there was a significantly lower percentage of people with diabetes having an annual household income of $50,000+ as compared to people who do not have diabetes (Figure 12). The burden of diabetes is considerably higher in people aged 65 and older, and many people in this age category are retired and on fixed incomes. Therefore, to test for confounding due to age, the age variable was controlled for during statistical analysis; the results remained the same. There are statistically significant disparities in diabetes and non-diabetes populations for household incomes of less than $25,000/year and more than $50,000/year.

Fig. 11: Annual Income <$25,000 among Diabetes and Non-Diabetes Populations in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Annual Income = Annual household income from all sources

Fig. 12: Annual Income $50,000+ among Diabetes and Non-Diabetes Populations in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
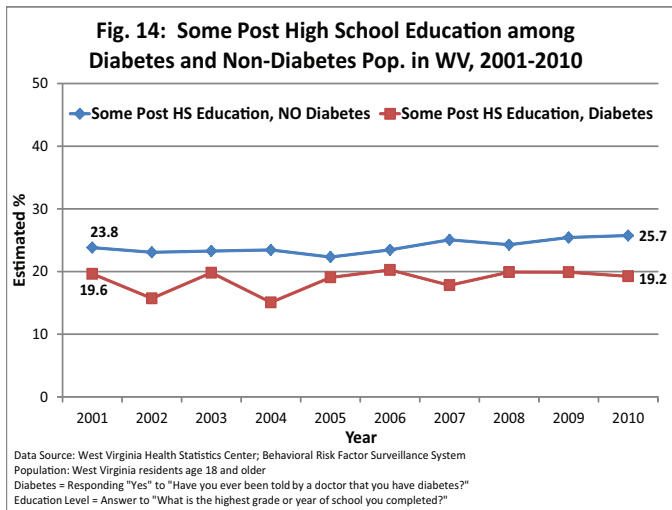Annual Income = Annual household income from all sources

Education

Education is another social determinant of health where comparing diabetes and non-diabetes populations will help develop the picture of health equity and diabetes in West Virginia. For analysis, education was broken into 4 categories: 1) Less than High School Education, 2) High School Education or GED, 3) Some Post High School Education, and 4) College Graduate. The categories with the greatest differences between people who have diabetes and those who do not have diabetes are: Less than High School

Fig. 13: Less than a High School Education among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Education Level = Answer to "What is the highest grade or year of school you completed?"
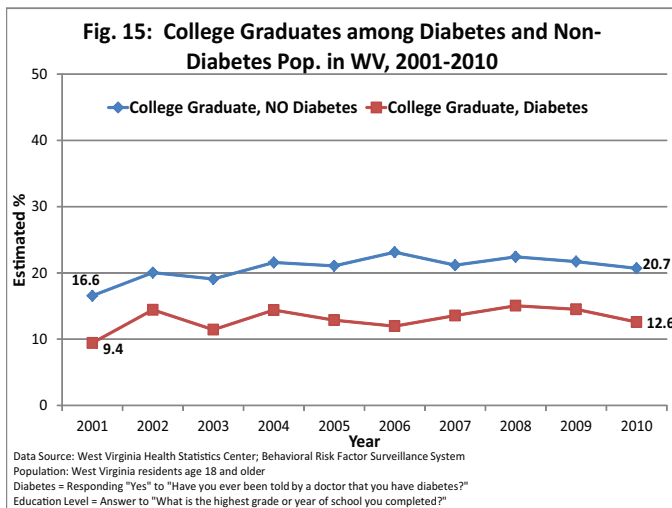
Education and College Graduate. These results remained significant when analyzed using age as the control variable.

In every year of a ten year timespan (2001-2010) among people who did not attain a high school education, there were significantly higher percentages of people with diabetes than people without diabetes. While this disparity remains significant, the gap has gradually reduced. In 2001, among those with diabetes 37.2% (CI 30.9-43.5) did not have a high school diploma; among people who did not have diabetes only 16.5% (CI 15.0-18.0) were without a high school education. Ten years later, in 2010 less than a high school education among those with diabetes dropped to 22.0% (CI 18.5-25.5) and 13.0% (CI 11.6-14.5) among those who did not have diabetes.

Fig. 14: Some Post High School Education among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Education Level = Answer to "What is the highest grade or year of school you completed?"

Post high school education may include several forms of education beyond a high school diploma. Examples of post high school education include learning in any of the following settings: universities, colleges, institutes of technology, vocational schools, trade schools, career colleges and academies. The category of Some Post High School Education indicates attendance at one or more of the above settings without earning a typical four year college degree. In half of the years analyzed, 5 out of 10, a significantly lower percentage of people with diabetes had received some

Fig. 15: College Graduates among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
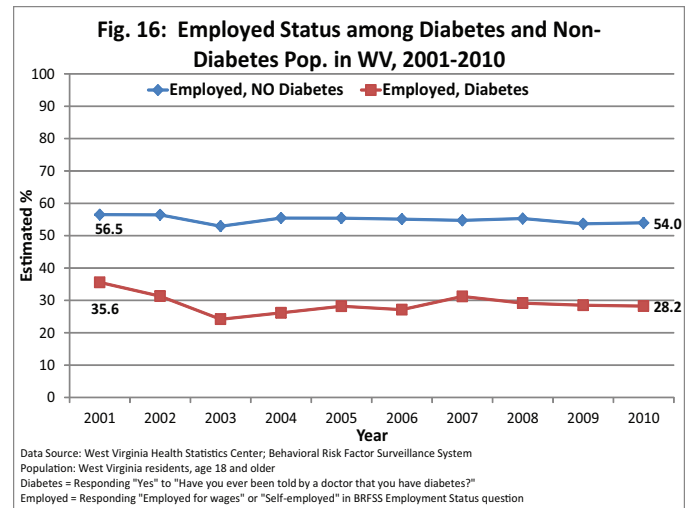Education Level = Answer to "What is the highest grade or year of school you completed?"

post high school education compared to those who did not have diabetes.

During 9 of the 10 years analyzed, there were significantly fewer college graduates among those with diabetes than college graduates among those who did not have diabetes. In 2010 among those with diabetes, 12.6% (CI 9.8-15.4) were college graduates; among those who did not have diabetes, 20.7% (CI 19.1-22.3) were college graduates. Overall, as the education data demonstrates, people with diabetes have less education than people without diabetes.
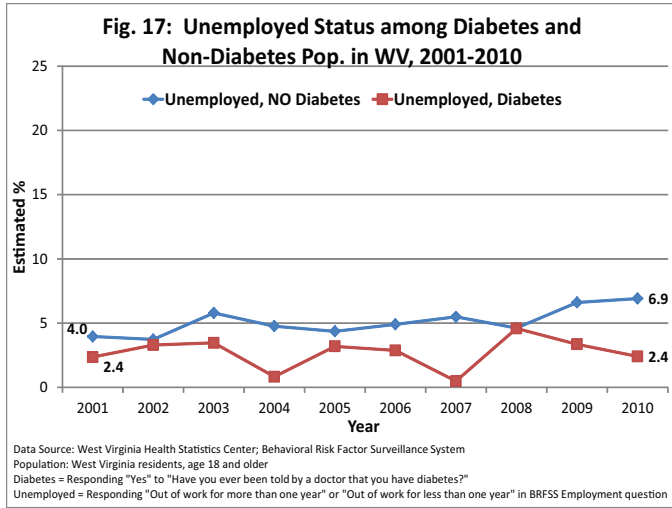
EMPLOYMENT STATUS

Comparing diabetes to non-diabetes populations, there are statistically significant differences in three of the BRFSS Employment Status categories: Employed, Unemployed, and Unable to Work. In each of the ten years of data analyzed, there was a significant disparity in the percentage of employment among people with diabetes verses people without diabetes. In 2010, among those with diabetes 28.2% (CI 24.0-32.4) were employed. In the same year, among people who did not have diabetes 54.0% (CI 51.8-56.1) were employed for wages.

Fig. 16: Employed Status among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Employed = Responding "Employed for wages" or "Self-employed" in BRFSS Employment Status question
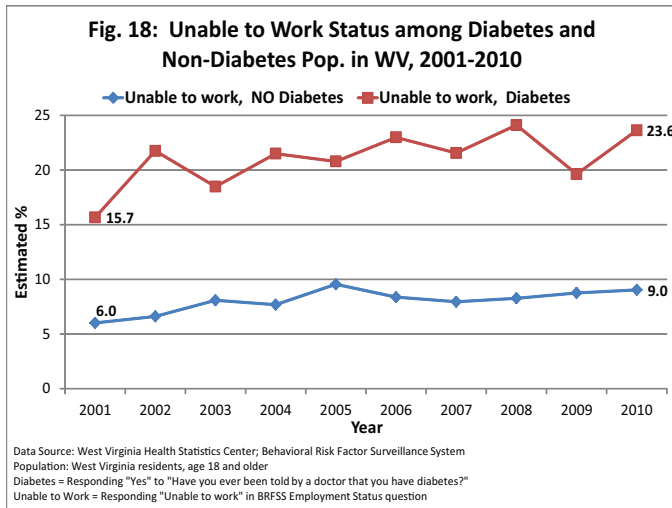
Unemployed status, those responding "Out of work for more than one year" or "Out of work for less than one year" to the BRFSS employment question, yielded significant results between those who had diabetes and those who did not in four out of ten years. The data does not exhibit a stable trend. In 2001 the percentage of those who had diabetes and were out of work was 2.4 (CI 0.7-4.1), and while the percentage rose and fell over the years, in 2010 it was again 2.4% (CI 1.0-3.8). However, the percentage among those who did not have diabetes and were out of work rose over the ten year span, from 4.0% (CI 3.0-4.9) in 2001 to 6.9% (CI 5.6-8.2) in 2010.

In the Unable to Work category, the percentage of those unable to work who also had diabetes was significantly higher in every year from 2001 to 2010 compared to those

who did not have diabetes. While the trend indicates inability to work increasing for those with diabetes as well as among those without diabetes, a large gap remains.

Fig. 17: Unemployed Status among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Unemployed = Responding "Out of work for more than one year" or "Out of work for less than one year" in BRFSS Employment question

The most current data evidences this gap. In 2010, among people with diabetes 23.6% (CI 19.8-27.4) were unable to work, as compared to 9.0% (CI 7.8-10.2) of those without diabetes.

Fig. 18: Unable to Work Status among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Unable to Work = Responding "Unable to work" in BRFSS Employment Status question
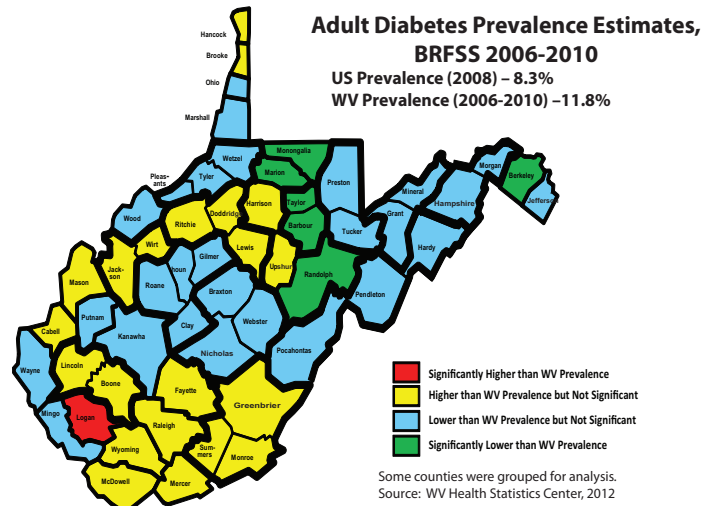
Overall, people with diabetes have lower employment than those who do not have diabetes. More people without diabetes are employed for wages; more people with diabetes are unable to work.
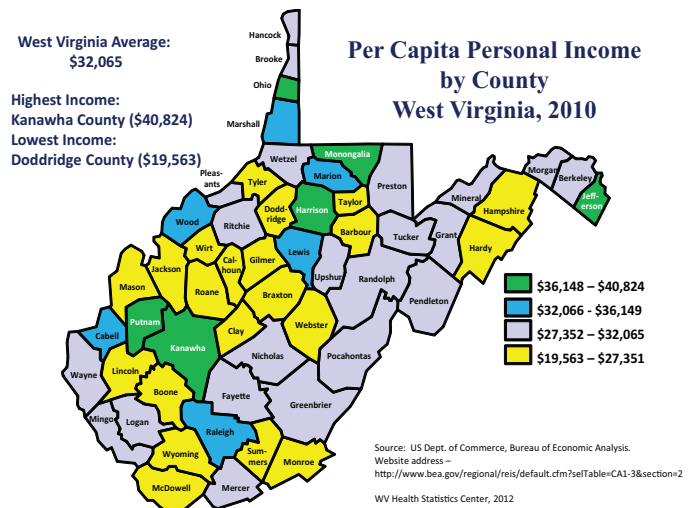
GEOGRAPHY

Where people live is often an important social determinant of health. In West Virginia, the burden of diabetes is greater in the southern coalfield counties as well as in some of the counties that make up the Mid-Ohio Valley region. Using five years of data to create reliable county level estimates, there is one county with significantly higher diabetes prevalence than the overall WV prevalence. The burden of diabetes in Logan county is estimated at 17.7% (CI 13.9-21.5), substantially higher than the WV prevalence

for the same years, 11.8% (11.3-12.3).

Adult Diabetes Prevalence Estimates, BRFSS 2006-2010
US Prevalence (2008) – 8.3%
WV Prevalence (2006-2010) –11.8%

Significantly Higher than WV Prevalence
Higher than WV Prevalence but Not Significant
Lower than WV Prevalence but Not Significant
Significantly Lower than WV Prevalence

Some counties were grouped for analysis.
Source: WV Health Statistics Center, 2012

Map 1

A considerable number of counties with higher diabetes prevalence estimates also have lower per capita personal income levels. Map 2 depicts 2010 per capita income by county; the overall WV average per capita income was $32,065. Most of the counties in the southern coal fields as well as the Mid-Ohio Valley region have per capita incomes below the West Virginia average.

West Virginia Average: $32,065

Highest Income: Kanawha County ($40,824)
Lowest Income: Doddridge County ($19,563)

Per Capita Personal Income by County West Virginia, 2010

$36,148 – $40,824
$32,066 - $36,149
$27,352 – $32,065
$19,563 – $27,351

Source: US Dept. of Commerce, Bureau of Economic Analysis.
Website address – http://www.bea.gov/regional/reis/default.cfm?selTable=CA1-3&section=2

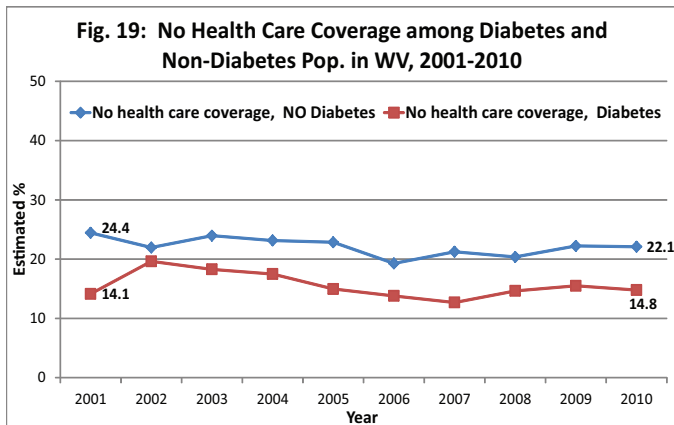WV Health Statistics Center, 2012

Map 2

ACCESS TO CARE

According to the County Health Rankings, "Access to health care measures accessibility to needed primary care, health care specialists, and emergency treatment".[7] Accessibility can be measured through conditions and factors at the individual, clinical, and community levels. Having health care coverage or health insurance, the ability to afford medical costs and health literacy comprise factors at the individual level. Conditions for access at the clinical level include: acceptance of health care coverage for payment, availability of health care providers and services, reasonable wait times for services and appointments, and cultural competence. The existence of primary care centers, clinics and/or health care providers located within close proxim-
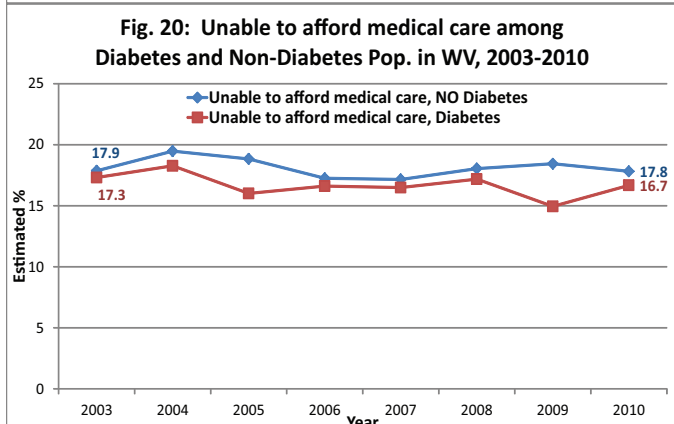
ity to populations and transportation are community and environmental influences on access to care.

The Behavioral Risk Factor Surveillance System (BRFSS) measures access to care with several questions about health care coverage/health insurance, affordability of health care, and individuals having a primary care physician that they have visited within the past year. Analysis of the access to care variables comparing those who had diabetes to those who did not have diabetes yielded mixed results. In 4 out of 10 years, there were significantly higher percentages of no health care coverage among those who did not have diabetes. While not significantly so, in every year analyzed, not having any type of health care coverage was higher among those who did not have diabetes. In 2010, among those who did not have diabetes, an estimated 22.1% (CI 19.7-24.5) had no health care coverage. In the same year, among those who had diabetes, 14.8% (CI 10.2-19.4) were without health care coverage.

In the eight years of data available for analysis, there were no significant differences in the percentages of those who did not visit a doctor due to cost among those who had diabetes and those who did not have diabetes. As seen in

had diabetes or not.

In the BRFSS question, "Do you have one person you think of as your personal doctor or health care provider?" there were significant differences among those with diabetes and those without diabetes in each year between 2001 and 2010. The percentage of people without diabetes answering "No" to the above question was 23.8 (CI 21.9-25.7) in 2001, rising to 26.2 (CI 24.0-28.3) in 2010. The percentage among those who had diabetes and did not have a personal doctor also rose; from 4.2 (CI 1.8-6.5) in 2001 to 8.2 (CI 5.4-11.1) ten years later.

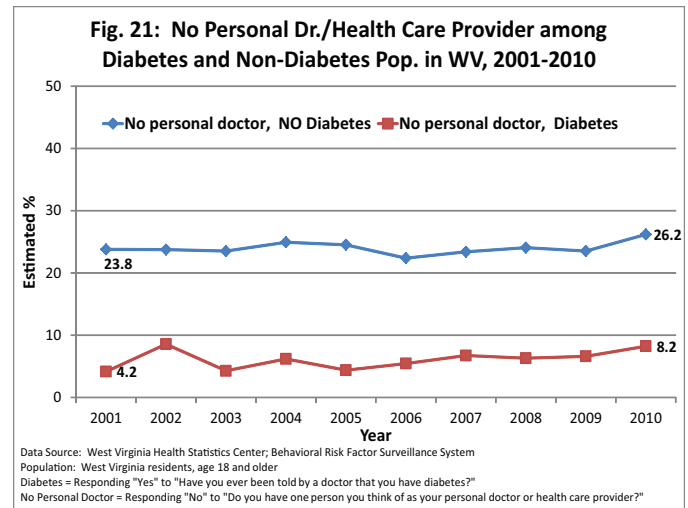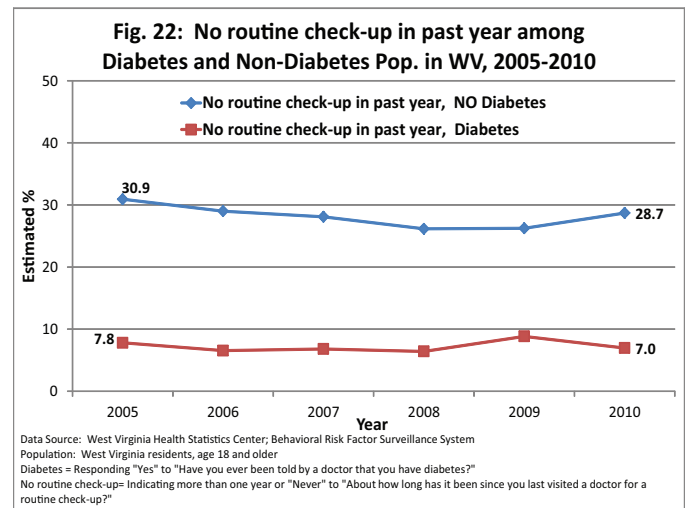Fig. 21: No Personal Dr./Health Care Provider among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
No Personal Doctor = Responding "No" to "Do you have one person you think of as your personal doctor or health care provider?"

Fig. 19: No Health Care Coverage among Diabetes and Non-Diabetes Pop. in WV, 2001-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
No Health Care Coverage = Responding "No" to "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMO's, or government plans such as Medicare?"

Fig. 20: Unable to afford medical care among Diabetes and Non-Diabetes Pop. in WV, 2003-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Unable to afford medical care = Responding "Yes" to "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?"

Receiving an annual physical exam or check-up is something most people should do as a preventive health measure. For people with diabetes, depending on an individual's level of disease control, the American Diabetes Association recommends 2-4 visits to a primary health care provider a year.[8]   Seen in Figure 22, there are significantly higher percentages of people who do not have diabetes that do not receive an annual routine check-up as compared to people with diabetes. In 2010, among people who did not have diabetes, 28.7% (CI 26.5-30.9) did not go to a doctor for a routine annual check-up. In the same year, 7.0% (CI 4.5-9.4) of people with diabetes did not see a doctor for an annual check-up.

Fig. 22: No routine check-up in past year among Diabetes and Non-Diabetes Pop. in WV, 2005-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
No routine check-up= Indicating more than one year or "Never" to "About how long has it been since you last visited a doctor for a routine check-up?"

Figure 20, the percentage of people who could not afford to visit a doctor hovered around 17% no matter if a person
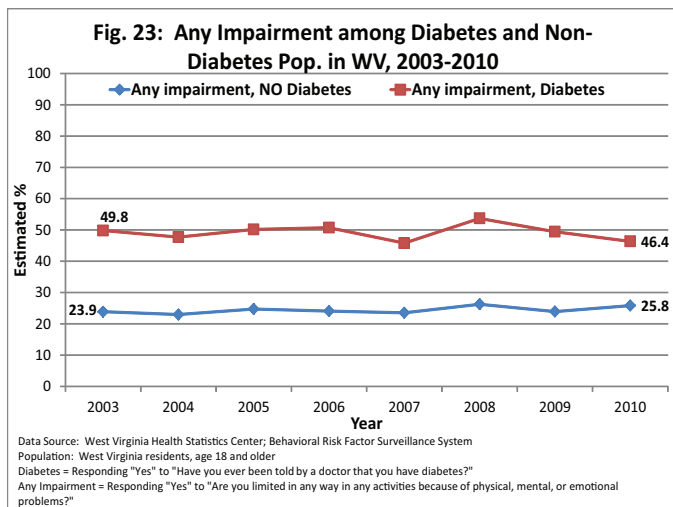
Overall, while there are similar numbers of people who cannot afford to go to a doctor, there are more people with diabetes who have health care coverage, a primary health care physician, and who receive annual routine check-ups.

DISABILITY

The Americans with Disabilities Act has defined the term disability with respect to an individual as "a physical or mental impairment that substantially limits one or more of the major life activities of such individual".[9] The BRFSS survey has two questions regarding disabilities. While both are general questions about disability, they are the best proxy measure available for comparing disabilities among those with diabetes to those without.
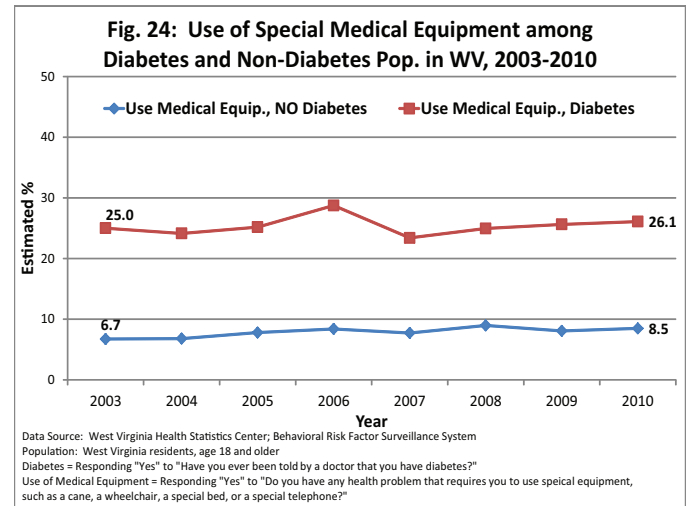
The first disability measure from BRFSS is responding "yes" to the question, "Are you limited in any way in any activities because of physical, mental, or emotional problems?". The vague nature of this question is its strength as well as its weakness. The words "any way" and "any activities" in the question are meant to capture as many disabilities as possible. However, due to the same vagueness, there is no way to determine if a disability is linked to a specific condition or disease such as diabetes.

Nevertheless, there are significantly higher percentages of people with diabetes answering "yes" to this question than people who do not have diabetes. Even when age was controlled for, there remained significant differences every year from 2003 to 2010 between the diabetes and non-diabetes populations. In 2010, the percentage of people answering "yes" among those with diabetes was 46.4 (CI 42.0-50.7) compared to the significantly lower percentage of 25.8 (CI 24.1-27.6) among people without diabetes.

Fig. 23: Any Impairment among Diabetes and Non-Diabetes Pop. in WV, 2003-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Any Impairment = Responding "Yes" to "Are you limited in any way in any activities because of physical, mental, or emotional problems?"

The second BRFSS disability question asks people if they "use special equipment, such as a cane, a wheelchair, a special bed, or a special telephone". Similar to the other disability-related question, this is a general question that provides no specific information regarding the cause or reason for the need to use special medical equipment.

Analysis of this question among diabetes and non-diabetes populations reveals statistically significant disparities in the percentage of those who require the use of specialized medical equipment. This trend continues to hold true when age is controlled for. In each of the years data was available, 2003-2010, the percentage of people who had to use special medical equipment was significantly higher among those with diabetes than among people without diabetes.

Fig. 24: Use of Special Medical Equipment among Diabetes and Non-Diabetes Pop. in WV, 2003-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Use of Medical Equipment = Responding "Yes" to "Do you have any health problem that requires you to use speical equipment, such as a cane, a wheelchair, a special bed, or a special telephone?"
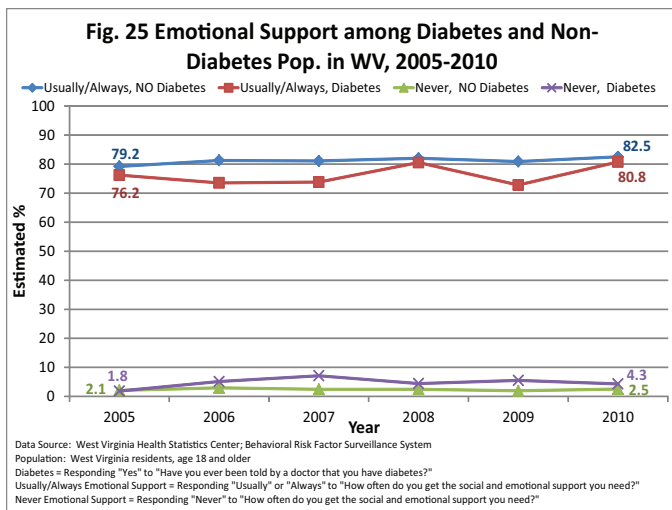
Overall, more people with diabetes claim to have some form of disability and require the use of special medical equipment than people who do not have diabetes.
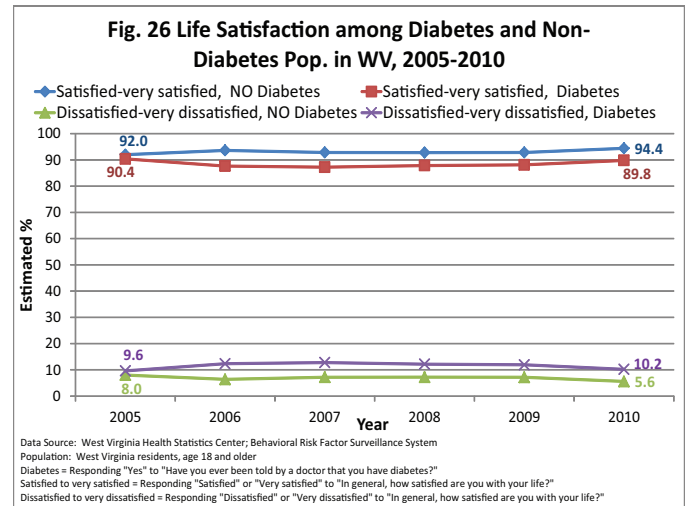
EMOTIONAL SUPPORT AND LIFE SATISFACTION

There is a large body of work giving proof to the ill effects of chronic stress on an individual's health. Perhaps most noteworthy are the Whitehall studies; longitudinal studies documenting the social determinants of health among the different socio-economic classes in Great Britain, led by Sir Michael Marmot. There are several approximate measures for gauging stress in a person's life. One such proxy measure is examining the levels of emotional and social support along with life satisfaction.

The BRFSS question for emotional and social support is, "How often do you get the social and emotional support you need?". For analysis, emotional support was broken into three categories: usually/always, sometimes/rarely, and never. While there were no meaningful differences observed in the 'sometimes/rarely' category, significant differences were seen in the other categories. In three out of the six years of data analyzed, people who did not have diabetes reported 'usually/always' receiving emotional and social support at significantly higher percentages than people who had diabetes. Additionally, in two out of six years, people with diabetes reported 'never' receiving emotional and social support at significantly higher percentages when compared to people who did not have diabetes. In all years, the data indicated people with diabetes received less emotional and social support.

9

Fig. 25 Emotional Support among Diabetes and Non-Diabetes Pop. in WV, 2005-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Usually/Always Emotional Support = Responding "Usually" or "Always" to "How often do you get the social and emotional support you need?"
Never Emotional Support = Responding "Never" to "How often do you get the social and emotional support you need?"

years analyzed, people with diabetes reported statistically significant higher percentages of being 'dissatisfied to very dissatisfied' with their lives when compared to those who did not have diabetes. In fact, while there was a slight increase in life dissatisfaction among people with diabetes, there was a decrease in dissatisfaction among those without diabetes

Fig. 26 Life Satisfaction among Diabetes and Non-Diabetes Pop. in WV, 2005-2010

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Satisfied to very satisfied = Responding "Satisfied" or "Very satisfied" to "In general, how satisfied are you with your life?"
Dissatisfied to very dissatisfied = Responding "Dissatisfied" or "Very dissatisfied" to "In general, how satisfied are you with your life?"

Life satisfaction is measured in BRFSS with the question, "In general, how satisfied are you with your life?". Two classifications were used when analyzing life satisfaction: satisfied to very satisfied and dissatisfied to very dissatisfied. The results indicated a higher level of life satisfaction among people who did not have diabetes and lower life satisfaction among people who did have diabetes. In five of the six years of data examined, people who did not have diabetes reported significantly higher percentages of being 'satisfied to very satisfied' with their lives as compared to people with diabetes. Following suit, in five of the six

Overall, people with diabetes have less emotional support and less life satisfaction than people who do not have diabetes.

DISCUSSION

There is no dispute - West Virginia carries a heavy burden of diabetes. Comparisons of WV and national diabetes prevalence estimates and diabetes-related mortality rates show significantly higher levels of diabetes disease and death in our state. Year after year, West Virginia is ranked among the top states with the highest prevalence of diabetes.[10] Acknowledging the severity of diabetes in WV, this review was designed to determine the health equity of diabetes in the state through an examination of various social determinants of health.

Health equity is a complex issue involving many facets of society, justice, the environment and how those factors influence the health of individuals. Measuring health equity through social determinants of health provides a quantifiable method to uncover diabetes-related health disparities. The data presented in this review gives evidence to the following significant disparity trends in health equity and diabetes in West Virginia:

- People with diabetes make less money than people without diabetes
- People with diabetes have less education than people without diabetes
- More people with diabetes are unable to work than people without diabetes
- The prevalence of diabetes is higher in the southern coal fields and portions of the Mid-Ohio Valley region
- Often, counties with higher diabetes prevalence have lower income levels
- More people with diabetes have a personal doctor or health care provider than people without diabetes
- More people with diabetes receive an annual routine check-up than those who do not have diabetes
- A higher prevalence of people with diabetes report they have an impairment that limits their activities
- More people with diabetes use special medical equipment than people who do not have diabetes
- People with diabetes have higher levels of life dissatisfaction

Dr. Tom Frieden, Director of the Centers for Disease control and Prevention, has written, "Interventions that address social determinants of health have the greatest potential public health benefit. Action on these issues needs the support of government and civil society if it is to be successful."[11] The Diabetes Prevention and Control Program (DPCP), part of

the Division of Health Promotion and Chronic Disease in West Virginia's Bureau for Public health, has made health equity an important component of its effort to reduce the burden of diabetes in West Virginia.

As part of this effort, the DPCP funds the WVU Office of Health Services Research in a Quality Improvement intervention with Federally Qualified Health Centers and Free Clinics serving at-risk and priority patient populations. The project is designed to improve chronic disease quality of care among the uninsured, underinsured, low-income and high-risk diabetes populations through meaningful use of electronic medical records (EMRs).   The intervention occurs through: 1) use of electronic patient registries and health records for tracking patient care; 2) fostering of quality improvement teams to analyze and apply clinical data to population level care; 3) use of clinical data to inform practice redesign and policy development; and 4) reinforcement of evidence-based care guidelines.[12] In a recent study conducted with over 25,000 adult diabetes patients and 46 health care practices, standards for diabetes care was 35 percentage points higher at facilities utilizing EMRs. Additionally, outcomes for patients were 15 percentage points higher in health care facilities using EMRs.[13]

 Another endeavor funded and monitored by the DPCP addressing diabetes-related health equity issues is the Chronic Disease Self-Management Program (CDSMP) and Diabetes Self-Management Program (DSMP) at Marshall University's Center for Rural Health. Utilizing this evidence based curriculum developed by Stanford University, master trainers are targeting counties throughout the state exhibiting the highest diabetes prevalence estimates. Knowing diabetes prevalence is often high in counties with low incomes, this intervention provides leader trainings (train-the-trainer courses) as well as CDSMP and DSMP workshops in regions with the greatest need as well as the greatest potential for positive health outcomes and reductions in health disparities.

Achieving health equity is a challenge not only for our state, but also for our country as well as the rest of the world. In their 2008 final report the World Health Organization's Commission on Social Determinants of Health identified three principals of action to achieve health equity. They are:

- **Improve the conditions of daily life – the circumstances in which people are born, grow, live, work, and age**
- **Tackle the inequitable distribution of power, money, and resources – the structural drivers of those conditions of daily life – globally, nationally, and locally**
- **Measure the problem, evaluate action, expand the knowledge base, develop a workforce that is trained in the social determinants of health, and raise public awareness about the social determinants of health[14]**

 Health policy and social policy are intrinsically linked; all social policies have the potential to impact health in one way or another. As demonstrated in this review, there are linkages to conditions and disease related death rates (diabetes in this example) to social factors such as income, education, age, race, geography, access to care, and disability. Only when policy makers adopt the principles outlined by the Commission on Social Determinants of Health will there be the opportunity for the necessary systems, policy, and environmental changes required to bring about health equity in West Virginia and elsewhere.

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Appendix A

Data Tables

TABLE 1 - DIABETES PREVALENCE IN WV AND USA				
YEAR	**WV**		**USA**	
	%	95% CI	%	95% CI
2001	8.8	7.7-9.9	6.8	6.6-6.9
2002	10.2	9.1-11.3	7.1	6.9-7.2
2003	9.8	8.7-10.9	7.5	7.3-7.7
2004	10.9	9.8-12.1	7.2	7.1-7.4
2005	10.4	9.4-11.5	7.8	7.6-7.9
2006	12.1	11.0-13.2	8.1	7.9-8.2
2007	10.8	9.9-11.8	8.6	8.4-8.7
2008	11.9	10.9-13.0	8.8	8.6-8.9
2009	12.4	11.3-13.4	9.1	8.9-9.2
2010	11.7	10.7-12.7	9.2	9.1-9.4

DATA SOURCES: WEST VIRGINIA HEALTH STATISTICS CENTER; BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA AND UNITED STATES RESIDENTS AGE 18 AND OLDER
DIABETES = RESPONDING "YES" TO "HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAVE DIABETES?"
NOTE: USA ESTIMATE INCLUDES TERRITORIES

TABLE 2 - WV AND USA DIABETES MORTALITY (AGE ADJUSTED RATE)				
YEAR	**WV**		**USA**	
	RATE	95% CI	RATE	95% CI
2000	35.7	32.9-38.4	24.9	24.8-25.1
2001	38.0	35.2-40.9	25.3	25.1-25.5
2002	39.4	36.5-42.3	25.5	25.4-25.7
2003	36.5	33.7-39.3	25.4	25.2-25.6
2004	38.8	36.0-41.7	24.6	24.4-24.8
2005	34.4	31.7-37.1	24.8	24.6-25.0
2006	33.4	30.7-36.1	23.4	23.3-23.6
2007	35.6	32.9-38.4	22.6	22.5-22.8
2008	32.5	29.9-35.2	21.9	21.7-22.1
2009	32.8	30.2-35.5	20.9	20.8-21.1

*MORTALITY RATES ARE PER 100,000 PEOPLE
DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER, NATIONAL CENTER FOR HEALTH STATISTICS; WV AND UNITED STATES VITAL STATISTICS
POPULATION: WEST VIRGINIA RESIDENTS, ALL AGES, VINTAGE 2009 CENSUS BUREAU; UNITED STATES RESIDENTS, ALL AGES, VINTAGE 2009 NCHS
BRIDGED-RACE POSTCENSAL POPULATION ESTIMATES
DIABETES DEATH = DEATH WITH THE UNDERLYING CAUSE OF DIABETES (ICD 10 CODES E10-14)

TABLE 3 - WV DIABETES PREVALENCE AMONG MALES AND FEMALES				
YEAR	**MALES**		**FEMALES**	
	%	95% CI	%	95% CI
2001	8.9	7.2-10.5	8.8	7.3-10.3
2002	10.3	8.6-12.1	10.1	8.6-11.5
2003	8.7	7.2-10.3	10.8	9.3-12.3
2004	11.6	9.7-13.5	10.3	8.9-11.6
2005	9.7	8.1-11.3	11.1	9.7-12.5
2006	12.8	11.0-14.6	11.5	10.1-12.9

2007	11.2	9.7-12.7	10.5	9.4-11.7
2008	12.1	10.5-13.8	11.8	10.4-13.2
2009	11.8	10.3-13.4	12.9	11.5-14.2
2010	11.8	10.2-13.4	11.5	10.3-12.8

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA RESIDENTS, AGE 18 AND OLDER
DIABETES = RESPONDING "YES" TO "HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAVE DIABETES?"

TABLE 4 - GENDER AMONG THOSE WITH DIABETES IN WV				
YEAR	MALES		FEMALES	
	%	95% CI	%	95% CI
2001	47.6	41.1-54.1	52.4	45.9-58.9
2002	48.4	42.6-54.1	51.6	45.9-57.4
2003	42.7	37.1-48.4	57.3	51.6-62.8
2004	51.1	45.5-56.6	48.9	43.4-54.5
2005	44.8	39.4-50.2	55.2	49.8-60.6
2006	50.9	46.0-55.8	49.1	44.2-54.0
2007	49.8	45.3-54.3	50.2	45.7-54.7
2008	49.1	44.4-53.8	50.9	46.2-55.6
2009	46.3	41.9-50.6	53.7	49.4-58.1
2010	49.1	44.7-53.4	50.9	46.6-55.3

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA RESIDENTS, AGE 18 AND OLDER
DIABETES = RESPONDING "YES" TO "HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAVE DIABETES?"

TABLE 5 - WV DIABETES MORTALITY BY GENDER (CRUDE RATE)				
YEAR	MALES		FEMALES	
	RATE	95% CI	RATE	95% CI
2000	37.3	33.3-41.3	46.0	41.6-50.3
2001	40.9	36.6-45.1	48.7	44.2-53.2
2002	41.6	37.3-45.9	51.9	47.2-56.5
2003	38.9	34.7-43.0	48.9	44.4-53.4
2004	45.3	40.8-49.7	48.9	44.4-53.4
2005	40.2	36.1-44.4	43.9	39.7-48.2
2006	40.4	36.2-44.6	42.1	38.0-46.3
2007	45.9	41.4-50.4	42.6	38.4-46.8
2008	42.5	38.2-46.8	39.3	35.3-43.3
2009	45.5	41.1-49.9	37.8	33.9-41.8

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER; BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA RESIDENTS, AGE 18 AND OLDER; CENSUS BUREAU VINTAGE 2009
DIABETES DEATH = DEATH WITH THE UNDERLYING CAUSE OF DIABETES (ICD 10 CODES E10-14)

TABLE 6 – WV DIABETES PREVALENCE BY AGE GROUP					
YEAR	AGE 18-24		AGE 25-34		AGE 35-44	
	%	95% CI	%	95% CI	%	95% CI
2001	0.0	--	1.3	0.2-2.4	4.7	2.7-6.8
2002	0.4	0.0-1.1	1.5	0.4-2.7	4.3	2.6-6.1
2003	1.4	0.0-4.0	2.8	1.2-4.4	5.4	3.3-7.4
2004	1.4	0.0-3.1	1.9	0.4-3.5	6.6	4.1-9.2

2005	0.8	0.0-2.5	2.6	1.1-4.1	8.0	5.5-10.4
2006	2.6	0.0-5.6	2.9	1.2-4.5	5.9	3.6-8.2
2007	1.1	0.0-2.6	3.6	1.8-5.4	5.2	3.2-7.1
2008	5.1	1.5-8.7	2.6	0.9-4.3	6.7	4.3-9.0
2009	3.3	0.0-6.5	2.8	1.2-4.3	7.2	4.8-9.5
2010	0.8	0.0-2.4	1.9	0.3-3.6	7.8	5.4-10.2

YEAR	AGE 45-54		AGE 55-64		AGE 65+	
	%	95% CI	%	95% CI	%	95% CI
2001	11.4	8.3-14.4	15.9	12.1-19.7	17.0	14.0-20.0
2002	11.5	8.7-14.4	20.0	15.9-24.0	20.8	17.6-23.8
2003	9.1	6.8-11.4	17.6	14.4-20.8	19.3	16.3-22.3
2004	10.6	8.0-13.2	19.4	16.0-22.8	22.1	18.9-25.3
2005	9.5	7.2-11.8	16.4	13.3-19.5	21.1	18.2-24.1
2006	12.1	9.5-14.6	20.4	17.4-23.5	23.5	20.6-26.4
2007	10.8	8.6-13.0	18.6	15.9-21.3	21.1	18.7-23.5
2008	12.3	9.9-14.7	17.6	14.9-20.2	22.8	20.2-25.5
2009	12.3	9.9-14.7	18.0	15.6-20.5	24.6	22.2-27.0
2010	11.8	9.3-14.3	20.1	17.4-22.8	21.3	19.0-23.5

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER; BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA RESIDENTS, AGE 18 AND OLDER
DIABETES = RESPONDING "YES" TO "HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAVE DIABETES?"

TABLE 7 – AGE DISTRIBUTION AMONG THOSE WITH DIABETES IN WV						
YEAR	AGE 18-24		AGE 25-34		AGE 35-44	
	%	95% CI	%	95% CI	%	95% CI
2001	0.0	--	2.4	0.3-4.4	9.8	5.7-14.0
2002	0.5	0.0-1.3	2.4	0.6-4.1	7.9	4.8-11.1
2003	1.7	0.0-5.1	4.4	1.9-6.9	9.7	6.2-13.3
2004	1.6	0.0-3.5	2.8	0.6-5.0	10.9	6.8-15.0
2005	1.0	0.0-2.9	3.9	1.6-6.1	13.2	9.3-17.2
2006	2.6	0.0-5.6	3.7	1.6-5.8	8.4	5.2-11.6
2007	1.1	0.0-2.7	5.2	2.6-7.8	8.0	5.1-11.0
2008	5.0	1.6-8.4	3.5	1.3-5.8	9.3	6.1-12.6
2009	3.0	0.0-6.0	3.6	1.6-5.6	9.6	6.5-12.7
2010	0.8	0.0-2.4	2.6	0.4-4.8	11.0	7.8-14.3
YEAR	AGE 45-54		AGE 55-64		AGE 65+	
	%	95% CI	%	95% CI	%	95% CI
2001	24.5	18.5-30.5	24.2	18.7-29.8	39.1	32.8-45.3
2002	22.2	17.1-27.3	27.5	22.2-32.7	39.5	34.1-44.9
2003	18.0	13.8-22.3	25.7	21.0-30.3	40.4	34.9-45.9
2004	19.3	14.8-23.8	25.8	21.2-30.3	39.7	34.4-45.0
2005	17.7	13.6-21.8	24.0	19.6-28.4	40.2	35.1-45.4
2006	19.4	15.4-23.3	26.9	22.8-30.9	39.1	34.5-43.7
2007	19.0	15.3-22.6	27.8	23.9-31.8	38.8	34.6-43.1
2008	19.6	16.0-23.3	24.2	20.5-27.9	38.3	33.9-42.7

| 2009 | 18.8 | 15.3-22.4 | 24.4 | 21.0-27.8 | 40.5 | 36.5-44.6 |
| 2010 | 18.8 | 15.1-22.5 | 29.0 | 25.2-32.8 | 37.8 | 33.8-41.7 |

TABLE 8 – WV DIABETES MORTALITY BY AGE (CRUDE RATE)					
YEAR	**AGE 64 AND UNDER**			**AGE 65+**	
	RATE	95% CI		RATE	95% CI
2000	12.2	10.5-14.0		205.1	188.3-222.0
2001	12.8	11.0-14.6		221.6	204.1-239.1
2002	15.7	13.7-17.7		218.8	201.4-236.2
2003	13.9	12.0-15.8		209.8	192.8-226.8
2004	14.6	12.7-16.5		226.6	208.9-244.3
2005	13.5	11.7-15.3		199.9	183.3-216.5
2006	13.5	11.7-15.4		193.3	177.0-209.6
2007	15.2	13.2-17.1		202.1	185.6-218.7
2008	14.3	12.4-16.1		183.8	168.1-199.5
2009	15.6	13.6-17.6		180.1	164.6-195.6

TABLE 9 – WV DIABETES PREVALENCE BY RACE					
YEAR	**WHITE/CAUCASIAN**			**BLACK/AFRICAN AMERICAN**	
	%	95% CI		%	95% CI
2001	8.8	7.6-9.9		9.5	3.4-15.7
2002	10.1	8.9-11.2		11.3	3.8-18.9
2003	9.8	8.7-10.9		9.6	2.0-17.3
2004	10.9	9.7-12.1		8.3	2.9-13.7
2005	10.4	9.3-11.4		13.3	5.7-21.0
2006	12.2	11.1-13.4		12.0	4.6-19.3
2007	10.9	9.9-11.9		12.0	4.7-19.3
2008	12.0	10.9-13.1		8.2	3.1-13.3
2009	12.3	11.2-13.3		17.2	8.5-25.9
2010	11.4	10.4-12.4		19.7	10.7-28.8

TABLE 10 – WV DIABETES MORTALITY RATE BY RACE (CRUDE RATE)					
YEAR	**WHITE/CAUCASIAN**			**BLACK/AFRICAN AMERICAN**	
	RATE	95% CI		RATE	95% CI
2000	41.1	38.1-44.1		81.3	59.8-108.2
2001	44.8	41.7-48.0		65.5	46.4-89.9
2002	46.2	43.0-49.4		87.1	64.8-114.5
2003	43.8	40.7-46.9		72.3	52.4-97.4

Year	%	95% CI	%	95% CI
2004	46.7	43.5-50.0	81.3	60.1-107.5
2005	41.5	38.4-44.5	82.0	60.8-108.1
2006	41.3	38.3-44.3	57.8	40.5-80.0
2007	43.9	40.7-47.0	72.4	53.0-96.6
2008	41.3	38.2-44.3	47.8	32.5-67.8
2009	42.0	38.9-45.0	51.2	35.4-71.5

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER, WEST VIRGINIA VITAL STATISTICS
POPULATION: WEST VIRGINIA RESIDENTS; CRUDE RATE; CENSUS BUREAU VINTAGE 2009
DIABETES DEATH = DEATH WITH THE UNDERLYING CAUSE OF DIABETES (ICD 10 CODES E10-14)
NOTE: RACE DATA IS DRAWN FROM THE CERTIFICATE OF DEATH

TABLE 11 – ANNUAL HOUSEHOLD INCOME				
YEAR	**LESS THAN $25,000 - NO DIABETES**		**LESS THAN $25,000 - DIABETES**	
	%	95% CI	%	95% CI
2001	38.3	36.2-40.5	51.1	44.0-58.2
2002	34.9	32.9-37.0	57.2	51.1-63.4
2003	37.3	35.2-39.3	56.5	50.5-62.6
2004	36.3	34.2-38.4	50.8	44.8-56.7
2005	36.9	34.8-39.0	51.8	46.0-57.6
2006	31.6	29.6-33.6	51.6	46.3-56.9
2007	30.8	29.0-32.7	48.2	43.3-53.1
2008	28.6	26.7-30.5	47.1	41.9-52.3
2009	26.0	24.3-27.8	42.9	38.4-47.5
2010	27.2	25.3-29.2	41.5	36.9-46.2
YEAR	**$50,000+ - NO DIABETES**		**$50,000+ - DIABETES**	
	%	95% CI	%	95% CI
2001	25.3	23.4-27.3	13.9	9.2-18.7
2002	27.8	25.8-29.8	18.4	13.2-23.7
2003	28.9	26.9-31.0	16.1	11.7-20.5
2004	31.9	29.8-33.9	16.8	12.0-21.7
2005	32.2	30.2-34.3	16.9	12.6-21.3
2006	35.7	33.6-37.8	22.4	17.6-27.3
2007	38.2	36.2-40.2	22.4	18.1-26.7
2008	39.8	37.7-42.0	23.7	19.2-28.3
2009	36.4	34.4-38.3	19.2	15.6-22.8
2010	36.5	34.2-38.7	22.2	18.0-26.4

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER; BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA RESIDENTS AGE 18 AND OLDER
DIABETES = RESPONDING "YES" TO "HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAVE DIABETES?"
ANNUAL INCOME = ANNUAL HOUSEHOLD INCOME FROM ALL SOURCES

TABLE 12 – EDUCATION				
YEAR	**LESS THAN HIGH SCHOOL -NO DIABETES**		**LESS THAN HIGH SCHOOL - DIABETES**	
	%	95% CI	%	95% CI
2001	16.5	15.0-18.0	37.2	30.9-43.5
2002	15.9	14.3-17.4	32.7	27.3-38.1
2003	17.4	15.8-19.0	30.3	25.1-35.4
2004	16.1	14.6-17.6	28.9	24.0-33.8
2005	16.8	15.2-18.4	25.7	21.0-30.4

Year	%	95% CI	%	95% CI
2006	13.9	12.5-15.4	26.1	21.9-30.2
2007	12.8	11.5-14.1	25.4	21.5-29.4
2008	13.4	11.9-14.8	20.8	17.2-24.4
2009	12.3	11.0-13.6	22.9	19.2-26.6
2010	13.0	11.6-14.5	22.0	18.5-25.5

Year	SOME POST HIGH SCHOOL - NO DIABETES		SOME POST HIGH SCHOOL - DIABETES	
	%	95% CI	%	95% CI
2001	23.8	22.0-25.7	19.6	14.5-24.7
2002	23.1	21.3-24.9	15.7	11.6-19.8
2003	23.3	21.5-25.0	19.8	14.8-24.8
2004	23.4	21.6-25.3	15.1	11.1-19.0
2005	22.3	20.6-24.1	19.1	14.9-23.2
2006	23.5	21.6-25.4	20.3	16.2-24.3
2007	25.1	23.3-26.8	17.8	14.5-21.1
2008	24.3	22.5-26.1	19.9	16.3-23.5
2009	25.4	23.7-27.2	19.9	16.4-23.4
2010	25.7	23.8-27.7	19.2	15.5-22.9

Year	COLLEGE GRADUATE - NO DIABETES		COLLEGE GRADUATE - DIABETES	
	%	95% CI	%	95% CI
2001	16.6	15.1-18.0	9.4	6.0-12.9
2002	20.0	18.4-21.6	14.4	10.0-18.9
2003	19.1	17.5-20.6	11.4	7.9-14.9
2004	21.6	20.0-23.2	14.4	10.3-18.5
2005	21.1	19.4-22.7	12.9	9.4-16.3
2006	23.1	21.4-24.8	12.0	8.8-15.1
2007	21.2	19.7-22.7	13.6	10.5-16.6
2008	22.4	20.8-24.0	15.0	11.6-18.5
2009	21.7	20.2-23.2	14.5	11.6-17.4
2010	20.7	19.1-22.3	12.6	9.8-15.4

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER; BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA RESIDENTS AGE 18 AND OLDER
DIABETES = RESPONDING "YES" TO "HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAVE DIABETES?"
EDUCATION LEVEL = ANSWER TO "WHAT IS THE HIGHEST GRADE OR YEAR OF SCHOOL YOU COMPLETED?"

TABLE 13 – EMPLOYMENT				
Year	EMPLOYED - NO DIABETES		EMPLOYED - DIABETES	
	%	95% CI	%	95% CI
2001	56.5	54.4-58.6	35.6	29.2-41.9
2002	56.4	54.4-58.5	31.3	25.8-36.8
2003	52.9	50.9-55.0	24.2	19.3-29.0
2004	55.5	53.4-57.6	26.1	20.9-31.4
2005	55.4	53.4-57.5	28.2	23.3-33.1
2006	55.1	53.0-57.2	27.1	22.5-31.7
2007	54.7	52.8-56.7	31.2	26.8-35.7
2008	55.3	53.3-57.3	29.1	24.7-33.6
2009	53.7	51.8-55.6	28.5	24.3-32.6
2010	54.0	51.8-56.1	28.2	24.0-32.4

Year	Unemployed - No Diabetes		Unemployed - Diabetes	
	%	95% CI	%	95% CI
2001	4.0	3.0-4.9	2.4	0.7-4.1
2002	3.7	2.9-4.5	3.3	1.1-5.5
2003	5.8	4.6-7.0	3.5	1.5-5.4
2004	4.8	3.7-5.8	0.8	0.0-1.6
2005	4.4	3.4-5.4	3.2	0.8-5.5
2006	4.9	3.8-6.0	2.9	1.0-4.8
2007	5.5	4.3-6.6	0.5	0.0-1.0
2008	4.6	3.6-5.6	4.6	1.9-7.3
2009	6.6	5.4-7.8	3.4	1.6-5.1
2010	6.9	5.6-8.2	2.4	1.0-3.8
Year	Unable to Work - No Diabetes		Unable to Work - Diabetes	
	%	95% CI	%	95% CI
2001	6.0	5.1-6.9	15.7	11.1-20.2
2002	6.6	5.6-7.6	21.8	16.8-26.7
2003	8.1	7.0-9.2	18.5	14.4-22.6
2004	7.7	6.6-8.7	21.5	17.2-25.8
2005	9.5	8.4-10.7	20.8	16.5-25.1
2006	8.4	7.3-9.5	23.0	18.9-27.1
2007	7.9	7.0-8.9	21.6	17.8-25.3
2008	8.3	7.3-9.2	24.1	20.2-28.1
2009	8.8	7.7-9.8	19.6	16.2-23.1
2010	9.0	7.8-10.2	23.6	19.8-27.4

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Employed = Responding "Employed for wages" or "Self-employed" ; Unemployed = Responding "Out of work for more than one year" or "Out of work for less than one year" ; Unable to Work = Responding "Unable to work" in BRFSS Employment Status question

TABLE 14 – GEOGRAPHY: 2006-2010 COUNTY LEVEL DIABETES PREVALENCE		
County/Group	%	95% CI
Logan	17.7	13.9 - 21.5
McDowell	16.7	11.9 - 21.5
Wyoming	16.4	11.8 - 21.0
Boone, Lincoln	14.0	11.0 - 17.1
Doddridge, Lewis, Ritchie	13.5	9.5 - 17.4
Cabell	13.2	10.6 - 15.8
Brooke	13.1	8.9 - 17.4
Jackson, Wirt	13.0	9.7 - 16.3
Fayette	12.8	9.3 - 16.4
Harrison	12.8	10.3 - 15.3
Upshur	12.8	9.0 - 16.7
Mercer	12.7	10.0 - 15.4
Raleigh	12.2	9.4 - 15.1
Mason	12.1	8.4 - 15.8
Hancock	12.0	8.7 - 15.4
Greenbrier, Summers, Monroe	12.0	9.7 - 14.3

County		
Wood	11.5	9.5 - 13.5
Wayne	11.0	8.2 - 13.8
Mingo	10.9	7.6 - 14.1
Pleasants, Tyler, Wetzel	10.8	7.4 - 14.2
Kanawha	10.7	9.4 - 12.0
Preston, Tucker	10.7	7.4 - 14.0
Braxton, Nicholas, Webster	10.6	8.4 - 12.8
Calhoun, Clay, Gilmer, Roane	10.5	8.1 - 12.9
Ohio	10.1	7.6 - 12.6
Grant, Mineral	9.5	6.7 - 12.4
Putnam	9.3	6.8 - 11.8
Marshall	9.2	6.1 - 12.3
Hampshire, Morgan	9.1	6.3 - 11.9
Hardy, Pendleton, Pocahontas	9.0	6.3 - 11.7
Jefferson	9.0	6.2 - 11.8
Marion	8.9	6.7 - 11.1
Barbour, Taylor	8.4	5.7 - 11.0
Berkeley	8.3	6.6 - 10.0
Randolph	7.9	4.9 - 11.0
Monongalia	7.5	5.4 - 9.7

DATA SOURCE: WEST VIRGINIA HEALTH STATISTICS CENTER; BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM
POPULATION: WEST VIRGINIA RESIDENTS, AGE 18 AND OLDER
DIABETES = RESPONDING "YES" TO "HAVE YOU EVER BEEN TOLD BY A DOCTOR THAT YOU HAVE DIABETES?"
NOTE: SOME COUNTIES WERE GROUPED FOR ANALYSIS

TABLE 15 – GEOGRAPHY: 2010 PER CAPITA PERSONAL INCOME BY COUNTY			
COUNTY	PER CAPITA INCOME	COUNTY	PER CAPITA INCOME
Kanawha	$40,824	Wayne	$28,031
Putnam	$38,326	Ritchie	$27,887
Ohio	$37,460	Upshur	$27,840
Harrison	$37,403	Fayette	$27,833
Jefferson	$36,892	Tucker	$27,763
Monongalia	$36,148	Preston	$27,352
Marion	$34,702	Boone	$27,333
Raleigh	$34,475	Wyoming	$27,271
Cabell	$33,521	Jackson	$26,326
Marshall	$33,375	Taylor	$26,185
Lewis	$32,674	Mason	$25,922
Wood	$32,100	McDowell	$25,557
Mercer	$31,492	Monroe	$25,450
Logan	$31,159	Braxton	$25,361
Greenbrier	$31,017	Hardy	$25,301
Morgan	$30,790	Tyler	$25,299
Berkeley	$30,789	Barbour	$25,231
Pleasants	$30,521	Webster	$24,359
Nicholas	$30,472	Roane	$24,197

Pendleton	$30,092	Lincoln	$24,133
Mineral	$30,015	Summers	$23,911
Wetzel	$29,872	Hampshire	$23,421
Hancock	$29,819	Clay	$22,464
Pocahontas	$29,708	Calhoun	$21,781
Randolph	$29,569	Wirt	$21,768
Brooke	$29,542	Gilmer	$21,462
Mingo	$29,202	Doddridge	$19,563
Grant	$28,939	West Virginia Average: $32,065	

TABLE 16 – ACCESS TO CARE				
YEAR	NO HEALTH CARE COVERAGE - NO DIABETES		NO HEALTH CARE COVERAGE - DIABETES	
	%	95% CI	%	95% CI
2001	24.4	22.3-26.6	14.1	8.6-19.7
2002	22.0	19.9-24.0	19.6	13.5-25.7
2003	24.0	21.9-26.1	18.3	12.4-24.2
2004	23.1	21.1-25.2	17.5	10.9-24.1
2005	22.8	20.7-25.0	15.0	9.9-20.1
2006	19.3	17.2-21.3	13.8	9.0-18.6
2007	21.2	19.3-23.2	12.7	8.4-17.0
2008	20.4	18.3-22.5	14.6	9.9-19.4
2009	22.2	20.2-24.2	15.5	9.8-21.2
2010	22.1	19.7-24.5	14.8	10.2-19.4
YEAR	NO PERSONAL DOCTOR - NO DIABETES		NO PERSONAL DOCTOR - DIABETES	
	%	95% CI	%	95% CI
2001	23.8	21.9-25.7	4.2	1.8-6.5
2002	23.8	21.9-25.6	8.6	5.2-12.0
2003	23.5	21.6-25.4	4.3	1.8-6.7
2004	24.9	23.1-26.8	6.2	3.2-9.2
2005	24.5	22.6-26.5	4.4	2.4-6.4
2006	22.4	20.5-24.3	5.4	3.0-7.9
2007	23.4	21.6-25.2	6.7	4.2-9.3
2008	24.1	22.1-26.0	6.3	3.7-9.0
2009	23.5	21.7-25.3	6.6	3.6-9.6
2010	26.2	24.0-28.3	8.2	5.4-11.1
YEAR	NOT AFFORD MEDICAL CARE - NO DIABETES		NOT AFFORD MEDICAL CARE - DIABETES	
	%	95% CI	%	95% CI
2003	17.9	16.3-19.5	17.3	12.9-21.7
2004	19.5	17.8-21.2	18.3	13.7-22.8
2005	18.8	17.2-20.5	16.0	12.0-20.0
2006	17.2	15.6-18.9	16.6	12.9-20.4
2007	17.2	15.6-18.7	16.5	12.9-20.1
2008	18.1	16.4-19.7	17.2	13.4-21.0
2009	18.4	16.9-20.0	14.9	11.8-18.1
2010	17.8	16.0-19.6	16.7	13.3-20.1

Year	No Annual Routine Check-Up - No Diabetes		No Annual Routine Check-Up - Diabetes	
	%	95% CI	%	95% CI
2005	30.9	28.9-32.9	7.8	5.1-10.5
2006	29.0	27.0-31.0	6.5	4.0-9.0
2007	28.1	26.3-29.9	6.8	4.2-9.4
2008	26.2	24.2-28.1	6.4	3.9-8.9
2009	26.2	24.4-28.1	8.8	5.6-12.0
2010	28.7	26.5-30.9	7.0	4.5-9.4

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
No Health Care Coverage = Responding "No" to "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMO's, or government plans such as Medicare?"
Could not afford medical care = Responding "Yes" to "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?"
No Personal Doctor = Responding "No" to "Do you have one person you think of as your personal doctor or health care provider?"
No routine check-up= Indicating more than one year or "Never" to "About how long has it been since you last visited a doctor for a routine check-up?"

TABLE 17 – DISABILITY

Year	Any Impairment - No Diabetes		Any Impairment - Diabetes	
	%	95% CI	%	95% CI
2003	23.9	22.2-25.6	49.8	44.1-55.5
2004	23.0	21.3-24.6	47.7	42.2-53.2
2005	24.7	23.0-26.5	50.2	44.8-55.5
2006	24.1	22.4-25.8	50.7	45.8-55.6
2007	23.5	22.0-25.1	45.8	41.3-50.3
2008	26.3	24.6-28.0	53.7	49.0-58.4
2009	23.9	22.3-25.5	49.4	45.1-53.8
2010	25.8	24.1-27.6	46.4	42.0-50.7

Year	Use Medical Equipment- No Diabetes		Use Medical Equipment- Diabetes	
	%	95% CI	%	95% CI
2003	6.7	5.8-7.7	25.0	20.3-29.7
2004	6.8	5.9-7.7	24.1	19.7-28.6
2005	7.8	6.8-8.8	25.2	20.6-29.8
2006	8.4	7.4-9.4	28.7	24.5-33.0
2007	7.7	6.9-8.6	23.4	19.7-27.1
2008	9.0	8.0-9.9	25.0	21.1-28.8
2009	8.1	7.1-9.0	25.6	21.9-29.3
2010	8.5	7.4-9.5	26.1	22.3-29.9

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Any Impairment = Responding "Yes" to "Are you limited in any way in any activities because of physical, mental, or emotional problems?"
Use of Medical Equipment = Responding "Yes" to "Do you have any health problem that requires you to use special equipment, such as a cane, a wheelchair, a special bed, or a special telephone?"

TABLE 18 – EMOTIONAL SUPPORT

Year	Usually/Always Supported - No Diabetes		Usually/Always Supported - Diabetes	
	%	95% CI	%	95% CI
2005	79.2	77.6-80.9	76.2	71.5-80.9
2006	81.3	79.6-82.9	73.5	69.2-77.9

Year	%	95% CI	%	95% CI
2007	81.1	79.5-82.7	73.8	69.9-77.7
2008	82.0	80.4-83.6	80.5	77.1-84.0
2009	80.9	79.4-82.4	72.8	68.8-76.8
2010	82.5	80.9-84.1	80.8	77.5-84.1
Year	**Never Supported - No Diabetes**		**Never Supported - Diabetes**	
	%	95% CI	%	95% CI
2005	2.1	1.5-2.6	1.8	0.6-3.1
2006	2.9	2.3-3.6	5.1	3.0-7.3
2007	2.4	1.8-3.0	7.1	4.7-9.5
2008	2.5	1.9-3.1	4.4	2.7-6.1
2009	1.9	1.5-2.4	5.5	3.7-7.4
2010	2.5	1.9-3.2	4.3	2.7-5.9

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Usually/Always Emotional Support = Responding "Usually" or "Always" to "How often do you get the social and emotional support you need?"
Never Emotional Support = Responding "Never" to "How often do you get the social and emotional support you need?"

Table 19 – Life Satisfaction				
Year	**Satisfied to Very Satisfied - No Diabetes**		**Satisfied to Very Satisfied - Diabetes**	
	%	95% CI	%	95% CI
2005	92.0	90.8-93.1	90.4	87.3-93.5
2006	93.6	92.6-94.6	87.7	84.4-91.0
2007	92.8	91.8-93.8	87.2	84.3-90.1
2008	92.8	91.7-93.9	87.8	84.8-90.8
2009	92.8	91.9-93.8	88.1	85.1-91.1
2010	94.4	93.4-95.4	89.8	87.1-92.5
Year	**Dissatisfied to Very Dissatisfied - No Diabetes**		**Dissatisfied to Very Dissatisfied - Diabetes**	
	%	95% CI	%	95% CI
2005	8.0	6.9-9.2	9.6	6.5-12.7
2006	6.4	5.4-7.4	12.3	9.0-15.6
2007	7.2	6.2-8.2	12.8	9.9-15.7
2008	7.2	6.1-8.3	12.2	9.2-15.2
2009	7.2	6.2-8.1	11.9	8.9-14.9
2010	5.6	4.6-6.6	10.2	7.5-12.9

Data Source: West Virginia Health Statistics Center; Behavioral Risk Factor Surveillance System
Population: West Virginia residents, age 18 and older
Diabetes = Responding "Yes" to "Have you ever been told by a doctor that you have diabetes?"
Satisfied to very satisfied = Responding "Satisfied" or "Very satisfied" to "In general, how satisfied are you with your life?"
Dissatisfied to very dissatisfied = Responding "Dissatisfied" or "Very dissatisfied" to "In general, how satisfied are you with your life?"

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