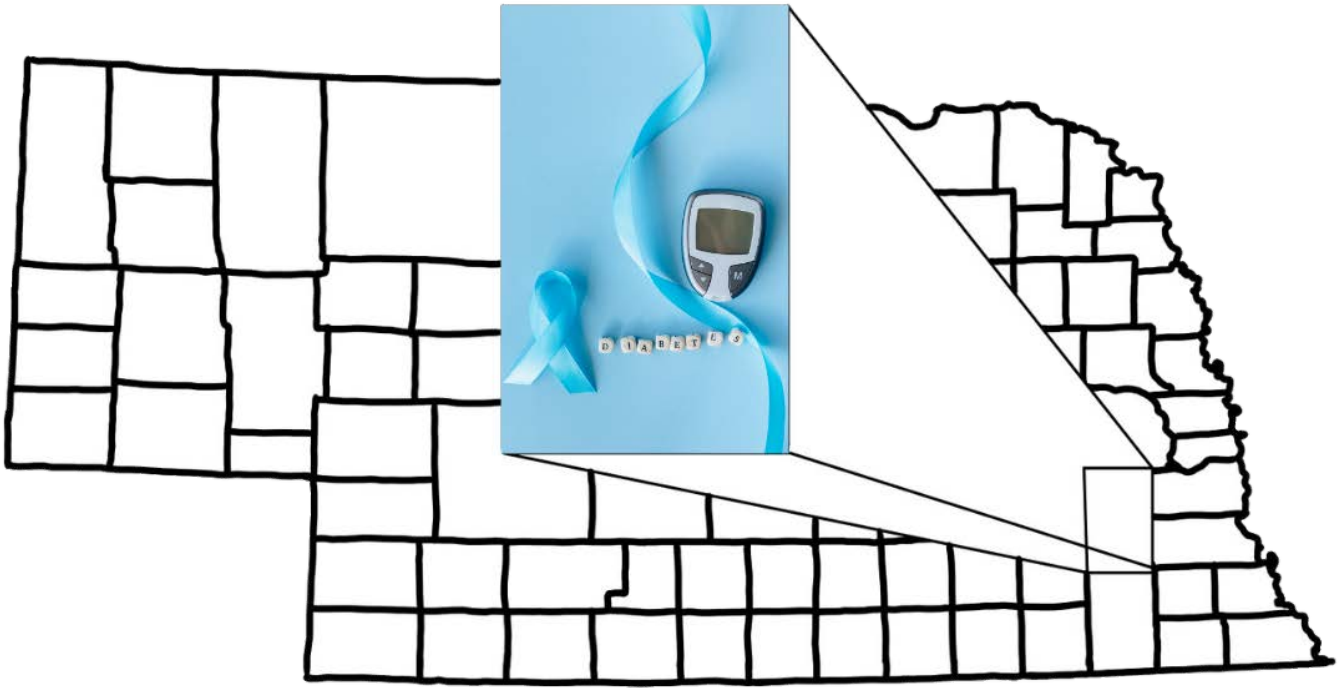
Lancaster County
Diabetes Report 2016-2020



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Lincoln-Lancaster County Health Department
Lincoln, Nebraska

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Introduction

Diabetes Mellitus is a metabolic disorder in which there is either an insufficient amount of insulin produced by the pancreas, or an underutilization of insulin by the body, resulting in increased sugars in the blood. There are three main types of Diabetes Mellitus: Type 1, Type 2, and gestational diabetes. Type 1 diabetes is an autoimmune disorder where the pancreas does not produce enough, or any, insulin. Type 1 diabetes makes up roughly 5-10% of all diabetes cases and is often called juvenile diabetes because it is usually detected and diagnosed in childhood. Type 2 diabetes is caused by an oversaturation of insulin, leading to insulin resistance. Type 2 diabetes makes up 90-95% of all diabetes cases and is often diagnosed later in life, although it is becoming more common for children and adolescents to be diagnosed with type 2 diabetes. Gestational diabetes is similar to type 2 diabetes, but occurs exclusively in pregnant women and often, but not always, goes away after the birth of the infant. In this report, all cases of diabetes are assumed to be type 2 diabetes based on the National Institute of Health statistics assertion that type 2 diabetes accounts for 90-95% of all diabetes cases.

Diabetes, especially uncontrolled, is associated with a whole host of health complications including an increased risk of strokes, high blood pressure, myocardial infarctions, nephropathy, neuropathy, and retinopathy. In addition to the possible health complications, diabetes creates a financial burden as well. It is estimated that those with diabetes spend roughly 2.3 times as much on medical expenditures than their non-diabetic counterparts. The Centers for Disease Control and Prevention (CDC) estimated that the total cost of diabetes in the United States in 2017 was $327 billion.

The purpose of this report is to highlight the prevalence rates and risk of diabetes for multiple different categorical demographic variables for Lancaster County from 2016 to 2020. This report will also examine the changes in prevalence rates and risk of diabetes from 2005-2020 in an effort to identify populations that have the highest prevalence or risk of diabetes.

Data Source and Data Analysis

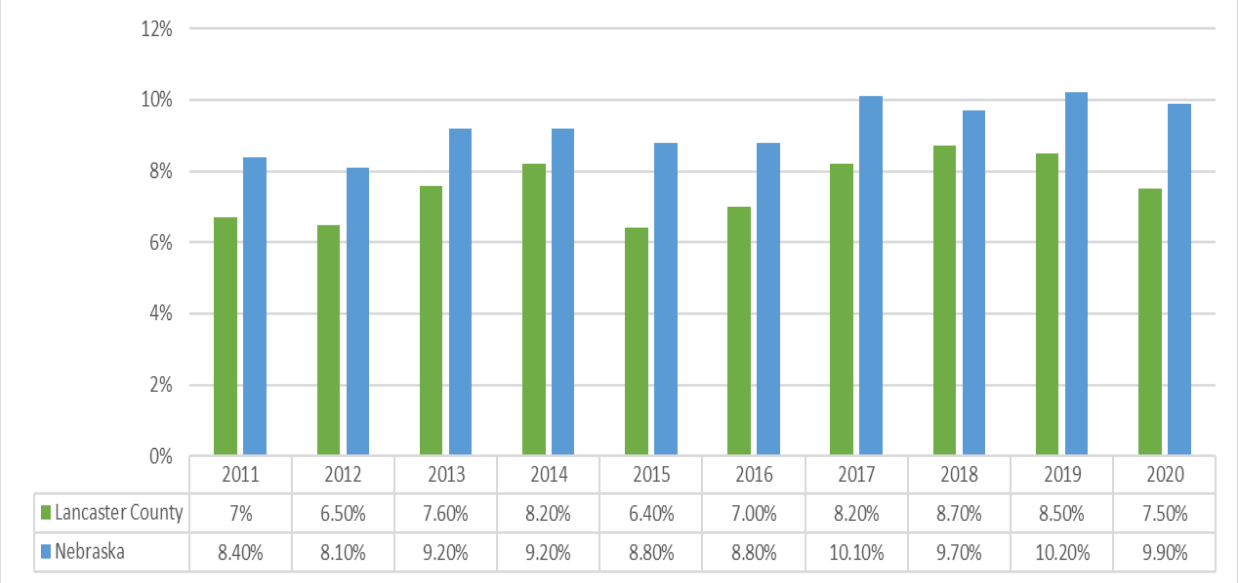
In Lancaster County there is no specific surveillance system that focuses on diabetes diagnosis, which makes it hard to understand the burden of diabetes in the County. The Behavior Risk Factor Surveillance System (BRFSS), which was designed by the CDC with the State in 1986, collects self-reported health risk behavior information from adults 18 years or older. The BRFSS data collected from 2016-2020 was used to determine the prevalence rates and risk of diabetes in Lancaster County. The following variables were considered for analytical purposes: diabetes question (Have you ever been told by a doctor/nurse that you have diabetes?), age, gender, race, ethnicity (Hispanic/non-Hispanic), education level, body mass index (BMI), and income level. All data was weighted to provide data that approximated the population of Lancaster County.

Section A: Diabetes Prevalence in 2020

Diabetes Multiyear

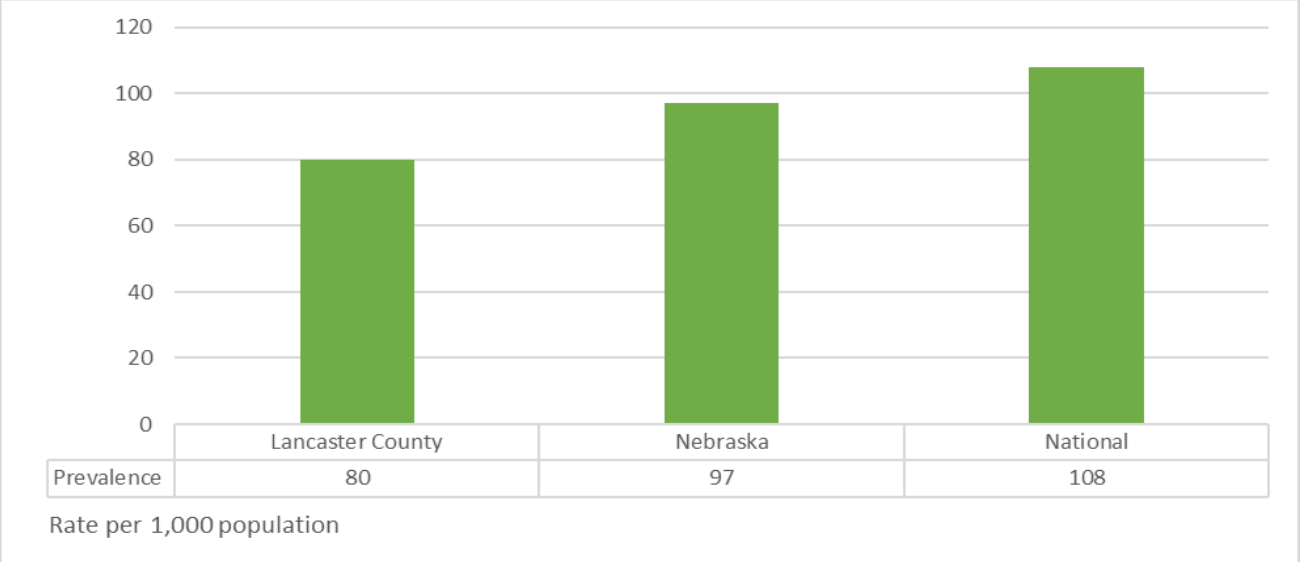
Between 2011 and 2020, both the State of Nebraska and Lancaster County have seen an increase in the prevalence of diabetes. In 2011, 7% of Lancaster County residents and 8.4% of Nebraskans had been diagnosed with diabetes. By 2020 those numbers had increased to 7.5% and 9.9%, respectively, and are predicted to continue to increase. Between 2016 and 2020, an estimated 80 out of every 1,000 adults 18 years and older had been diagnosed with diabetes in Lancaster County, as seen in Figure 2. In the same time period, the average prevalence in Nebraska and the United States was 97 out of every 1,000 adults and 108 out of every 1,000 adults, respectively. While Lancaster County may have the smallest prevalence rate of the three locations, the prevalence rate works out to 8% of the total Lancaster County population.

Figure 1: Percentage of adults 18 and older who report that they have ever been told by a doctor, nurse, or other health professional that they have diabetes (excluding pregnancy)
Lancaster County, Nebraska
2011-2020



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Lancaster County	7%	6.50%	7.60%	8.20%	6.40%	7.00%	8.20%	8.70%	8.50%	7.50%
Nebraska	8.40%	8.10%	9.20%	9.20%	8.80%	8.80%	10.10%	9.70%	10.20%	9.90%

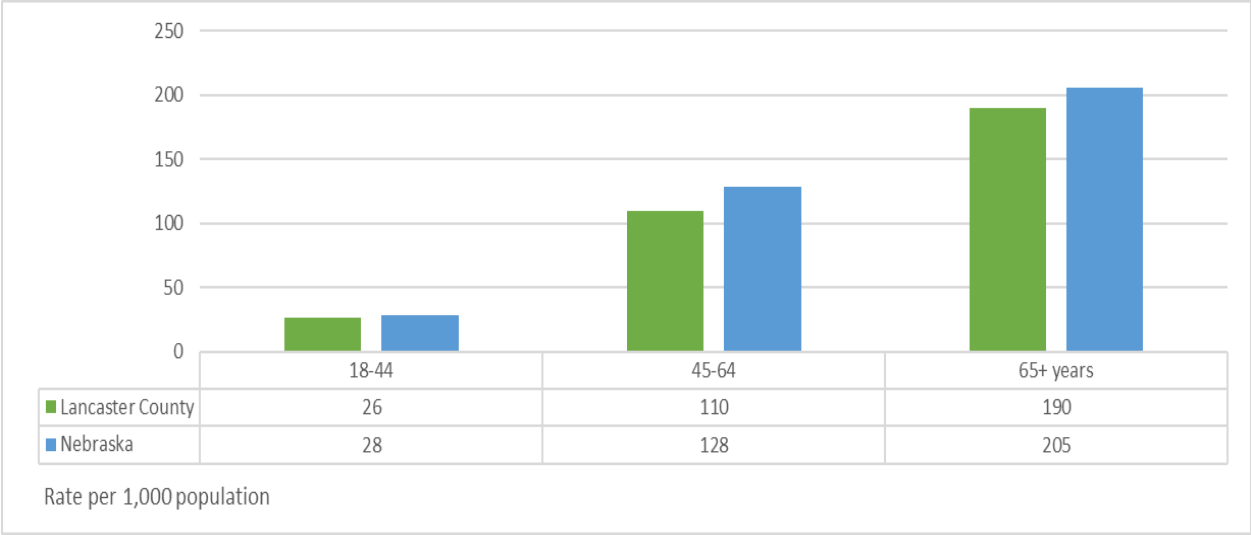
Figure 2: Self-Reported Diabetes Prevalence
Lancaster County, Nebraska, United States
2016-2020



Diabetes and Age

The total sample gathered was divided into three age categories, as defined by the National Institute of Health (NIH): 18-44 years old, 45-64 years old, and 65 years or older. The average prevalence rates for each of the three categories for both Lancaster County and Nebraska are shown below in Figure 3. In Lancaster County, the average prevalence rate was 26 per 1,000 adults for 18-44 year-olds, 110 per 1,000 adults 45-64 years old, and 190 per 1,000 adults 65 years or older. Overall, the prevalence rates for Nebraska as a whole are slightly higher than those for Lancaster County with prevalence rates of 28 per 1,000 adults for 18-44 year-olds, 128 per 1,000 adults 45-64 years old, and 205 per 1,000 adults 65 years or older. These results indicate a linear relationship between age and diabetes prevalence where, as age increases, we also see an increase in the prevalence of diabetes.

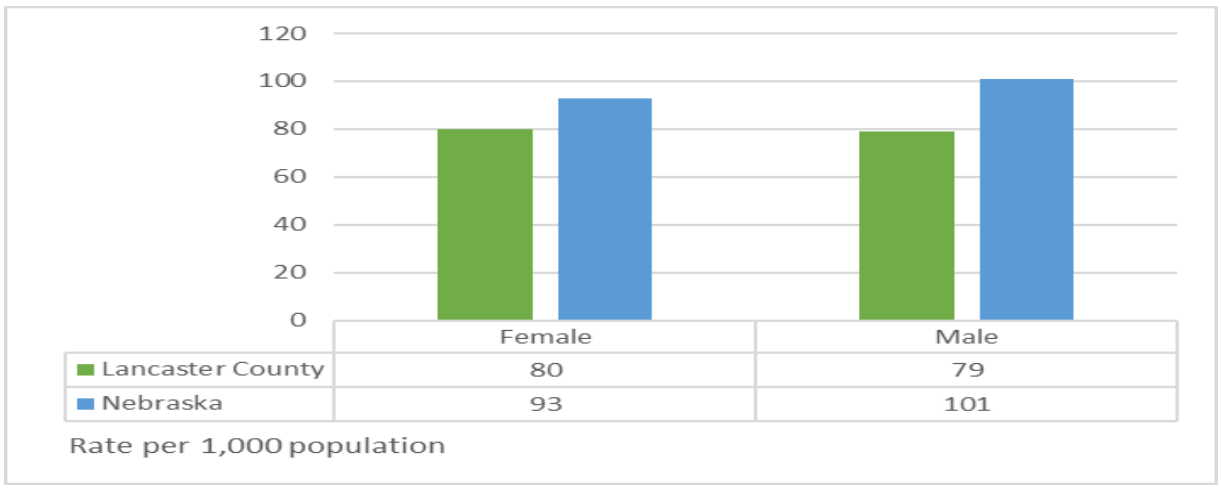
Figure 3: Self-Reported Diabetes Prevalence by Age
2016-2020



Diabetes and Gender

In Figure 4, we see the difference in prevalence rates between males and females in both Lancaster County and the State of Nebraska from 2016 to 2020. In Lancaster County, the prevalence of diabetes was almost identical with a rate of 80 per 1,000 female adults and 79 per 1,000 male adults. In the State of Nebraska, there was a slight disparity between the genders with prevalence rates of 93 per 1,000 female adults and 101 per 1,000 male adults.

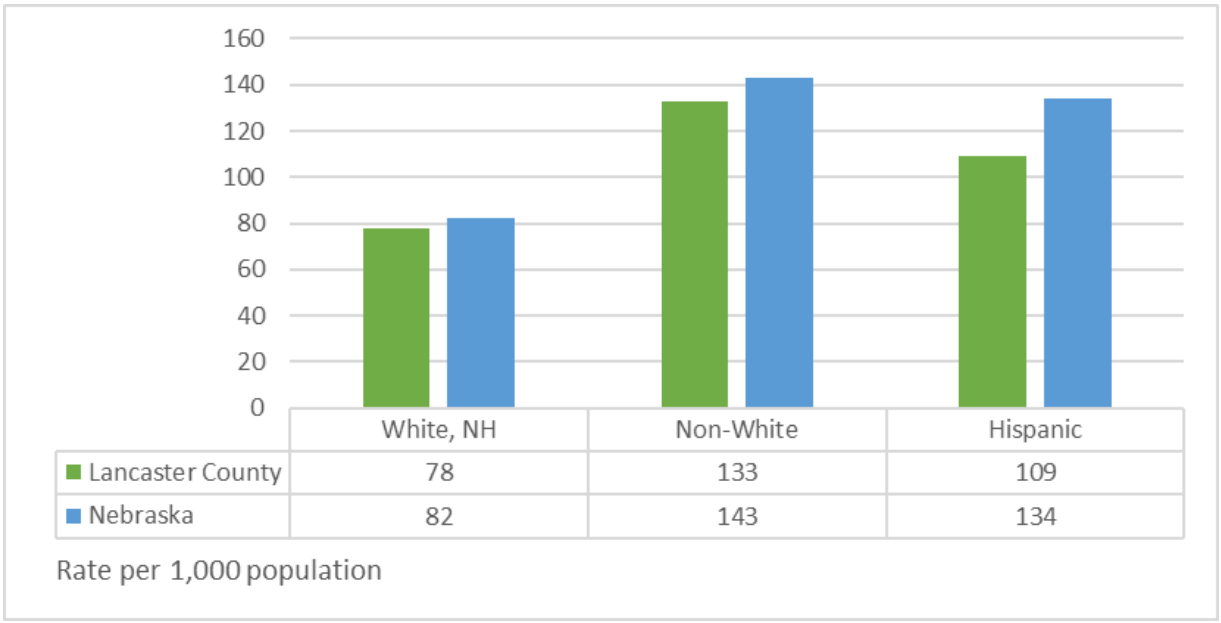
Figure 4: Self-Reported Diabetes Prevalence by Gender
2016-2020



Diabetes and Race and Ethnicity

From 2016 to 2020 the prevalence of diabetes among Whites in Lancaster County was 78 per 1,000 adults, while the prevalence for Non-Whites was 133 per 1,000 adults (Figure 5). For the State of Nebraska, those rates increased to 82 per 1,000 White adults and 143 per 1,000 Non-White adults. These results reflect that diabetes is more prevalent in African American, Asian America, Hispanic American, and Native American populations, compared to Non-Hispanic Whites. When observing the difference in diabetes prevalence for those who are Hispanic versus Non-Hispanic, we see that Hispanics have a higher prevalence with a rate of 109 per 1,000 adults in Lancaster County compared to Non-Hispanic with a rate of 78 per 1,000 adults. These prevalence rates are also larger for the State of Nebraska with rates of 82 per 1,000 for Non-Hispanics and 134 per 1,000 for Hispanics.

Figure 5: Self-Reported Diabetes Prevalence by Race/Ethnicity
2016-2020

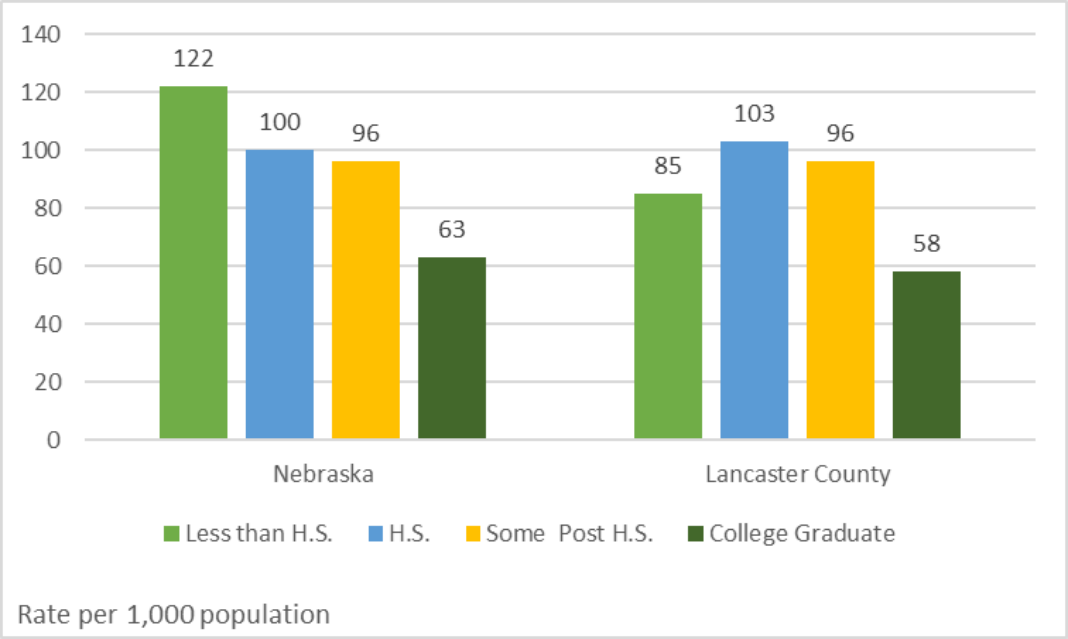


Diabetes and Education Level

Figure 6 shows the prevalence of diabetes for both Lancaster County and the State of Nebraska broken down by education level. Overall, there seems to be a negative correlation between education status and diabetes prevalence where, as education level increases, the prevalence of diabetes decreases. In both Lancaster

County and the State of Nebraska, the prevalence rate is the lowest for those who are college graduates with prevalence rates of 58 per 1,000 population and 63 per 1,000 population, respectively.

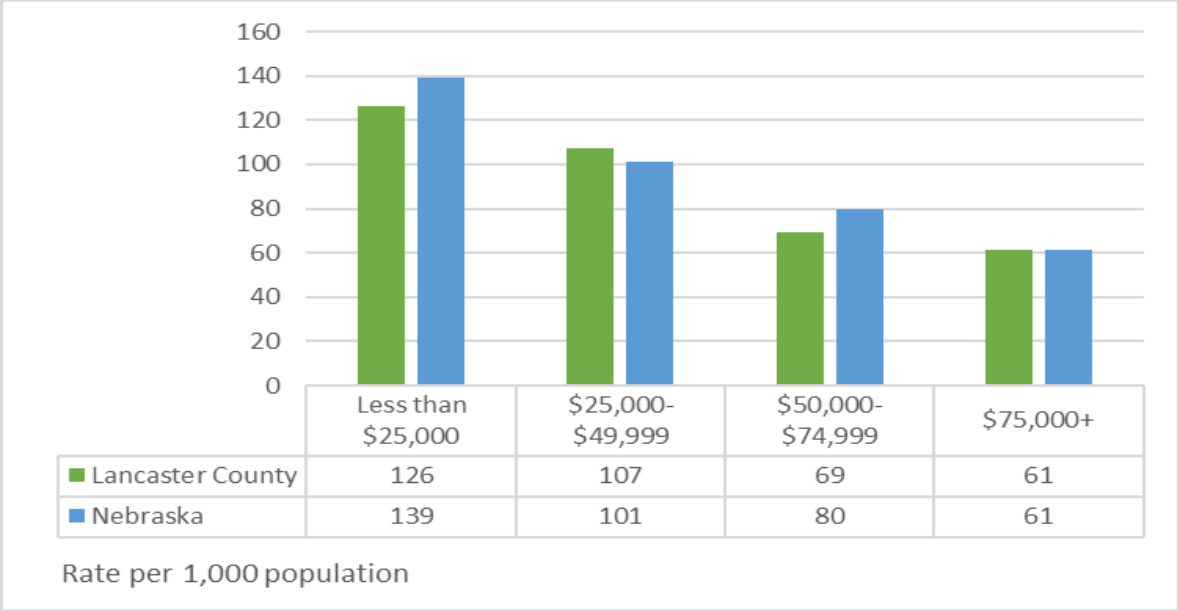
Figure 6: Self-Reported Diabetes Prevalence by Education Level
Nebraska, Lancaster County
2016-2020



Diabetes and Income

Figure 7 shows the prevalence of diabetes in Lancaster County and the State of Nebraska by annual income level broken down into four categories: less than $25,000, $25,000-$49,999, $50,000-$74,999, and $75,000+. While income is not a risk factor for diabetes, in both Lancaster County and the State of Nebraska as income increased, the prevalence decreased. In Lancaster County, those who made less than $25,000 annually had a prevalence rate over twice as high compared to those who made +$75,000. A similar result was found in the State of Nebraska where those making less than $25,000 annually had a prevalence rate that was 2.3 times as high as the rate for those making +$75,000 annually.

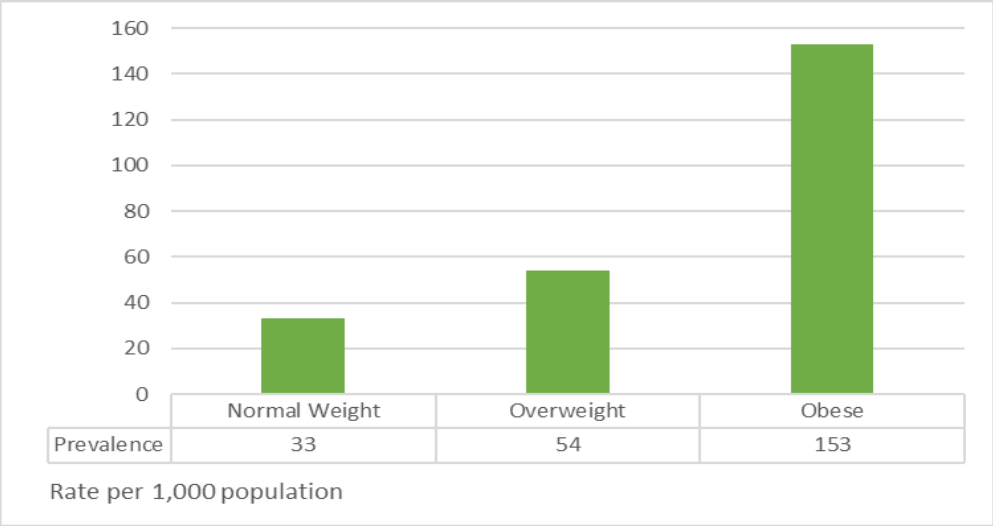
Figure 7: Self-Reported Diabetes Prevalence by Income Level
2016-2020



Diabetes and BMI

For this comparison, the body mass index (BMI) scale is broken into three distinct categories: normal weight (BMI <25), overweight (BMI 25-29.9), and obese (BMI >30). Figure 8 shows the prevalence rates for diabetes in Lancaster County from 2016-2020. The prevalence rate for those with a normal weight was 33 per 1,000 adults. The prevalence rate for those who were classified as overweight was 54 per 1,000 adults. For those who were defined as obese, the prevalence rate was 153 per 1,000. These results show that there is a strong relationship between BMI and diabetes prevalence. The risk of developing diabetes associated with being overweight or obese will be discussed in Section B: Diabetes Risk.

Figure 8: Self-Reported Diabetes Prevalence by Body Weight
Lancaster County 2016-2020



Section B: Diabetes Risk in 2020

As seen from the results in the previous section, the prevalence of diabetes varies by age, gender, racial and ethnic origins, education level, and income level. For this section, binary logistic regression analysis was performed to test the following hypotheses:

1) The risk of developing diabetes increases with age.
2) Women are at a higher risk of developing diabetes than men.
3) Non-Whites are at a higher risk of developing diabetes than Whites.
4) Hispanics are at a higher risk of developing diabetes than Non-Hispanics.
5) The risk of developing diabetes increases with overweight and obesity status.
6) People with a lower socioeconomic status are at a higher risk of developing diabetes.

The results of the logistic regression analysis in this section refer to the odds of developing diabetes, which is the association between a variable being present and the likelihood of an individual developing diabetes. Table 1 shows a summary of the logistic regression analysis with the odds ratios (OR) and 95% confidence intervals (95% CI) for each variable level.

Increasing Age

As seen in Table 1, age is the strongest predictor of the development of diabetes where, as age increases, the likelihood of diabetes also increases. In Lancaster County, those who were 45-64 years old had 3.76 times the odds of having diabetes compared to those who were 18-44 years old (OR=3.76, 95% CI: 1.98-7.13). Similarly, those who were 65 years or older had 9.5 times the odds of having diabetes compared to those who were 18-44 years old (OR=9.5, 95% CI: 5.2-17.5).

Gender

Concurrent with the prevalence rates in the previous section, the odds of having diabetes do not significantly differ between men and women (OR=1.16, 95% CI: 0.8-1.7).

Race/Ethnicity

Despite the differences in prevalence rate between Whites and Non-Whites that were observed, the results of the logistic regression analysis found that the odds of having diabetes do not seem to be influenced by race (OR=0.9, 95% CI: 0.3-2.6). Additionally, when considering ethnicity, Hispanics had an odds ratio of 1.5, however, these results are not statistically significant, meaning that there is not a significant

difference in the odds of having diabetes between Hispanics and Non-Hispanics (OR=1.5, 95% CI: 0.3-6.1).

Body Weight

Body weight is a known predictor of diabetes and the results in Table 1 provide further support. Compared to those with a normal body weight (BMI <25), those who were overweight (BMI 25-29) had an odds ratio of 1.3. However, the difference in the odds between those with a normal weight and those who were overweight was not significant (OR=1.3, 95% CI: 0.7-2.4). The odds of diabetes were even greater for those who were obese (BMI >30) with those who are obese having 4.5 times the odds of having diabetes compared to those who were a normal body weight (OR=4.5, 95% CI: 2.6-7.8).

Income Level

For this analysis income level was split into five categories: less than $15,000, $15,000-$25,000, $25,000-$35,000, $35,000-$45,000, and $50,000+. The reference category for this analysis was $50,000+. While three of the income levels had an odds ratio of less than one, they are not statistically significant. Based on the results in Table 1, we can conclude that the odds of diabetes do not significantly differ between the different income levels.

Table 1: Diabetes Risk

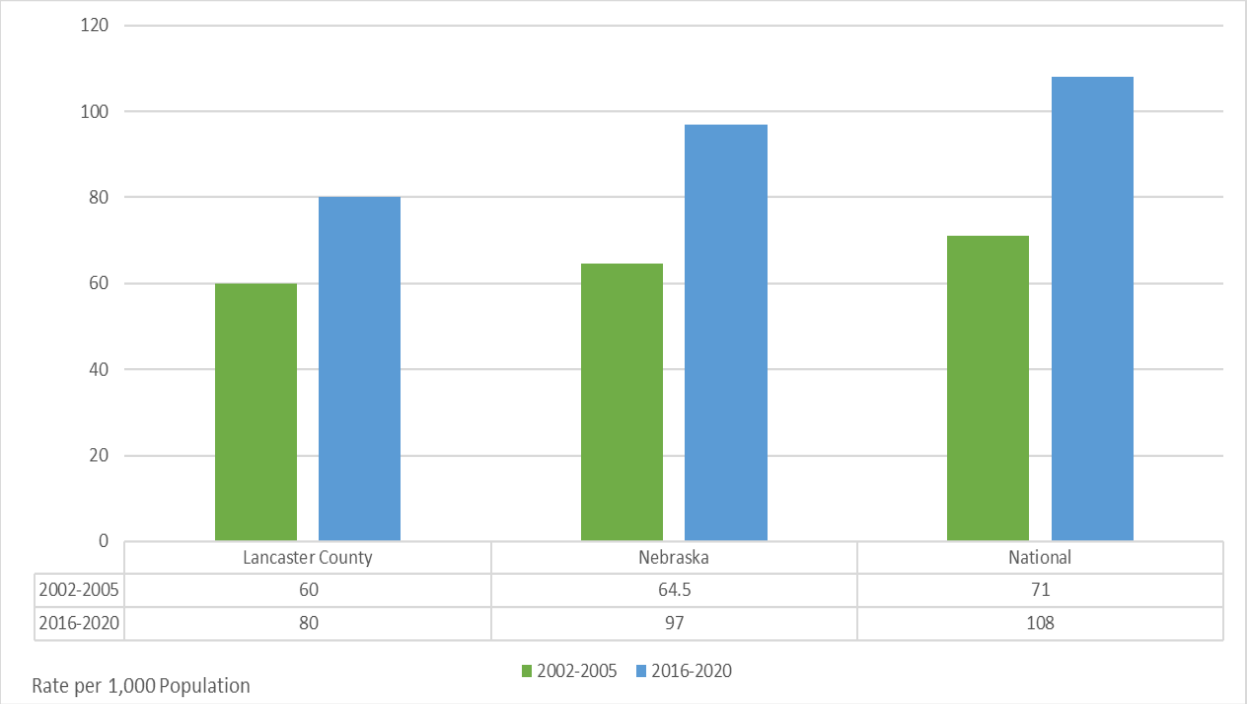
Independent Risk Variable	Odd Ratio	95% Confidence Interval
Age Category*		
18-44 years	…	
45-64 years	3.76	1.98-7.13
65+ years	9.5	5.2-17.5
Gender**		
Women	…	
Men	1.16	0.8-1.7
Race***		
White	…	
Non-white	0.9	0.3-2.6
Ethnicity******		
Non-Hispanic	…	
Hispanic	1.5	0.3-6.1
Body Weight*******		
Normal Weight	…	
Overweight	1.3	0.7-2.4
Obese	4.5	2.6-7.8
Income********		
Less than $15,000	0.6	0.3-1.3
$15,000-$25,000	1	0.5-2.1
$25,000-$35,000	0.5	0.2-1.1
$35,000-$50,000	0.4	0.2-0.8
$50,000 +	…	

*** Reference Category: 18-44 years**
**** Reference Category: Women**
***** Reference Category: White**
****** Reference Category: Non-Hispanic**
******* Reference Category: Normal Weight**
******** Reference Category: Income more than $50,000**

Section C: Diabetes Prevalence Changes from 2005 to 2020

Between 2002-2005, an estimated 60 out of every 1,000 adults in Lancaster County had diabetes. Now, between 2016-2020, that estimate has gone up to 80 out of every 1,000 adults. This equates to a 33% increase in the prevalence rate of diabetes within Lancaster County. An increase in prevalence rates was also seen within the State of Nebraska, as well as nationally. Between 2002-2005, there was a prevalence rate of 64.5 out of every 1,000 people in Nebraska for diabetes, which increased 50% to 97 out of every 1,000 people in 2016-2020. Nationally, in the same time periods, we saw an increase of 52% going from 71 per 1,000 population to 108 per 1,000 population.

Figure 9: Diabetes Prevalence Changes
Lancaster County, Nebraska, United States
2002-2005 to 2016-2020

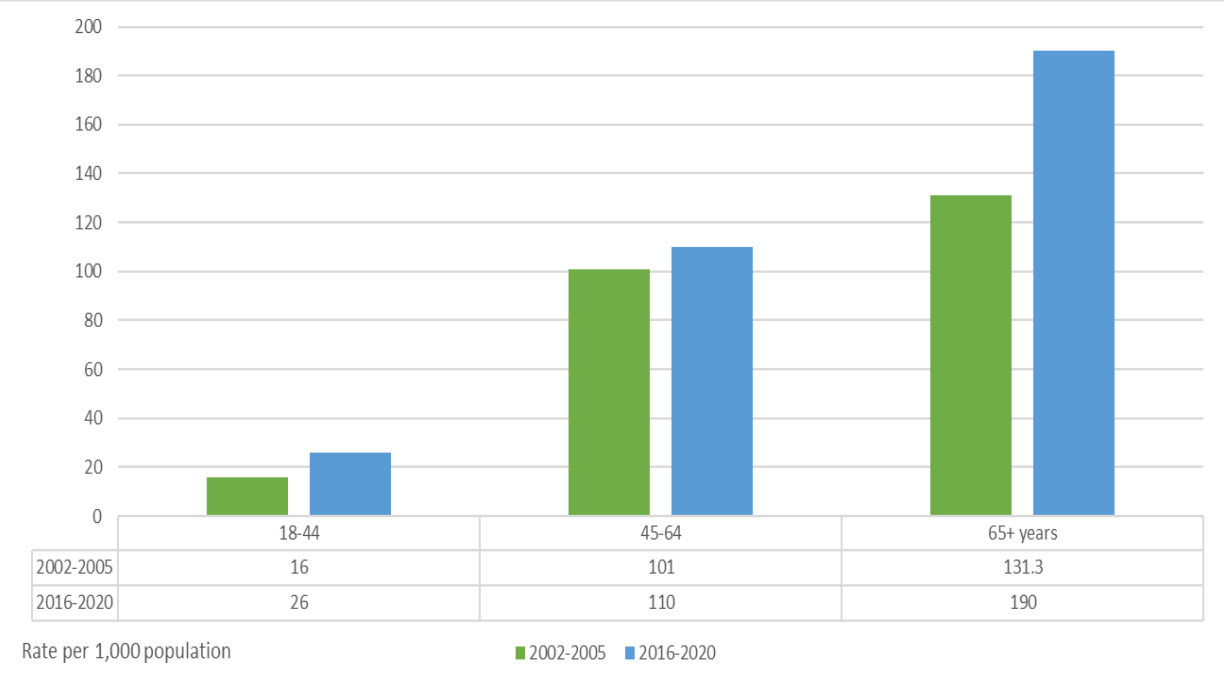


Diabetes and Age

Figure 10 shows that there has been an increase in the prevalence of diabetes in Lancaster County for all age groups. For those aged 18-44, the prevalence increased from 16 per 1,000 to 26 per 1,000, which is an increase of 62.5%. For those aged 45-64, the prevalence rate increased from 101 per 1,000 to 110 per 1,000, which is an 8.9% increase. Finally, for those 65+ years, there was a 44.7% increase in the

prevalence rate going from 131.3 per 1,000 to 190 per 1,000. Overall, those in the 18-44 year-old group had the most significant change in their prevalence rate, which is important to note as type 2 diabetes is historically diagnosed in older adults, but these results show us that adults are starting to be diagnosed with diabetes at a younger age.

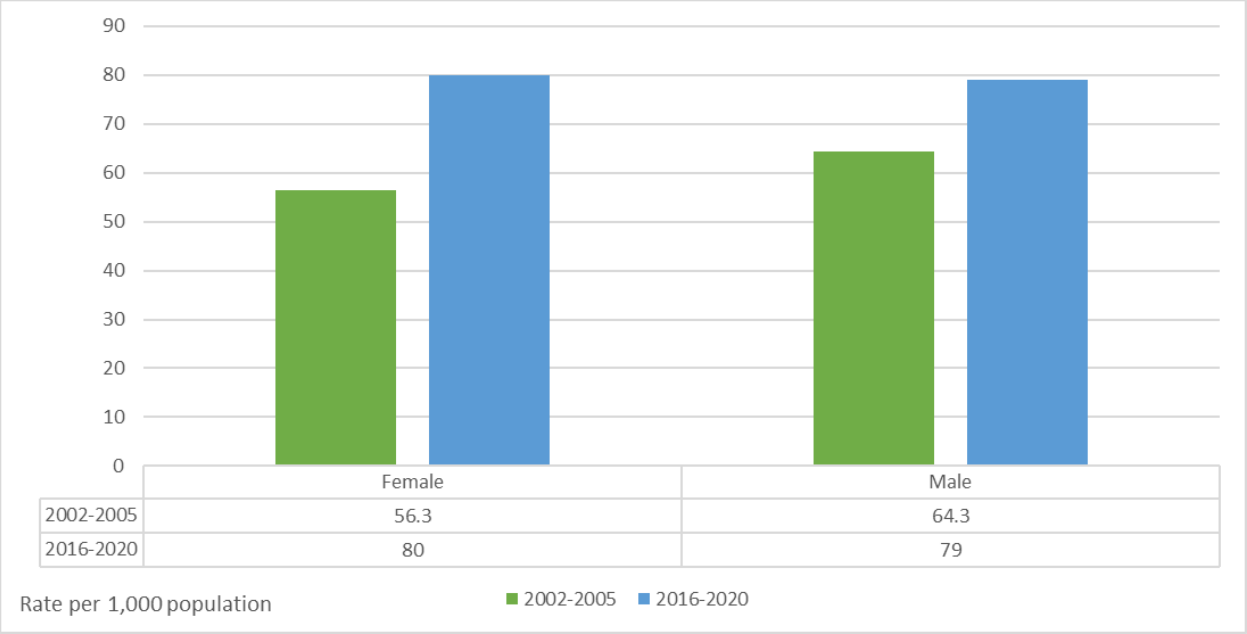
Figure 10: Diabetes by Age Comparison
Lancaster County
2002-2005 to 2016-2020



Diabetes and Gender

Although we did not find a difference in the prevalence rate of diabetes between males and females from 2016-2020, males had a slightly higher prevalence of diabetes compared to females in 2002-2005. However, in the same time period, national statistics showed an equal prevalence of diabetes between males and females. Despite the equal prevalence between males and females, the prevalence rates have gone up over the past two decades for both genders. The prevalence for females has increased 42.1%, going from 56.3 per 1,000 to 80 per 1,000. For males, the prevalence has increased 22.9%, going from 64.3 per 1,000 to 79 per 1,000.

Figure 11: Diabetes by Gender Comparison
Lancaster County
2002-2005 to 2016-2020



Diabetes and Race/Ethnicity

From 2002 to 2005, the prevalence of diabetes among Non-Hispanic Whites was 59 per 1,000 while it was 79 per 1,000 for Non-Whites, as shown in Figure 12. Moving forward to 2016-2020, the prevalence of diabetes for Non-Hispanic Whites increased 32.2% from 59 per 1,000 to 78 per 1,000. For Non-Whites, the prevalence of diabetes has increased by over 68% going from 79 per 1,000 to 133 per 1,000. Based on the results shown in Figure 12, we can conclude that diabetes is more prevalent in Non-Whites compared to Non-Hispanic Whites as it took almost two decades for the prevalence of diabetes in Non-Hispanic Whites to be the same as the prevalence rate of diabetes in non-whites almost two decades prior.

Between 2002-2005, an estimated 92 out of every 1,000 Hispanic adults had diabetes in Lancaster County. Now, that rate has decreased 15.2% to 78 out of every 1,000 adults. Between 2002-2005 the prevalence rate for Non-Hispanics was 59 per 1,000 adults. Now, between 2016-2020, the prevalence rate has increased 84.7% to 109 per 1,000 adults.

Figure 12: Diabetes by Race Comparison
Lancaster County
2002-2005 to 2016-2020

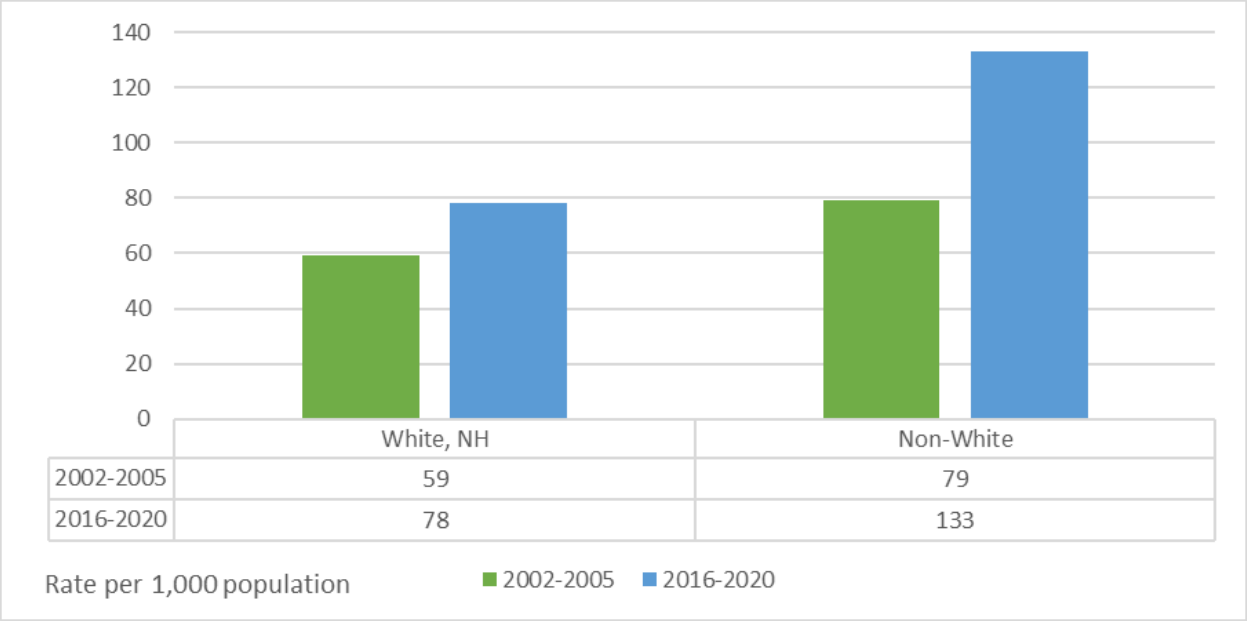
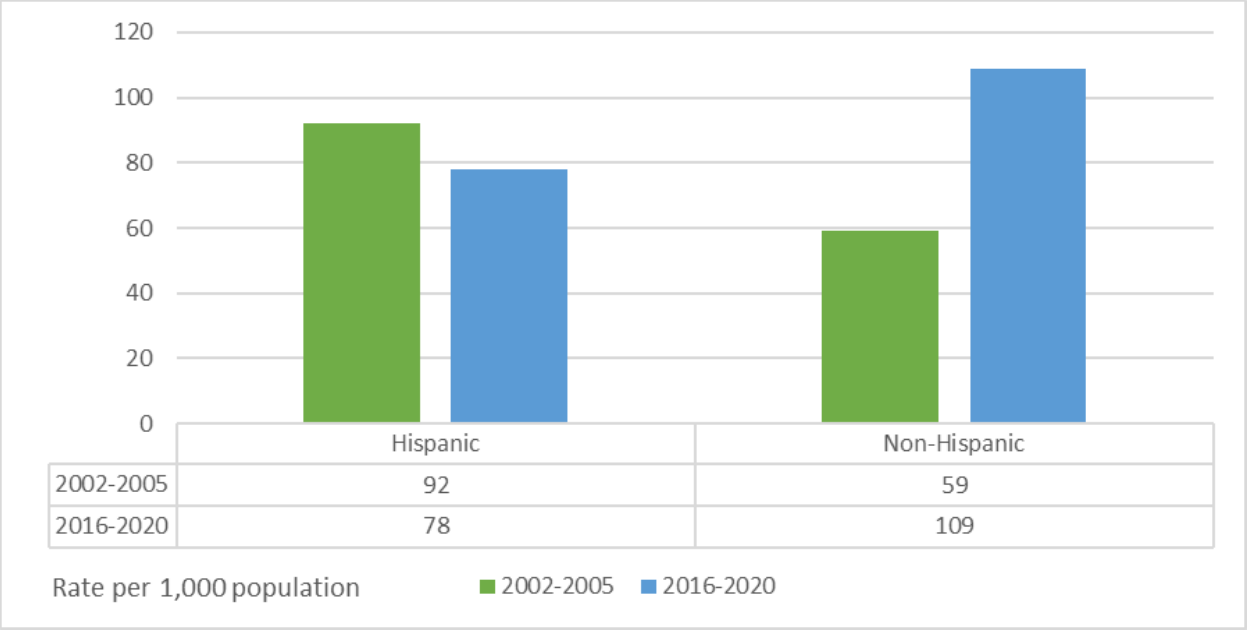


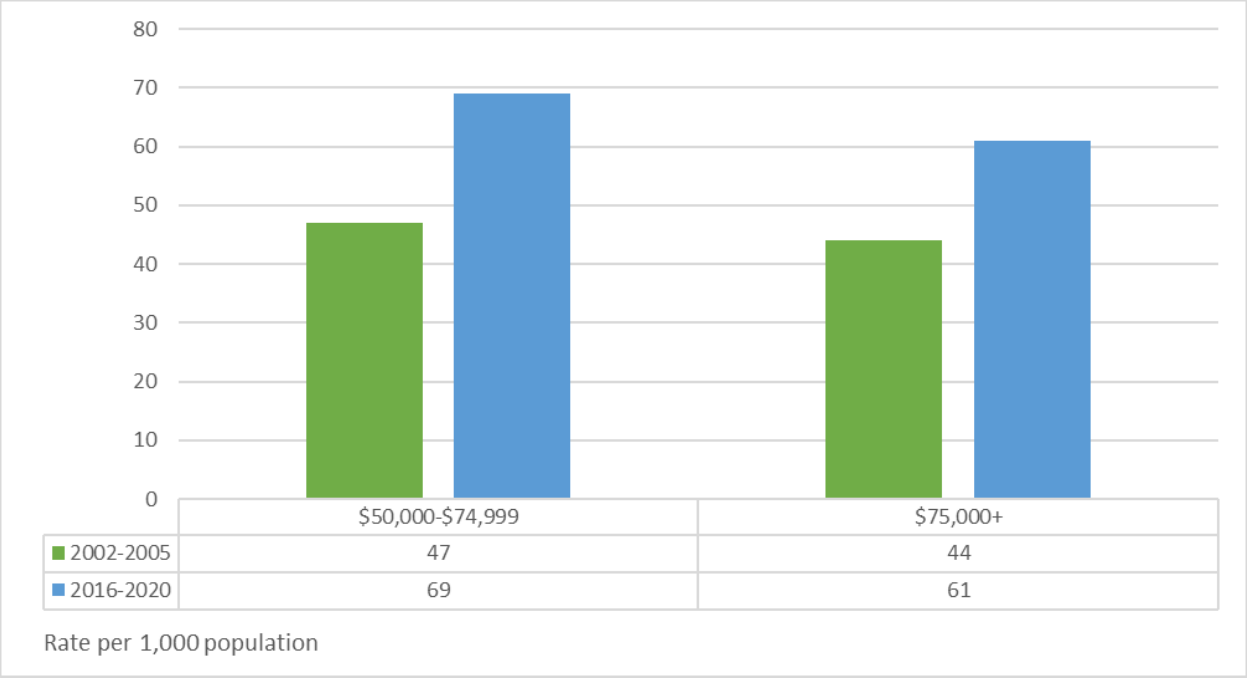
Figure 13: Diabetes by Ethnicity Comparison
Lancaster County
2002-2005 to 2016-2020



Diabetes and Income

Data from the BRFSS was used for all analyses for both this report and the 2006 report. However, since the 2006 report, the BRFSS has changed how it groups income levels. Because of this, we cannot easily compare the change in prevalence between different income levels. Fortunately, there are two income levels we can compare: $50,000-$74,999 and $75,000+. Figure 14 shows the prevalence rate of diabetes in Lancaster County for $50,000-$74,999 and $75,000+ from 2002-2005 and 2016-2020. In the 2006 report, those who earned $50,000-$74,999 had a prevalence rate of 47 per 1,000 adults, and those who earned $75,000+ had a prevalence rate of 44 per 1,000 adults. Now, in the current report, those who earned $50,000-$74,999 had a prevalence rate of 69 per 1,000 adults, and those who earned $75,000+ had a prevalence rate of 61 per 1,000 adults. That is a 46.8% and 38.6% increase, respectively.

Figure 14: Diabetes by Income Level Comparison
Lancaster County
2002-2005 to 2016-2020

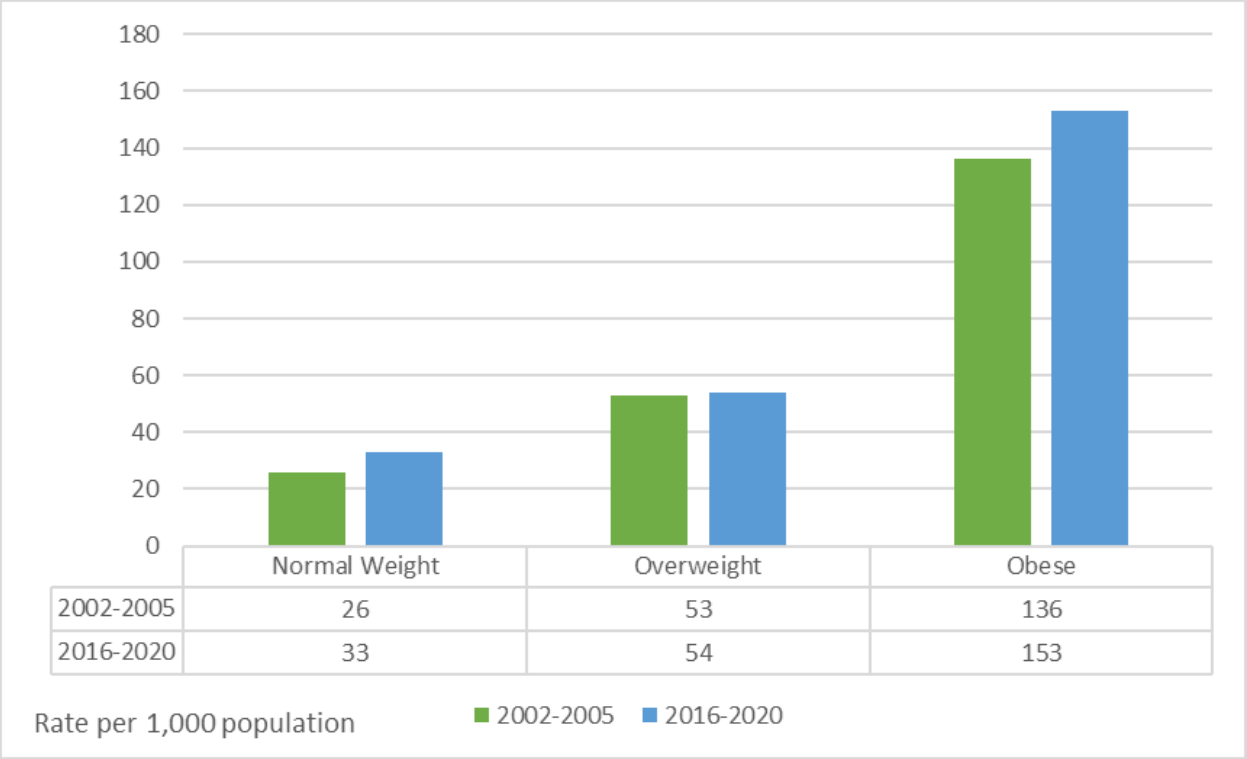


Diabetes and Body Mass Index

From 2002-2005, the prevalence rate for those who were a normal weight was 26 per 1,000 population. For those who were overweight and obese, the prevalence rates were 53 per 1,000 population and 136 per 1,000 population, respectively. Fast forward to 2016-2020, the prevalence rate for those with a normal weight has increased

26.9% to 33 per 1,000 population. For those who are overweight, the prevalence rate has stayed pretty steady, only increasing from 53 per 1,000 to 54 per 1,000. For those who are obese, the prevalence rate has increased 12.5% from 136 per 1,000 to 153 per 1,000.

Figure 15: Diabetes by BMI Comparison
Lancaster County
2002-2005 to 2016-2020



Section D: Diabetes Risk Changes from 2005 to 2020

Increasing Age

In both the 2006 data report and now this current report, age was the strongest predictor of the development of diabetes. In both reports, we saw that as age increases the prevalence of diabetes also increases significantly. In the 2006 report Lancaster County adults aged 45-64 had 6.3 times the odds of having diabetes compared to those aged 18-44 (OR=6.3, 95% CI: 5.9-6.7). Additionally, those aged 65 years or older had 8.2 times the odds of having diabetes compared to those aged 18-44 (OR=8.2, 95% CI: 7.7-8.8). The current odds ratios for 2022 are similar with those aged 45-64 having 3.76 times the odds (OR=3.76, 95% CI: 1.98-7.13) and those aged 65 years and older having 9.5 times the odds (OR=9.5, 95% CI: 5.2-17.5) of having diabetes compared to those aged 18-44.

Gender

While prevalence rates were higher in males in both the 2006 report and the current report, in both risk analyses gender did not appear to influence the risk of having diabetes (2006: OR=1.14, 95% CI:1.18-1.10, 2022: OR=1.16, 95% CI: 0.8-1.7).

Race/Ethnicity

In the 2006 report it was found that Non-White Lancaster County residents had 1.3 times the odds of having diabetes as compared to White Lancaster County residents (OR=1.3, 95% CI: 1.2-1.4). However, this difference was not seen in the 2016-2020 data (OR=0.9, 95% CI: 0.3-2.6). Additionally, in the 2006 report, it was found that Hispanics had relatively higher odds of having diabetes as compared to Non-Hispanics (OR=1.6, 95% CI: 1.4-1.7). For the collection years 2016-2020, we found that Hispanic residents had 1.5 times the odds of having diabetes as compared to Non-Hispanic residents (OR=1.5, 95% CI: 0.3-6.1), however, this difference in odds was not statistically significant.

Body Weight

As we know, body weight is a strong predictor of diabetes. In the 2006 report we found that compared to those of a normal body weight, those who were overweight had two times the odds of having diabetes (OR=2, 95% CI: 1.9-2.1). Similarly, we found that those who were obese had 5.2 times the odds of having diabetes as compared to those with a normal body weight (OR=5.2, 95% CI: 4.8-5.5). Now, in the current report, we found that those who were overweight had 1.3 times the odds of having diabetes, however, this finding is not statistically significant (OR=1.3, 95% CI: 0.7-2.4).

Additionally, those who were obese have 4.5 times the odds of having diabetes (OR=4.5, 95% CI: 2.6-7.8), as compared to those with a normal body weight.

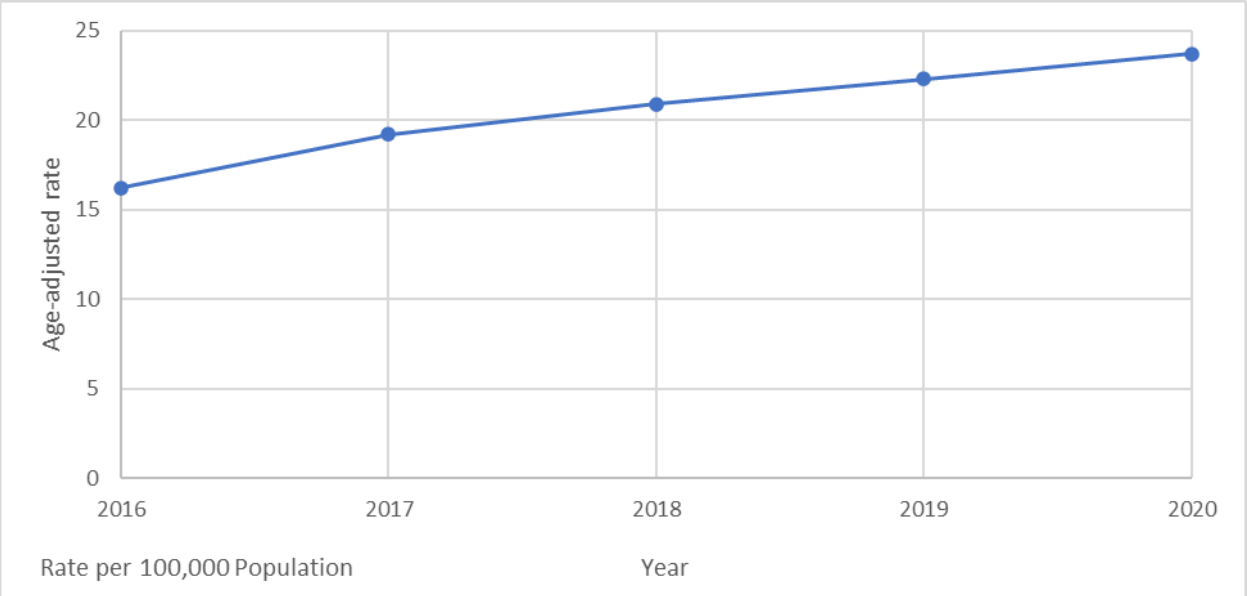
Income Level

Due to the BRFSS changing how it categorized income levels, we are not able to compare the differences in odds ratios between income levels between the 2006 report and the current report.

Section E: Deaths Due to Diabetes

Between 2016 and 2020, the mortality rate for Lancaster County has increased from 16.2 deaths per 100,000 adults to 23.7 deaths per 100,000 adults. Between 2001-2004 the mortality rate in Lancaster County increased from 15 deaths per 100,000 adults to 34 deaths per 100,000 adults. While the most recent mortality rate in 2020 was lower than it was in 2004, the mortality rate of diabetes in Lancaster County has been steadily increasing over the past four years, as seen in Figure 15.

Figure 16: Trend in Diabetes Deaths
Lancaster County
2016-2020



Glossary

Prevalence: The proportion of a population that is affected by a specified condition during a specified time frame. The proportion is calculated by dividing the number of people with the condition by the total specified population, either at a particular point in time (point prevalence) or during a specified period of time (period prevalence).

Odds Ratio (OR): A ratio that allows you to compare the probability of a specified outcome between two groups. The odds ratio is a measure of association between an exposure and an outcome. An odds ratio of 1 means that the event is equally as likely to occur in either group. An odds ratio greater than 1 implies that the event is more likely to happen in the first group than in the second group. An odds ratio of less than one means that the event is less likely to happen in the first group than in the second group. It is important to note that the odds of an event occurring is not the same as the risk of an event occurring.

Confidence Interval: A confidence interval is an estimated range of values for an unknown population parameter. The estimated range is calculated from a given set of sample data.

Body Mass Index (BMI): The Body Mass Index is a relationship between a person's weight and height that is associated with overall body fat and health risks. BMI is calculated by dividing a person's weight in kilograms by their height in meters squared. A BMI of 18.5-24.9 is considered normal weight, 25-29.9 is considered overweight, and greater than 30 is considered obese.