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The Impact of Food Insecurity on Diabetes Prevalence in the US: A look at the Northeast and the Midwest

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Title of Project: The impact of food insecurity on diabetes prevalence in the US: A look at the Northeast and the Midwest.

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Mentor Name: Amber Todd - Medical Education

Track: Population and public health

Scholarship in Medicine Final Report

By checking this box, I indicate that my mentor has read and reviewed my draft proposal prior to submission (I am in the May “super short” course)

Abstract

Diabetes is one of the most common chronic conditions globally. Various risk factors have been found to be associated with the incidence of diabetes. These include genetic predispositions, physical activity and diet. However, less attention has been given to the potential risk of food insecurity to diabetes prevalence. Therefore, the goal of this study was to look at the prevalence of food insecurity and diabetes in New York and Ohio, and try to see if a correlation exists between food insecurity and diabetes prevalence in these states.

In our methods, we used the 2019 data from County Health Rankings (CHR) on both food insecurity and diabetes prevalence. We then used unpaired t-tests to compare food insecurity rates and diabetes prevalence between the two states. Finally, we used a Pearson correlation test to see if any correlation existed between food insecurity and diabetes prevalence in both states.

After our analysis, we found that both food insecurity rates (13.69%) and diabetes prevalence (12.54%) were higher in Ohio than in New York State (11.03% and 10.63% respectively) in 2019. We also found a small but significant positive correlation between food insecurity and diabetes prevalence in both Ohio and New York State in 2019.

We therefore conclude that food insecurity is a risk factor for diabetes.

Key Words: Diabetes, food, insecurity, prevalence, Ohio, New York.

Introduction

Diabetes is a chronic disease characterized by ineffective metabolism of glucose in the body leading to high blood glucose levels. Diabetes is one of the most common chronic conditions worldwide. The etiology of diabetes includes irreversible risk factors such as ethnicity, race and genetics. Some reversible risk factors include diet and physical activity.¹ The hyperglycemia caused by diabetes has various devastating effects on the human body. The burden of diabetes is due to its numerous complications such as end-stage kidney dysfunction, coronary artery disease, stroke, diabetic neuropathy and retinopathy.² Looking beyond the individual patient, the socioeconomic effects of diabetes are huge. In 2017, diabetes was ranked as the 7th most common cause of mortality in the United States.³ In 2018, the prevalence of diabetes was 10.5%, with 34.2 million Americans being diagnosed with diabetes, and about 80 million others designated as prediabetics.⁴ In New York state and Ohio, the prevalence of diabetes in 2019 were 10% and 12% respectively.^{5,6}

A number of risk factors have been attributed to diabetes¹, but less attention has been given to how access to healthy meals and food insecurity contribute to the development of diabetes in the United States. Food insecurity, defined as limited access to nutritious meals owing to cost and availability, is associated to many chronic diseases.⁷ Food insecurity could increase people's risk for diabetes since these people usually have limited access to healthy meals. Only a few papers have looked at the relationship between food insecurity and the incidence of diabetes. In their study in 2018, Berkowitz et al reported that in 2015, 12.7% of American households were food insecure. Results from their study found that food insecurity was highly associated with hospital visits related to diabetes and respiratory illness.⁷ Christopher A. Tait and his colleagues from Canada looked into the association between food insecurity and diabetes in Canada. Results from their study showed that, food insecure households were twice as likely to develop type 2 diabetes compared to individuals with adequate food security.⁸

Even though it may be plausible to assume that an association exists between food insecurity and diabetes prevalence, no researchers in the United States have looked into this topic. This has led to less relevant data and information being reported in the literature on this topic. It will therefore be helpful to know whether food insecurity has any association with diabetes prevalence while looking at data from New York state and Ohio. This will help to increase the awareness of food insecurity as a risk factor for diabetes in the United States.

Research Questions

RQ1: How does diabetes prevalence rates compare between Ohio and New York state in 2019?

RQ2: How does food insecurity rates compare between Ohio and New York state in 2019.

RQ3: How does food insecurity correlate to diabetes rates in Ohio for the year 2019.

RQ4: : How does food insecurity correlate to diabetes rates in New York state for the year 2019.

Methods

Context/Protocol

Data from County Health Rankings was used for this project. For the 2019 data on diabetes prevalence, County Health Rankings(CHR) used data from 2015 for both Ohio and New York State. The data was collected by using the CDC Interactive Diabetes Atlas, which provides county-level estimates of obesity, inactivity and diabetes using three years of data from the CDC's Behavioral risk Factor Surveillance System and data from the U.S Census Bureau's Population Estimates Program. This data includes the percentage of adults aged 20 and above, who were diagnosed with diabetes in a given county.

For the 2019 data on food insecurity, CHR used data from 2016 for both Ohio and New York State. This included the percentage of population who lacked adequate access to food. The data was collected from the Map the Meal Gap project which publishes annual reports on food insecurity in each state in the country annually.

Data Collection

The data gathered from the CHR was downloaded and stored on a separate spreadsheet for each of the states being looked at on my laptop for easy access and analysis. I chose data for New York to represent the Northeast, and Ohio as a representation of the Midwest. All the data collected from CHR was used in this project. Data for patients who were diagnosed with diabetes and were below the age of 20 were excluded from the project as reported by CHR.

Data Analysis

In analyzing the data from County Health Rankings and Roadmaps, we compared diabetes prevalence rates in Ohio and New York state using an unpaired t-test. Data for the year 2019 was used in the analysis. We also compared food insecurity levels in Ohio and New York state for the year 2019 using an unpaired t-test. We then used a Pearson correlation test to see if there was a correlation between food insecurity and diabetes prevalence in Ohio and New York state. For this measure, we used data for 2019.

Results

Diabetes prevalence (RQ1) were found to be different between Ohio (12.54%) and New York State (10.63%) in 2019 ($t = 7.659, p < .001$) (Table 1)

Table 1:Diabetes Prevalence in 2019 Between Two States

State	n	Mean	SD
Ohio	88	12.54% ^a	1.44%
New York	62	10.63%	1.57%

Abbreviation: SD, Standard Deviation

^astatistically significantly different from New York State ($p < .001$)

Food insecurity rates (RQ2) were found to be different between Ohio (13.69%) and New York State (11.03%) in 2019 ($t = 6.792, p < .001$) (Table 2)

Table 2: Food Insecurity in 2019 Between Two States

State	n	Mean	SD
Ohio	88	13.69% ^a	2.48%
New York	62	11.03%	2.18%

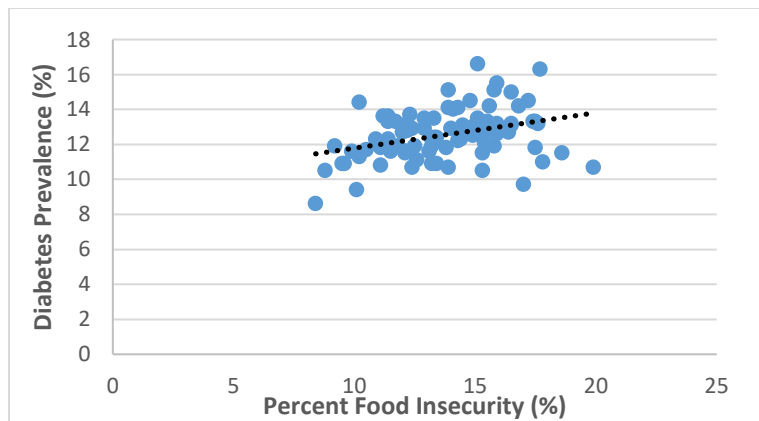
Abbreviation: SD, Standard Deviation

^astatistically significantly different from New York State ($p < .001$)

In our investigation of how food insecurity rates correlate to diabetes prevalence in Ohio in 2019 (RQ3) we found a small but significant correlation using a Pearson correlation

($r = .350, p = .001$), where, as food insecurity rates increases, the percentage of adults with diabetes increases (Figure 1).

Figure 1: Correlation Between Food Insecurity and Diabetes Prevalence in Ohio 2019.

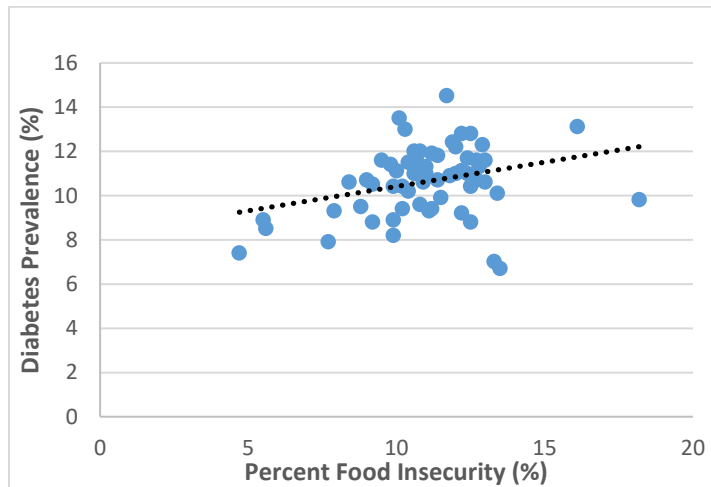


A Pearson correlation indicates a small but significant correlation ($r = .350, p = .001$) where, as food insecurity rates increases, the percentage of adults with diabetes increases.

In our investigation of how food insecurity rates correlate to diabetes prevalence in New York State in 2019 (RQ4), we found a small but significant correlation using a Pearson correlation

($r = .305, p = .016 .001$), where, as food insecurity rates increases, the percentage of adults with diabetes increases (Figure 2).

Figure 2: Correlation Between Food Insecurity and Diabetes Prevalence in New York State 2019



A Pearson correlation indicates a small but significant correlation ($r = .305$, $p = .016$) where, as food insecurity rates increase, the percentage of adults with diabetes increases.

Discussion

Many risk factors have been associated to the development of diabetes in the United States.

These factors include diet, physical activity, genetics and obesity. No researchers have however, looked at food insecurity as an independent risk factor for diabetes. Food insecurity is defined as limited access to nutritious meals owing to cost and availability, is associated to many chronic diseases.⁷ Even though food insecurity is usually seen in developing countries, there have been reports of food insecurity in many developed countries including the United States. Food insecurity rates continue to rise in developed countries despite increasing

knowledge about the adverse effects of food insecurity.⁹ The latest statistics on national food insecurity in the United States was done by the United States Department of Agriculture (USDA). The USDA reported that in 2018, 11.1% of U.S households were food insecure.¹⁰

Our analysis showed that in 2019, Ohio had a higher percentage (13.69%) of its residents being food insecure, which was higher than that of New York (11.03%). The difference in food insecurity rates could be attributed to the difference in income levels, and availability of large chain grocery shops. These contributing factors have been reported in the literature as accounting for these differences. Notably, New York state residents have a numbers of interventions such as food stamps which help to provide a relatively low cost access to groceries. These services although available in Ohio and other midwestern states tend to be limited.

It was also not surprising to see a correlation between food insecurity and diabetes prevalence after our analysis. Researchers had reported this association in a study in Canada.⁸ As expected, Ohio had a higher diabetes prevalence (12.54%) than New York State (10.63%) since the percentage of people in food insecure homes were higher (13.69%) than that of New York State (11.03%). These findings from our research add to the limited knowledge about food insecurity and its effects on diabetes prevalence. In discussions with patients about diabetes, it is important for healthcare practitioners to screen patients for food insecurity, since it had been shown to be a risk factor for diabetes.

Conclusion

In conclusion, the results from this project proves that food insecurity is a risk factor for diabetes. The major limitation of this project is that County Health Rankings used data from 2015 and 2016 for the measures of diabetes prevalence and food insecurity respectively in 2019. To better understand how food insecurity correlates to diabetes prevalence, more research should be done in the future to help expand the knowledge on this matter. Researchers should look at multiple states to see if the same association exist between the two variables.

Even though our project has shown that food insecurity is a risk factor for diabetes prevalence, there is the need for more research to increase the amount of knowledge on this subject. This will help guide decisions and policies that affect these measures, which can help reduce the diabetes prevalence in the United States.

References

1. Sami W, Ansari T, Butt NS, Hamid MRA. Effect of diet on type 2 diabetes mellitus: A review. *Int J Health Sci (Qassim)*. 2017;11(2):65-71. Accessed May 7, 2020. <http://www.ncbi.nlm.nih.gov/pubmed/28539866>
2. Harding JL, Pavkov ME, Magliano DJ, Shaw JE, Gregg EW. Global trends in diabetes complications: a review of current evidence. *Diabetologia*. 2019;62(1):3-16. doi:10.1007/s00125-018-4711-2
3. Kochanek KD, Murphy SL, Xu J, Arias E. *National Vital Statistics Reports Volume 68, Number 9 June 24, 2019 Deaths: Final Data for 2017*.; 2019. Accessed May 8, 2020. <https://www.cdc.gov/nchs/products/index.htm>.
4. CDC. *National Diabetes Statistics Report 2020. Estimates of Diabetes and Its Burden in the United States*.; 2020.
5. Diabetes prevalence in New York | County Health Rankings & Roadmaps. Accessed May 8, 2020. <https://www.countyhealthrankings.org/app/new-york/2020/measure/outcomes/60/data>
6. Diabetes prevalence in Ohio | County Health Rankings & Roadmaps. Accessed May 8, 2020. <https://www.countyhealthrankings.org/app/ohio/2020/measure/outcomes/60/data>
7. Berkowitz SA, Seligman HK, Meigs JB, Basu S. Food insecurity, healthcare utilization, and high cost: A longitudinal cohort study. *Am J Manag Care*. 2018;24(9):399-404.

8. Tait CA, L'Abbé MR, Smith PM, Rosella LC. The association between food insecurity and incident type 2 diabetes in Canada: A population-based cohort study. Meyre D, ed. *PLoS One*. 2018;13(5):e0195962. doi:10.1371/journal.pone.0195962
9. Roncarolo F, Bisset S, Potvin L. Short-term effects of traditional and alternative community interventions to address food insecurity. *PLoS One*. 2016;11(3). doi:10.1371/journal.pone.0150250
10. USDA ERS - Key Statistics & Graphics. Accessed May 26, 2020. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics.aspx>