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Exploring the Relationship between Health Behaviors, Factors, and Chronic Diseases in Mississippi's 82 counties

Dawn Camel, B.A.

Abstract

Nearly half of Americans suffer from at least one chronic condition, and the number is growing. According to the CDC, by 2025 chronic diseases will affect an estimated 164 million Americans – nearly half of the U.S. population (Centers for Disease Control and Prevention, 2007). Mississippi has some of the highest chronic disease rates in the nation. In 2019, Mississippi ranked 49th nationally with an obesity rate of 39.5%; 47th for high blood pressure with a reporting rate of 40.8%; and 48th for diabetes with a reporting rate of 14.3% (Health Measures in Mississippi, 2019). The purpose of this study is to investigate the relationship between select health variables and the prevalence of obesity, diabetes, and high blood pressure in Mississippi's 82 counties. This study's findings indicated statistically significant relationships existed between select health variables and the percent of adults with high blood pressure, obesity, and diabetes. In regards to differences among Mississippi's rural and urban counties, rural counties had a higher percentage of adults reporting no leisure time for physical activity, and a higher percentage of adults with obesity, diabetes, and high blood pressure. By exploring the relationship between select health behaviors and chronic diseases, this study hopes to provide policymakers, practitioners, and community residents with information that can help reduce the impact of those diseases in Mississippi.

Introduction

According to the Centers for Disease Control and Prevention (CDC), more than half of all Americans live with a preventable chronic disease and many such diseases are related to obesity, poor nutrition, and physical inactivity (Mississippi Obesity Action Plan, 2018). The diets people eat define a large extent of their health, growth and development (World Health Organization, 2015). The old adage "You are what you eat" is the notion that in order to live

healthy you must eat good nutritious foods. While the ancient saying captures a great piece of the puzzle for living healthy, there are other factors that must be considered. For example, risk behaviors, such as tobacco use and physical inactivity, can negatively impact an individual's health (World Health Organization, 2015) and over time can lead to the development of chronic diseases (Prevalence of selected risk behaviors and chronic disease, 2008).

In 2019, Mississippi ranked the least healthy state according to the America's Health Rankings report (Health Measures in Mississippi, 2019). In that report, Mississippi ranked 48th for Diabetes, 49th for Obesity, 47th for High Blood Pressure, and 49th for Physical Inactivity. The report highlighted many of the State's pressing challenges such as high levels of poverty, inadequate healthcare, food insecurity, and a host of other issues/challenges. While there are many factors to consider when assessing the overall population's health in Mississippi (e.g., lifestyle, economic, educational), these factors also present potential opportunities to address some of the current health outcomes and challenges present in the state.

The purpose of this research brief is to investigate the relationship between health behaviors, factors, and the prevalence of obesity, diabetes, and high blood pressure in Mississippi's 82 counties. This study seeks to answer the following research questions: 1.) Is there a statistically significant relationship between select health behaviors, factors, and rates of obesity, diabetes, and high blood pressure? 2.) Are there any statistically significant differences among Mississippi's rural and urban counties in regards to the prevalence of diabetes and select health behaviors and factors?

Background

Chronic Diseases and National Statistics

Chronic diseases are defined broadly as conditions that last 1 year or more and require ongoing medical attention or limited activities of daily living or both (CDC, 2020). Risk behaviors for many chronic diseases include tobacco use, poor nutrition (including diets low in fruits and vegetables), lack of physical activity, and excessive alcohol use (CDC, 2020). Research indicates the major contributors to the leading chronic diseases are poor eating habits, lack of physical activity, and tobacco use (Booth, Roberts, & Laye, 2012). Many chronic diseases usually emerge in middle age after long exposure to an unhealthy lifestyle involving tobacco use, a lack of regular physical activity, and consumption of diets rich in highly saturated fats, sugars, and salt (Steyn & Damasceno, 2006).

Nearly half of Americans suffer from at least one chronic condition, and the number is growing. According to the CDC, chronic diseases are the leading cause of death and disability in the United States (CDC, 2020) and by 2025, chronic diseases will affect an estimated 164 million Americans – nearly half (49%) of the U.S. population (Centers for Disease Control and Prevention, 2007). Chronic diseases such as cancer, diabetes, hypertension, obesity, and heart disease can lead to hospitalization, long-term disability, reduced quality of life and, death (Raghupathi & Raghupathi, 2018).

Americans with chronic conditions utilize and spend more on health care services, and often have reduced physical and social functioning (Buttorf, Ruder, & Bauman, 2014). In 2016, the total costs in the U.S. for direct health care treatment for chronic health conditions totaled $1.1 trillion (Waters & Graf, 2018). Hypertension (high blood pressure) was listed as one of the most common chronic health diseases, and diabetes was listed as one of the most expensive conditions in terms of direct health care costs totaling approximately $189.6 billion (Waters & Graf, 2018). Diseases caused by obesity and being overweight accounted for 47.1 percent of the total cost of chronic diseases, and resulted in the U.S. spending approximately $480.7 billion in direct health care costs. The total cost of chronic diseases caused by obesity in 2016 was $1.72 trillion (Waters & Graf, 2018).

Individuals with multiple chronic conditions tend to have poorer health, use more health services, and spend more on health care. About 51 percent of adults have at least one chronic disease, and 26 percent live with multiple chronic diseases (Chronic Disease Prevention and Management, 2013). By 2030, an estimated 83.4 million people in the U.S. will have three or more chronic diseases compared to 30.8 million in 2015 (Waters & Graf, 2018).

Comorbidity of Obesity, High Blood Pressure, and Diabetes

Comorbidity is the term used to describe when an individual has multiple chronic conditions or diseases. The CDC defines comorbidity as "more than one disease or condition present in the same person at the same time (CDC, 2020)." They may also be described as coexisting or co-occurring. According to the CDC, six in ten adults in the U.S. have a chronic disease, and four in ten adults have two or more chronic diseases (CDC, 2020).

Many of the risk factors (e.g., unhealthy diet, physical inactivity) for obesity, high blood pressure, and diabetes overlap with some of the diseases listed as actual risk factors. For example, obesity and diabetes are listed as risk factors for developing high blood pressure. There is some research indicating that obesity significantly increases a person's risk of diabetes and high blood pressure (Khaodhiar, McGowen, & Blackburn, 1999). Additionally, up to 75% of adults with diabetes also have hypertension. Thus, hypertension and diabetes are common, intertwined conditions that share a significant overlap in underlying risk factors (Long & Dagogo-Jack, 2011).

Obesity, High Blood Pressure, and Diabetes in Mississippi

Mississippi has some of the highest obesity rates in the nation among states (Health Measures in Mississippi, 2019). In 2019, Mississippi ranked 49th nationally reporting an obesity rate of 39.5% (national average 30.9%). Mississippi ranked 47th for high blood pressure with a reporting rate of 40.8% (national average 32.2%), and the state ranked 48th for diabetes with a reporting rate of 14.3% (national average 10.9%) (Health Measures in Mississippi, 2019).

The previous sections provide a foundation for understanding the widespread impact of chronic diseases both nationally and on a statewide basis. This study seeks to build upon that foundation by investigating the relationship between select health variables and the prevalence of obesity, diabetes, and high blood pressure in Mississippi's 82 counties. By exploring the relationship between select health behaviors and chronic diseases, this study hopes to provide

policymakers, practitioners, and community residents with information that can help reduce the impact of those diseases in Mississippi.

Methods

This study used a non-experimental correlational research design to investigate the relationship of chronic diseases (i.e., obesity, high blood pressure, and diabetes) and health behaviors in Mississippi's 82 counties. Variables measuring health behaviors included daily consumption of five or more fruits and vegetables; food insecurity; limited access to healthy foods; access to physical activity opportunities; and no leisure time for physical activity. Data was retrieved from Mississippi's County Health Rankings (2015) and from the Mississippi Department of Health (MSDH) County Health Profiles (2016). The 2016 MSDH County Health Profiles reported data for the years 2011-2015.

Analysis procedures included compiling descriptive statistics, running correlation tests, and conducting independent t-tests to determine the relationship among the study variables. Data included in this study was not normally distributed therefore the nonparametric Spearman Rho test facilitated the correlational analysis. Due to six counties having missing data, the actual number of counties analyzed is 76 (verses 82) using the "Listwise" missing data option in the SPSS' statistical program (version 27).

Findings

Table 1 provides a demographic description of the data reported on Mississippi's 82 counties as of 2016.

Table 1
Description of Data (Race, Gender, Geography)

Variable	Percentage
Female	50.9%
Male	49.1%
Urban	25.6%
Rural	74.4%
White or Caucasian	53.9%
Black or African American	40.8%
Hispanic	2.6%
Asian	.54%
Native Hawaiian or Pacific Islander	.04%

Table 2 lists descriptive statistics of the health behaviors and factors examined in this study for Mississippi's 82 counties as of 2016.

Table 2
Means, Standard Deviations, and Ranges for Study Variables

Variable	*Mean*	*S.D.*	Range
Percent (%) Obesity	37.76	5.70	29.5
Percent (%) Diabetic	14.53	1.98	10.5
Percent (%) High Blood Pressure (HBP)	44.10	7.23	47.1
5 > fruits daily consumption (%)	48.17	7.12	40
5 > veg daily consumption (%)	66.44	8.56	40.7
Percent (%) Food Insecure	22	4.71	18.7
Percent (%) Limited access to healthy foods	10.17	7.11	38
Physical activity (%)	36.87	4.99	24.5
Access to physical activity opportunities (%)	45.09	22.9	86.8
No Leisure time for physical activity (%)	34	3.03	15.4

Correlation Findings

Table 3 displays the Correlation matrix for select variables included in this study. The Correlation matrix indicates there is a moderate positive relationship between the percentage of "Food Insecure" and the following variables: High Blood Pressure (HBP) (r =.300, n = 76); p (two-tailed) <0.01; Diabetic (r = .464, n =76); p (two-tailed) < 0.01; and Obesity (r = .364, n = 76), p (two-tailed) <0.01. Thus as the percentage of food insecure increases, the percentage of HBP, diabetic, and obesity also increases.

There is an inverse relationship between percent of adults consuming five or more vegetables and the following variables: Obesity (r = -.292, n =76), p (two-tailed) <0.01; and Diabetic (r = -.313, n =76, p (two-tailed) <0.01). An inverse relationship means as one variable increases the other variable decreases. The percentage of "Limited Access to Healthy Foods" was not statistically significant as related to percent Obesity, Diabetic, and HBP. Also, the

percentage of “Adults Consuming 5 or More Fruits” was not statistically significant as related to percent Obesity, Diabetic, and HBP.

Results indicate that there is an inverse relationship between access to “Exercise Opportunities” and the following variables: HBP % (r = -.437, n =76); Obesity (r = -.401), n =76); and Diabetic (r = -.425), n =76). Thus, as the percentage of “Access to Exercise Opportunities” decreases, the percentage of HBP, Obesity, and Diabetic increases.

A statistically significant positive relationship was found between “No Leisure Time for Physical Activity” and Obesity, and Diabetic. Thus as the percentage of adults reporting no leisure time for physical activity increases, the percentage of Obesity and Diabetic increases. Between the two chronic diseases, Obesity had the strongest correlation with percentage of adults reporting “No Leisure Time for Physical Activity” (r = .520, n =76), p (two-tailed) <0.01; followed by percent Diabetic (r = .426, n = 76), p (two-tailed) p <0.01. Percent HBP was not statistically significant.

A statistically significant positive relationship was found between percentage of “Physical Activity or Exercise” during the past 30 days and percentage of HBP (r = .372, n =76), Obesity (r = .382, n =76), and Diabetic (r = .347, n =76). As the percentage of adults reporting physical activity increases, the percentage of HBP, Obesity, and Diabetic also increases. More research is needed to explain this apparent disconnect with traditional research literature findings.

Interestingly, the correlation matrix confirms research literature findings establishing the comorbidity/intermingling of the three diseases. That is, HBP, Obesity, and Diabetic variables display a moderate positive relationship with each other. For example, as the percentage of HBP increases, the percentage of Obesity and the percentage of Diabetic also increase.

Table 3

Correlation Matrix

	HBP %	Obesity%	Diabetic %	5> fruits %	5>veg %	Food Insecure %	Limited access healthy foods %	No leisure time for physical activity %	Access to exercise opportunities%	Physical activity or exercise %
HBP%	-									
Obesity%	.443**	-								
Diabetic%	.395**	.387**	-							
5>fruits%	-.055	-.083	-.011	-						
5> veg%	-.106	-.292**	-.313**	.166	-					
Food Insecure%	.300**	.364**	.464**	.101	-.514*	-				
Limited access healthy foods%	.086	.062	.137	.227*	-.124	.496**	-			
No leisure time for physical activity %	.211	.520**	.426**	-.145	-.381**	.384**	-.020	-		
Access to exercise opportunities%	-.437**	-.401**	-.425**	.178	.169	-.027	.186	-.272	-	
Physical activity or exercise%	.372**	.382**	.347**	-.220	-.213	.210	-.077	.602**	-.350**	-

*Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Urban/Rural Comparison

An Independent Samples t-test compared the mean scores of select variables for Urban and Rural counties. Table 4 displays the results from the Independent Sample t-test that found

Table 4

Differences in Chronic diseases and select health behaviors/factors among MS rural and urban counties

	Rural		Urban				
	Mean	S.D.	Mean	S.D.	df	t	Sig. (two-tailed)
HBP	44.67	6.07	40.45	6.87	30.243	2.430	0.21
Obesity	38.02	4.65	34.70	5.51	29.258	2.401	0.23
Diabetic	14.83	1.71	12.95	1.85	31.377	3.988	0.00
Phys_activity or exercise during the past 30 days	37.74	4.39	33.60	5.01	30.081	3.267	0.03
5 > veg daily	65.44	8.78	69.26	7.40	39.425	-1.882	0.67
5> fruits daily	47.32	7.63	50.56	4.84	53.209	-2.179	0.34
Access to exercise opportunities	38.20	19.52	69.52	14	46.754	-7.683	0.00
No leisure time phys_ activity	34.33	2.38	32.10	3.85	24.398	2.315	0.29
% Food insecure	20.95	3.65	22.50	5.53	25.171	-1.159	.257
% Limited access to healthy foods	9.04	7.54	12.44	4.78	53.242	-2.316	.024

significant differences between the means of the two groups. Results indicate there are statistically significant differences among rural and urban counties as related to HBP, Diabetic, Obesity, Physical Activity, 5 > fruits daily, Access to Exercise Opportunities, No Leisure Time for Physical Activity, and Limited Access to Healthy Foods.

Rural counties had statistically significant higher mean scores than urban counties for HBP (*M*= 44.67, *sd*= 6.07); Obesity (*M*= 38.02, *sd*= 4.65); Diabetic (*M*= 14.83, *sd*= 1.71). Rural counties also had a statistically significant higher mean score for No Leisure time for Physical Activity (*M*=34.33, *sd*= 2.38) than Urban counties (*M*= 32.10, *sd*= 3.85). Urban counties had statistically significant higher mean scores for Access to Exercise Opportunities (*M*= 69.52, *sd*= 14) than rural counties (*M*= 38.20, *sd*= 19.52). Urban counties also had a higher mean score for Limited Access to Healthy Foods (*M*=12.44, *sd*= 4.78) than Rural counties (*M*= 9.04, *sd*= 7.54).

Discussion

The purpose of this research brief was to investigate the relationship between select health variables and chronic diseases in Mississippi's 82 counties. An examination of research literature revealed that obesity, diabetes, and high blood pressure are comorbid diseases; that is, developing one disease places individuals at a much higher risk for developing the other two diseases. This study's findings also found a significant correlation exists between select health behaviors and the percent of adults with high blood pressure, obesity, and diabetic, including both positive and inverse relationships. In regards to differences among Mississippi's rural and urban counties, rural counties had a higher percentage of adults reporting no leisure time for physical activity and a higher percentage of adults with obesity, diabetes, and high blood pressure.

Food Security & Physical Activity

Significant findings indicate that as the percentage of adults consuming five or more vegetables increases, the percent of obesity and diabetic decreases. As the percentage of food insecurity increases, the percent of high blood pressure, obesity, and diabetic also increases. Food insecure refers to the inability to afford nutritionally adequate and safe foods. While there have been few studies which evaluate the association between food insecurity and chronic diseases among adults (Seligman, Laraia, & Kushel, 2010), adults who are food insecure may be at an increased risk for a variety of negative health outcomes and disparities (Healthy People, 2020). Research literature clearly documents the relationship between a healthy nutritious diet and an individual's health. However, if individuals do not have access or the means to acquire adequate amounts of nutritious foods, this can have a negative impact on the health of individuals.

Another significant finding revealed as the percent of adults reporting "No Leisure Time for Physical Activity" increases, the percent of obesity and diabetic also increase. One of the major risk factors for all of the chronic diseases is lack of physical activity. Individuals who report a lack of physical activity are at an increased risk for developing a chronic disease.

Another significant finding was that as the percent of adults reporting physical activity increases, high blood pressure, diabetic, and obesity also increase. This finding contradicts the research literature which states that physical activity tends to be associated with healthier outcomes. Further investigation into this study's finding should help provide more insight regarding its validity.

Other Factors

Although "Lifestyle" factors served as the focal point of this research study, other factors need considering when examining health and chronic diseases. For example, the role that race, age, and genetics can have on developing chronic diseases. This research study focused on the lifestyle factors because they are adjustable. An individual cannot change the design of their genes or race, but they can to some degree control the diet they consume and their level of participation in physical activity. While the research implications are clear and simple (for example, eat a healthy diet, participate in daily physical activity), there are many other factors that can influence a person's ability to do so such as economics, education, access to grocery stores/healthy foods.

Conclusions

This study sought to answer the following questions: 1.) Is there a statistically significant relationship between select health behaviors, factors and obesity, diabetes, and high blood pressure?; and 2.) Are there any statistically significant relationship differences among Mississippi's rural and urban counties in regards to the prevalence of obesity, diabetes, and high blood pressure and select health behaviors and factors?

Study results indicated there is a significant relationship between select health behaviors, factors, and obesity, diabetes, and high blood pressure. Findings indicated that as the percentage of food insecurity increases, the percentage of HBP, diabetic, and obesity also increase. As the percentage of access to exercise opportunities decreases, the percentage of HBP, Obesity, and Diabetic increase. As the percentage of adults reporting no leisure time for physical activity increases, the percentage of obesity and diabetic increase. Finally, as the percentage of adults consuming five or more vegetables daily increases, the percentage of obesity and diabetic decrease.

Statistically significant differences among Mississippi's rural and urban counties were found. Rural counties reported higher mean scores for HBP, Obesity, and Diabetic which implies the prevalence of these chronic diseases are higher in Mississippi's rural counties. Rural counties also reported higher mean scores for no leisure time for physical activity, whereas urban counties reported higher mean scores for access to exercise opportunities. Rural counties appear to report a lower physical activity level than urban counties and a higher prevalence of HBP, Obesity, and Diabetic than urban counties.

Recommendations

The following recommendations are proposed to help decrease the prevalence of chronic diseases in Mississippi. These recommendations can positively impact citizens by improving their health and quality of life. These recommendations include:

- Transform public spaces to promote and encourage physical activity (e.g., bike lanes, sidewalks, walking trails)
- Develop programs which actively work to educate citizens on how to practice healthy nutritional habits
- Develop strategies to increase physical activity at the community level

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