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RESEARCH ARTICLE

A COMMUNITY-BASED STUDY OF RESIDENTIAL PROXIMITY TO SELECTED CVD ENVIRONMENTAL INFLUENCES-A MISSISSIPPI CASE STUDY.

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Abstract

Background: The objective of this study was to describe the perceptions of community members from three counties in central Mississippi, Hinds, Madison, and Rankin, regarding selected risk factors for cardiovascular disease and prevalence based on proximity to liquor stores/fast food restaurants.

Methods: The study interviewed 118 selected participants of Jackson Heart Study Community Health Advisory Network (JHS CHAN) along with some other community members. We then used the survey data to plot the distribution map of self-reported obesity, diabetes, and overweight of three areas. The plot was then compared with the map from the Jackson Heart Study. We also plotted distribution maps of liquor stores and fast food stores.

Results: The pattern of disparities with the selected measures was similar to the pattern observed in the Jackson Heart Study cohort. The data illustrate areas where liquor stores and fast foods are concentrated posing accelerated risks for residents within the three counties.

Conclusions: Understanding geographic variation in cardiovascular health is an important component of any plan to facilitate capacity building in African American communities, and the collection of data in neighborhood regional context is an important step in initiating health promotion and prevention and intervention strategies as communities strive to gain a better understanding of the prevalence of risk factors and disease. Recognizing certain community characteristics may help public health advocates better focus their preventative efforts.

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Introduction:-

Much of the burden of cardiovascular disease (CVD) has been attributed to modifiable risk factors like lipid abnormalities, hypertension, obesity, the metabolic syndrome, diabetes, and physical inactivity (Addison et al., 2007)]. Other less studied risk factors that contribute to the development of CVD relate to the built environment, which includes everything in the vicinity that has been developed and altered by man. Analyzing community data

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has allowed researchers and state officials to identify high priority populations suffering from the poorest health outcomes as they strive to lead efforts in analyzing and monitoring trends in health disparities (National Conference of State Legislatures, 2011).

The use of geographic information systems (GIS) in chronic disease research and management is not widespread (Diex Roux et al., 2011). Health departments around the country have recently begun to develop the capacity to integrate GIS into daily operations because GIS offers the capacity to increase productivity (Miranda et al., 2013). Public health professionals can use geographic analysis to explore and manage data based on geographical location. They can develop maps and data reports that can uncover avenues for intervention, community outreach, and policy design (Miranda et al., 2011; Dulin et al., 2010). Public health organizations have begun to recognize the fact that the use of GIS can be very beneficial in setting their operation priorities (Bazemore et al., 2010; Dubowitz et al., 2011).

Objectives:-

The objective of this study was to describe the perceptions of community members from three counties in central Mississippi, Hinds, Madison, and Rankin, regarding selected risk factors for cardiovascular disease and prevalence based on proximity to liquor stores/fast food restaurants.

Methods:-

We conducted this qualitative investigation by holding a series of interviews and focus groups with a total of 118 purposefully selected African American residents of Hinds, Madison, and Rankin Counties which are the counties where the Jackson Heart Study data collection has taken place from 2000-2012. The Jackson Heart Study (JHS) study is the largest investigation of causes of CVD in an African-American population, involving 5,301 men and women in Jackson, MS metropolitan area comprising Hinds, Madison, and Rankin Counties. The JHS is uniquely positioned to investigate CVD risk factors, especially manifestations related to hypertension and diabetes, such as coronary artery disease, heart failure, stroke, peripheral arterial disease, and renal disease. Data were collected during three examination periods, Exam 1 (2000-2004), Exam 2 (2005-2008), and Exam 3 (2009-2012) (Campbell-Jenkins et al., 2009; Addison et al., 2011). JHS data collection is ongoing with collection of Annual Follow-up and Surveillance data. For the purpose of comparison, we used self-reported high blood pressure and diabetes diagnoses variables selected from JHS Exam 1 (2000-2004) which also included demographics, psychosocial inventories, medical history, anthropometry, resting and ambulatory blood pressure, phlebotomy and 24-hour urine collection, ECG, echocardiography, and pulmonary function (Addison et al., 2011).

For our study, we plotted the geographic variation in cardiovascular risk factors to make information sharing about preventable cardiovascular disease (CVD) risk factors clearer among community members who generally may not have a clear understanding of sophisticated statistical methods. Eye-balling descriptive factors on the map can provide a visual image to non-scientific community members and draw attention to risk factors for CVD, prevalence of CVD, and environmental influences, like liquor stores and fast food restaurants. This served as a good starting point for investigating health disparities with the intention of gathering information that can be used to plan quality interventions. This investigation allowed us to examine the availability of known built environment risk factors that made it easier for residents in the neighborhoods to access and consume alcohol and high fat and calorific foods. This investigation had the potential to ascertain which area-based cardiovascular risks would be best suitable for monitoring and initiating interventions to reduce cardiovascular risk and inequalities in the health.

Results:-

There are two aspects of the built environment in Hinds, Madison, and Rankin Counties in Mississippi that may impact health that were examined in this study, the preponderance of liquor stores and fast food stores in Hinds, Madison, and Rankin Counties. The location of those establishments that are in close proximity to where individuals live and work may consequently affect their health and contribute to the prevalence of CVD in Mississippi.

The pattern of disparities with the selected measures was similar to the pattern observed in the Jackson Heart Study cohort. However, disparities were generally smaller than for the JHS cohort. The data in Table 1 present a description of the self-reported diagnosis of blood pressure and diabetes of the 5301 African American participants of the Jackson Heart Study who are resident in the tri-county area of Hinds, Madison, and Rankin Counties in Mississippi. The data provide indirect background information about the 118 African American members of the study group who also reside in the same counties as the cohort of the Jackson Heart Study. As is evident from the

data in the table, the reported prevalence of diabetes exceeds the Mississippi average (9.5%) (CDC, 2004) and the national average (9.3%) (American Diabetes Association) with the level among residents in Hinds County being the highest at 17.6%, followed by Madison County at 16.1%, and Rankin County at 12.1%). More than half of the residents in Madison and Rankin Counties reported having high blood pressure which exceeds the Mississippi average and the national average, with the level among residents in Hinds County being the lowest at 43.4%.

Table 1:- County of Residence * Self Reported Categories of CVD

County of Residence	Self Reported Blood Pressure		
	Yes	No	Total
Hinds	1895 (43.4%)	2472 (56.6%)	4367 (100.0%)
Madison	254 (51.0%)	244 (49.0%)	498 (100.0%)
Rankin	125 (53.9%)	107 (46.1%)	232 (100.0%)
Unknown	105 (51.5%)	99 (48.5%)	204 (100.0%)
Total	2379 (44.9%)	2922 (55.1%)	5301 (100.0%)
	Self Reported Sugar/Diabetes		
	Yes	No	Total
Hinds	768 (17.6%)	3599 (82.4%)	4367 (100.0%)
Madison	80 (16.1%)	418 (83.9%)	498 (100.0%)
Rankin	28 (12.1%)	204 (87.9%)	232 (100.0%)
Unknown	36 (17.6%)	168 (82.4%)	204 (100.0%)
Total	912 (17.2%)	4389 (82.8%)	5301 (100.0%)

Adapted from Addison et al., 2011

Table 2 presents a description of the 118 participants in this study. There were 54.2% of them who resided in Hinds County, 28.0% from Madison County, and 15.3% from Rankin County. The majority of the participants were female (78.8%); 64.4% of them had a BMI level that would be considered overweight or obese, and 79.7% of them reported that they had a disease that was related to obesity and weight problems.

Table 2:- Characteristics of Study Participants.

	Frequency	Percent
County of Residence		
Hinds	64	54.2
Madison	33	28.0
Rankin	18	15.3
No Response	3	2.5
Total	118	100.0
Gender		
Male	23	19.5
Female	93	78.8
No Response	2	1.7
Total	118	100.0
Obesity		
BMI < 18.5	5	4.2
BMI 18.5-24.9	12	10.2
BMI 25-29.9	28	23.7
BMI 30.0 +	48	40.7
No Response	25	21.2
Total	118	100.0
Diseases Associated with Obesity (CVD)		
Yes	94	79.7
No	17	14.4
No Response	7	5.9
Total	118	100.0

Figure 1 is a display of the self-report prevalence of obesity among the participants in this study. The largest group of obese participants comprised those residing in Rankin County, followed by Madison County, and Hinds County. Figure 2 is a display of the self-report prevalence of diabetes among the participants in this study. The largest group of participants with diabetes comprised those residing in Hinds County, followed by Rankin County, and Madison County. Figure 3 presents the percent of participants who reported that they were overweight, and Figure 4 presents the percent of participants who reported that they had one or more cardiovascular disease.

Figure 1:- Percent of Adults Self-Reporting Obesity.

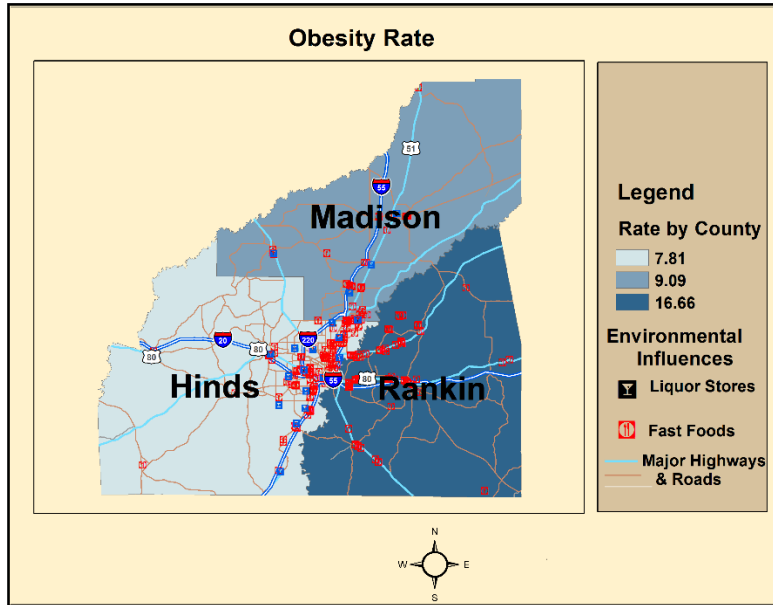


Figure 2:- Percent of Adults Self-Reporting Diabetes

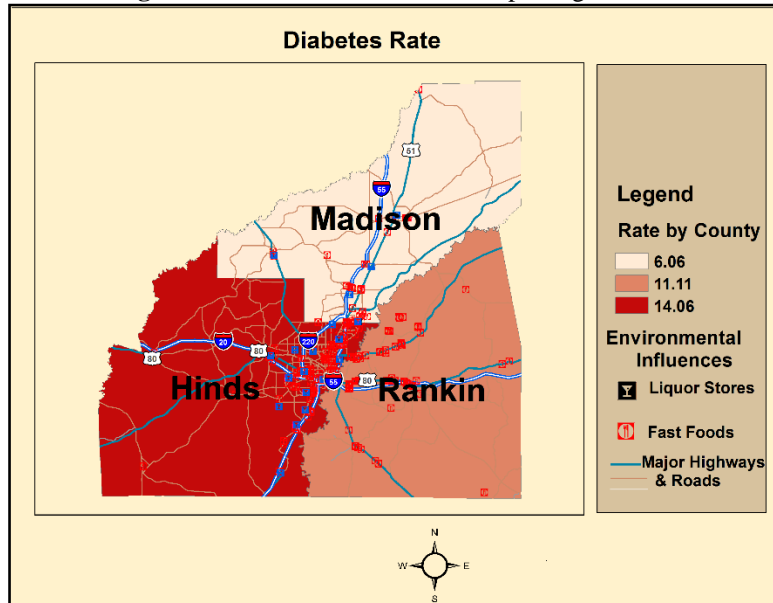


Figure 3:- Percent of Adults Self-Reporting Overweight

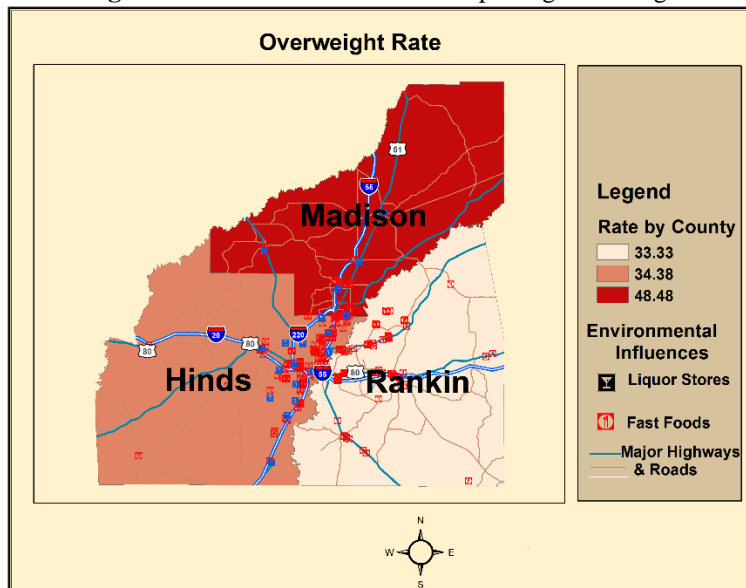
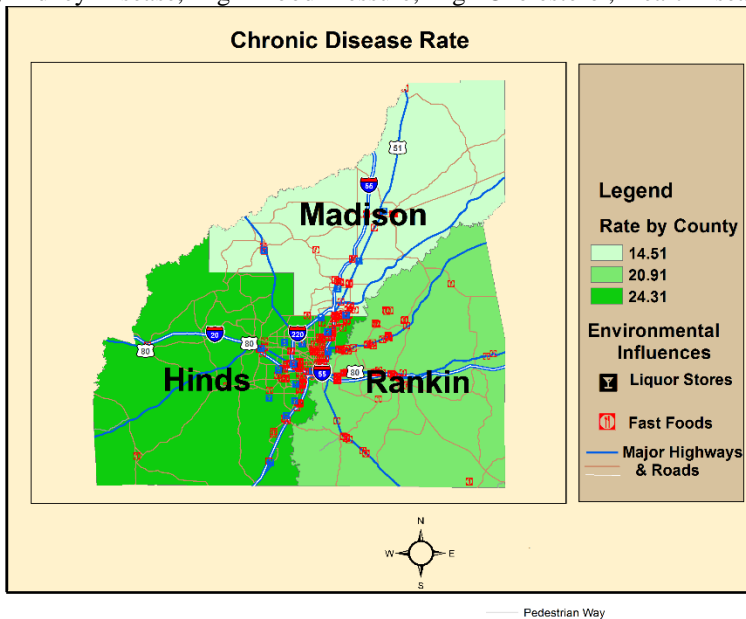


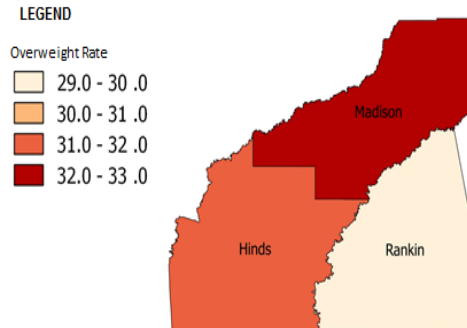
Figure 4:- Percent of Adults Self-Reporting at Least One of the Following Chronic Disease: Overweight, Diabetes, Obesity, Kidney Disease, High Blood Pressure, High Cholesterol, Heart Disease, Cancer



In the Jackson Heart Study (JHS), Madison County had the highest overweight rate (Figure 5), and Rankin County had the highest obesity rate (Figure 6). The entire JHS study rate had high rates of obesity and overweight.

Figure 5:- Overweight in the JHS

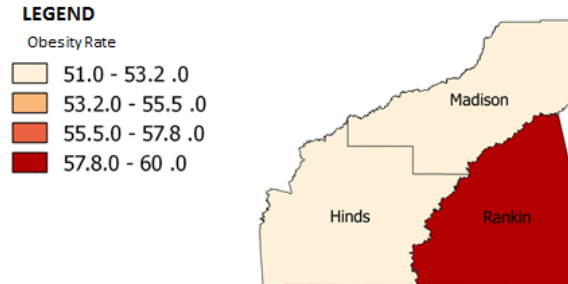
Rate of Participants who said yes to being overweight in the JHS



Adapted from Addison et.al., 2011

Figure 6:- Obesity in the JHS

Obesity Rate of JHS calculated by (yes to obesity/number who answered survey)*100



Adapted from Addison et.al., 2011

The data in Figures 7 and 8 illustrate the location of two built environment risk factors, liquor stores and fast foods, within the three counties under investigation in this study. Figure 7 highlights the areas where liquor stores are concentrated. This information is of importance because of the reported relation between alcohol consumption and cardiovascular disease (Pearson, 1996). Figure 8 highlights the areas where fast foods are concentrated. This is important information for community members to examine because excessive fast food intake is believed to increase risks for diabetes and heart disease (Odegard et al., 2012; Morgenstern et al., 2009).

Figure 7:- Liquor Store Hotspots

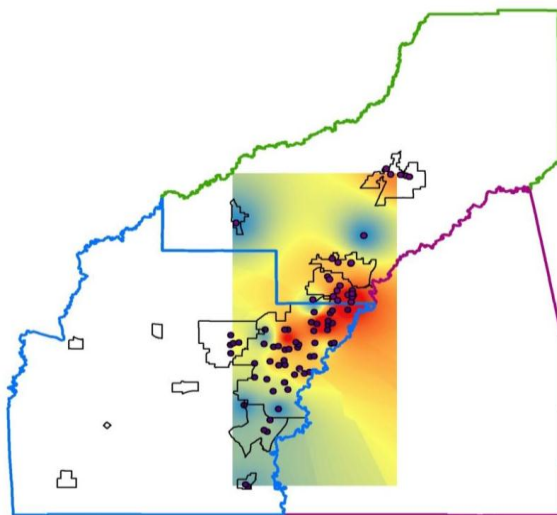
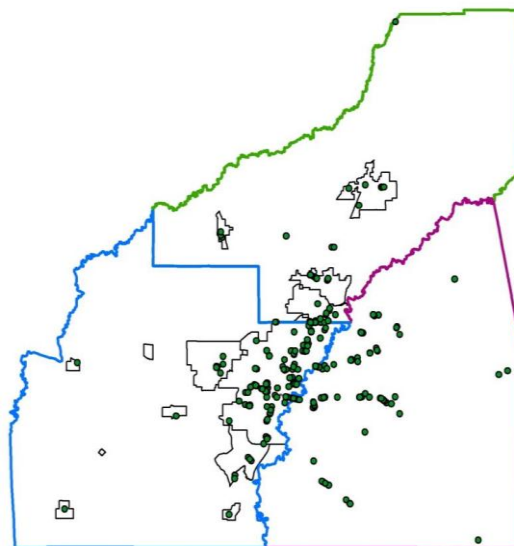


Figure 8:- Fast Foods Hotspots



Conclusions:-

This study examined the distribution of liquor stores and fast foods in the tri-county area of Hinds, Madison, and Rankin Counties in Mississippi. Excessive consumption of alcohol and fast foods have been presented as risk factors for the development of cardiovascular disease. Essentially, the information presented in this study demonstrates that liquor stores and fast food restaurants are concentrated in specific areas within the three counties where easy access could contribute to the prevalence of CVD and cardiovascular disease risk factors. The prevalence of cardiovascular disease and risk factors may be specific to neighborhood characteristics, and recognizing certain community characteristics may help public health advocates better focus their preventative efforts.

Liquor stores and fast food eating places are not randomly distributed across space within the tri-county area of Hinds, Madison, and Rankin Counties. They tend to form clusters, or hotspots (Eck, 2005). These hotspots develop to target the many potential customers in the neighborhoods (e.g. people, residences) that fit a certain demographic. In the same way the population at risk can be clearly and easily identified for businesses to set up shop, such as the number of households per neighborhood, public health professionals and community members can identify these neighborhoods and target them for intervention as they wage a campaign to change negative health status and instill more positive practices in the psyche of the community. Understanding geographic variation in cardiovascular health is an important component of any plan to facilitate capacity building in African American communities, and the collection of data in neighborhood regional context is an important step in initiating health promotion and prevention and intervention strategies as communities strive to gain a better understanding of the prevalence of risk factors and disease. With the dissemination of the information gathered using GIS mapping, public health professionals can begin the development and subsequent implementation of targeted interventions for improving overall quality and increasing knowledge that have the potential to reduce racial and ethnic disparities in health and healthcare among the African American residents of these counties.

Since it is believed by many researchers that the built environment has some negative influence on public health, it is important for communities and public health officials to examine the issues associated with the built environment and its influence on public health and explore solutions in the same manner that biomedical and behavioral risk factors are examined. The use of GIS to map disease incidence and prevalence will facilitate environmental scanning of the risk factor infrastructure of Hinds, Madison, and Rankin Counties, study environmental hazards that may be present, and identify segments of the communities that can be prioritized and targeted for interventions. The data provided can be used to stimulate public concern, discussion, and engagement about how the communities of Hinds, Madison, and Rankin Counties can achieve the essential goal of improving the quality of their lives on the way to eliminating health disparities.

The GIS maps provided in the figures depict clusters of these environmental influences that are located in areas of the counties where an abundance of at-risk community members reside. This information can be disseminated to community members and key policymakers. If the objective is to promote risk reduction efforts, communities can begin to increase access to comprehensive viable resources and services by examining the neighborhood level data and seeking innovative solutions. To the general public and many policy-makers, issues relating to public health, health care, and health disparities remain indistinct. Using GIS mapping to capture and present population health issues and health disparities data can help to open the dialogue and provide an avenue to begin the discussion about realistic ways to address some of the risk factors, reduce risk behaviors, modify restrictive policy, and ultimately reduce the prevalence of cardiovascular disease in Mississippi and improve community health overall. Neighborhood characteristics can influence CVD risk that exist because of the type of environmental, neighborhood, and cultural characteristics that are present. Modifying policies and developing interventions based on the type of geographical challenges noted in this study can address the social determinants that people experience and help to reduce some of the inequalities in CVD risk factors.

This study has several limitations that should be noted. The analysis and the results of this study cannot be generalized to other places. The number of participants who provided self-reported information is a limitation to the generalizability of the findings. The self-reported data provided by the participants could also be a limitation. This is a qualitative study that did not allow more numerical analyses of the data which can also be regarded as a limitation. Further analyses are recommended for a future study for correlating specific distance from participants' home address to nearest fast food/liquor store with BMI, BP, or lipid characteristics. Also, a future study evaluating public health preventative interventions based on built community characteristics is warranted. In addition, a future study can examine obesity rates in communities after construction of fast food/liquor stores.

Conflicts of Interest: The authors declare no conflict of interest.

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Author Contributions:-

All authors conceived the manuscript. Clifton Addison, Donna Antoine-LaVigne and Brenda Jenkins undertook data analysis and conceived the presentation of results. Brenda Jenkins, Donna Antoine-LaVigne, and Sherry Stephens-Gibson drafted different versions of the manuscript. Milton Dawkins, Marinelle Payton, James Kelley and Robert Hughes provided ongoing feedback and reviews concerning data analysis, interpretation of results, and write-up until final manuscript completion. All authors read and approved the final manuscript.

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