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Emergency Department Utilization by South Carolina Patients with Type 2 Diabetes: A Needs Assessment to Inform Primary Care Access and Telehealth Improvement

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Emergency Department Utilization by South Carolina Patients with Type 2 Diabetes: A Needs Assessment to Inform Primary Care Access and Telehealth Improvement

BY

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A doctoral project submitted to the faculty of the Medical University of South Carolina
in partial fulfillment of the requirements for the degree
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Acknowledgments

I am a first generation college graduate from the projects of Columbia SC with parents who could not read or write. My father instilled in me a "never give up attitude" that I carried with me in everything I chose to accomplish in life. My mother died when I was 26 years old and my father died two years later. I was a non-traditional college student with four young children (3, 5, 6, and 12) and no parents to help me along the way. That "never give up attitude" was very relevant through my academic journey because it was very much a challenge. I obtained my BSW at the age of 34, my MSW 11 months later, and now my doctorate degree at age 58. My mottos are "It's never too late to start a journey," and "When you accomplish one goal, set another one and go after it."

I would like to thank my children, Tiarea, BJ, T'Keilah, and Beontae. They have always been my motivation to succeed and now they are my biggest cheerleaders. I would like to acknowledge my five grandchildren because they are the loves of my life (Hazel, 10; Neeko, 3, Raevyn, 2, Bernard III, 9 mos, and MaKeilah, 8 mos. They keep me on my toes and we cherish one another.

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Abstract of Doctoral Project Presented to the
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Degree of Doctor of Health Administration

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Beverly Wilson Holmes

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BACKGROUND: Type 2 diabetes (T2D) is a major population health issue that affects 9.4% of the United States (US) while disproportionately affecting minority populations. T2D is highly prevalent and correlated with increased morbidity as well as early mortality rates, making it the seventh leading cause of death in the US in 2019. There is a high prevalence of T2D in the US and approximately 7 million people are undiagnosed.

OBJECTIVE: To assess if race plays a role in ED utilization and identify geographic areas where improvement in primary care and support by telehealth would be of greatest value.

RESEARCH DESIGN: This is an exploratory research design that used an all-payer claims database (APCD) to explore all SC ED visits in 2019 for AAs and whites.

RESULTS: The overall findings demonstrate that in SC, AAs per 1000 with a presence of T2D utilized the ED more than Whites regardless of the county designation of rural or high SVI.

CONCLUSION: ED utilization across the total adult SC population was higher for AAs than Whites.

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CHAPTER I INTRODUCTION

1.1 Background and Need

Type 2 diabetes (T2D) is a major population health issue that affects 9.4% of the United States (US) while disproportionately affecting minority populations (Campbell and Egede, 2020; Haw, et al, 2021; Hill, et al, 2013). T2D is a complex disease and is classified as a chronic disease because of its potential to last for a long time, reoccur, and lead to death. T2D is highly prevalent and correlated with an increased morbidity as well as early mortality rates, making it the 7th leading cause of death in the US in 2019 (Campbell and Egede, 2020;). There is a high prevalence of T2D in the US and approximately 7 million people are undiagnosed (Spanakis and Golden, 2013). The prevalence is projected to increase as much as three-fold by 2050 (Menegehini, et al, 2019). While T2D is one of the two types of diabetes affecting the US population, it accounts for 95% of all diabetes cases (Campbell and Egede, 2020).

T2D is more prevalent in the American Indians/Alaska natives (14.7%), Hispanics (12.5%), and African Americans (11.7%) (Campbell and Egede, 2020). African Americans disproportionally experience the largest burden of disease compared to Whites. African Americans have an T2D incidence rate of 6.5 per 1000, compared to 7.0 per 1000 for Hispanics and 6.0 per 1000 for Whites (Campbell and Egede, 2020).

1.2 Problem Statement

Community level barriers among vulnerable populations contribute to the health disparities that diabetes patients of color experience at a disproportionate rate. These barriers may include poverty, unemployment, discrimination, lack of education, violence, food deserts, limited transportation, and limited access to technology. They are essentially the social determinants of health (SDoH) that many vulnerable populations experience within their communities. SDoH can be described as locations where people are born, live, grow, work, play, and age (Walker, et

al, 2014). A more comprehensive discussion of SDoH can be found in the Social Determinants of Health and its Impact on Healthcare section. These barriers interfere with patients' access to healthcare and resources, which greatly influence their health outcomes (Campbell and Egede, 2020). Patients with diabetes who also have limited access to primary care frequent the emergency department (ED) seeking care for a variety of reasons that may not necessarily be associated with T2D (McNaughton, C, Self, W., and Slovis, C., 2011). Telehealth may improve access to healthcare by reducing barriers such as limited access to transportation, eliminating cost associated with traveling, as well as addressing the shortage of providers in underserved communities. Telehealth also may contribute to better health outcomes (Schorn, et al., 2023). Many of these same communities are designated as socially vulnerable due to their capacity to anticipate, confront, repair, and recover from catastrophic events (Flanagan & Hallisey, 2018). The CDC developed a tool to help determine if a community has a high social vulnerability index (SVI). The section of this paper entitled, "Social Determinants of Health and its Impact on Healthcare" will provide a more comprehensive discussion into SVI. It is not known how many people in SC use the ED to manage diabetes and if those rates differ by AA, White, and SVI.

1.3 Study Objective

To assess if race plays a role in ED utilization and identify geographic areas where improvement in primary care and support by telehealth would be of greatest value.

1.4 Research Questions

This study aims to address this primary research question, "Is there a difference in Emergency Department (ED) utilization rates among African Americans (AAs) compared to Whites who have a presence of Type 2 diabetes (T2D) at the time of the ED visit and who are living in high Social Vulnerability Index (SVI) counties in South Carolina? The secondary research questions that this study will address are:

1. Is the presence of T2D associated with higher ED utilization rates in South Carolina for AAs as compared to Whites?
2. Is living in a high SVI county associated with higher ED utilization rates in South Carolina for AAs as compared to Whites?
3. Is the presence of T2D and living in high SVI counties associated with higher ED utilization rates for AAs as compared to Whites?

For the purposes of this study ED utilization rates refers to the number of ED visits for each county of SC per 1000 adult residents.

1.5 Research Hypotheses

I hypothesize that ED utilization rates for the presence of T2D and living in a high SVI County in SC are higher for AAs.

1.6 Population

The population of interest for this study were adults aged 18 and older who lived in South Carolina and had an ED visit in 2019. The study included all AA and White patients with an ED visit and a presence of T2D as identified by one or more of the T2D ICD 10 codes in Table 2. Other ethnicities were excluded from this study because of the low population proportionality. The incidence rates of T2D were highest for Whites and lowest for African Americans which necessitated a comparison between these two groups (Campbell and Egede, 2020).

2 CHAPTER II SCOPING LITERATURE REVIEW

2.1 Introduction

The study will evaluate the following question, "Is there a difference in Emergency Department (ED) utilization per 1000 AAs compared to Whites who have a presence of Type 2 diabetes (T2D) at the time of the ED visit and lives in high SVI counties in South Carolina? The literature is being examined to determine: (1) the rate of T2 diabetes in SC adults who are AA in comparison to Whites; (2) the community level risk factors of T2 diabetes in communities influenced by SDoH; (3) ED utilization in socially vulnerable communities.

2.2 Background

Type 2 diabetes is a chronic and progressive health condition that affects how the body turns food into energy (Office of Minority Health). The body does not make enough insulin or use it properly, which causes too much sugar to remain in the bloodstream (Office of Minority Health). Diabetes disproportionately affects AAs more than any other race (Office of Minority Health). According to the US Department of Health and Human Service, AAs were two times more likely to die from complications of diabetes than Whites and 3.8 times more likely to be admitted into the hospital with complications of diabetes (Office of Minority Health).

There are multiple risk factors associated with developing T2D. These risk factors are similar for AAs and Hispanics. One of the major risk factors is obesity, which is an epidemic in the US (Aguyo-Mazzucato, et al., 2019). The increasing rate of obesity is one of the primary risk factors for developing T2D among the minority groups in the United Kingdom as well (Nagar, et al., 2021). Throughout much of the world, obesity is an indicator for health inequity especially among minority populations, low-income communities, and immigrants (Candib, L., 2007). US obesity rates for adult minorities are higher than Whites (49.9% AAs, 45.6% Hispanic and 41.4% White) in the US (CDC.gov)

Another major risk factor for developing T2D is lifestyle and lower socioeconomic status, which falls under the umbrella of SDoH (Chatterjee, R., Maruthur, N., and Edelman, D., 2015). Socioeconomic status is not just about economics, it also includes educational and occupational status. SDoH is a strong predictor in the development and progression of many diseases that are associated with minority populations (Hill-Briggs, et al., 2021). There is an urgent need to better understand how SDoH influences health disparities (Cleveland, et al., 2023).

2.3 **Diabetes**

Diabetes is a global public health burden and it continues to be a substantial societal and individual burden among those who are affected by the disease (Spanakis, E. and Golden, S, 2013; Meneghini, et al, 2019). This is especially significant for racial/ethnic minorities, the socioeconomically disadvantaged, and the underinsured individuals in the US (Meneghini, et al, 2019). The burden of the disease is manifold and contributes to poor health outcomes and poor quality of life for diabetes patients (Meneghini, et al, 2019).

Complications that are traditionally associated with T2D includes macrovascular conditions such as coronary heart disease, stroke and peripheral arterial disease, and microvascular conditions, including kidney disease, retinopathy and peripheral neuropathy (Tomic, et al, 2022). Complications of diabetes are a major factor that leads to morbidity in these patients. Retinopathy, nephropathy, and lower extremity amputations are the most predominant microvascular complications (Haw, et al., 2021). Retinopathy is the most common, and there are over 10,000 cases of blindness among diabetes patients annually in the US. Racial minorities with diabetes are more likely to experience this complication (Haw, et al., 2021). Nephropathy is the leading cause of renal failure among diabetes patients, and this complication disproportionally affects AAs and Hispanics more than Whites (Haw, et al, 2021).

There is a similar trend with lower extremity amputations where AAs who have diabetes experience this complication at the highest rate compared to other races (Haw, et al., 2021). Macrovascular complications include cardiovascular and cerebrovascular diseases and among diabetes patients, these diseases contribute to excess morbidity and mortality. AAs are disproportionally affected by cerebrovascular disease (Haw, et al., 2021). Although, these traditional complications continue to pose a great burden for those patients living with diabetes, rates of these conditions have been on the decline as improvements have been made to the disease management process (Tomic, et al., 2022). With these improvements, people with T2D are living longer and consequently experiencing a different set of complications (Tomic, et al., 2022).

2.4 Social Determinants of Health and its Impact on Healthcare

The Centers for Disease and Control describes SDoH as social and economic situations that affect health outcomes of people and communities (Walker, et al, 2015). It is further depicted as settings in which people are born, live, grow, work, play, age, as well as systems set up to address illness (Walker, et al, 2014). SDoH are associated with the disparate development of chronic diseases and the challenges of disease management (Hill, et al, 2013). Clinicians are recognizing the important role SDoH plays in the increasing incidences of T2D and their contribution to health disparities in the US (Hill, et al., 2013). These social determinants include income, education, housing, and access to nutritious food (Hill, et al, 2013).

According to the Department of Health and Human Services, Office of Disease Prevention and Health Promotion, there are five domains of SDoH (Figure 1). These five domains includes education access and quality; economic stability; social and community context; neighborhood and build environment; and health care access and quality (Office of Disease Prevention and Health Promotion, 2022). These complex factors are viewed as the best

predictors of individual and population level health outcomes (Hill, et al., 2013). Several barriers make T2D more problematic for deprived patients. First, increased health care costs can cause a financial burden, which can exaggerate the effects of poverty (Hill, et al., 2013). Second, deprived patients with T2D may have limited access to resources that are needed to successfully manage their diabetes (Hill, et al., 2013). Some of the necessary resources includes adequate housing, nutritious food, and heath care services. Third, if T2D is not successfully managed, it can lead to employment problems (Hill, et al., 2013). These barriers could exacerbate poverty, deprivation, and social exclusion (Hill, et al., 2013).

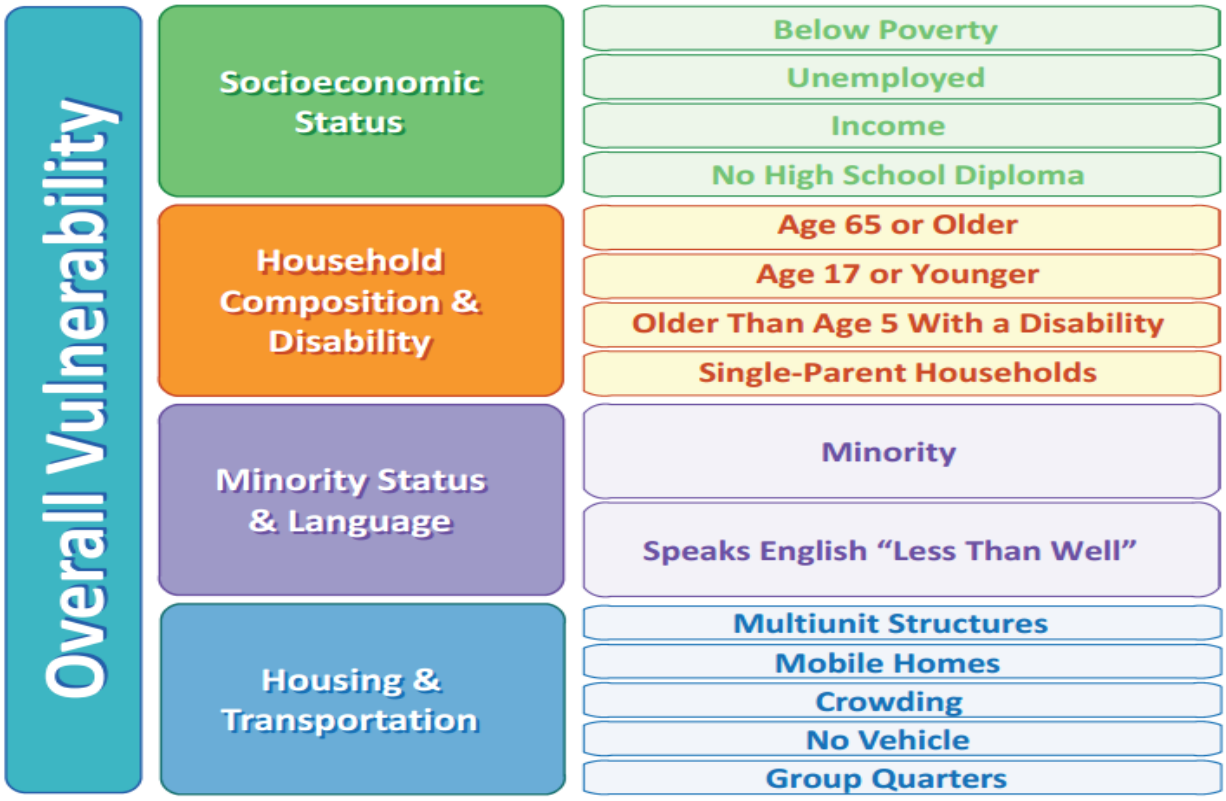
Figure 1 Social Determinants of Health Graphic

Source: (Office of Disease Prevention and Health Promotion, 2022)

Social vulnerability is a construct that is described as characteristics of people or their community's response to disasters in their capacity to anticipate, confront, repair, and recover (Flanagan & Hallisey, 2018). Evidence indicates the poor are more vulnerable at all phases of a catastrophic event. Racial/ethnic minorities, children, elderly, and disabled people are also vulnerable (Flanagan & Hallisey, 2018). Socially vulnerable communities are expected to experience higher rates of mortality, morbidity, and property destruction and less likely to be able to recover compared to those communities that are considered less vulnerable (Flanagan & Hallisey, 2018).

The Geospatial Research, Analysis, and Services Program (GRASP) at Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry created a Social Vulnerability Index (SVI) to assist disaster management state agencies in identifying their most vulnerable locations. Each SVI is made up of 15 census variables and then grouped into four themes as identified in Figure 2. The census variables were each ranked from highest to lowest vulnerability across all census tracts (Flanagan & Hallisey, 2018). Each of the four themes were given a percentile rank and an overall percentile rank was given for each census tract. In order to identify social vulnerability, each census tract that had a percentile rank of $\geq$90 was flagged as being more socially vulnerable (Flanagan & Hallisey, 2018; Wilson, J., 2023).

Figure 2 Variables and Themes in Social Vulnerability Index Databases



Source: (Flanagan, B. & Hallisey,E., 2018).

2.5 ED Utilization in place of primary care

Patients who visit EDs more often are less likely to have a regular primary care home. ED care and primary care tend to be used as a substitute for one another in many instances (Maeng, D., Hao, J., and Bulger, J., 2017). If primary care becomes more accessible and available, the patients who currently use the ED in lieu of primary care may use it less often, especially for non-emergent purposes (Maeng, D., Hao, J., and Bulger, J., 2017). This in turn may lead to patients managing their chronic diseases more effectively because patients with T2D likely receive better care from a primary care home than the ED (Chiou, et al.,2009). Seeking routine disease management from a primary care home will also reduce the cost burden of treating diabetes and other chronic diseases because these patients pay more for care when they visit the

ED but do not receive any guarantee the quality of the services is better for managing their disease (Chiou, et al., 2009).

2.6 Conclusion

T2D is a chronic and progressive disease that disproportionally affects AAs more than any other race (Office of Minority Health). It poses a significant societal and individual burden for those who are affected (Spanakis, E. and Golden, S, 2013; Meneghini, et al, 2019). In the US, the disease primarily burdens racial and ethnic minorities, socioeconomically disadvantaged, and underinsured individuals. T2D leads to poor health outcomes and poor quality of life for diabetes patients (Spanakis, E. and Golden, S, 2013; Meneghini, et al, 2019).

SDoH are associated with the disparate development of chronic diseases and the challenges of disease management (Hill, et al, 2013). They are recognized as having an important role in the increasing incidences of T2D and their contribution to health disparities in the US (Hill, et al, 2013). The social determinants includes income, education, housing, and access to nutritious food and they are viewed as the best predictors of individual and population level health outcomes (Hill, et al, 2013). This study will evaluate the ED utilization of adults who are among the T2D population. A comparison will be made between AAs and Whites with T2D (African Americans and Whites, respectively) to quantify whether ED utilization differs between these two groups. There continues to be a huge gap in health disparities for minorities and the gap is significantly wider for AAs who lives in high social vulnerability index communities. It is important for more research to be conducted with the aim at closing the gap on health inequality. One important factor is to ensure this vulnerable population has a seat at the table research participants.

3 CHAPTER III METHODOLOGY

3.1 Research Design

This study examined Emergency Department (ED) visits among South Carolinians with a presence of Type 2 diabetes (T2D) by 1) race and 2) whether they live in a high social vulnerability index (SVI) county. This is an exploratory research design that used an all-payer claims database (APCD) to explore all SC ED visits in 2019.

3.2 Sample Selection

The inclusion criteria for the sample selected for this study were adults aged 18 and older who 1) had an ED visit in 2019, 2) had a presence of T2D at the time of the visit, and 3) were a resident of SC (Table 1). Other races were excluded from the study because of a limited sample of study patients.

Table 1 Inclusion Criteria

Criteria	Definition
ED visit in 2019	ED visit that did not result in a hospital admission
Presence of T2D	Identified by at least one T2D ICD 10 Code
Resident of SC	Lives in one of the 46 counties in SC
Age	18 and older
Race	African American and White

3.3 Data Set Description

The APCDs are large state databases that are mandatory in some states and voluntary in others. The APCD collects a variety of claims data including medical claims, pharmacy claims, and dental claims (AHRQ, 2017; McCarthy, 2020). The APCD for SC collects all ED visit data for patients covered under Medicaid, Medicare, private insurance, or uninsured in 2019. The

sample for this study includes AAs and Whites who were least 18 years old, had a presence of T2D, and were a resident of SC. Hispanic patients were excluded due to a limited sample.

3.4 Data Collection/Procedure

The SC APCD used for this study captured all ED visits that occurred in SC for adults aged 18 and older regardless of payer. This data provided a comprehensive view of ED utilization in SC for 2019. The data that were extracted for this study was from 2019 and included all adult ED visits. This data was further narrowed down to include only ED visits that established a presence of T2D as identified by one or more of the T2D related ICD 10 codes listed in Table 2. Descriptive patient variables were evaluated by presence of T2D. (Table 3).

Table 2 Type 2 diabetes mellitus diagnoses ICD 10

ICD 10 Codes	Diagnosis
E11	Type 2 diabetes mellitus
E11.0-E11.01	Type 2 diabetes mellitus with hyperosmolarity
E11.1-E11.11	Type 2 diabetes mellitus with ketoacidosis
E11.2-E11.29	Type 2 diabetes mellitus with kidney complications
E11.3-E11.39	Type 2 diabetes mellitus with ophthalmic complications
E11.4-E11.49	Type 2 diabetes mellitus with neurological complications
E11.5-E11.59	Type 2 diabetes mellitus with circulatory complications
E11.6-E11.69	Type 2 diabetes with other specified complications
E11.8	Type 2 diabetes mellitus with unspecified complications
E11.9	Type 2 diabetes mellitus without complications

3.5 Independent and Dependent Variables

The primary independent variables were the total number of ED visits that did not result in a hospital admission, the number and percentage of ED visits, race (AA and White), and age (18+) of the patients who had an ED visit in 2019. I further controlled for the following patient descriptive variables: insurance status, sex, Charlson score (0, 1, 2+), and SVI (high or low) (Table 3).

High or low SVI counties were determined by the Centers for Disease and Control (CDC) social vulnerability index. Those counties in SC that ranked 90% or higher met the criteria for a high SVI county (Flanagan & Hallisey, 2018). This study used "1" to indicate yes if a county met the criteria for a high SVI and a "0" for no. The dependent variables were all ED visits, presence of T2D at the time of the visit as defined by the ICD 10 codes in Table 2 and a resident of SC at the time of the visit. The comparison groups, AAs and Whites, stratified these variables in order to investigate the ED utilization rate of each group.

3.6 Data Analysis

All ED visit records for each county were counted and used with the census population data to calculate the adult utilization rates of ED visits. The county rates for all residents, AAs and White, were calculated and displayed as "heat maps" to show variations in ED use rates for residents with diabetes. Further, counties were compared by rural and urban description and by CDC SVI.

ED visits that did not result in a hospital admission were extracted from SC APCD for all adult ED visits in SC for 2019. Hospital admissions were excluded because I am looking at patients who have limited access to primary care but uses ED as primary care. Patient level descriptive statistics were assessed by high and low SVI counties in South Carolina.

3.7 Protection of Human Subjects

This study is exempt from Institutional Review Board approval due to the use of secondary de-identified data.

4 CHAPTER IV RESULTS

4.1 Demographic Characteristics of Study Sample

Descriptive statistics, proportions, and means of the demographics and comorbidity burden were calculated and presented in Table 3. All adult patient records (N=23560) with a primary diagnosis of T2D diabetes as identified by at least one T2D ICD 10 code E11.xx (Table 2) for 2019 were observed. All records for ED visits were then extracted (N=64,908) from the SC All payer database. County level binary indicators of rurality (rural=1), CDC Social Vulnerability Index (CDC_SVI >90%=1), number of adults in each of the 46 counties of SC in the 2020 census, and the number of AAs in the county were factored into the extraction of data. The Charlson comorbidity indicator was calculated based on all ICD-10 codes present in the patient ED record.

The study patients were aged 18 and older. There was a significant difference ($p<.0001$) in the age of the study patients. Patients between the ages of 50 and 64 were the largest sample (34.7%), followed by ages 65-79 (30.4%) and patients 18-49 (26.4%). The smallest sample were ages 80 and older (8.5%). There were 51% of the study patients identifying as male and 49% as female. Race is categorized as AA (50%) and White (46.6%) which is the comparison group for the purposes of this study. Other races were excluded from the study due a limited sample size. Medicare was the largest insurance group at 52%, followed by Private insurance at 19%, and Medicaid at 12.3%. Uninsured and other combined accounted for about 17% of insurance coverage type. The Charlson Comorbidity Score (Table 3) indicated the patients in the study sample had a medium to moderate level of comorbidity as indicated by the mean score of 1.53 (SD 1.9).

Table 3 Demographic characteristics of the study patients with a diagnosis of diabetes

Patient Characteristic	**Number (%)***
Age Group:	
18-49 years	6,224 (26.4)
50-64 years	8,164 (34.7)
65-79 years	7,172 (30.4)
80+ years	2,001 (8.5)
Sex:	
Male	12,020 (51.0)
Female	11,540 (49.0)
Race:	
White	10,981 (46.6)
AA	11,695 (50.0)
Insurance Coverage:	
Medicare	12,257 (52.0)
Private Insurance	4,475 (19.0)
Medicaid	2,891 (12.3)
Uninsured	2,4,79 (10.5)
Other	1,459 (6.2)
Charlson Comorbidity Score	
Mean (SD) Range	1.53 (1.9) 0-14*

*Charlson scores are presented as Mean (SD)

Further review of the insurance types by race in Table 3A revealed that insurance type is not equal for AA and White patients. White patients have the highest rates (57%) of Medicare and AAs have the highest rate (13%) of Medicaid. There were a difference of 3% in uninsured with 13% for AAs and 10% for Whites. The other category of insurance types were equal for AAs and Whites at 6%.

Table 3A Insurance Coverage by Patient Race

Insurance Type	White	AA
Medicare N (%)	6,216 (57)	5,763 (49)
Private Insurance N (%)	2,111(19)	2,215 (19)
Medicaid N (%)	911 (8)	1,474 (13)
Uninsured N (%)	1,071 (10)	1,556 (13)
Other N (%)	672 (6)	687 (6)
Total Patients N (%*)	10,982 (47)	11,695 (50)

4.2 ED Visits for South Carolinians with a T2D ICD-10 Code

Table 4 shows the ED visits in 2019 for patients aged 18 and older who had at least one T2D ICD 10 code in their record and lived in one of the 46 counties of SC at the time of their ED visit. The table breaks down total ED visits and ED visits per 1000 for AAs vs Whites, rural vs urban counties of SC, and high SVI vs low SVI counties of SC. There were 64,908 ED visits for patients who had a T2D ICD 10 code in their record in 2019 across all 46 counties of SC. AAs accounted for 56% of those ED visits (36,426) compared to 39% of ED visits (25,480) for Whites. The average rate in SC in 2019 was 25 ED visits per 1000 adults. Of those, there were 39 ED visits per 1000 for AAs compared to 13 ED visits per 1000 for White residents. That amounted to 26 (three times) more ED visits per 1000 for AAs than Whites.

When comparing ED visits per 1000 of the population residing in rural versus urban counties in 2019 there were an average of 28 ED visits per 1000 in the rural and urban counties combined. Of those, there were 38 ED visits throughout the rural (15) counties and 18 ED visits throughout the urban (31) counties. That amounted to 20 more ED visits per 1000 in rural counties than the urban counties. AAs per 1000 in rural communities had 50 ED visits compared

to 19 ED visits per 1000 Whites, which amounted to 31 more ED visits per 1000 for AAs than Whites.

When comparing ED visits per 1000 of the population residing in high SVI and low SVI counties in 2019, there were an average of 25 ED visits per 1000 in high SVI and low SVI counties combined. Of those, there were 35 ED visits within the high SVI (18) counties and 18 ED visits within the low SVI (28) counties. That amounted to 20 more ED visits in the high SVI counties than the low SVI counties. AAs per 1000 in high SVI counties had 45 ED visits compared to 17 ED visits for Whites, which amounted to 28 more ED visits for AAs than Whites.

Table 4 2019 ED visits for SC Adults with a T2D ICD 10 code

Variable	Total Pop. (AA & White)	AA Pop. (%)	White Pop. (%)	Difference (AA minus White)
ED visits Population	64,908	36,426 (56%)	25,480 (39%)	10,946 (17%)
ED visits per 1000	25	39	13	26
	Sum of ED visits (Rural and Urban)	Rural (%)	Urban (%)	Difference (Rural minus urban)
ED visits	64908	9578 (15%)	55330 (85%)	0
ED visits per 1000-Population	28	38	18	20
ED visits per 1000 AA	39	50	34	16
ED visits per 1000 White	13	19	11	8
	Sum of ED Visits (High SVI and Low SVI)	High SVI (%)	Low SVI	Difference (High SVI minus Low SVI)
ED visits	64908	17685 (27%)	47223 (73%)	0
ED visits per 1000-population	25	35	18	17
ED visits per 1000 AA	39	45	34	11
ED visits per 1000 White	13	17	11	6

4.3 **Counties with the Highest and Lowest ED visits per 1000**

Table 5 displays the top five counties with the highest T2D ED utilization rates. The five counties are Marion (90 ED visits per 1000 adults), Allendale (77.4), Dillon (60.3), Hampton

(57.6), and Colleton (40.6). The ED utilization rate was compared for AAs and Whites. Each of the five county's classification of rural or SVI were identified. The ED visits ranged from 90 to 40.6 ED visits per 1000. The range of ED visits for AAs were 46.7-94 and Whites 21-39.1. All five counties were classified as rural as well as high SVI.

Table 5 Top 5 counties with the highest ED visits per 1000 compared to ED visits per 1000 for AAs and Whites

Counties	ED per 1000	ED per 1000 AAs	ED per 1000 Whites	Rural	SVI <90%
Marion	90	46.7	21	yes	yes
Allendale	77.4	94	31	yes	yes
Dillon	60.3	72.7	39.1	yes	yes
Hampton	57.6	88.1	22.3	yes	yes
Colleton	40.6	66.8	24	yes	yes

Table 6 displays the five counties with the lowest T2D ED visits per 1000. The five counties with the lowest ED visits are Aiken (6.7 ED visits per 1,000 adults), McCormick (6.7), York (7.2), Lexington (7.9), and Lancaster (9.8). The top five counties with the lowest ED visits includes one county with a high SVI (Aiken), and one county that is classified as rural as well as high SVI (McCormick). The ED visits per 1000 range from 6.7-9.8. In comparison, the ED visits for AAs range from 12.9-24.1 and 3.7-13.3 for Whites.

Table 6 Top 5 counties with the lowest visits per 1000 compared to ED visits per 1000 for AAs and Whites

Counties	ED per 1000	ED per 1000 AA	ED per 1000 White	Rural	SVI <90%
Aiken	6.7	12.9	4.4		yes
McCormick	6.9	19.9	13.3	yes	yes
York	7.2	20.5	3.7		
Lexington	7.9	13	5		
Lancaster	9.8	24.1	5.8		

5 CHAPTER V DISCUSSION

5.1 Discussion of Results

The purpose of this study was to conduct a needs assessment to inform primary care access and support by telehealth. I examined the differences in ED utilization per 1000 among AAs compared to Whites who had a presence of T2D at the time of the ED visit in 2019 and who were living in a high SVI county of SC. I hypothesized that ED utilization for the presence of T2D and living in a high SVI county in SC were higher for AAs. Table 4 presents the findings of my examination of ED visit data for the total SC population of adults who visited the ED in 2019. The data revealed that AA's visited the ED three times more than Whites. Upon further review of ED utilization rates, AAs visited the ED about 2.5 times more than Whites in both high SVI and in rural counties. These study findings supports my hypothesis of AAs per 1000 having more ED visits than Whites.

I also examined the five counties with the highest ED rates per 1000 and made a comparison among the ED rates per 1000 for AAs and the Whites. I further explored the five counties with the lowest ED rates per 1000 and similarly compared the ED rates per 1000 among AAs and Whites. The findings revealed that within the counties with the highest ED rates; AAs per 1000 visited the ED more than two times that of Whites. The findings were very similar overall for the counties with the lowest ED rates when making a comparison between AAs and Whites in that AAs visited the ED more than 3.5 times more than Whites.

Figures 3 and 4 present heat maps as a visualization of ED utilization across all 46 counties in SC among AAs per 1000 compared to whites. The ED utilization rates range from very low (lightest color) to very high (darkest color). The heat map for AAs show the largest number of counties (24) had a low ED utilization rate followed by nine counties at a moderate rate. The remaining counties ranged from very low (5), high (3), and very high (5). In

comparison, according to the heat map for Whites, the largest number of counties (38) had a very low ED utilization rate with the remaining eight counties having a low utilization rate. There were no moderate, high, or very high ED utilization among Whites per 1000 during this period in SC.

Figure 3 ED Visits for Adult AAs with T2D per 1000 in SC

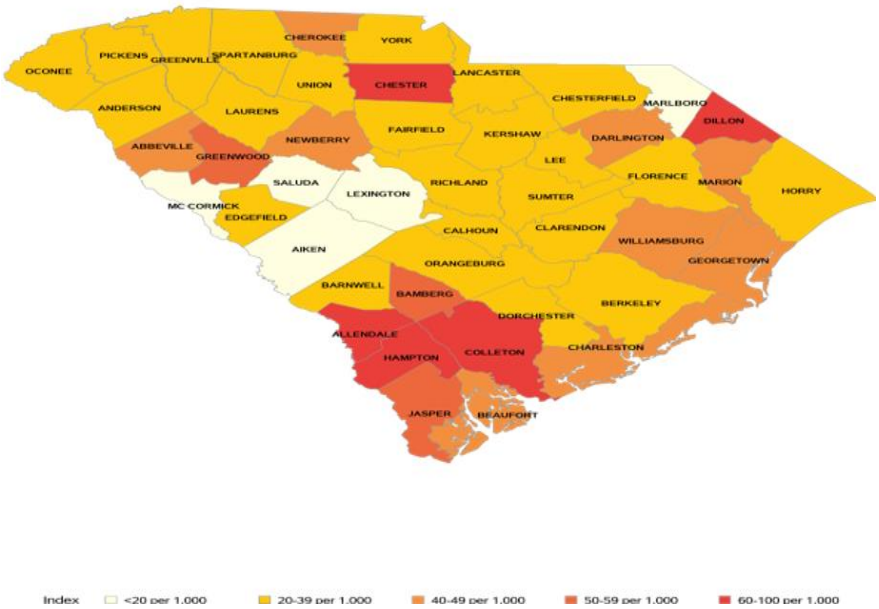
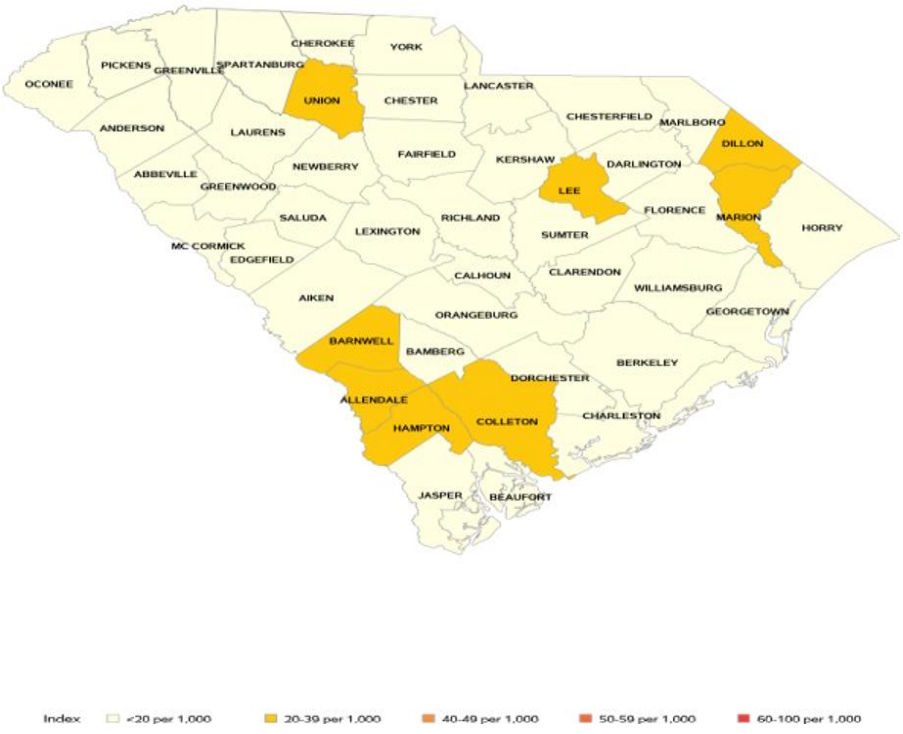


Figure 4 ED Visits for Adult Whites with T2D per 1000 in SC



The overall findings demonstrated in SC, AAs per 1000 with a presence of T2D utilized the ED roughly 2.5 times more than Whites regardless of the county designation of rural or high SVI. This may be an indication that AAs in rural counties and high SVI counties encounter SDoH more than those living in urban and low SVI counties. Communities of color are more disadvantaged in terms of SDoH in that they frequently have limited access to resources they need to successfully manage their diabetes such as primary care. As a result, they may use EDs to manage their chronic diseases, which could influence a higher ED utilization rate per 1000 AAs.

5.2 Implications for Policy and Practice

Since there is such a widespread utilization of the ED for primary care among AAs in underserved communities in SC, the hospital systems could develop partnerships with community health centers to provide a link to care for the underserved communities. Funding resources would need to be acquired so that such an operation could be sustainable.

5.3 Limitations

The study had several limitations. The first limitation of the study was the exclusion of ED visits that resulted in an inpatient admission because I was examining patients who use the ED as an alternative to primary care. The next limitation was the absence of a regression analysis, so results are not adjusted for variables of interest, such as the proportion of the population with T2D and which specific T2D ICD-10 codes were present at the time of the ED visit. Results are relevant to South Carolina adults in 2019 and are not necessarily generalizable to populations and time periods beyond those. The last limitation was the exclusion of SC races other than AAs and Whites due to a low population proportionality.

5.4 Future Research

This study highlighted the need to further evaluate the role SDoH have on ED utilization

as primary care for chronic disease management. Future research should examine the most common rationale for underserved populations utilizing the ED to manage their chronic disease. There is also a need to explore access to primary care in all 46 counties of SC and examine the rate of primary care use per 1000. It would be interesting to evaluate the role Glucagon-like petide (GLP) receptors play on ED utilization rates for T2D patients.

5.5 Conclusions

This exploratory study was conducted to determine if there were any differences in ED utilization per 1000 among AAs compared to Whites who have a presence of T2D at the time of the ED visit and who are living in a high SVI county in SC. This study found that ED visits per 1000 for AAs were higher than Whites in rural and high SVI counties. It was further concluded that ED utilization across the total adult SC population were higher for AAs compared to Whites. In general, AAs in SC had more ED visits in 2019 than Whites. This may be an indication that SDoH plays a major role in the AAs population per 1000 across SC regardless of the counties designation of rural or high SVI.

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