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Disparate Access to Medical Coverage Associated with Type 2 Diabetes Care in Low-income and Rural Communities in Georgia

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This is to certify that the doctoral dissertation by

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Walden University
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Abstract

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Abstract

Disparate access to diabetes care in rural and low-income communities among older adults has been an ongoing issue among Americans. Type 2 diabetes in low-income and rural communities has continuously burdened many residents due to age, costs of care, income, geographic location, and education levels. Researchers have demonstrated that providing resources and tools to rural and low-income communities would assist in decreasing type 2 diabetes and increase education and awareness. The purpose of this quantitative cross-sectional study using secondary data was to examine the relationship between health insurance status and lack of access to health care resources and delay of diabetes diagnosis. The socio-ecological model was used as the theoretical framework. Hypotheses were tested on a dataset of 7,354 participants in the Behavioral Risk Factor Surveillance System study using multiple and logistic regression. The results of these analyzes show that controlling for age, gender, education, and income, having health insurance and lack of access to resources predicted delay in diagnosis of Type 2 diabetes. Implications for positive social change include increased accessibility to healthcare, chronic disease intervention programs, and medication management that can help lessen delays in diagnosis.

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Dedication

I want to dedicate this dissertation to my daughter Kensley Holt who has been my motivation and partially my reason for achieving this with many other milestones. She has inspired me to continue to exceed the goals I set for myself and be the example for her future endeavors showing her anything is possible if she puts her mind to it. She created light in me that has never gone out and has only grown brighter as I accomplish my hopes and dreams and see the light in her eyes as she tells me how proud she is of me. I also would like to dedicate this to my grandmothers, Patricia Hall and Gloria T. Edwards, who both loved unconditionally and nurtured me, teaching me the love behind having a passion for what I want and where I want to be. My aunt, Kathy-Ann Hernandez, was a great example of a strong woman hard at work in a revolving world. My best friends and sisters Jaton F. Jenkins-Conley, and Raven M. Henderson, for always encouraging, motivating, listening, advising, helping, and being my rock and shoulder, giving me strength, confidence, and love through it all.

My brother, Augustine (Ricardo) Edwards Jr., has always supported me and encouraged me to fulfill my dreams in healthcare no matter what. My mother, Atticus A. Riedinger, has always helped relieve the burden off my shoulders but offered positivity and love throughout challenges and barriers while working toward my goals. My stepmother, Tanya B. Edwards, had always provided excellent advice, encouragement, love, kindness, and honesty when I did and did not need it, helping me stay on track and get back up anytime I may have fallen off. Finally, I would like to dedicate this to my father, Ricardo John-Fitzgerald Edwards, who taught me the importance of hard work,

setting goals, being true to myself, and integrity. He prepared me to tackle, overcome and accomplish many aspects of life through diverse influences, knowledge, and experiences.

He has been and will always be the definition of a true hero as he overcame many obstacles himself, serving over 20 years in the United States Army as a tank crew member in the Infantry. He sacrificed his life for his soldiers in several scenarios while serving in numerous wars over the years and still being a great father and role model. Thank you, dad, for paving the way for freedom for me and many other citizens in this country.

Acknowledgements

I want to take this time to thank my dissertation chair, Dr. Srikanta Banerjee, who I am genuinely thankful for guiding and supporting me throughout this entire process. It indeed was something I do not believe I could have achieved without his knowledge and personal experiences. I want to think it was fate that allowed him to be my chair based on his wide variety of experience with my dissertation topic. Since this is my first dissertation, he was responsible for assisting me in the appropriate layout, editing, and mapping of the information and configuration of my findings. He was always readily available and kept the lines of communication open throughout the entire process, working to answer questions I had and convey information to me.

Thank you for providing the mapping tool for my target population and providing me with helpful resources when you were going through the process. Thank you Dr. Banerjee for the continuous encouragement and willful guidance you gave me from beginning to end.

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Chapter 1: Introduction to the Study

Diabetes is a stable chronic condition that involves extremely high blood sugar or blood glucose (Sapra & Bhandari, 2021). The human body gets its energy and blood glucose from foods and beverages. Glucose gets into cells when insulin is produced from the pancreas. There must be more than scientific observation and speculation, such as clinical resources, to minimize the gaps in knowledge (Zierath, 2019). There is a lack of information regarding clinical prognosis and diagnosis.

Some of the highest chronic disease burdens, such as stroke, diabetes, heart disease, and cancer, impact Georgia. There are approximately 10 million residents residing in the state of Georgia, but more than 5 million of those residents suffer from the listed chronic diseases (Centers for Disease Control and Prevention, 2018). With these conditions affecting the residents of Georgia, the state pays out more than 40 billion dollars per year for the treatment of these illnesses (Centers for Disease Control and Prevention, 2018). The second leading cause of premature death for adults in the state of Georgia is cardiovascular disease (CVD). To minimize the risk, underlying risk factors, and comorbidities that are associated with the disease-causing increased mortality rates, the risk factors should be evaluated for intervention purposes to reduce morbidity and mortality in the target communities included in the study.

CVD is responsible for more than 24,000 deaths per year and is the leading clinical cause of mortality rates in Georgia (Centers for Disease Control and Prevention, 2018). A large portion of these deaths could have been prevented if the burden of economic, health systems, social and health consequences was not so heavy. The most vulnerable are mostly impacted by this creating a barrier to changing behaviors on both

an individual and community levels. Prediabetes and diabetes have a significant contribution to morbidity rates and the cost of healthcare in the state of Georgia, with more than 1.1 million residents diagnosed with diabetes in 2016 (Centers for Disease Control and Prevention, 2018). Additionally, 241,000 adults in Georgia were unfamiliar that they had diabetes.

Similarly, 360,000 Georgia residents have prediabetes, and approximately 10% of this population develop Type 2 diabetes yearly (Centers for Disease Control and Prevention, 2018). The purpose of this quantitative study was to examine the delay of diagnosis corresponding with health visits affecting diabetes access care in rural, low-income communities on adults 18 years of age and older who either are or are not medically insured. In 2017, Georgia spent $10.9 billion on diabetes cases and treatment (Centers for Disease Control and Prevention, 2018). Georgia Medicaid participants diagnosed with diabetes in 2012 received $3,200 in treatment per participant leading to $372.6 million in expenditures total in 2012 (Centers for Disease Control and Prevention, 2018). The cost of diabetes based on medical treatment was $7.8 billion, and more than $3.1 billion was lost in 2017 in output (Centers for Disease Control and Prevention, 2018).

To address gaps in terms of diabetes care, previous studies have suggested using technological devices like mobile applications (see Adu et al., 2019). Technology enables patients to manage their conditions as an intervention tool. To advance and improve diabetes self-management, employment, environment, the financial burdens should also be addressed (Adu et al., 2019). Prognosis and diagnosis are as important as treatment and self-management of the disease. Some may suffer from the disease and not know

they have it or know they have the disease and lack accessibility and healthcare resources to treat or self-manage the condition.

The study involving addressing personal effects, subjective and functional health, lifestyle activities, and geographical location as contributors to slow diagnosis and rapid depreciation of health outcomes. Although researchers have investigated diabetes, the topic has not been explored in the way low-income rural communities in Georgia suffer from high obesity rates amongst older adults compared to high-income communities has not been explored. Environmental and socioeconomic factors are root causes among older adults. Low-income communities and rural areas continue to suffer from diabetes increasingly; lack of information leads to this gap, which in turn, affects the Georgia population. The population suffers from these gaps because if researchers are unable to address these issues and how they affect at-risk groups or individuals, as well as how to resolve the issue within these individuals or groups such as diabetes, people continue to be diagnosed with diabetes and mortality and morbidity rates rise. However, the high-income communities have steadily low rates of diabetes.

There also needs to be research to provide evidence that the lack of opportunity and resources is the cause of groups continuously neglecting their health. Lack of access to resources and health services leads to poorer outcomes and more actionable research addressing these gaps in a targeted. My research shows when low-income communities are introduced to better resources and health opportunities, they will do their part on an individual level to care for their health and address upstream factors to better meet the needs of such communities. The gap is that there has not been much research or studies on how health coverage influences certain groups such as older adults visiting or not

visiting hospitals for their chronic illnesses. There should be more data reflecting the differences and impacts of low-income rural individuals with chronic illnesses suffering based on health coverage and existence of hospital visits.

The specific research problem that is being addressed through this study is the concern of socioeconomic factors impacting Georgia residents' health that live in low-income and rural communities due to risk factors and lack of access and availability to a variety of resources (Tran et al., 2019). This relates to the social problem because if older adults in communities had more resources to take better care of themselves and more opportunities to live healthier lives, the health concern would not continue to be such a concern. The research consists not just of researching why particular groups such as older adults are more at risk than others but also an intervention that will provide evidence that when these groups are given the necessary tools, they will do a better job at medically care for themselves health wise. The role of health coverage for low-income chronic illness patients is a secondary role to income. Those that are low-income have minimal to no health coverage and either cannot afford hospitals visits or incur major medical debts due to hospital visits for treating their chronic illness. By addressing chronic diseases, places with inequities such as low-income individuals, groups, and communities can be better addressed.

Statement of the Problem

This project involving examining the effect of diabetes on adults who were 18 and older living in rural and low-income communities in Georgia. Researchers and endocrinologists have a need to understand diabetes and delay in diagnosis as it pertains to rural areas in Georgia. Challenges involving rural health are highlighted as barriers and

contribute to delays in diagnosis and their effects on health in low-income and rural communities in Georgia. My goal was to answer the proposed research questions and test hypotheses using the quantitative study methods. The issue poses concerns such as a delay in disease diagnosis, mortality rates rising, low-income and rural communities suffer more than those that are not, individuals in these communities being able to extend their quality of life and provide better access to more resources, health visits impacting health outcome, health coverage affecting hospital visits, medication management, treatment options, and healthcare cost burdening individuals and their health outcomes.

This quantitative study involved examining delay of diagnosis due to lack of health visits and how this affected diabetes access care in rural and low-income communities in Georgia among adults who were 18 and older who were or were not medically insured.

Nature of the Study

To address the research questions in this quantitative study, cross-sectional design was used due to new samples of people being utilized each time with the possibility of information simultaneously changing. The longitudinal method was not appropriate because it involves tracking the same individuals over time. The method assisted in answering research questions and addressing how to fix the problem.

Gaps in health coverage involving hospital visits for adult patients living in rural low-income communities with chronic illnesses were addressed throughout the study based on the data provided. Delay of diagnosis is a significant issue with diabetes, so it is safe to assume a person who has not accessed healthcare for some time is delayed in diagnosis of any chronic illness. Haw et al. (2021) used a similar cross-sectional method

to analyze the epidemiological patterns in complications from diabetes, particularly in minorities, as well as healthcare utilization and prevention. The reference supports the idea of highlighting the different factors that plague the adverse outcomes of the groups being studied.

This study involved using secondary data analysis with the dependent variable delay of diagnosis. I used a database such as 2019 Behavioral Risk Factor Surveillance System (BRFSS) in finding secondary data in chronic conditions throughout low-income communities in Georgia measuring the effect of diabetes on minorities. The Behavioral Risk Factor Surveillance System is a system created in 1984 that surveys behavioral risk factors throughout the United States. The BRFSS gathers data from adults aging 18 years of age and older measuring health behaviors through surveys given by individual state health departments. The BRFSS includes datasets measuring survey responses on chronic illnesses that is readily available and accessible.

The responses by a number of individuals affected by diabetes who are living in rural low-income neighborhoods in Georgia were examined, who either were or were not insured in terms of frequency of health visits. Other variables included age, gender, and ethnicity, which are also measured by the 2019 BRFSS. Onset of diabetes happens at least 4 to 7 years prior to diagnosis (Harris et al., 1992).

Research Questions, Hypothesis and Variables

To analyze associations between dependent, independent and covariate variables, the proposed research questions were as follows:

RQ1: Is there an association between delay in diagnosis of type 2 diabetes and health insurance coverage among low-income and rural communities after controlling for age, gender, and ethnicity?

Dependent Variable: Delay of diagnosis

Independent Variable: Health insurance coverage, general health, routine checkup, number of days with poor physical health, awareness of having prediabetes/diabetes

Covariate Variables: Age, gender, income level, and educational level

$H_0$1: There is no association between delay in diagnosis of type 2 diabetes and health insurance coverage and low-income and rural communities after controlling for age, gender, and ethnicity.

H_a1: There is an association between delay in diagnosis of type 2 diabetes and health insurance coverage and low-income and rural communities after controlling for age, gender, and ethnicity.

RQ2: Is there an association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity?

Dependent Variable: Delay of diagnosis

Independent Variable: Health insurance coverage, general health, routine checkup, number of days of poor physical health, awareness of having prediabetes/diabetes, frequency of visits with health professionals for diabetes.

Covariate Variables: Age, gender, income level, and educational level

$H_0$2: There is no association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity.

H_a2: There is an association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity.

Table 1 describes the intent for each variable. Each variable has a summarized description as its intent to the future data that will be presented further into the report. Each label in the left column represents variables being introduced into the study.

Table 1

Description of Variables

MEDCOST (Could Not See Doctor Because of Cost)	The main question is, "Was there a time the past 12 months when you needed to see a doctor but could not because of cost?" For further information, the reason may be explored however not be included the regression model. The question asked participants, "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?". The variable for doctor attendance in correspondence with delay in diagnosis of diabetes is useful because onset of diabetes happens at least 4-7 years prior to diagnosis, therefore, it is fair to assume that a delay in medical care is the cause of a delay in diabetes diagnosis (Gopalan et al., 2018). This existence justifies the research problem and better characterizes "delay of diagnosis".
GENHLTH (General Health)	Categorical Variable

PHYSHLTH (Number of Days Physical Health Not Significant)	Continuous Variable
CHECKUP1 (Length of time since last routine checkup)	Continuous Variable
DOCTDIAB (Times Seen Health Professional for Diabetes)	Continuous Variable
PREDIAB1 (Ever been told by a doctor or other health professional that you have pre-diabetes or borderline diabetes?)	Categorical Variable
DIABETE4 ((Ever told) you had diabetes)	Categorical Variable
HLTHPLN1 (Have any health care coverage)	Categorical Variable
INCOME2 (Income Level)	Categorical Variable
EDUCA (Education Level)	Categorical Variable
CADULT1 (Are you 18 years of age or older?)	Categorical Variable
CELLSEX (Are you male or female?)	Categorical Variable

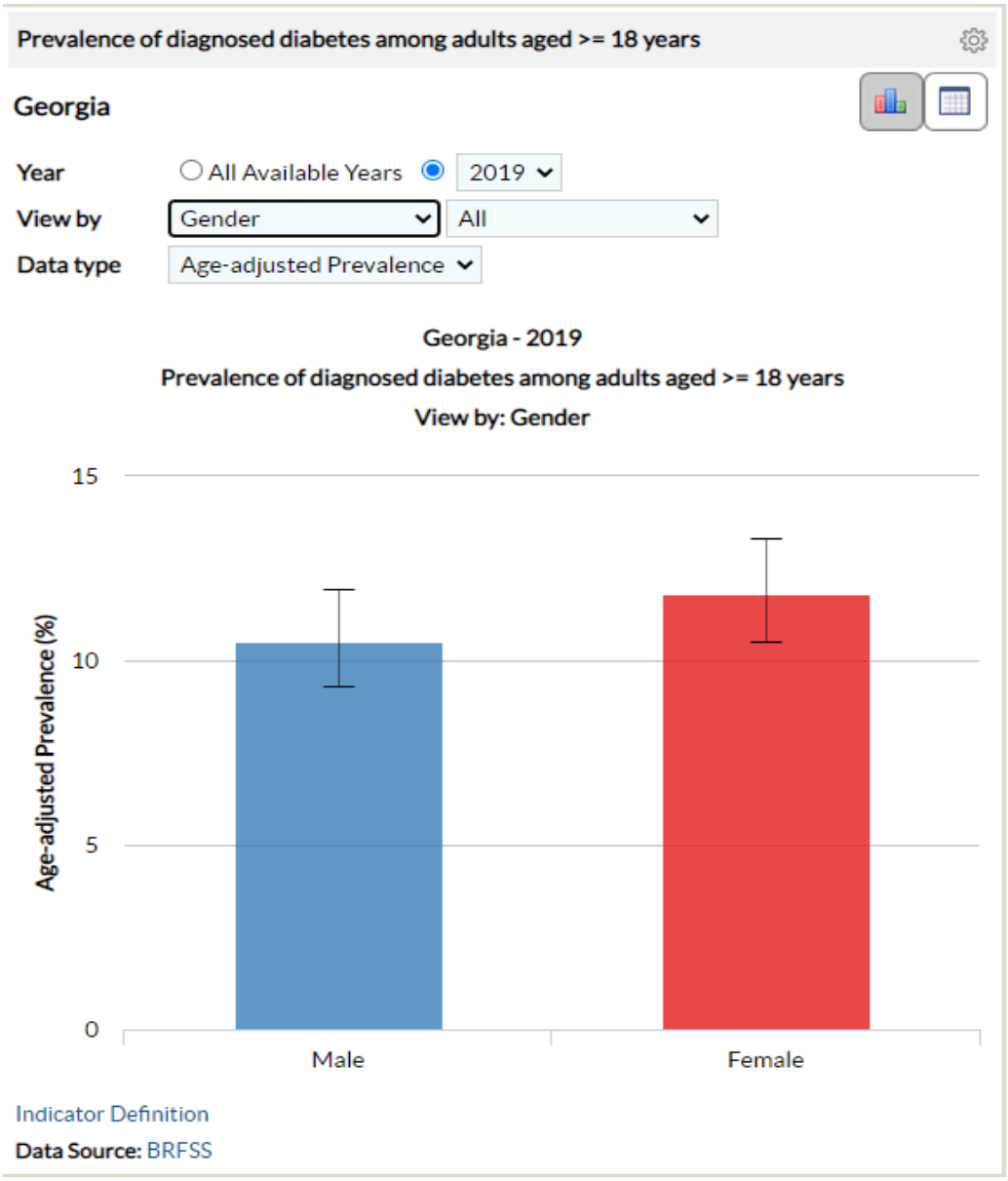
Purpose of the Study

Type 2 diabetes is increasing in adults; 88 million American adults are prediabetic, and 34.2 million Americans are diagnosed with diabetes (Centers for Disease Control and Prevention [CDC], 2020). Health insurance is a secondary issue to income as an impact on the number of Georgia residents diagnosed with chronic illness. Underdiagnosis of diabetes leads to delays in diagnosis due to lack of access to care (Centers for Disease Control and Prevention, 2020). There were 8.5 million adults who were 18 years or older who either did not know they were diabetic, or they did not report having the disease (Centers for Disease Control and Prevention, 2020). This means 3.4% of the adults in the U.S. and 23% of all adults who have diabetes are undiagnosed (Centers for Disease Control and Prevention, 2020).

Therefore, with such statistics mentioned, the purpose of the study is to analyze the relationship between the dependent variable being delay in diagnosis, the independent variables health insurance coverage, general health, routine checkup, number of days of poor physical health, awareness of having prediabetes/diabetes, frequency of visits with health professionals for diabetes, and the covariate variables age, gender, income level, and educational levels. Figures 1 through 4 display prevalence of diabetes based on race/ethnicity and age over the course of a 1-year time span from 2019 to 2020 in the state of Georgia. Delay of diagnosis due to lack of access to care could possibly be a social problem, and many Americans may self-report delays in diagnosis of diabetes due to this issue as well as factors which result from negative health outcomes.

Figure 1

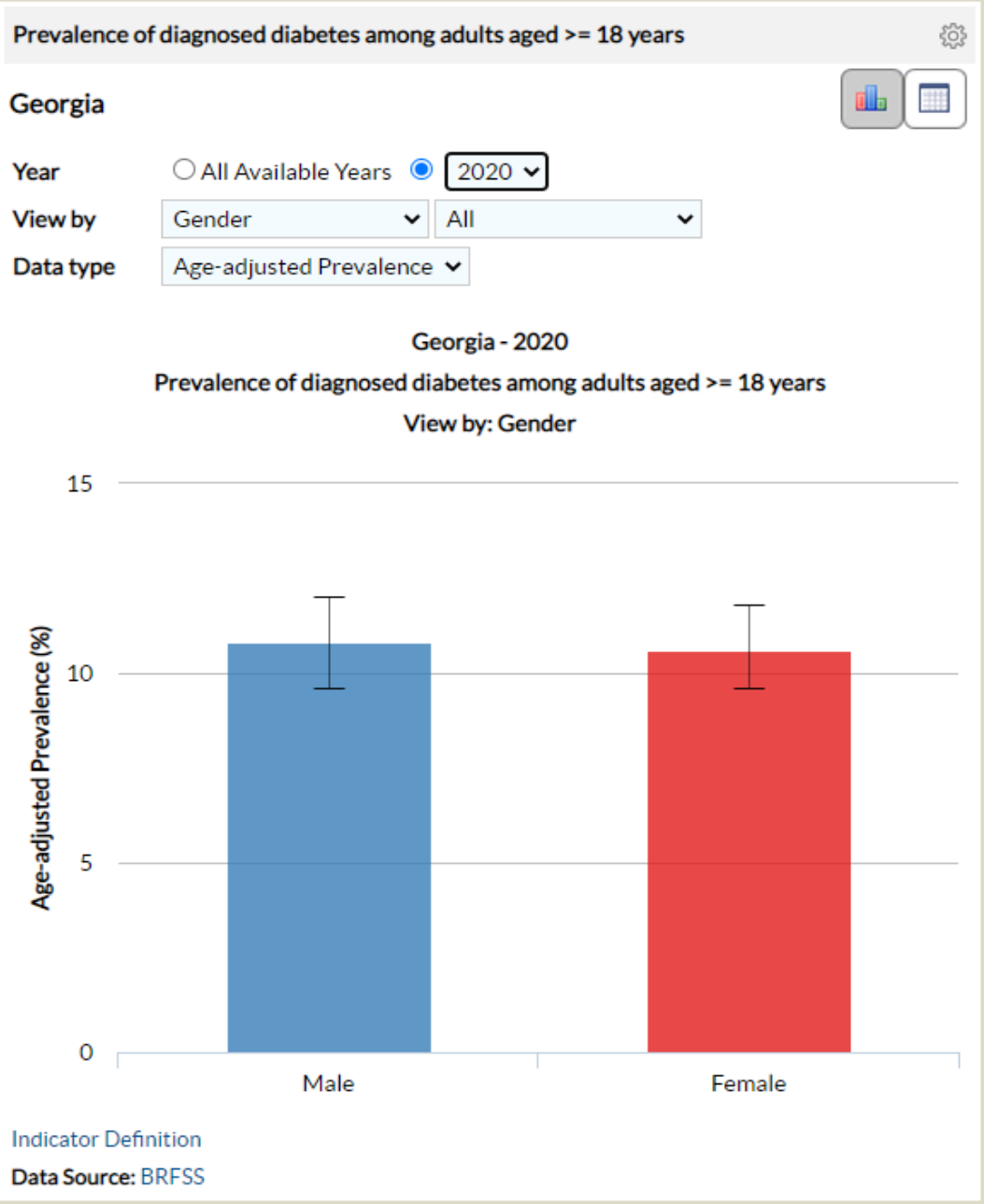
Prevalence of Diabetes in 2019



Note. A graph comparing the impact of diabetes between genders for the age groups 18 and over for 2019.

Figure 2

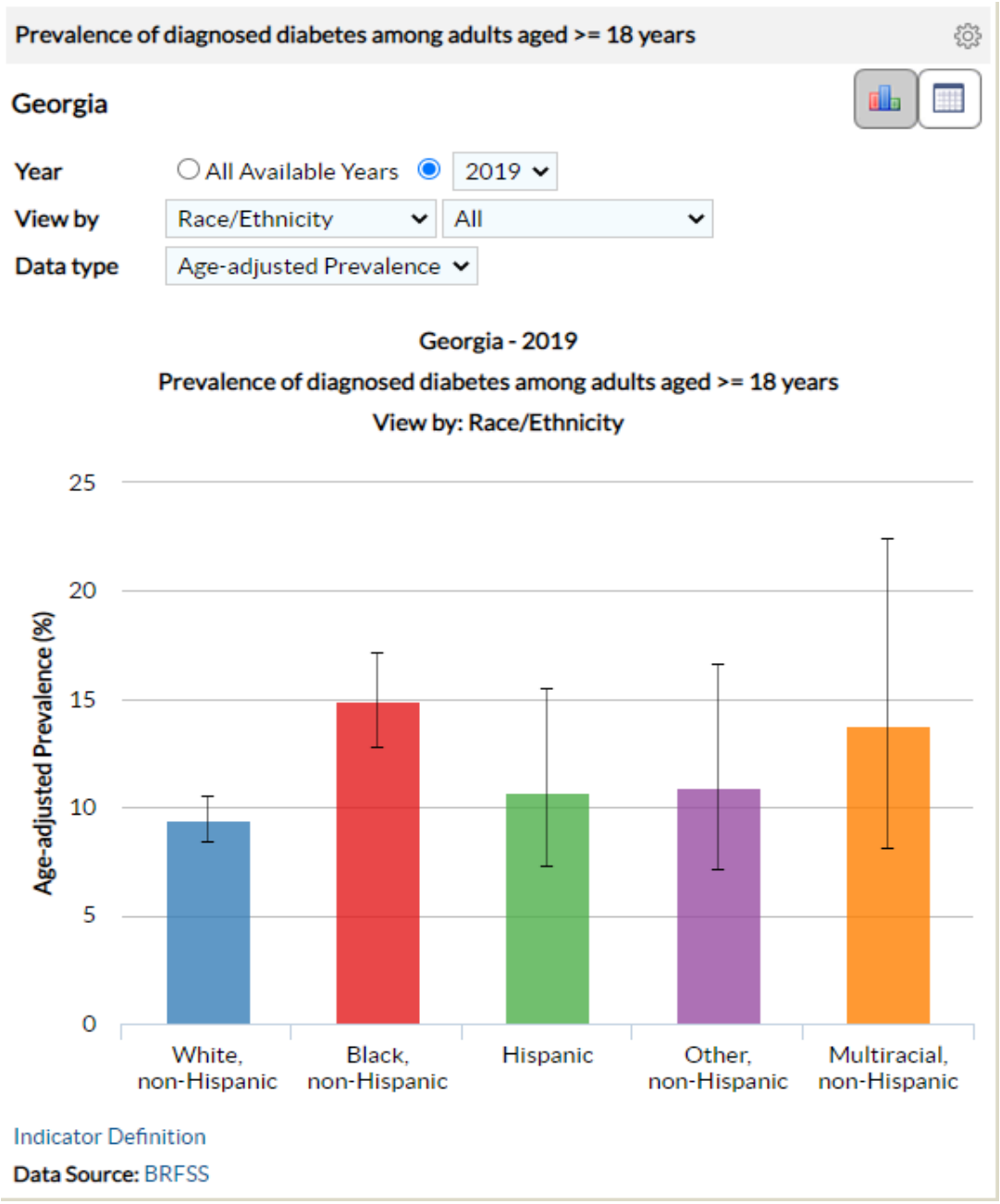
Prevalence of Diabetes in 2020



Note. A graph comparing the impact of diabetes between genders for the age groups 18 and over for 2020.

Figure 3

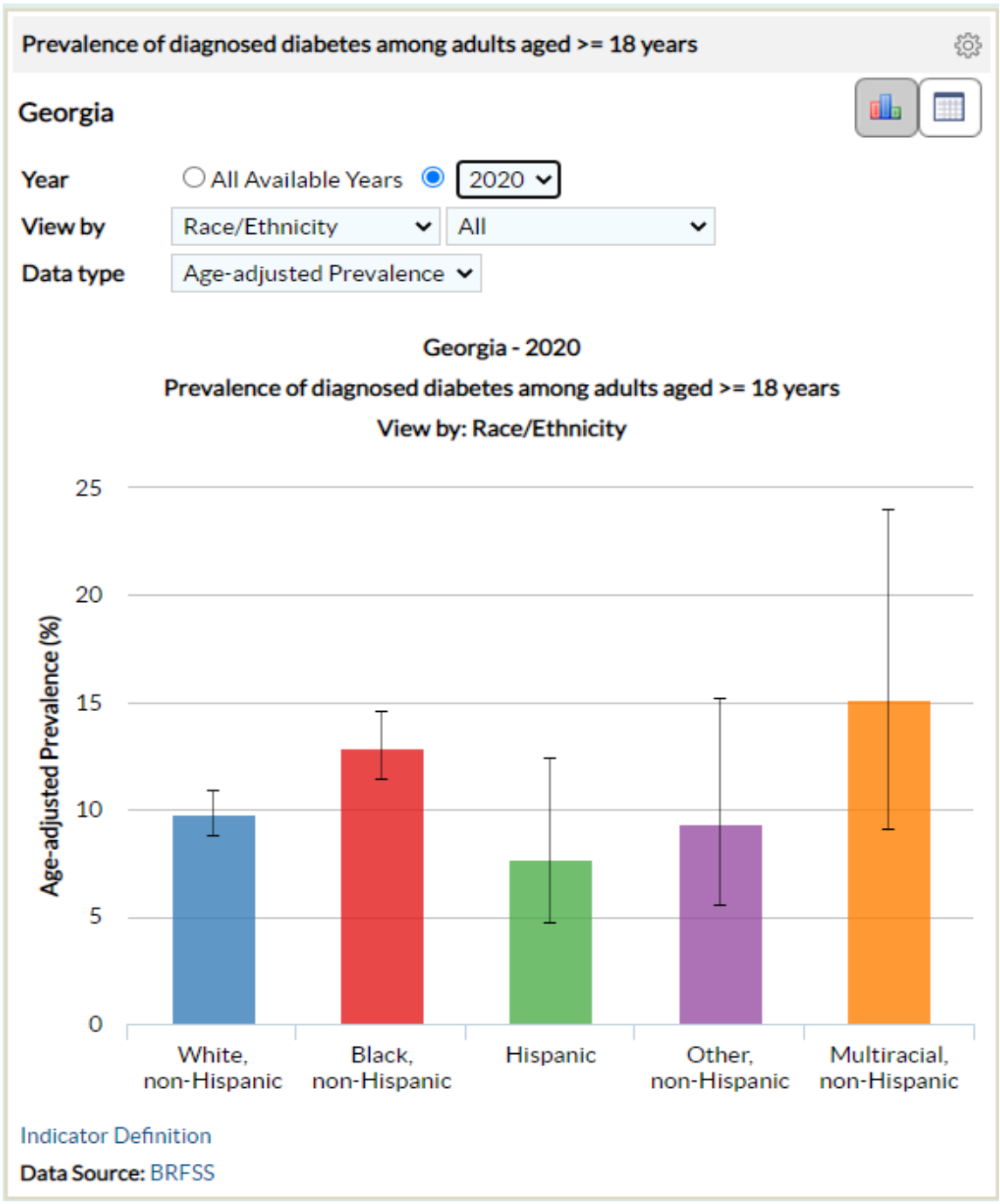
Prevalence of Diabetes for 2019



Note. A graph comparing the impact of diabetes during 2019 amongst the targeted populations.

Figure 4

Prevalence of Diabetes for 2020



Note. A graph comparing the impact of diabetes during 2020 amongst the targeted populations.

Theoretical Framework

The social-ecological model (SEM) was used to ground the proposal and chosen to understand the range of factors that affect individuals on multiple levels. The model was developed by Urie Bronfenbrenner in the late 1970s and has been used to create prevention programs through social environments. The model was created to take a deeper dive into diverse interrelations amongst numerous personal and environmental levels. The SEM was used to highlight five diverse levels to be mentioned and their ability to be influenced by social environments (Kelly et al., 2009). Levels such as interpersonal, community, organizational, public policy, and individual are the diverse levels mentioned.

The model was a suggestion that a healthier environment makes an easier transition for individuals in that environment to engage in healthy behaviors. The logical connections between the framework presented and the nature of my study included a conceptual framework that was built upon the Social Ecological Model, which stated individual and population patterns of diabetes had logical connections between the framework and the research problem, purpose, and gap. Surrounding environments on many levels impact relationships and development, which was described by the model. Environmental factors included cultural values, laws, family, and customs with consideration to individuals and their link to other people, communities, and organizations to have an impact (Kilanowski, 2017).

The SEM includes five levels: Individual, interpersonal (which includes relationships), organizational, community, and public policy, which includes society (Kilanowski, 2017). Humans are included in nature, and portrayal of natural and social

systems is random and produced, not natural. Concentrated poverty is the cause of increased diabetes in low-income and rural communities, therefore influencing decisions of people in those populations. If policymakers and local and state governments made the living conditions better and offered better accessible care, people in those populations would be more aware and educated and care for themselves better via routine screenings and better medication management. The gap in literature can be filled by recognizing the roles economics and governments play on a social level.

All levels are connected in the framework when reviewing the economic, social, and political determinants of health, not just the biological or psychological basis. Course of life is based on determinants that stem from individual as well social and economic burdens (Lynch et al., 2012). The purpose of the study in connection with the social ecological model explains the concept works to improve economic and technological changes, which were changes that increased diabetes in vulnerable communities. Economic policies created to prevent and decrease diabetes still need to be expanded and revamped. Politicians and governments need to first accept how environment plays a vital role in diabetic care and then work to support and advocate for interventions geared toward better health outcomes (Lynch et al., 2012).

Individuals do not report the diagnosis of diabetes or have knowledge that they have the disease due to factors such as poor to no health coverage or living in areas that lack the necessary resources to be screened. Such barriers cause delays in diagnosis and treatment which result from lack of health coverage and other health resources.

Conceptual Definitions

The following section consists of diverse conceptual meanings of terms listed throughout the study. The contextual and viable definitions are depicted in this relative section. The purpose of the breakdown of definitions was to provide an explanation of each term's meaning in the study, while the viable definitions grant additional information to make sense of the study. Conceptual is referring to ideas and concepts developed and the usefulness of each term.

Assumptions, Advantages, Limitations, and Delimitations

Assumptions

Based on prior research that has been published for similar studies, many assumptions can be made. I assumed low-income and rural communities are delayed in terms of diagnosis of the disease due to lack of access to care based on socioeconomic factors such as income, geography, and health coverage affordability. Factors such as education, community, income, and social support are reasons low-income and rural living individuals are slow to get a diagnosis. I also assumed minority groups such as but not limited to African American, Hispanics and native individuals living in low-income communities were unable to afford medical care; therefore, they are unable to receive diagnosis or treatment for diseases. Whether or not they had health insurance coverage was based on income class.

Those that live in more rural, urban, and low-income communities lack access to hospitals; therefore, there are no hospital visits, and resources to create better health habits are not available. Health literacy and education when speaking about managing their health, avoiding chronic illnesses and medication management are not taught.

Previous research by prior researchers in diabetic cases has been linked to Georgia residents need for more funding going toward prevention programs and resource management for at-risk communities and groups (CDC, 2018). It was assumed that if these communities and groups are provided with affordable health insurance, they will schedule hospital visits and follow up on their care. It was also assumed that if they had the resources and accessibility to follow with affordability, they would not have a delay in the diagnosis of diabetes. In this study, I assumed that all participants in the study answered the survey questions to the best of their knowledge.

Advantages

Recent data was utilized in the study creating an advantage in the reliability of the information retained during the survey. The data was represented nationally and is precisely based on Behavioral Risk Factor Surveillance System (BRFSS) data. The data was instrumental in working to create funding and methods to mitigate the trend of diabetes in the state of Georgia (Centers for Disease Control and Prevention, 2018). The Behavioral Risk Factor Surveillance System (BRFSS) tracks telephone surveys and collects information related to individual health.

The surveillance system collects information from states regarding risk behaviors, chronic illnesses, and preventative services. The BRFSS was used to record accurate and real-time data throughout the study which is an advantage when assessing the data from the dataset. Accurate and viable data is essential to evidence-based studies.

Limitations

This was a study that involved using secondary data analysis. Access to data, I feel, was not necessarily impossible but was a challenge based on there not being many studies in Georgia relevant to the topic. I had to work slightly harder to find data that was up-to-date and accurate. I used BRFSS databases to locate and collect data that I was able to find useful for the study. There were some limitations on document retrieval based on laws that protect individuals from their private health information being disclosed to the public.

I overcame that by working with information that is not against any privacy laws, as well as using secondary data sources. At the end of the study, I ensured I was able to give current data and data recorded throughout the study. Narrowing my topic and being precise in the data I need was the best way to avoid including information that does not focus particularly on the topic at hand. The study was feasible and can be released for review, given I used secondary sources to conduct and verify the results.

Scope and Delimitations

The study included participants that were 18 and older and were a part of the targeted low-income and rural communities in Georgia. Georgia public health districts include were prioritized in the study, which included the priority populations from rural and low-income communities. Participants were adults with high blood pressure or groups at risk for type 2 diabetes experiencing socioeconomic, and ethnic/racial disparities which lead to limited access to care, and primary care physician, lived in rural communities, were low-income, disabled, had limited health literacy, and experienced other disparities that contributed to their current health status.

Minors were excluded due to low prevalence and inconsistent data over the years within different communities.

Participants either did or did not have medical insurance, which affected their decisions to seek medical care and have primary care physicians. Diagnosis and health visits are consequential in terms of treatment of illness and health literacy.

Study Significance and Social Change

This study was significant in terms of providing essential information about challenges adults diagnosed with diabetes face living in low-income rural communities in Georgia. By addressing this topic, public health professionals can become more educated in terms of how to assist the at-risk groups living in these communities with or without health coverage, and those with diabetes can learn how to better manage their disease. The research also had the potential to lead to positive social change in low-income and rural areas in Georgia. I also provided evidence of the increased need for intervention programs for those living in rural and low-income communities to more access to healthcare resources, self-care methods, resources, and clinics to those individuals who live in such areas. This is crucial to advancing overall health of diabetic patients, extending their quality of life, and preventing effects of the disease on low-income rural populations.

Summary

Research and statistics are pertinent to tackling the gaps in healthcare when looking at the burden of chronic illnesses in rural and low-income communities in the state of Georgia. Social changes in healthcare are a revolving effort and aspect that should follow as research is conducted. The rise of positive social change comes from

numerous interactions, and the interaction from the surveys from members in the previously mentioned communities can cause that shift in positive social change in healthcare. Chapter 2 includes an overview of diabetes and its effects on diverse at-risk populations. Chapter 3 includes detailed descriptions of the quantitative research method, target population, and data collection and analysis steps.

Chapter 4 includes data as well as outcomes of bivariate analyses via data from BRFSS surveys. Chapter 5 includes outcomes and recommendations involving links between delayed diagnosis, lack of treatment, and health insurance coverage as the result of socioeconomic factors as well as other factors such as age and race.

Chapter 2: Literature Review

Patel et al. (2016) conducted a study with data which supported the idea that hypertension and type 2 diabetes mellitus could obliquely be related to one another through the consequences of obesity, but not exactly due to cause and consequence. If a person is obese for a long period of time, their chances of developing obesity and or hypertension are increased (Patel et al., 2016). Waist circumference and body mass index (BMI) are both acceptable forecasters for the prevalence of hypertension and diabetes. Different ethnicities and environments impact BMI and waist circumstance amongst groups differently and some are more at risk for cardiovascular disease than others (Patel et al., 2016). The prevalence of hypertension in diabetic patients has doubled in comparison to those without diabetes.

Hypertension being present in diabetic patients make the patients more susceptible to complication such as suffering from stroke, retinopathy which relates to their eyes, nephropathy in relation to kidneys and myocardial infarction related to the heart muscles (Patel et al., 2016). With such complication, a patient has an increased chance of morbidity and mortality. There have been numerous studies depicting hypertension and obesity as independent factors of risk for diabetes, but the link between both obesity and hypertension has a gap in literature bridging the association of both affecting diabetic patients. Researchers have reported 60% to 76% of patients that are obese or considered overweight are suffering from hypertension, which suggest that there is a correlation between obesity and high blood pressure (Jia & Sowers, 2021). As hypertension increases, vascular changes can cause arteries to become stiff, followed by

insulin resistance occurring and diabetes promoting the same stiffness of arteries being the cause of not just hypertension but also cardiovascular disease (Jia & Sowers, 2021).

Socioeconomic and environmental factors affect many things in a person's life, one of those things being their health status (Jia & Sowers, 2021). As time progresses, studies should continue to occur to understand the mechanisms of insulin resistance and its relation to hypertension in type 2 diabetes in patients to minimize its risk and extend the quality of life for every person.

The improvement or lack of improvement and the growth of health concerns play an intricate part in the SEM and community involvement method. The model efficiently assists health care workers, research staff, and community leaders in evaluating community, society, and individual risk factors (Figure 6). The figure represents a technique where all levels are explained individually and combined to improve health overall. The levels contribute to low quality in health and navigate strategies created to prevent diseases and promote healthier habits at each level. The concept combines strategies to alter the social and physical environments instead of only changing individual health behaviors and habits.

The primary purpose of this literature review was to gather literature concerning connections between delay in diagnosis of type 2 diabetes and health visits relevant to access in rural or low-income areas in Georgia for adults 18 and older who did or did not have medical insurance. I discuss gaps involving health literacy and diagnosis treatment which leads to increases in diabetes rates. I focus on how prevalence of diabetes affects diverse ethnic groups and environments. I also discuss the importance of interventions, how socioeconomic factors affect residential health, proactive health habits, and health

insurance. In this study, I used the following search terms: *type 2 diabetes, diabetes in minority groups, prediabetes, diabetes in low-income communities, diabetes self-management, lack of access to health coverage, medication management of type 2 diabetes, diabetes in low-income communities, and diabetes self-management*.

MEDLINE, Embase, PsycInfo, ASSIA, and CINAHL were used in the study to examine primary care among endocrinologist professionals and how care influenced treatment plans and goals in 2019.

Literature Review

Understanding patients' knowledge and skill is important in terms of finding resolutions to help those affected by the disease. Adu et al. (2019) explored adult patients' knowledge and skills in terms of managing the disease while also looking into challenges they face when managing the illness. Self-efficiency was had no association with coping strategies, medication management, and blood glucose levels. Numerous adult diabetic patients did not have the will to minimize diabetic complications, nor did they know how to use telehealth products. The nature of the illness was frustrating and created financial burdens for patients.

Rushforth et al. (2016) found staff, as well as patients, should be educated and trained about diseases and different barriers patients face. The education was necessary to learn how to best be of assistance to adult patients battling diabetes. This assisted the study in ways that can decrease morbidity and mortality by teaching patients more about the effect of the disease and what they can do to have a longer quality of life. The goal was to allow those with the disease to live longer by managing it, which is why the study

is important and will allow me to focus on education and awareness in vulnerable communities.

Scott et al. (2019) found diabetic education and improved access to facilities and treatments decreases socioeconomic disparities in terms of access and health outcomes. The study was important because the socioeconomic disparity is the key to highlighting how such communities are more vulnerable than others. It allowed me to reveal the lack of care through clinicians when it comes to medication management.

Walker et al. (2016) said ethnicity, race, and social determinants of health have a significant effect on patients suffering from diabetes. To improve the status and minimize the influence, researchers must first understand the culture of the patient's environment and how it affects their health. The study focused on reviewing the literature associated with racial, social, and ethnic determinants of health influencing levels and efforts of care in the prevalence of diabetes.

Minority groups are more at risk of type 2 diabetes than any other group. Towne et al. (2017) found the odds of a person having diabetes were higher among minority groups who lived in low-income areas where lack of education was an issue, with *p*-value of <0.01. Those who live in rural and southern areas were more likely to have been diagnosed with the disease. Similar results were found for those who have received medical care after being diagnosed with the disease in those regions. Individuals who were in the lower income bracket resided in the Southern regions and were a part of ethnic and racial minority groups were higher prevalence of diabetes. Discovering what groups are at risk assists in the development of prevention programs and helps medical professionals and researchers better educate patients in terms of managing the disease.

The study was important because it not just shows that health professionals need more education and training on vulnerable groups, but it shows a consistent pattern of it occurring within these ethnicities and groups. Health outcomes are not only connected to our health but also our environments, mental and emotional status. Walker et al. (2016) found that social determinants are an influencer on health outcomes and so are psychosocial concerns like depression, stress, and self-efficacy.

Adu et al. (2019) found patients with diabetes need more education regarding telehealth products like mobile apps along with prevention programs to teach them about better managing the disease. Adu et al. (2019) found patients with diabetes need more education regarding telehealth products like mobile apps along with prevention programs to teach them about better managing the disease. Such a study is important because if a researcher can find the barriers, that increases the chances of minimizing, even ridding of those difficulties. I intended on using the study to analyze those barriers and discuss ideas on making the research gap to make those challenges non-existent.

Tran et al. (2019) found the differences in diabetic screening in rural and urban communities are vital to slow the increasing prevalence of diabetes in such communities. The study focused on analyzing if individuals that live in rural communities have an increased risk of having diabetes in the United States. Tran et al. (2019) noticed a significant statistical difference between those that lived in suburban areas compared to those that lived in rural areas. The results showed that there is an increased need for residents to be screened more often, if at all, in rural communities where the residents are more likely to have diabetes than those that live in urban communities (Tran et al., 2019). That was the importance of the study because screening shows awareness and self-care.

This was useful in the study because it starts here; it starts at patients and non-patients, understanding the risk of not being screened. Baghikar et al. (2019) conducted a systematic qualitative study consisting of interviewing 27 adults that had type 2 diabetes and were a part of a random control trial for self-management of diabetes in low-income neighborhoods that consisted of immigrants in Chicago. There is a high prevalence of type 2 diabetes among Mexican Americans, which leads to massive mortality and morbidity rates in these communities (Baghikar et al., 2019). Scott et al. (2019) voiced type 1 diabetes is a disease that requires insulin and treatment, but the health outcome depends on a patient's ability to manage their health and condition. There is a gap in research regarding medication adherence among the group as well as barriers involving communication with medical providers and inability to afford medication.

Baghikar et al. (2019) medication had negative effects on patients and was to maintain. Educational efforts could assist patients in better adhering to self-management in terms of medication. Intervention programs could also be useful in terms of building better support systems for medication management. Factors that increase diabetes are important to the study because it tells us what the reason for the health concern may be. McBrien et al. (2017) administered a cross-sectional study to decipher and maximize the impact of patients, analyze medical professionals and system challenges to achieving care goals for diabetic patients, and gauge different barriers in glycemic control for diverse patients. The similarities and differences were compared based on levels of care, sociodemographic factors, and length of diabetic diagnosis. Said patients who had HbA1c $\geq$ 10% said they had great access to healthcare, but 20% of those, with HbA1c $\geq$ 10% felt there could have been better organization and accommodation for healthcare needs.

The study concluded that there needed to be a better plan for those who could not afford the same healthcare opportunities as those who are able to. Barriers to care about, such as financial and environmental factors, should gear initiatives to create multi-faceted preventions. Poor glycemic control was important to the study because it highlights the various levels in diverse patients. That gives importance, and I used this to consider the genetics and impact of such levels on patients. Rushforth et al. (2016) included 11 glycemic control cases, 17 diabetic care cases, one cholesterol, and three blood pressure. There have been socioeconomic inequalities linked to patients not having access to care or treatment at a facility nearby.

Research continues to focus on how these factors impact and influence poor health linked to disparities. Patients living in rural and low-income neighborhoods had issues in terms of accessing healthcare and medication due to financial burdens and lack of education in the healthcare system. Lack of communication and health literacy also leads to poor healthcare. Towne et al. (2017) reported diabetes burdens millions of people all over the globe. The BRFSS was used to examine factors involving diagnosis of diabetes among adults in the U.S. BRFSS The binomial logistic regression model examined the chances of an individual having diabetes and the odds of medical care for those with the disease. With medical attention, mortality and morbidity are proven to be reduced.

Health equity refers to everyone having equal and fair opportunities in health. Equity of health in diabetes means all Americans that have diabetes are at risk for the illness or are pre-diabetic and have fair access to their health. Access is equal and available no matter their gender, income, age, race, geographical location, or education.

Those that live in low-income, rural areas do not always have the same access or opportunities.

When there is a lack of equity in health, people are at substantial risk of being burdened with the disease. There is a need for more training in health professionals to efficiently examine social determinants of health and analyze their effect on clinical care. The importance of the study stemmed from the need to decrease factors that affect diabetic patients that are not in control of certain factors such as environment.

Theoretical Foundation

Risk factors that are in the control of the individual or a community, such as being physically active, maintaining healthy dietary choices, minimizing consumption of fatty and sugary foods and beverages, losing extra weight, and maintaining a healthy weight assist in reducing the chances of a person having diabetes (Centers for Disease Control and Prevention, 2018). The theory depicted is a breakdown of how the theory is suggested to be significant on each level in diabetic concern and treatment; with such an approach, mitigating morbidity and mortality rates increase. Figure 5 explains the influences on each level leading up to the government level.

Figure 5

Levels of Social Factors

Note. A Socio-ecological Model bridging factors to health-literacy, self-care, and other health related activities linked to the extension of quality-of-life on multiple levels

The interpersonal and individual level of influence corresponds with the factors that affect the individual on a personal level. Factors such as income class is a factor regarding affordability of care and health insurance coverage. Socioeconomic status relates to an individual's position in social and economic factors, which is not limited to but includes the communities an individual lives in, whether it be low-income or a rural environment. Even after the Medicaid expansion on insurance coverage, the increase was not by much for the subpopulation with obesity at (5.59%, 95% CI: 2.35%-8.83%) in comparison to those without obesity at (7.35%, 95% CI: 5.35%-9.34%) (Rajbhandari-Thapa et al., 2020). According to Rajbhandari-Thapa et al. (2020), reducing the costs of insurance coverage by mitigating the barrier of affordability and obesity for low-income adults is working to resolve possible health disparities due to limited access to care.

Opportunities for prevention and maximized treatment occur through access to care that focuses on reducing obesity and the occurrence of other diabetic-related illnesses associated with increased health care costs. For low-income individuals to afford access to care for diagnosis and treatment, they must be able to have affordable health coverage so that they are not burdened with medical costs leading to medical debt and can afford medication treatment. On the organizational level, this involves organizations becoming more involved in reducing the mortality and morbidity rates in at-risk communities and groups. This includes organizations such as medical facilities and health companies providing knowledge of the disease and the importance of hospital visits to the public. Educating residents through hospital visits increase their health literacy and increases their awareness.

Staff should receive training on how to properly educate patients, and the government should fulfill their roles in creating positive influences on communities. The community level consists of physicians and other entities using social platforms to advertise healthy habits to combat the increase of preventable illnesses. Self-management education in programs through medical facilities assists those affected in managing the illness and extending their quality of life. Public policy levels are more the response of the government on local and state levels creating guidelines such as calories being advertised on menus to assist in decreasing obesity rates which correspond with diabetes. More funding must be prioritized towards creating interventions and plans that offer healthier food and beverage choices, safe environments for exercise, affordable health care, access to healthcare, and other resources leading to increased health literacy and education.

Diabetes

Obesity Disease Definition and Epidemiology

Obesity is a convoluted disease that includes an extreme amount of body fat (Cleveland Clinic, 2022). The medical condition puts these patients at risk for other health-related diseases and concerns such as but not limited to high blood pressure, particular cancers, heart disease, and diabetes. The prominent factor for type 2 diabetes is obesity. The highest rates of obesity or falling into the overweight category are among African American women in comparison to other races in the United States. Amongst that group, four out of the five women are obese or overweight (Cleveland Clinic, 2022). Surveys documented that in 2018, 1.3 women of color were more prone to becoming overweight than any other racial group (Cleveland Clinic, 2022).

Cleveland Clinic (2022) details African American women being 50% more likely to be overweight in comparison to non-Hispanic Caucasian women (Cleveland Clinic, 2022). When an individual is overweight, they open the spectrum for chronic illness previously mentioned as well as high levels of low-density lipoprotein (LDL) cholesterol, blood fats, or stroke. The same study was able to record African Americans being 20% less likely to be a part of an exercise in comparison to non-Hispanic Caucasians (Cleveland Clinic, 2022). When a woman's body mass index (BMI) is 30 kg/m2, they are 28 times more at risk of having diabetes than those women that are at a healthy weight (Cleveland Clinic, 2022). There is a strong correlation between body mass index, insulin resistance, and diabetes.

The levels of hormones, molecules that are released from triglycerides due to enzyme lipase and then released into the blood attaching to albumin, glycerol, pro-inflammatory markers, cytokines, and other elements are included in the creation of insulin resistance growth (Cleveland Clinic, 2022). Increased risk of having type 2 diabetes correlates with having a BMI of 25-29.9, which is overweight, a BMI of 30-39.9 is obese, or a BMI of 40 or greater being morbidly obese (Cleveland Clinic, 2022). Displayed are tables with age-adjusted percentages for men and women of Non-Hispanic Black, Non-Hispanic White, and Non-Hispanic Black / Non-Hispanic White Ratio. Tables 2 through 5 represents body mass index varying from 25 or greater for various age groups.

Table 2

Age-Adjusted Percentage (BMI of 25 or Greater)

Age-adjusted percentage of persons 20 years of age and over who were overweight or obese, 2013-2016. (BMI of 25 or greater)			
	Non-Hispanic Black	**Non-Hispanic White**	**Non-Hispanic Black / Non-Hispanic White Ratio**
Men	70.6	75.3	0.9
Women	80.6	64.8	1.2
Total	76.1	69.8	1.1

Note. Health, United States 2018 Chartbook. (2019).

Table 3

Age-Adjusted Percentage (BMI of 30 or Greater)

Age-adjusted percentage of overweight persons 20 years of age and over who were obese, 2013-2016. (BMI of 30 or greater)			
	Non-Hispanic Black	**Non-Hispanic White**	**Non-Hispanic Black / Non-Hispanic White Ratio**
Men	38.0	37.0	1.0
Women	56.0	37.9	1.5
Total	47.9	37.4	1.3

Note. Health, United States 2018 Chartbook. (2019).

Table 4

Age-Adjusted Percentage (BMI of 25 or Greater)

Age-adjusted percentage of persons 18 years of age and over who were overweight but not obese, 2018. (BMI of 25 or greater)			
	Non-Hispanic Black	**Non-Hispanic White**	**Non-Hispanic Black / Non-Hispanic White Ratio**
Men	34.7	40.0	0.9
Women	30.9	27.7	1.1
Total	30.0	33.9	0.9

Note. Health, United States 2018 Chartbook. (2019).

Table 5

Age-Adjusted Percentage (BMI of 30 or Greater)

Age-adjusted percentage of persons 18 years of age and over who were obese, 2018. (BMI of 30 or greater)			
	Non-Hispanic Black	**Non-Hispanic White**	**Non-Hispanic Black / Non-Hispanic White Ratio**
Men	31.2	31.2	1.0
Women	44.2	28.7	1.5
Total	38.3	30.0	1.3

Note. Health, United States 2018 Chartbook. (2019).

Diabetes Disease Definition and Epidemiology

When the body has too much glucose or sugar in the bloodstream, it is known as diabetes (Centers for Disease Control and Prevention, 2018). Diabetes is a case that can become worse and speed up the illness process in patients that are obese. In the body, the pancreas works to control the level of glucose in the bloodstream. The pancreas is responsible for developing the hormone known as insulin, which transfers glucose out of the bloodstream. Usually, insulin takes glucose to the muscles utilizing it for energy or storing it for later in the person's liver.

When a person is diabetic, their cells mitigate the transfer of insulin, moving sugar into the cells. The liver harbors a large amount of fat where the remaining glucose is deposited, making the space for the extra sugar minimal; therefore, it stays in the bloodstream. The pancreas then works more to move that glucose out of the blood developing more insulin (Centers for Disease Control and Prevention, 2020). It is working to fight the resistance created due to the fat also being stored. Diabetes carries

the highest burden for the age group 75 and older in comparison to 26.1% versus 2.2% for 18-44 years of age (Centers for Disease Control and Prevention, 2020).

As blood glucose levels increase chronically, the organs are damaged and can cause life-threatening diabetic concerns. It is essential that type 1 diabetes is continuously researched until there is a cure or prevention for the illness. The research included analyzing prevention strategies, treatment methods, and reversal of diabetic complications. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and other mechanisms of the National Institutes of Health (NIH) administer and aid in research targeting multiple illnesses (Lin et al., 2020). The quality of life has been improved, and the risk of acute hypoglycemia for individuals with type 1 diabetes has been reduced due to the advancement of wearable technologies and the improvement in insulin formulations.

Unfortunately, the advancements in technology and insulins still have not rehabilitated individual blood glucose levels. The 2020 Centers for Disease Control and Prevention's National Diabetes Statistics Report revealed there to be approximately 10.5% of the current population is diagnosed with diabetes (Lin et al., 2020). If there is a continuous rise in these numbers, it is expected to impact 642 million people all over the world by the year 2040 (Lin et al., 2020). Vascular complications from diabetes can, directly and indirectly, affect an individual due to numerous factors. There are microvascular and macrovascular lesions that are caused by diabetes.

Microvascular lesions cause health issues such as retinopathy, renal failure, and neuropathy (Lin et al., 2020). Macrovascular lesions can cause peripheral vascular disease, cerebrovascular disease, and cardiovascular disease. Within the last few years,

the global impact of diabetes has increased, and with the increase in population, more people are being diagnosed with the illness. The impact of diabetes on at-risk populations is linked to geographical locations such as state, city, and community (Lin et al., 2020). Although the incidence of the illness is seemingly high, diagnosis, treatment and nursing has decreased complications.

The increasing prevalence of diabetes and the complications associated with the illness is due to lack of nursing awareness and inadequate diagnosis (Lin et al., 2020). Many healthcare systems have the burden of health care costs which affect the treatment of the diabetic complications.

Hypertension Definition and Epidemiology

Hypertension is a condition in which the blood is forced against an individual's artery walls at a high rate (Centers for Disease Control and Prevention, 2018). The state of Georgia is recorded to come in ninth place out of the nation for residents with high hypertension rates having a 36.2% diagnosing rate (Centers for Disease Control and Prevention, 2018). It is also reported that approximately 1 million people in the state are undiagnosed of the illness totaling over 3 million people with hypertension in the state of Georgia (Centers for Disease Control and Prevention, 2018). Hypertension was highest amongst age groups 65 years of age and older (Centers for Disease Control and Prevention, 2018). Women that are younger develop hypertension quicker in the state of Georgia and can go undetected until they are pregnant and get their pregnancy check-up.

Due to the underlying illness surfacing during pregnancy, it put the mother and fetus at risk throughout the pregnancy and when it comes time to give birth (Centers for Disease Control and Prevention, 2018).

Cardiovascular Disease Definition and Epidemiology

Cardiovascular disease is a condition that affects the blood vessels as well as the heart. Fatty deposits continue to build in the arteries causing a higher risk for blood clots, structural concerns, and diseased vessels (Centers for Disease Control and Prevention, 2018). In this instance, the heart's primary blood vessels are destroyed. A risk factor for CVD as well as stroke is hypertension, and both can affect health systems as well as increase the cost of health care. The state spent $783 million settling health care claims associated with hospitalizations from stroke patients (Centers for Disease Control and Prevention, 2018).

Georgia is reported to have more than 88,000 people hospitalized due to CVD, which in turn, costs the state $7 billion dollars spent in direct as well as indirect expenses per year (Centers for Disease Control and Prevention, 2018).

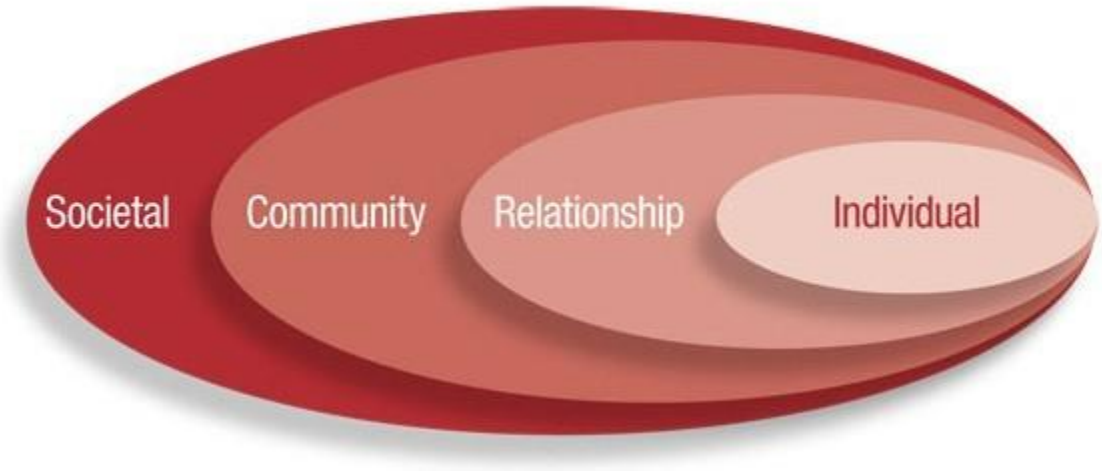
There are four main principles that elaborate methods the model holds to help include an individual in the subject communities. Stokols (1996) expresses these primary principles as: An individual's health, emotional state, and social attachments are swayed by the cultural, physical, and social range of a person or a group's environment and inner psychology, genetics, design, and behaviors. An individual's inability to control their financials and environment can impact their health when living in the same environment based on multiple instances. Groups and individuals are in specific environments routinely such as the workplace, their neighborhoods where they reside, and more prominent locations in the community such as church which, when around other things or individuals, can influence them to make unhealthy decisions turning those into unhealthy habits. The number of resources available, social norms, and physical environment are all

considered leverage points which are environmental and personal points that have significant conditions and effects on a person’s well-being and health status.

To guide programs targeted to assist in health improvements, the Centers for Disease Control and Prevention developed a four-level model providing a foundation for factors which affect health reflective of the Socioeconomical Model; see Figure 6. The first level, the individual level, is where a person's genetic makeup and personal traits like educational background, age, race, income, and health history are considered. The following level, level two, is a relationship that involves an individual's inner circle, such as family, spouse/partner, and friends, who drastically influence how an individual behaves and the decisions they make regarding their behaviors. The next level is the third level, community. At this level, the individual's setting is analyzed, such as where they work, socialize, and build social relationships; this is done to identify traits in these settings that trigger negative health habits. The fourth and final level, societal, analyzes an array of societal factors that affect a person's health.

Figure 6

Framework for the Prevention Method using the SEM



Note. The levels of the Socio-ecological Model at each level of society.

Societal factors would be but are not limited to socioeconomic status, educational opportunities, economic hardships, social and cultural norms, and social policies which provide, maintain, and strengthen inequalities for these groups with poor health (Dahlberg et al., 2002). The model created by the CDC allows health partners to analyze an inclusive array of factors that influence poor health and create a wide variety of strategies to combat health concerns at every level to create and maintain positive change. An example of such a process at each of the four levels would look as such when working to reduce diabetes: Individual which conducts education programs to assist people in making better decisions regarding their diet, exercise, and maintaining a healthy weight. Interpersonal relationships which interact with community groups to find out what resources, tools, and supplies they need to monitor those with diabetes and provide

them with those resources. Community which works with local health departments and alike health organizations to hold seminars that provide education on diabetes, medication management, and methods for preventing such chronic illnesses. Build relationships with the organizations closer to the low-income and rural communities working with them to provide access to groups that worry about transportation and lack access to affordable health coverage. Identify barriers and find techniques to combat them while still educating and aiding where it is needed. Discuss long-term solutions with community members and the importance of healthy habits and characteristics. Society which advocates for policy changes that benefit minority groups, benefit all age groups, benefit low-income classes, and a percentage of state funding are allocated towards improving the status of health overall for low-income minority groups that lack access to healthcare and chronic illness resources. These are great benefits of the social-ecological model mentioned.

Looking at the model long-term for each level and considering social change at each level develops the habit of positive changes and collaboration to aid in continual advances in health.

Community-Based Participatory Research

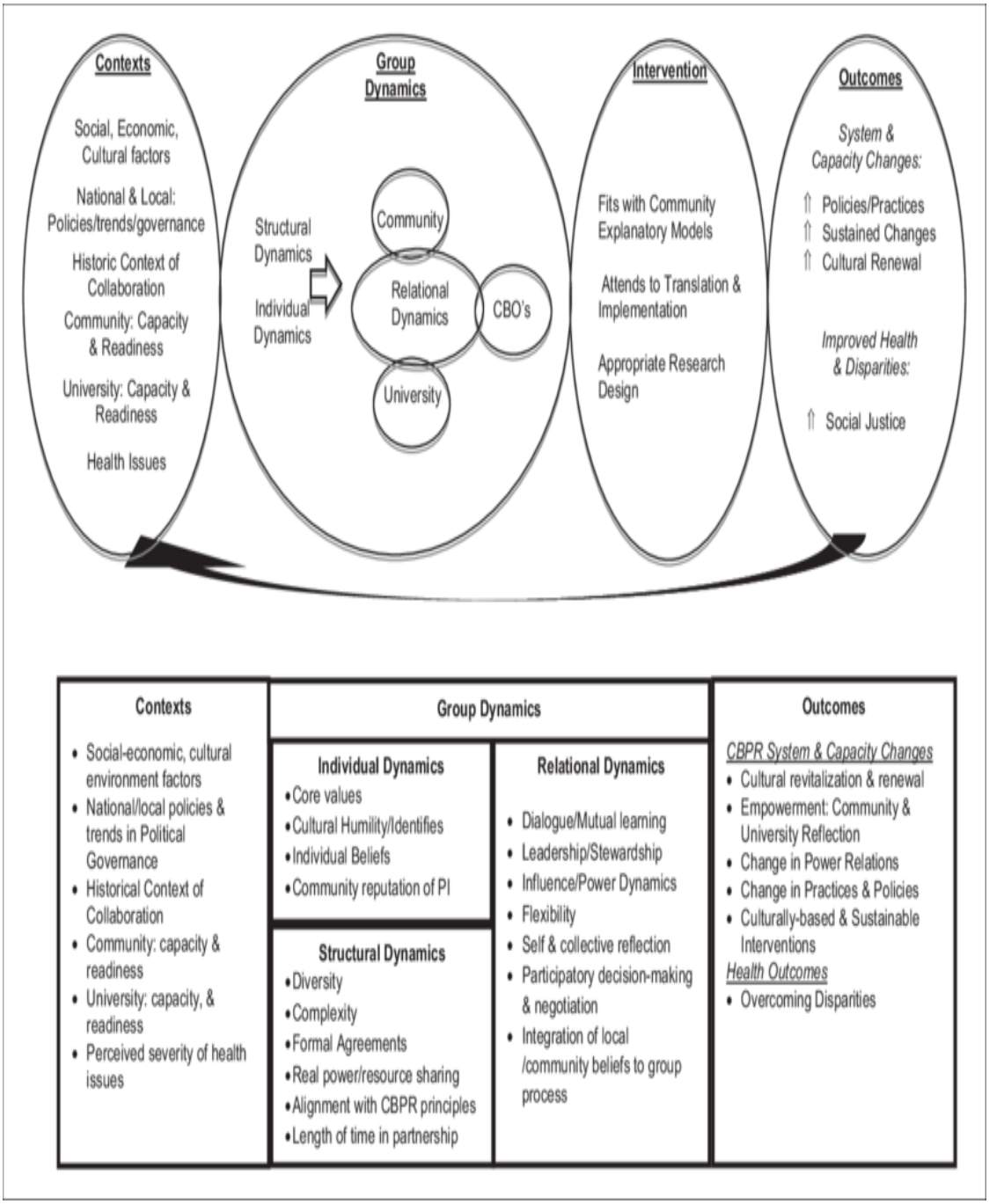
All partnerships in the research understand that each entity brings its strengths, making the research data stronger and more viable. With community-based participatory research (CBPR), the community is more involved in every part of the research method. The method starts with an essential topic, such as diabetes, and targets goals supporting a social change to advance health initiatives and prevent differences (Israel et al., 2003). Wallerstein et al. (2008) conducted a study that analyzed CBPR impacts on ending

results. It used surveys and published literature to evaluate the value of information from CBPR and its usefulness for positive outcomes.

CBPR involves examining possible routes to transitional systems and volume change outcomes being lateral to positive health outcomes. Context factors that navigate the focus of research and the relationships built. The next aspect is group dynamics where there is interaction with the contextual factors to create areas to intervene and develop the design. Lastly, capacity changes and a transitional system to support positive health outcomes based on the information gathered from the research. Figure 7 illustrates such a model as it is vital to creating change by evaluating the community's involvement and how it carries out its health efforts.

Figure 7

Framework for Community-Based Participatory Research



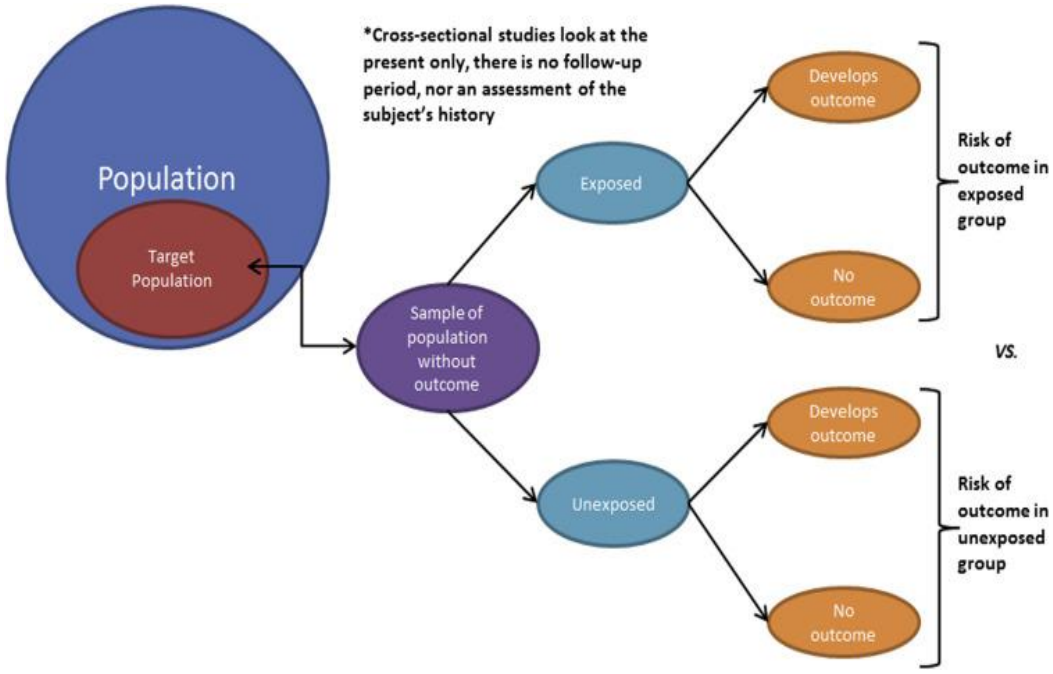
Note. A Framework for Community-Based Participatory Research detailing four aspects of CBPR in relation to one another as an individual and group dynamic.

Cross Sectional Research Design

A cross-sectional study design is an observational study that observes the outcome and exposure of participants engaging in the study for the same length of time illustrated in Figure 8. The strengths of such a design are attainable and timely being that there is no follow-up timeframe as shown in Figure 8. Multiple exposures and/or multiple diseases can be studied at one and are helpful when creating new hypotheses. With such a method, the repetitiveness and health concerns can be depicted when analyzing a large population and assist in quicker health planning. The ability to quickly examine measure prevalence, such as surveys, is helpful to the study.

Figure 8

Cross-Sectional Design Flow Chart



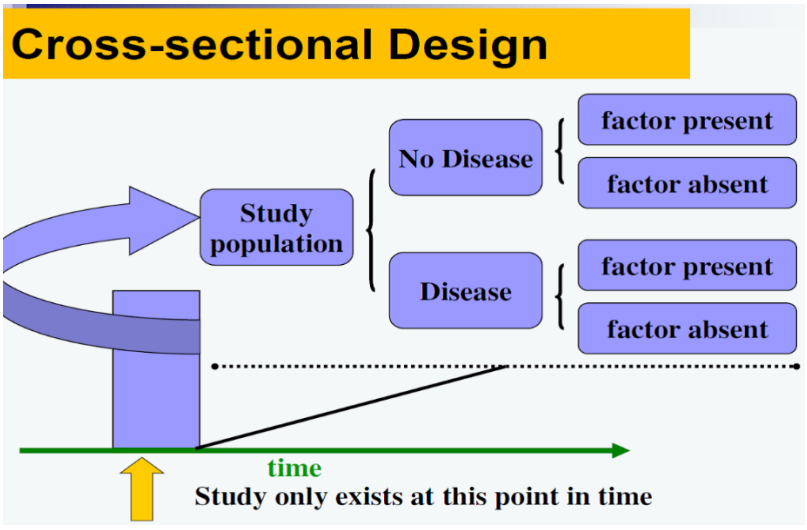
Note. A presentation of the flow that follows the cross-sectional design showing the present flow of exposed and unexposed participants.

The existence of the disease is the focus rather than the extent of the disease. Cross-sectional designs are primarily helpful in analyze the allocation of epigenetic differences throughout different populations with diverse traits. A significant number of epigenetic studies were conducted through the cross-sectional method. During the cross-sectional method, individuals' traits and epigenetic scopes are taken for a short time or at one time. Defining the population is the beginning to the design to get data on the exposure and disease.

The final product has individuals that either have or do not have the disease and individuals that either have not been exposed or are not exposed but have the disease. Figure 9 is a representation of the exposure showing how factors are presented at a point of time during a study.

Figure 9

Schematic Cross-Sectional Design Scheme



Note. A schematic set of time for the cross-sectional design for those with or without the disease.

Health Disparities and Target Population

The Georgia Department of Heath discovered that over one in six residents of Georgia are living under the 100% federal poverty level, with 17.2% of that population residing in rural communities (Georgia Department of Public Health, 2022). The Georgia State Health Assessment (SHA) recorded that numerous population groups are at risk of suffering from terminal health disparities in diverse health outcome fields. Health equity strategies were the objective the department of health used to develop an environment in which people have unbiased circumstances to accomplish health goals no matter their ethnicity, class of income, race, education, socioeconomic status, or childhood experiences. Communities with higher hypertension and stroke rates were in areas that are low-income and rural. The locations with the highest hypertension rates are Albany, Dublin, Dalton, and Rome counties in Georgia.

The counties with the highest diabetes rates are Savannah, Dublin, Augusta, and Columbus in the state of Georgia. The BRFSS data reveals that there are not any significant changes in comparison to prediabetes amongst Georgia adults based on race, ethnicity, or gender (Georgia Department of Public Health, 2022). There is a drastic need and requirement in the target communities and healthcare systems throughout the entire state of Georgia to manage public health systems to minimize obesity, stroke, heart disease, and diabetes. Low-income populations are excessively hindered by multiple chronic illnesses that are adaptable risk factors for Type 2 diabetes and the overall illness. Emory School of Public Health conducted an inclusion study that included communities and target populations (Emory University, 2022).

Emory University focused on looking for trends of diabetes and hypertension and explained the burden of the two conditions on a population level. The data from the study showed that from the year 2000 to 2013, more than 1.8 million people were hospitalized due to cardiovascular disease. There were 223,924 Georgia residents hospitalized due to diabetes during these same years. The individuals hospitalized were of groups that were socioeconomically disadvantaged and a part of the ethnic/racial at-risk minority groups. African Americas were hospitalized more than Caucasians for diabetes at 12.5% in comparison to 9.7% (Emory University, 2022).

Individuals that made approximately $15,000 in a year or less accounted for 13.1% compared to those that made $75,000 or more a year, which accounted for 7.8% (Emory University, 2022). During the decline in hospitalizations from 2000 to 2013, groups with socioeconomic disadvantages still had higher rates of hospitalizations, with the low-income class reporting at 11.8% and the high-income class only accounting for 5.1% (Emory University, 2022). Those with a college education were 4.6%, but those with no high school education were 12.9% (Emory University, 2022). From the years 2000 leading up to 2015, there was an increase of residents hospitalized based on county due to both hypertension and diabetes. There were more hospitalized due to diabetes (2.00%) than those that had hypertension (0.75%) in 2000 (Emory University, 2022).

The number of residents hospitalized due to diabetes increased quicker each year, going from 0.01% to 0.003% (Emory University, 2022). To fix the increase, the study suggested that these disadvantaged counties needed to be studied to identify and resolve the issues causing the increase in residents being hospitalized for both hypertension and

diabetes in the state of Georgia. Many of the counties in the state do not have an established diabetes prevention program.

Positive Social Change to Mitigate Diabetes in Georgia

The network of partners involved with the strategies created by the Centers of Disease Control and Prevention and the Georgia Department of Public Health collaborate to support the success of each strategy, objective, and activity geared toward combating chronic illness. To improve community health and the health systems used in these communities, Georgia has built collaborations with numerous partners on many health points. The Expanded Chronic Care Model has acted as a tool used to strengthen training and knowledge in bridging the gap between clinical efforts and the community (Georgia Department of Public Health, 2022). Through the partnerships between private organizations, public organizations, clinical partners, hospital systems, and federally qualified health centers (FQHCs), the Georgia Department of Public Health has been able to develop community clinical linkages and systems transformation. The necessary public health practices utilized to carry out these efforts included policies created to document national quality measures, advocating the use of the Triple Aim Model to educate on steps to prevent chronic diseases, and the use of system change practices (Georgia Department of Public Health, 2022).

Strategies

To implement the activities, Georgia partnered with a broad network of partners to aid in the execution of the activities. There are twelve activities that are being conducted in target communities to assist in mitigating the increase in diabetes for the target minorities. Health system transformation and community linkage are how Georgia

intends to manage to diabetic increase in these groups by teaching them diabetes and cardiovascular management and prevention of type 2 diabetes and cardiovascular disease (Georgia Department of Public Health, 2022). The type 2 diabetes and diabetes management prevention strategies were divided into two categories.

Category A

Category A consists of: Advancing access to and cooperation in Association of Diabetes Care & Education Specialists (AADE) accredited Diabetes Self-Management Education and Support (DSMES) programs and Americans with Disabilities Act of 1990 (ADA) recognized programs in underprivileged communities (Figure 10). Working toward having more pharmacists involved in assisting those with diabetes with medication management or diabetes self-management education and support. Aiding health care organizations in developing systems to analyze individuals diagnosed with prediabetes and direct them towards Centers for Disease Control and Prevention (CDC) identified programs advocating healthy ways of living to prevent type 2 diabetes. Partnering with essential private and public sectors and payer companies in Georgia to extend access to the National Diabetes Prevention Program as a benefit to the state and public workers, employees of private sector companies, and Medicaid beneficiaries. Creating ideas to advance participation in the CDC change of lifestyle programs. Creating a statewide foundation to advocate for long-term maintenance or compensation for Community Health Workers (CHWs) to assist in encouraging employees to use the CDC lifestyle change programs for the prevention of type 2 and use of Association of Diabetes Care and Education Specialists and Diabetes Self-Management Education and Support programs to manage the diabetes disease.

Category B

Category B consists of: Advocating for a better understanding of using health information technology (HIT) and electronic health records (EHR) to enhance patient health and provider results in relation to diagnosing and managing adults with hypertension (Figure 11). Assisting in the arrangement of medical staff such as nurses, pharmacists, physical therapists, nurse practitioners, nutritionists, and social workers in learning how to manage cholesterol and hypertension in the clinic. Advocating for the acceptance of medical transportation management amongst physicians and pharmacists to better get a handle on high blood cholesterol, blood pressure, and positive lifestyle changes. Establishing a statewide foundation to advocate endurance for Community Health Workers (CHWs) to help manage high blood cholesterol and hypertension. Coordinating with adults with hypertension on how to use self-measured blood pressure monitoring (SMBP) with the help of medical staff. Developing strategies to organize referrals to community prevention programs and resources for patients diagnosed with high blood cholesterol and hypertension

Explanation for CAT A Efforts and Strategies

There is a need for more accredited programs due to only being 101 Diabetes Self-Management Education and Support (DSMES) locations in Georgia to assist 1.1 million adults that have diabetes (Georgia Department of Public Health, 2022). The goal of these strategies is to bring awareness to diabetes and through stakeholders and health organization, minimize those diagnosed with diabetes throughout the state, increasing the number of people diagnosed with diabetes that attend these programs. The first year focuses on improving knowledge at federally qualified health centers, hospitals, and

clinics through the increase in diabetes education, increase of education on DSMES and accrediting these centers, and technical aid in providing areas that are at risk with DSMES foundations. There will be a focus on public health districts and non-physician providers such as dieticians, dental professionals, etc., referring patients to DSMES. There will be a registry built that will assist in helping patients seek such programs where they reside and be accessible to them when it comes to their insurance plan and schedule.

The 1305 Cooperative Agreement was created to better provide knowledge DSMES to pharmacists on the necessity of the program and the accreditation process (Georgia Department of Public Health, 2022). The Georgia Department of Health has since continued its efforts to strengthen the number of pharmacists and pharmacies advocating for DSME amongst their patient population that suffers from diabetes. As the plan continues to progress, STRAND Pharmacy solutions and Georgia Pharmacy Association will receive assistance from the Georgia Department of Health in getting DSMES accredited and advocating for diabetic patients to enroll. The partnership allows pharmacists to have a closer look into how patients are cared for through medication therapy management training and various events that include Collaborative Practice Agreements (CPAs). The Georgia Department of Health found the gap in patients being referred to diabetes prevention programs throughout the state that are partnered with the Office of Rural Health, the American Medical Association (AMA), Area Agencies on Aging, GHA, Atlanta Regional Collaborative for Health Improvement, and the University of Georgia Office of Consumer Sciences, lack of testing and lack of screening amongst the population (Georgia Department of Public Health, 2022).

The goal is to maximize patients being seen in the healthcare organization due to referrals to participate in Diabetes Prevention Programs, and to reach this goal, AMA, Rural Health partnerships, and GHA partnerships will work with the state to strengthen the competency of these systems to advance testing, screening, and referral processes (Georgia Department of Public Health, 2022). In addition to these efforts, the state has partners with partners such as the Area Agency of Agency and other partners to recruit more participants to participate in CDC programs aimed at assisting people engaging in healthy lifestyle behaviors. Through this initiative, people can direct to prediabetes programs in their communities, making the referral transition process smoother for health care providers. The American Medical Association, the Georgia Hospital Association, and the Rural Health collaboration groups-built registries for physicians to be able to utilize up-to-date program data. As the Department of Health partners with involved organizations, there will be an increase in the number of employees having the National Diabetes Prevention Program as a covered benefit.

Employers from counties with a high prevalence of diabetes will be assisted by the Department of Health to make National Diabetes Prevention Program a benefit for their employees. To assess the progress of the newly implemented changes, an evaluation plan will be developed looking into waist circumference as well as blood pressure and Diabetes Prevention Recognition Program as a necessary measurement (Table 6). Georgia has 34 in-person National Diabetes Prevention Programs, which are in the metro Atlanta region. The Georgia Department of Health has plans to continue providing guidance and education to lifestyle coaches in areas with a high prevalence of diabetes to bring awareness to organizations in the CDC. With the Department of Health

building a partnership with STRAND and the Community Pharmacy Extended Service Network (CPESN), the state can make these programs more available at locations where pharmacies reside, equipping up to 30 pharmacies with pharmacy data outlets and Lifestyle Coach Training (Centers for Disease Control and Prevention, 2018).

Internal partnerships will take place to create bidirectional referrals amongst Oral Health, Cardiovascular Disease, Diabetes Prevention, Women's Infant & Children, and Tobacco Cessation. The 1815 grant, which is funded by the Centers for Disease Control Prevention and given to the Georgia Department of Health, is being used to support the Community Health Worker (CHW) program (Centers for Disease Control and Prevention, 2018). With the grant, the staff is hired are advocate the program throughout the state of Georgia and work with stakeholders to build continuous advancement of lifestyle training and certification processes. With these efforts, there will be justification that reimbursement and payment devices are necessary for diabetes care and programs.

Explanation for CAT B Efforts and Strategies

The main objectives will focus on continuous health system improvements through the 1305 funding plan (Georgia Department of Public Health, 2022). Involving partners with strategies strengthens systems utilized to highlight and acknowledge adult patients that have or have not been diagnosed with hypertension (Centers for Disease Control, 2018). Georgia Health Information Technology Extension Center (GA-HITEC) is working with the Georgia Department of Health to find and pick providers located in an area more at risk to give technical assistance in the best way to use the electronic health records to point out patients with or without hypertension. Doing this will advance the Quality Payment Program measures in relation to high blood pressure and

hypertension, and the creation of protocols relevant to electronic health records to improve how data is retrieved for documenting quality measures and advancing how patients with hypertension are cared for. The Georgia Hypertension Control Champions initiative will be put into action to find and aid clinicians, practices, and health systems using health information technology and team-based care routines to successfully gain dominance over high hypertension rates.

Centene Corporation has the Peach Health Project, in which they have included the state of Georgia in to mimic the Asheville Project, which is located at 10 pharmacy sites. The project allows communities, schools of pharmacies, worksites, and pharmacies to partner up and extend health care to patients with chronic illnesses. The project extends to other regions of the state through other schools of pharmacy. The Georgia Department of Health will also allocate funds to a maximum of four health districts of public health to collaborate with community clinics, working to advance hypertension control through the nursing staff. Surveying methods will assist in gauging the ability of nurses to use telemedicine and telehealth to gain control of hypertension in high-burden communities to achieve expansion of access to care amongst at-risk populations in those communities.

Geographic Information Systems will provide training to chart blood pressure medication observed data to analyze preferred communities that are priority counties that could have an advantage at increased medical staff care to advance medication management and control hypertension (Centers for Disease Control, 2018). Georgia Pharmacist Association will then be able to use the data to find pharmacists that can offer Medical Transportation Management in high-burden communities and provide training

on Medical Transportation Management to at-risk areas. There will also be educational growth available to pharmacists. Provider associations will provide training and education to physicians. Chronic Illness and Disability Payment Systems partnerships and planning team will participate in advocating Community Health Worker benefits and certification protocols and processes.

The technique will allow the health department to hire employees that can manage the Community Health Workers Advisory Committee and advocate the group efforts throughout Georgia. The strategies involve planning and executing the 3rd annual Community Health Worker Stakeholder Forum to include stakeholders in the future creation of curricula and certification techniques. American Heart Association holds a partnership with the state health department offering Self Measured Blood Pressure (SMBP) knowledge to many stakeholders that are providers. Catapult is the quality improvement action plan created by DPH to strengthen the utilization of SMBP to better gain control of hypertension amongst at-risk groups. The department will be a part of six total health systems that reside in highly at-risk communities to apply the Catapult Hypertension Management Module initiative.

Under the 1305 funding opportunity, the health department will continue to aid three health systems in applying the Catapult hypertension model. The strategies and methods will assist the progress of referral systems for adult patients that have been diagnosed with hypertension in locating resources and programs in their communities.

Figure 10

1815 Grant Category A

MEASURE NUMBER	DESCRIPTION	DATA SOURCE
Measure A.1.i	Number and proportion of new ADA-recognized/AADE-accredited DSMES programs established (DSMES Programs)	ADA/AADE Report
Measure A.1.ii	Number and proportion of new ADA-recognized/AADE-accredited DSMES sites established (DSMES Sites)	ADA/AADE Report
Measure A.3.i	Number of pharmacy-based diabetes self-management education and support (DSMES) programs that are recognized by ADA or AADE.	ADA/AADE Report
Measure A.3.ii	Number of pharmacists using patient care processes to promote medication management for people with diabetes (Pharmacists/MTM)	Program Records; pEACHealth Reports
Measure A.4	Number of patients served within health care organizations with systems to identify people with prediabetes and refer them to CDC-recognized lifestyle change programs	Health Systems Assessment
Measure A.5.i	Number of employees of private sector organizations (adult age 18 and older) and their dependents who have the National DPP lifestyle change program as a covered benefit (Private Employees Covered)	Program Records; Self-insured and commercial plan data
Measure A.5.ii	Number of employees of state/public organizations (adult age 18 and older) and their dependents who have the National DPP lifestyle change program as a covered benefit (Public Employees Covered)	Georgia Department of Community Health (DCH); University System of GA
Measure A.5.iii	Number of Medicaid beneficiaries (adult age 18 and older) who have the National DPP lifestyle change program as a covered benefit (Medicaid Beneficiaries Covered)	DCH
Measure A.7.i	Number of academic and other institutions offering CHW core competency training (Institutions Offering Training)	Program Records; CCS Hub; CHW Survey
Measure A.7.ii	Number of CHWS who have received core competency training (CHWs Trained)	Program Records; CCS Hub; CHW Survey
Measure A.7.iii	Number of CHWS who have received certification (if available in that state) (CHWs Certified) (optional measure)	Program Records; CCS Hub; CHW Survey
Measure A.7.iv	Number of CHWS in the state who are paid from sustainable payment mechanisms (Sustainable Payment) (optional measure)	Programs Records, CCS Hub, CHW Survey
Measure A.8	Number of people with diabetes with at least one encounter at an ADA-recognized/AADE-accredited DSMES program	CDC Reported Data: DSMES State Data
Measure A.9.i	Total number of participants enrolled in CDC-recognized lifestyle change programs (primary measure)	DPRP Report
Measure A.9.ii	Number of participants enrolled in CDC-lifestyle change programs using 1815 funds (sub-measure)	Program Records
Measure A.10	Proportion of people with diabetes with an A1C > 9	CDC Reported Data; DPH Health Systems Assessment; FQHC HRSA Data
Measure A.11.ii	Number of CDC-recognized organizations (cumulative) achieving a minimum average weight loss of 5% in their eligible participants (measured at 12 months) (Proxy)	CDC Reported Data: DPRP State Evaluation Quarterly Report

Figure 11

1815 Grant Category B

MEASURE NUMBER	DESCRIPTION	DATA SOURCE
Measure B.1	# and % of patients within health care systems that have systems to report standardized clinical quality measures for the identification, management and treatment of patients with hypertension	HI-BRIDGE Solutions Reports; DPH Health Systems Assessment
Measure B.1	# and % of patients within health care systems that have systems to report standardized clinical quality measures for the identification, management and treatment of patients with hypertension	HI-BRIDGE Solutions Reports; DPH Health Systems Assessment
Measure B.1	# and % of patients within health care systems that have systems to report standardized clinical quality measures for the identification, management and treatment of patients with hypertension	EHR Data from Health Districts
Measure B.1	# and % of patients within health care systems that have systems to report standardized clinical quality measures for the identification, management and treatment of patients with hypertension	HI-BRIDGE Solutions Reports; DPH Health Systems Assessment
Measure B.1	# and % of patients within health care systems that have systems to report standardized clinical quality measures for the identification, management and treatment of patients with hypertension	HI-BRIDGE Solutions Reports; DPH Health Systems Assessment
Measure B.1	# and % of patients within health care systems that have systems to report standardized clinical quality measures for the identification, management and treatment of patients with hypertension	HI-BRIDGE Solutions Reports; DPH Health Systems Assessment
Measure B.3.a	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address blood pressure control	HRSA FQHC Data; DPH Health Systems Assessment
Measure B.3.a	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address blood pressure control	DPH Health Systems Assessment
Measure B.3.a	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address blood pressure control	DPH Health Systems Assessment
Measure B.3.a	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address blood pressure control	DPH Health Systems Assessment
Measure B.3.a	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address blood pressure control	EHR Data from Health Districts
Measure B.3.b	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address cholesterol management	DPH Health Systems Assessment
Measure B.3.b	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address cholesterol management	HRSA FQHC Data; DPH Health Systems Assessment
Measure B.3.b	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address cholesterol management	DPH Health Systems Assessment
Measure B.3.b	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address cholesterol management	DPH Health Systems Assessment
Measure B.3.b	# and % of patients in health care systems implementing new or enhanced team-based approaches or policies to address cholesterol management	EHR Data from Health Districts
Measure B.4.a	# of pharmacists who provide MTM services to promote medication self-management and lifestyle modification for patients with high blood pressure	Program Records; DPH Community Pharmacy Survey

Measure B.4.b	# of pharmacists who provide MTM services to promote medication self-management and lifestyle modification for patients with high blood cholesterol	Program Records; DPH Community Pharmacy Survey
Measure B.5	# of CHWs covered under state efforts to expand CHW curricula and training delivery vehicles, CHW certification systems, and/or CHW payment mechanisms	Program Records; CCS Hub; CHW Survey
Measure B.6	# and % of patients within health care systems that have policies or systems to encourage self-measured blood pressure monitoring (SMBP) with clinical support for patients with hypertension	Health Systems Survey Data
Measure B.6	# and % of patients within health care systems that have policies or systems to encourage self-measured blood pressure monitoring (SMBP) with clinical support for patients with hypertension	HRSA FQHC Data; DPH Health Systems Assessment
Measure B.6	# and % of patients within health care systems that have policies or systems to encourage self-measured blood pressure monitoring (SMBP) with clinical support for patients with hypertension	EHR Data from Health Districts
Measure B.6	# and % of patients within health care systems that have policies or systems to encourage self-measured blood pressure monitoring (SMBP) with clinical support for patients with hypertension	DPH Health Systems Assessment
Measure B.6	# and % of patients within health care systems that have policies or systems to encourage self-measured blood pressure monitoring (SMBP) with clinical support for patients with hypertension	DPH Health Systems Assessment
Measure B.7.a	# and % of patients in health care systems with high blood pressure referred to an evidence-based lifestyle program	
Measure B.7.a	# and % of patients in health care systems with high blood pressure referred to an evidence-based lifestyle program	
Measure B.7.a	# and % of patients in health care systems with high blood pressure referred to an evidence-based lifestyle program	Electronic Health Record (EHR) Data;Health Systems Survey Data
Measure B.7.a	# and % of patients in health care systems with high blood pressure referred to an evidence-based lifestyle program	Programs Records; ARCHI Reports; YMCA Reports
Measure B.7.a	# and % of patients in health care systems with high blood pressure referred to an evidence-based lifestyle program	Programs Records; ARCHI Reports; YMCA Reports
Measure B.7.b	# and % of patients in health care systems with high blood cholesterol referred to an evidence-based lifestyle program	Program Records;Reports from health systems: DPH Health systems assessment
Measure B.7.b	# and % of patients in health care systems with high blood cholesterol referred to an evidence-based lifestyle program	
Measure B.7.b	# and % of patients in health care systems with high blood cholesterol referred to an evidence-based lifestyle program	
Measure B.7.b	# and % of patients in health care systems with high blood cholesterol referred to an evidence-based lifestyle program	Program Records;YMCA Reports; Reports from health systems
Measure B.7.b	# and % of patients in health care systems with high blood cholesterol referred to an evidence-based lifestyle program	Program Records;YMCA Reports; Reports from health systems
Measure B.8	Proportion of adults with known high blood pressure who have achieved blood pressure control	HI-BRIDGE Solutions Reports; DPH Health Systems Assessment; HRSA FQHC Data; EHR Data from Health Districts
Measure B.9.a	Proportion of patients considered at high risk of cardiovascular events who have their cholesterol managed with statin therapy	Health Systems Survey Data;Electronic Health Record (EHR) Data

Table 6

Performance Measures Example

Measure A.3.ii & Measure A.4

Yr	Type	Numerator/ Count	Denominator	Reach Numerator	Reach Denominator	Reach %	Date Collected
Base	Actual	33					09/30/19
Yr3	Target	45					
Yr3	Actual	90					06/29/21
Yr4	Target	100					
Yr4	Actual	105					

Yr	Type	Numerator/ Count	Denominator	Reach Numerator	Reach Denominator	Reach %	Date Collected
Base	Actual	62,757					02/28/19
Yr3	Target	285,000					
Yr3	Actual	58,642					06/29/22
Yr4	Target	120,000					
Yr4	Actual	58,642					

Note. A reference to the performance measures based on survey and program records from partnered health organizations for years 2019-2022. The first set of numbers (Measure A.3.ii) reference the number of pharmacists using patient care processes to promote medication management for people with diabetes. The first second set of numbers (Measure A.4) references the number of patients served within health care organizations with systems to identify people with prediabetes and refer them to lifestyle change programs through the CDC.

Outcomes

The Georgia Department of Health has created an initiative linked to funding that will allow partnerships on statewide, local, public, and private partnership opportunities. These opportunities will allow all involved to develop and analyze evidence-based approaches to cease and control diabetes as well as cardiovascular disease in areas that carry high-risk groups, communities, and populations in the state of Georgia. As Georgia's chronic disease rates continue to rise, the Georgia Department of Health is working alongside the Centers for Disease Control and Prevention to mitigate risk factors for chronic diseases and propose positive health outcomes regarding diabetes and cardiovascular disease. With the combination of all partnerships, evidence-based and team-based interventions can create self-management education, programs to manage the disease, blood pressure screening, and interventions to manage cases. Figure 12 displays proposed outcomes created to accomplish health goals through government and state approved initiatives.

A quantitative methodology is being utilized to evaluate the two chosen strategies. The Health Systems Evaluator continues to collect, code, analyze and interpret data from

various data sources. Data sources comprise of web-based surveys, program records, interviews, reports from partners such as Centers for Disease Control and Prevention (CDC) on the Diabetes Prevention Recognition Program (DPRP), Georgia Pharmacy Association (GPhA), pEACHealth quarterly reports, the retrieval of data from the Georgia Department of Community Health (DCH) on who have the National DPP lifestyle change program as a covered benefit, and vital statistics data from Georgia Department of Public Health (DPH) Office of Health Indicators and Planning (OHIP). The DPH-created Health Systems Assessment (HSA) will be completed with new partners upon contract signature to determine the extent to which health systems in Georgia have policies or systems in place to support high-quality service delivery for their adult primary care patients with respect to screening and management of prediabetes, diabetes, hypertension, and cholesterol.

Figure 12

Short-Term Outcomes

Short-term outcomes:
A1. Increased access to and coverage for ADA-recognized/AADE-accredited diabetes self-management education and support (DSMES) programs for people with diabetes.
A2. Increased use of pharmacist patient care processes that promote medication management for people with diabetes.
A3. Increased access to and coverage for the National DPP lifestyle change program for people with prediabetes.
A4. Increased community clinical links that facilitate referrals and provide support to enroll and retain participants in the National DPP lifestyle change program.
B1. Increased reporting, monitoring, and tracking of clinical data for improved identification, management, and treatment of patients with high blood pressure and high blood cholesterol.
B2. Increased use of and adherence to evidence-based guidelines and policies related to team-based care for patients with high blood pressure and high blood cholesterol.
B3. Increased community clinical links that support systematic referrals, self-management, and lifestyle change for patients with high blood pressure and high blood cholesterol.
Intermediate outcomes:
A1. Increased participation in ADA-recognized/AADE-accredited DSMES programs by people with diabetes.
A2. Increased enrollment and retention in CDC-recognized organizations delivering the National DPP lifestyle change program.
B1. Increased medication adherence among patients with high blood pressure and high blood cholesterol.
B2. Increased engagement in self-management among patients with high blood pressure and high blood cholesterol.
B3. Increased participation in evidence-based lifestyle interventions among patients with high blood pressure and high blood cholesterol.
Long-term outcomes:
A1. Decreased proportion of people with diabetes with an A1C>9.
A2. Increased number of people with prediabetes enrolled in a CDC-recognized lifestyle change program who have achieved 5-7% weight loss.
B1. Increased control among adults with known high blood pressure and high blood cholesterol.

Note. A plan from the Georgia Department of Health consisting of short-term, intermediate, and long-term outcomes to combat the rise of morbidity and mortality rates of diabetes in Georgia for grant 1815 Cat A and Cat B.

Summary

The Georgia Department of Health continues efforts toward decreasing chronic illnesses and raising awareness of illnesses in the state of Georgia. As these efforts continue, Georgia uses evaluation systems and personnel to evaluate intervention programs created to combat chronic illnesses such as type 2 diabetes. The programs target at risk groups in low-income and rural communities and work to provide results in those groups. With proper funding and support, these efforts can continue to advance and show improvement amongst low-income and rural communities. Advocating for a healthier Georgia means taking time to reach out to those groups and educate them on the resources being provided and the opportunities that come from such resources.

Georgia residents can be educated on the risk of chronic illnesses and the importance of staying healthy through routine checkups, screenings, and medication management. Working with healthcare professionals and pharmacists can build that positive relationship and extend each residents quality of life.

Chapter 3: Methods

The Centers for Disease Control and Prevention has utilized statistical methods beginning in the 1980s leading up to 2010 (Centers for Disease Control and Prevention, 2018). These methods are known as post stratification essential in weighting BRFSS survey information for known proportions of variables such as sex, race, age, ethnicity, and geographical location for a population. Iterative proportional raking was introduced in 2011 which is much more advanced than the post stratification strategy (Centers for Disease Control and Prevention, 2018). More demographic variables can be utilized such as home ownership or educational level. These variables can be used in the statistical weighting process of iterative proportional raking.

With this new introduction to weighting, these are less chances of potential bias and a greater chance for accurate estimates. With the method BRFSS incorporated in 2011, telephone ownership such as if the participant has a landline and/or cellphone can now be weighted as one of the responses for the survey (Centers for Disease Control and Prevention, 2018). Such developments are important to surveying as time and technology progress, so do participants.

Type 2 diabetes continue to rise in adults in the U.S. affecting all ethnicities and ages (Centers for Disease Control and Prevention, 2020). Health insurance is a secondary issue as lack of affordability leads to increasing risks. Although Georgia has created initiatives and programs to mitigate diabetes in the state, it still burdens many communities. Georgia's intervention initiative programs aim to advance cardiovascular

health, minimize the burden of the disease, and address disparities linked to stroke and heart disease.

Such programs are created to mitigate challenges and barriers individuals face when suffering from chronic illnesses who lack resources and tools to manage these diseases. The purpose of the study reviewed how those living in low-income and rural communities are affected by factors that drive their health status such as costs of care, income, geographic location, and education levels. There is 33.7% of the adult population in Georgia diagnosed with prediabetes with blood glucose levels that are higher than average but not high enough to be considered diabetes (Dall et al., 2019). Each year 63,717 individuals in Georgia find out they have diabetes (Dall et al., 2019). Georgia diabetes prevalence has a percentage of the population 20-79 years of age but is broken down into three groups when transmitting data from the surveys for research purposes.

Research Design and Rationale

Research assessed how delays in diagnosis was linked to lack of health coverage in low-income and rural communities in Georgia. It was also examined how delays in diagnosis occur due to lack of access to credible healthcare tools. A quantitative approach analyzed if there were associations because this method is the best design to emphasize connections between multiple variables. The dependent variable was delay of diagnosis, and independent variables were general health, routine checkup, number of days of poor physical health, whether they had been told they had prediabetes/diabetes, and how much time it had been since they last saw a health professional for diabetes. Covariate variables were presence or absence of health insurance coverage, age, gender, income level, and education levels.

Noyes et al. (2019) described the quantitative method as the best method to use due to it being objective, producing quicker results, more scientific, and acceptable. Quantitative research involves using logic, numbers, and an objective stance, which is associated with numeric and consistent information and elements (Noyes et al., 2019). Results are free flowing rather than restricted. The BRFSS is a survey used to collect data and assist in the evolution of health. The BRFSS survey includes data such as patient demographics, diabetic cases, and previous medical history that is collected through a system that gathers data from entire populations.

The research used the quantitative method to answer research questions and analyze variables. The goal was to understand effects of lack of access on healthcare and health insurance coverage for these groups. Variables controlled for was age, gender, and ethnicity for at-risk communities that lack healthcare resources and insurance options while analyzing why there were delays in individuals being diagnosed. Data for everyone that responded was included from gathered surveys and detailed in a dataset. To study associations between factors, patients were given surveys during initial hospital visits when filling out demographic information.

Information was then used to assess whether they had insurance coverage, availability of resources, and knowledge of the topic. Providers can then submit those responses to assess what is needed to provide access and reduce diagnosis delays. The hypothesis was tested through quantitative methodology plugging in patient responses and calculating the percentages of those patients' lacking accessibility and resources based on the affiliated factors. Social economic theories were built to explain the effects of the economy on societal patterns examining if it advances or hinders society. The

theory dives into social norms and beliefs affecting how an individual behaves. The social economic theory highlighted the economy as an effect of societal trends regarding the progress or lack of progress of society's health status (Galama & van Kippersluis, 2019). The goal was to emphasize the theory's explanation of the economy affecting the health of the Black non-Hispanic, Hispanic, Other non-Hispanic, Multiracial non-Hispanic and White non-Hispanic groups.

The theory suggested that the wealthier classes have access to healthcare and affordable insurance; therefore, they are diagnosed quicker than those with minimal access to healthcare and poor to no health insurance coverage (Galama & van Kippersluis, 2019). Through quantitative methodology, a variable was analyzed, proportions were evaluated, and new theories were created (Galama & van Kippersluis, 2019). The social-ecological theory is built on the broad idea that numerous factors impact an individual's health. The 1947 Constitution of the World Health Organization was established based on the conceptualization of multiple factors, such as mental, social, and physical factors affecting health which is relevant to the social-ecological theory (Constitution of the World Health Organization, 1947). The theory breaks down health to be impacted based on the relationship between a group or community, a person, and the social, physical, and environmental factors (Israel et al., 2003; Sallis et al., 2008; Wallerstein et al., 2008).

Methodology

Population

Participants in the study were included based on their age. All participants were18 and older. This extensive range was necessary for more efficient proof. The secondary

data analysis was cross-sectional in which new samples of people were used each time with a diverse population of Black non-Hispanic, Hispanic, other non-Hispanic, multiracial non-Hispanic and White non-Hispanic participants. The BRFSS data used in the study included 7,354 individuals who responded to questions on the survey.

Sample and Strategies

BRFSS data was useful in terms of investigating the low-income and rural minority residents in Georgia being evaluated and was reported though program and health records and surveillance systems the Centers for Disease Control and Prevention and GDPH use to determine methods for assisting in improving the health of the public. Diabetes intervention programs were developed to translate results from each year in order to improve equity of the health systems in Georgia for all residents, whether they are insured or not insured. Adults who were visiting hospitals, clinics and pharmacies and report their health via survey responses were a part of the study. Pharmacies also submitted responses regarding medication management based on patients.

State-based data collection procedures are complex; therefore, data sets were altered to fit needs of the study. Certain states use multiple optional modules dependent on their needs. This study focused on the state of Georgia and used diverse modules to convey information. All states currently use the BRFSS to maintain and track health objectives, health programs, health-related activities, disease prevention initiatives and state and local trends. Individuals who were 18 years of age and older participated in surveys and assisted in the process to improve the health of all Americans.

The state of Georgia uses combined cell phone and landline information for 14 modules. The modules include Childhood Asthma Prevalence, Breast and Cervical

Cancer Screening, Cognitive Decline, Diabetes, Home/ Self-measured Blood Pressure, Industry and Occupation, Random Child Selection, Sex at Birth, Sexual Orientation and Gender Identity (SOGI), HPV Vaccination, Hepatitis Treatment, Shingles Vaccination, Tetanus Diphtheria (TDAP) (Adults), Tobacco Cessation (Centers for Disease Control and Prevention, 2018). The data sets used for the modules is LLCP2021 and the data weight is _LLCPWT (Centers for Disease Control and Prevention, 2018). Those included in the study must have met all criteria based on the dependent, independent and covariate variables. Those excluded were the ones that did not meet all the criteria needed to conduct the study, meaning they did not meet certain requirements.

The BRFSS data set included 7,354 responders which aged 18 years of age and older from the data set that will was used for the study. Prior research has demonstrated that approximately 12.4% of Georgia residents have been diagnosed with diabetes (Georgia Department of Public Health, 2022). Using 5.9% for the prevalence of diabetes in the state of Georgia, the total number of individuals from the BRFSS dataset (7,354 subjects) was determined to be 434 subjects. To analyze the complete sample of 1,282, which included woman who were told they had diabetes during pregnancy, calculations were made using G*Power utility software. The primary analysis used to conduct this study was binomial logistic regression.

The binomial logistic regression had a sample size of 1,282 and yielded the power of 95% with $\alpha = 0.05$. The confidence for the sample size of 7,354 participants with the anticipated 1,282 subjects with diabetes, was efficient to conduct an analysis for the current study being presented for a sample size of 1,279.

Instrumentation and Materials

The secondary analysis was conducted with data received from local hospitals and clinics, partnered with CDC and GDPH, which is available to view on the internet through BRFSS. The surveys were taken by each institution then submitted for tracking and input into the database BRFSS records. During the process of gathering data from partnered organizations, the appropriate sample is first selected; those undiagnosed and diagnosed. The sample selection happens in stages first selecting participants in certain counties in surrounding Georgia communities that visited hospitals and clinics and was input into health information system (HIS). Next, households with the appropriate age group, sex and health status are selected for the BRFSS survey.

After this, those households that match the criteria are selected. Finally, participants in those qualifying households were selected for the study based on diagnosis and visits. Participants identified that meet the admittance criteria were included in the sample and provided a survey during their initial hospital visit to be included in BRFSS. Pharmacies used databases shared with CDC and GDPH to track participants included in the medication management efforts. Individuals that participated in the surveys were informed their information would be confidential, were told their rights, following a form signed consenting the data collected to be utilized for the study in efforts to improve overall health. Criteria for personal interviews are selected based on health status and limitations, utilization of health care, access to care, health insurance, selected health conditions, poisonings and injuries, health behaviors, functioning/disability, and immunizations (Centers for Disease Control and Prevention, 2020).

The health information collected and put into the BRFSS is kept rigorously confident. While undergoing the informed consent process, participants included in the survey are assured that the data collected will be used only for the purposes disclosed and will not be shared or released to anyone that does not have permission from the individual or the organization following the Public Health Service Act. The consent forms are given to the participants who then sign allowing their information to be kept for future research.

Validity and Reliability of the Instrument

Validity

To ensure each instrument and measurements were valid, precautions were taken while gathering and examining information throughout the study. The BRFSS program started in the 1980s and has been a part of numerous studies that target certain health topics and population groups (Centers for Disease Control and Prevention, 2020). The survey analyzes a nationally representative sample to include approximately 5,000 individuals yearly (Centers for Disease Control and Prevention, 2020. As the surveys have been conducted, specialists have improved methods fixing errors and screening for ways to improve survey features methods related to how the surveys are created, improved, distributed, and administered. Data is gathered looking into the prevalence of chronic conditions for the population groups.

The survey constructs individuals that were undiagnosed prior and those currently diagnosed that reported their condition.

Empirical Validity

Well known as predictive validity or statistical validity, is a description of how closely scores correlate on a test with the act as measured in other circumstances. The National Center for Health Statistics (NCHS) works as a unit with the Centers for Disease Control and Prevention, Human Services and Department of Health (Centers for Disease Control and Prevention, 2020). The NCHS gathers, examines, and distributes appropriate, vital, and efficient health information and results. Through NCHS, the program educates the population and provide guidance on programs and policies which shape resolutions to advance the health of the public (Centers for Disease Control and Prevention, 2020). Through data briefs, NCHS publicizes statistical data the details information on the status of certain public health topics (Centers for Disease Control and Prevention, 2020).

Each intricate report provides data on a subject of health and compiles it in text form and figures that allow readers to understand the information being displayed.

Content Validity

Content validity refers to an instrument or a test examining all features of construct, topic or behavior created to measure. The Centers for Disease Control and Prevention utilizes the strengths of BRFSS program to gather data on how chronic illnesses prevail groups or populations (Centers for Disease Control and Prevention, 2020). An individuals' daily routine, establishment, genetics, risk factors, and/or environment that makes the person more susceptible to certain diseases are analyzed through BRFSS. The samples taken through this program are gathered throughout the United States and is administered to all age groups. To ensure content is valid and reliable, BRFSS collects more samples for those 60 years of age and older,

predominantly Hispanics and African Americans (Centers for Disease Control and Prevention, 2020).

There has been a dramatic increase in elderly individuals in the United States. Due to this increase, elderly individuals are in much more need of healthcare, examinations, research, and public policy changes. Selection bias, confounding bias and information bias are to follow describing how these are decreased to ensure the content provided is valid (Centers for Disease Control and Prevention, 2020).

Selection Bias

Selection bias is a falsification in a measure of common interest, for example, individuals volunteering for a study, occurring when a sample selection is not appropriately mirroring the target population. There is a potential for selection bias when selecting the appropriate individuals for research for reasons such as risk ratio and individuals volunteering for the study that either have the disease or do not have the disease. The Centers for Disease Control and Prevention have created a systematic method to mitigate selection bias through randomization. Primary sampling units are first selected, then divided by community. Following this, random households from the communities are selected and categorized by age, gender, and ethnicity (Centers for Disease Control and Prevention, 2020).

The approach ensured researchers bias would be eliminated in the general population and increases chances of external validity will occur. In the past, BRFSS had minimal responses which created the potential for bias to occur.

Confounding Bias

Confounding bias is a systematic misinterpretation of a measure of common interest between risk and the health outcome occurring due to the result of the risk of focal interest having incidental hazardous factors. For example, a study that looks at the link between diabetes and cardiovascular disease may be confounded by age, gender, ethnicity, and diet, amongst other risk factors that may unequally be shared between the groups in the study being compared. The CDC has worked to reduce confounding bias through randomization, matching, and restriction (Centers for Disease Control and Prevention, 2020). Randomization is a random selection of confounding variables between groups. Matching is creating equal distribution of confounders between groups or individuals in the study.

Restriction is confining access to the study of those that have risk bias as confounding factors.

Information Bias

Information bias is a distortion in the measure of association caused by a lack of accurate measurements of key study variables (Centers for Disease Control and Prevention, 2020). Information bias, also called measurement bias, arises when key study variables (exposure, health outcome, or confounders) are inaccurately measured or classified (Althubaiti, 2016). An example of information bias is having the belief that more information can be gathered to make a choice, no matter the relevance of the information. To reduce the bias, it is vital to ensure information is heavily supported and not solely opinionated (Althubaiti, 2016). The information should present facts associated with all variables, not just a select few.

The appropriate study design should be selected, and all appropriate protocols should be taken when handling information and data (Althubaiti, 2016). All exposures and outcomes should be well defined.

Construct Validity

Construct validity refers to identifying the causes, settings, effects, and individuals participating in the research study (Vincze et al., 2020). For example, a reference to such would be scaling or assessing the construct accurately. In this study, an example of construct validity was measured an individual's ability to manage their illness and report their outcome measures to their practitioner. For the content to be valid, we must analyze if the content and structure is applicable based on the measurements. For the example previously given, does the patient have the knowledge and skills needed to manage their disease efficiently.

Scientist at BRFSS ensure construct validity through diverse strategies such as ensuring the measurements and indicators utilized in the study are meticulously created relevant to the knowledge already gathered. A new instrument, the diabetes self-management questionnaire (DSMQ), as develop a consistent link in results according to the outcome of diabetes in diabetic patients like glycated hemoglobin (HbA1c) (Vincze et al., 2020).

Reliability

Reliability is essential to control for errors in measurement throughout the entire study. The calculation, specification, and measurement must be relied upon to be precise. The study should yield the same results during an experiment when being repeated. When collecting the data, the manuscripts entered were matched with what was reflected in the

BRFSS site, cross checking during and after entering the data. After the data is evaluated, the nominal, ordinal, and ratio data variable are precisely coded and assigned values, ranked, and dummy coded efficiently with established values.

After this step, the collection, analysis, and assignment of data is analyzed with evaluators for the GDPH to ensure consistency and dependability. Lastly, the data is cross-referenced with a team of evaluators for comparison and reliability to ensure the data is exact and ready to be analyzed. The steps are essential to ensuring validity and accuracy while testing all variables during the study. BRFSS data process is accurately evaluated to ensure improvements are made to make these instruments valid and reliable.

Study Variables

The study variables included in the study were chosen based on the current research gathered through reliable sources, literature review, and the information provided through the BRFSS program.

Dependent Variable

Delay of Diagnosis

Majority of individuals with Type 2 diabetes are delayed in clinical diagnosis of approximately 4–7 years after hyperglycemia (Gopalan et al., 2018). Many times, even if the period of going undiagnosed is usually asymptomatic, it is essential it is caught early enough to intervene and treat hyperglycemia, initiate behavioral changes, and focus on cardiovascular concerns. Approximately a quarter of individuals have altered microvascular by the time they see a clinician and are diagnosed with diabetes. Gaining control of hyperglycemia is essential in stopping complications associated with relative diseases. Education on how the conditions currently prevails at each level is vital to the

delay in type 2 diabetes to minimize any delays in diagnosis and providing early treatment.

Lack of access to care and going unscreened are contributions to the delay of diagnosing diabetes in Americans. With those factors mentioned previously in mind, the missed diagnosis and delay of diagnosing type 2 diabetes is still prevalent amongst insured and uninsured individuals; even when hyperglycemia is evident in EHRs. Gopalan et al. (2018) details a cross-sectional study which examined 1426 adult documented through EHR having hyperglycemia, 79% of those diagnosed also were diagnosed with diabetes. The chart review from 2010 at a Veterans Affairs Medical Center showed a 3.7-year average delay between the EHR showing those with hyperglycemia and those clinically diagnosed. The study looked at traits on an individual level and early care variations relating to diagnosis of type 2 diabetes.

Respondents were asked “Was there a time the past 12 months when you needed to see a doctor but could not because of cost?” These responses were dummy coded as “Yes” (coded as 1), “No” (coded as 2), “Do not know/Not sure” (coded as 7), “Refused” (coded as 9), and “Not asked or missing” (coded as Blank).

Independent Variables

Health Insurance Coverage

The Affordable Care Act (ACA) being developed required health insurance companies in the U.S. to honor health insurance coverage to individuals no matter their ethnicity, race, or condition. Individuals with pre-existing illnesses, to include type 1 and type 2 diabetes, amongst other chronic diseases must be allotted the same treatment as everyone else. Individuals with diabetes that do not have health care coverage is linked to

poor glycemic control. With limited use of health care services, poor glucose and blood pressure control affect those with diabetes and causes long-term concerns going untreated. Participants were asked “Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?” during the BRFSS survey and is dummy coded as a categorical variable. Responses were “Yes” (coded 1), “No” (coded as 2), “Do not know/Not Sure” (coded as 7), “Refused” (coded as 9), and “Not asked or Missing” (coded as Blank).

General Health

The program records tracked the number of hospital visits each participant had relative to their condition. The survey questions asked, “What has your overall health been like.” For the purposes of this study, the participants answered “Excellent” (coded as 1), “Very Good” (coded as 2), “Good” (coded as 3), “Fair” (coded as 4), “Poor” (coded as 5), “Do not know/Not sure” (coded as 7), “Refused” (coded as 9), and “Not asked or Missing” (Blank). Respondents were also asked “About how long has it been since you last visited a doctor for a routine checkup?” Participant answered “Within past year (anytime less than 12 months ago)” (coded as 1), “Within past 2 years (1 year but less than 2 years ago)” (coded as 2), “Within past 5 years (2 years but less than 5 years ago)” (coded as 3), “5 or more years ago” (coded as 4), “Do not know/Not sure” (coded as 7), “Never” (coded as 8), “Refused” (coded as 9), and “Not asked or Missing” (coded as Blank). The final question “Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?” Participant responses were “Number of days” (coded as 1-30), “None”

(coded as 88), and “Do not know/Not sure” (coded as 77), “Refused” (coded as 99), and “Not asked or Missing” (Blank).

Diabetes

Diabetes was answered through the BRFSS survey regarding diabetes. For the need of the study, the individuals were asked “Have you ever been told you have prediabetes or borderline diabetes?” Participant responses were “Yes” (dummy coded as 1), “Yes, during pregnancy” (dummy coded as 2), “No” (dummy coded as 3), “Do not know/Not sure” (dummy coded as 7), “Refused” (dummy coded as 9), and “Not asked or Missing” (dummy coded as Blank). “Have you been told by a health professional that you have diabetes?” Participant responses were “Yes” (dummy coded as 1), “Yes, but female told only during pregnancy” (dummy coded as 2), “No” (dummy coded as 3), “No, pre-diabetes or borderline diabetes” (dummy coded as 4), “Do not know/Not sure” (dummy coded as 7), “Refused” (dummy coded as 9) and “Not asked or Missing” (dummy coded as Blank). “About how many times in the past 12 months have you seen a doctor, nurse, or other health professional for your diabetes?” Participant responses were “Number of times [76=76 or more]” (dummy coded as 1-76), “None” (dummy coded as 88), “Do not know/Not sure” (dummy coded as 77), “Refused” (dummy coded as 99), and “Not asked or Missing” (dummy coded as Blank).

Covariate Variables

Age

The age of each participant was established based on the age everyone provided or the date of birth given from program records. The survey asked each respondent “Are you at least 18 years of age or older.” The category for age was dummy coded as follows

"Yes" (coded 1) and "Not asked or Missing" (coded as Blank). The descriptive statistics section had the age distribution as a category for the study. The age is coded as a categorical variable for the study.

Gender

The participants that participated in the BRFSS study documented their sex as being male or female. The research study categorized the genders as dummy code for "Female" (coded 2) or "Male" (coded 1) and is categorized as a categorical variable.

Income and Education Levels

Participants were asked their statuses for income, and education asking, "What is your category of income?" and "What is the highest grade or year of school you completed?" For income they were categorized as "$0 to $25,000" (coded as 1), "$26,000 to $50,000" (coded as 2), "$51,000 to $75,000" (coded as 3), and "$75,000 or more" (coded as 4). For education level, the responses were categorized as "Never attended school or only kindergarten" (coded as 1), "Grades 1 through 8 (Elementary)" (coded as 2), "Grades 9 through 11 (Some high school)" (coded as 3), "Grade 12 or GED (High school graduate)" (coded as 4), "College 1 year to 3 years (Some college or technical school)" (coded as 5), "College 4 years or more (College graduate)" (coded as 6), "Refused" (coded as 9), and "Not asked or Missing" (coded as Blank).

Data Collection and Analysis

The purpose of this quantitative study was to examine the delay of diagnosis corresponding with health visits affecting diabetes access care in rural, low-income communities on adults 18 years of age and older who either are or are not medically insured. Through G*Power and SPSS, statistical analysis was completed to assess data.

RQ1: Is there an association between delay in diagnosis of type 2 diabetes and health insurance coverage among low-income and rural communities after controlling for age, gender, and ethnicity?

$H_0$1: There is no association between delay in diagnosis of type 2 diabetes and health insurance coverage and low-income and rural communities after controlling for age, gender, and ethnicity.

H_a1: There is an association between delay in diagnosis of type 2 diabetes and health insurance coverage and low-income and rural communities after controlling for age, gender, and ethnicity.

To address this research question, a binomial logistic regression model was utilized to analyze the association between delay in diagnosis and health insurance coverage in the at-risk communities controlling for age, gender, and race/ethnicity. The model was built to reflect whether Georgia's health initiatives have contributed to increasing the availability of diabetes programs in underserved areas.

Dependent Variable: Delay of diagnosis

Independent Variable: Health insurance coverage, general health, routine checkup, number of days with poor physical health, awareness of having prediabetes/diabetes

Covariate Variables: Age, gender, income level, and educational level

RQ2: Is there an association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity?

$H_0$2: There is no association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity.

H_a2: There is an association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity.

To address this research question, a binomial logistic regression model was utilized to analyze the association between delay in diagnosis and lack of access to healthcare resources in at-risk communities controlling for age, gender, and race/ethnicity. To answer these questions, the model reflected information provided through patients served within health care organizations with systems to identify people with prediabetes and diabetes. The binomial logistic regression yielded the power of 95% with $\alpha = 0.05$.

Sample Weights and Other Considerations

To increase precision, a larger sample group was used. Samples that are larger are least likely to have changes in error as opposed to small samples which the original may have a variant. To minimize margin of error, it was best to use a large sample size. Larger sample sizes allow the opportunity to manipulate the risk of disclosing false-positive or negative conclusions (Centers for Disease Control and Prevention, 2018). The larger the number of samples, the increased chance the results will be accurate.

Sampling weights are necessary to adjust for flaws in the sample that could create bias and other deviations from what is expected between what is being sampled and the target population (Centers for Disease Control and Prevention, 2018). Such flaws involve

the choice of units with unequal probabilities, lack of coverage for the target population, and lack of response. There are several charts introduced in the prior chapter that show the difference amongst groups based on the multiple questions answered by the surveys patients completed and the number of referrals to each pharmacy relative to the research questions. The sample also included the number of patients screened and the systems used to identify patients with pre-diabetes and diabetes. Primary sampling units (PSU) are sampling units that are chosen at the primary level of a multi-stage sample to choose certain features (Centers for Disease Control and Prevention, 2018).

The features can be chosen directly and in such a creation, the features are the only sampled units. With the use of The Behavioral Risk Factor Surveillance System (BRFSS) telephone surveys are helpful in gathering data on numerous health outcomes, risk related to health behaviors, preventive services, and chronic conditions of adults in the United States (Centers for Disease Control and Prevention, 2018). The procedures were updated in 2011 to reflect an improvement in the structure, data collection process and weighting methodology to include cell phone responses on top of the landline telephone responses. The survey utilizes a set of questions and offers multiple options in accordance with health concerns. Complex sampling procedures are used to complete analyses based on the data in BRFSS (Centers for Disease Control and Prevention, 2018). The data is accurately layered and weighted to display the data being represented. Weighting the data assists in reducing possible bias that can occur from selection probabilities and portions of the population that are not covered (Centers for Disease Control and Prevention, 2018).

Threats to Validity

Internal validity can be defined as analyzing if an experimental condition or treatment has an impact or not, and if there is reliable evidence to support the data. External validity is measuring the usefulness of the outcome for that condition or treatment. The internal threats for the study can be classified as instrumentation, and statistical regression. The external threat can be classified as selection bias in which there is an error in the individuals or groups chosen to participate in the study. Instrumentation refers to observers, changes that occur in the instrument being used, and scores which could manipulate the outcome. Statistical regression, regression to the mean, is threatening based on the selection of participants and what they scored when answering survey questions. The surveys are answered based on the individuals' experiences and mindset which differ between everyone. External refers to things such as but not limited to changes in health insurance, economic shifts, and health behaviors. To address these threats, surveys are to the point and have terminology the individual can decipher. The proper questions are asked to analyze if the individual should be included or excluded from the study. History of the patient is used to determine if the patient has had any changes that could affect how the questions are answered on each survey.

Ethical Protection of Human Participants

Multiple ethical guidelines must be taken into consideration for research with human participants to be conducted. The Centers for Disease Control and Prevention consists of two Institutional Review Boards (IRBs). One of the IRB locations are in Atlanta, Georgia and reviews protocols from each CDC Center, Office, and Institute. The second location is The National Institute for Occupational Safety and Health's IRB,

which conduct analysis of human research completed or advocated by the Institute. The IRBs conducted by the CDC are accurately included in accordance with 45 CFR part 46 and 21 CFR part 56 as required (Centers for Disease Control and Prevention, 2018).

Through Certificates of Confidentiality (CoC), which are issued to researchers, the CDC ensures the protection of research subject rights by stopping any leaks of sensitive information from occurring or being disclosed to anyone that is not a part of the research unless the participant consents to this release or other situations were to arise (Centers for Disease Control and Prevention, 2018). Section 308(d} of the Public Health Service Act, the Privacy and Confidentiality Unit (PCU} was created to adapt Assurance of Confidentiality (AoC) protection by those employed or contracted by the CDC to ensure sensitive information being collected for a project stays confidential throughout and after the project is concluded (Centers for Disease Control and Prevention, 2018). The CDC relies on tools of ethical analysis to protect participants privacy and abide by each regulation regarding ethics. The study was a secondary review, and the data is available for public review through the CDC website, therefore, there are no ethical concerns.

The Institutional Review Board (IRB) is responsible for making sure that all Walden University research follows all the university's ethical standards and the federal regulations created. It is a requirement that the IRB's ethics committee assesses and approves all Walden-affiliated research prior to participant recruitment, collection of information, or dataset usage. The ethics approval determination for research includes data that already exist or minimal risks. Walden University will not give credit towards

any student's studies that was completed and did not receive an approval from the IRB committee. They will also not approve a study that failed to meet with IRB requirements.

Summary

With a detailed description of each term and its importance to the study, addressing the use of these terms for a logistic regression is necessary to understand how each variable will either support or reject the hypothesis. Chapter 4 presents data from the quantitative study analysis as well as evaluations of research questions. Hypotheses were evaluated to show how socioeconomic factors can impact health and how assistance from public health professionals can improve in engaging Georgia residents in their own health.

Chapter 4: Report of Results

The goal of this study was to determine if costs of healthcare were associated with delays involving diagnosis in diabetes based on socioeconomic factors such as education and income. Via analysis of BRFSS data, I investigated mortality and morbidity rates involving diabetes which occur due to environmental and socioeconomic risk factors. The sample included responses from Georgia residents for the year of 2019 and was examined to determine if delay of diabetes was linked to costs and other factors. Associations between diabetes and other variables such as age, gender, education, income, general health, and doctor visits were also examined via multiple logistic regression. All participants were at least 18 or older.

Socioeconomic factors and variables were tested via the regression model. Weights that were adjusted from BRFSS data were used to represent residents of Georgia. Chapter 4 includes results from the study. There was a total of 7,354 participants in the BRFSS survey during 2019. Among subjects who participated, 11.3% of respondents responded to the diabetes survey. Of those, 37.3% responded to the health coverage questions and 7% said costs of healthcare were issues in terms of their overall health. Chapter 4 includes the data collection and results. I used the following research questions:

RQ1: Is there an association between delay in diagnosis of type 2 diabetes and health insurance coverage among low-income and rural communities after controlling for age, gender, and ethnicity?

$H_0$1: There is no association between delay in diagnosis of type 2 diabetes and health insurance coverage and low-income and rural communities after controlling for age, gender, and ethnicity.

H_a1: There is an association between delay in diagnosis of type 2 diabetes and health insurance coverage and low-income and rural communities after controlling for age, gender, and ethnicity.

To address RQ1, a binomial logistic regression model was used to analyze associations between delay in diagnosis and health insurance coverage among at-risk communities when controlling for age, gender, and race/ethnicity.

Dependent Variable: Delay of Diagnosis

Independent Variable: Health insurance coverage, general health, routine checkup, number of days with poor physical health, awareness of having prediabetes/diabetes

Covariate Variables: Age, gender, income level, and educational level

RQ2: Is there an association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity?

$H_0$2: There is no association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity.

H_a2: There is an association between delay of diagnosis of type 2 diabetes and lack of access to healthcare resources defined by number of visits in low-income and rural communities after controlling for age, gender, and ethnicity.

Data Collection

Data was collected for participants who responded to the BRFSS during 2019. Descriptive statistics for general health had a mean of 2.7 and standard deviation of 0.012 with a valid sample of 7354 individuals. Number of days of poor health had a mean of 5.2 and standard deviation of 9.611. That question was addressed by 6802 individuals. Among those who reported they could not see a doctor due to costs there were 6,163 responses (84.1%) among those who reported yes. There were 1,163 individuals (15.9%) that reported no.

Among those who had health insurance, 1,126 said they had none (15.4%) and 6,195 said they had (84.6%). In this group, 5,931 individuals (81.7%) reported they had not seen a provider in the past year. In addition, 581 participants (8%) reported they saw a provider within the past 2 years, while 339 (4.7%) saw one in the past 5 years, 348 (4.8%) had not seen one in 5 years or more, while 60 (0.8%) reported never having a checkup. Among those who had been diagnosed with diabetes, 1,218 responded yes (16.6%). Of those, 64 (0.9%) were females who were pregnant, 5,927 (80.6%) reported no, and 127 (1.7%) reported no, pre-diabetes or borderline diabetes. Among those with prediabetes, 669 (9.1%) said yes, 59 (0.8%) were pregnant, and 4,868 (66.2%) responded no.

In terms of gender, 2,632 (51.9%) participants were male and 2,440 (48.1%) were female. For the variable education 25 (.3%) never attended school, 278 (3.8%) attended grades 1 through 8 (elementary), 585 (8%) attended grades 9 through 11 (some high school), 1949 (26.6%) attended grade 12 or received their GED (high school graduate), 1982 (27.1%) had 1-3 years (some college), and 2500 (34.2%) had 4 or more years

(college graduate). In terms of income, 1865 reported making less than $25,000. There were 1372 (29.1%) reported making $25,000-$50,000, 1403 individuals reported making $50,000-$75,000 (21.9%), and 1768 (27.6%) reported making more than $75,000 a year. The dependent variable was altered to only being delay of diagnosis and the remaining variables were split into independent variables and covariate variables. The variables were altered between models 1 through 4 in Table 12 due the dependent variable needing to be the predictor variable for the best results. The covariates being used were more useful as a covariate to make the prediction of the dependent variable. With the statistics being presented based on response, inclusion of covariates in each model to be mentioned was necessary for the predictor variables to show the strength of each variable in the logistic binomial regression test. Table 7 shows descriptive statistics, table 8 shows reported frequency of responses.

Table 7

Descriptive Statistics

Variable	Mean	SD	Valid Sample
Health	2.7	0.012	7354
Days of Poor Health	5.2	9.611	6802

Table 8

Frequencies

Variable	Category	Number	Percent
Inability to See Doctor Because of Cost	Yes	6163	84.1
	No	1163	15.9
	Total	7326	
Health Insurance	No	1126	15.4
	Yes	6195	84.6
	Total	7321	
Time Since Last Checkup	Within the past year	5931	81.7
	Within the past 2 years	581	8.0
	Within the past 5 years	339	4.7
	5 or more years ago	348	4.8
	Never	60	0.8
	Total	7259	
Diabetes Diagnosis	Yes	1218	16.6

	Yes, female told during pregnancy	64	0.9
	No	5927	80.6
	No, pre-diabetes or borderline diabetes	127	1.7
	Total	7336	
Prediabetes Diagnosis	Yes	669	9.1
	Yes, during pregnancy	59	0.8
	No	4868	66.2
	Total	5596	
Gender	Male	2632	51.9
	Female	2440	48.1
	Total	5072	
Education	Never Attended School	25	0.3
	Grade 1-8 (Elementary)	278	3.8
	Grade 9-11 (Some High School)	585	8.0
	Grade 12 or GED (High School Graduate)	1949	26.6
	College, 1-3 years (Some College)	1982	27.1
	College, 4 or more years (College Graduate)	2500	34.2
	Total	7319	

Income	Less than $25,00	1865	29.1
	$25,000-$50,000	1372	21.4
	$50,000-$75,000	1403	21.9
	More than $75,000	1768	27.6
	Total	6408	

Note. The frequencies table displays the distribution of observations based on the selections in each variable listed.

Results

The Spearman correlations address the first portion of the research question, which is whether the independent variables have a relationship to the dependent vary being delay in diagnosis. The Spearman Correlation confirms that there is a relationship between the dependent variable and the independent variables. The logistic regression assesses whether this relationship remains after controlling for the covariates. The logistic regression confirms that there is still a relationship with general health, days health was not good, insurance and time since last checkup after controlling gender, education, and income. Model 3 shows this relationship (Table 12), and the model assesses the valid independent variables after controlling for independent variables.

Binary variables were recoded as 0 and 1 rather than 1 and 2 for use in models as binary. This was the case for the variable that an individual could not see he Dr. because of cost, gender, and insurance. Time since last checkup, education, and income are treated as ordinal variables. The age variable was invalid because all entries were entered as over 18 or missing. The number of times a person had seen a health professional for

diabetes variable was also invalid but there were no valid responses for the Georgia dataset.

The codebook (Table 9) describes the variables codes and labels. Descriptive statistics for scale variables and frequencies for nominal/ordinal variables can be seen in table 7 and table 8. The scale variables of general health and days health were not good were also explored for the assumption of normality using the skewness and kurtosis values, histograms, and boxplots. Health, a scale from 1-5 with 5 representing worse health, had skewness and kurtosis of .220 and -.623 respectively, within acceptable range, with no apparent departures from normality. Number of days per month that health was not good had skewness=1.845 and kurtosis=1.882 but the distribution of values revealed an egregious departure from normality due to most responses being 0, creating a floor effect.

The remainder of values from the mentioned variables creates a positive skew. For this reason, non-parametric options were explored for other tests. To establish individual relationships to the dependent variable could not see doctor because of cost, spearman correlations, t tests, and chi-square tests for independence were used for the scale, ordinal, and nominal variables, respectively, which can be seen in the respective tables (Tables 10-11) (Figure 13). The logistic regression test was done in four models to show the strength of the predictor variables and the covariates (Table 12). The dependent variable was found to have a relationship with the proposed predictor variables, health, days that health was not good, insurance, time since last checkup, and diabetes diagnosis, but did not have a significant relationship with pre-diabetes diagnosis. The dependent

variable was also found to have a relationship with the covariates gender, education, and income.

The first level of binary logistic regression included all four of the proposed independent variables. The overall model was found to be statistically significant, but neither the pre-diabetes diagnosis, nor diabetes diagnosis were found to be significant predictors in the model. The second model excluded diabetes and pre-diabetes diagnoses, using only health, days health not good, insurance, and time since last checkup as independent variables, all of which were significant in the model. The four independent variables in the model remained significant after introducing the covariates, gender, education, and income. Thus, these predictors remain significant after controlling for gender, education, and income.

Only gender and income were significant in the model. Thus, the final model, model four, includes the health, days health not good, insurance, and time since last checkup, as well as the gender, and income.

Table 9

Codebook

Name	Label	Values	Missing	Level	Notes
CADULT1	ARE YOU 18 YEARS OF AGE OR OLDER?	n/a		na	Invalid variable, only response was over 18 or missing
CELLSEX	ARE YOU MALE OR FEMALE?	1: Male, 0: Female		Nominal	2 was recoded to 0 for binary use

GENHLTH	GENERAL HEALTH	1: Excellent, 2: Very Good, 3: Good, 4: Fair, 5: Poor	7,9	Scale	
PHYSHLTH	NUMBER OF DAYS PHYSICAL HEALTH NOT GOOD	n/a	77,99	Scale	88 was recoded to 0 for ratio variable
HLTHPLN1	HAVE ANY HEALTH CARE COVERAGE	1 Yes, 0 No	7,9	Nominal	2 was recoded to 0 for binary use
MEDCOST	COULD NOT SEE DR. BECAUSE OF COST	1 Yes, 0 No	7,9	Nominal	2 was recoded to 0 for binary use
CHECKUP1	LENGTH OF TIME SINCE LAST ROUTINE CHECKUP	1: Within the past year, 2: Within the past 2 years, 3: Within the past 5 years, 4: 5 or more years ago, 8: Never	7,9	Ordinal	
DIABETE4	(EVER TOLD) YOU HAD DIABETES	1: Yes, 2: Yes, female told during pregnancy, 3: No, 4: pre-diabetes or borderline diabetes	7,9	Nominal	
EDUCA	EDUCATION LEVEL	1: Never attended school or only kindergarten, 2: Grades 1 through 8 (Elementary), 3: Grades 9 through 11 (Some high school), 4: Grade 12 or GED (High school graduate), 5: College 1 year to 3 years (Some college or technical school), 6:	7,9	Ordinal	

		College 4 years or more (College graduate)			
INCOME2	INCOME LEVEL	1: Less than $25,000, 2: $25,000-$50,000, 3: $50,000-$75,000, 4: more than $75,000	77,99	Ordinal	
PREDIAB1	EVER BEEN TOLD YOU HAVE PRE-DIABETES OR	1: Yes, 2: Yes, during pregnancy, 3: No	7,9	Nominal	
DOCTDIAB	TIMES SEEN HEALTH PROFESSIONAL FOR DIABE	n/a			Invalid variable, no responses

Figure 13

Spearman Correlation: Rho (P)

	Insurance	Time since last Checkup	Days Health not Good	Health	Gender	Education	Income
Inability to See Doctor because of cost	-.350 (<.001)	.222 (<.001)	.214 (<.001)	.185 (<.001)	-.066 (<.001)	-.150 (<.001)	-.235 (<.001)
Insurance		-.347 (<.001)	-.038 (.002)	-.085 (<.001)	-.008 (.565)	.251 (<.001)	.221 (<.001)
Time since last Checkup			-.052 (.001)	-.029 (.015)	.109 (<.001)	-.093 (<.001)	-.077 (<.001)
Days of Poor Health				.491 (<.001)*	-.054 (<.001)	-.141 (<.001)	-.219 (<.001)
Health					-.003 (.836)	-.285 (<.001)	-.309 (<.001)
Gender						-.070 (<.001)	.057 (<.001)
Education							.448 (<.001)

Note. *Pearson correlation of time since last checkup, r (6784)=.537, p<.001. To establish individual relationships to the independent variable, could not see doctor because of cost, spearman correlations, t tests, and chi-square tests for independence were used for the scale, ordinal, and nominal variables, respectively. The Spearman correlations address the first portion of the research question, which is whether the independent variables have a relationship to the dependent vary being delay in diagnosis. The Spearman Correlation confirms that there is a relationship between the dependent variable and the independent variables.

Table 10

T Test: Inability to See Doctor Due to Cost

	No		Yes					
	Mean	SD	Mean	SD	df	t	p	Cohen's D
Health	2.61	1.09	3.19	1.14	7301	-16.415	<.001	-0.526
Days of Poor Health*	4.41	8.98	9.31	11.51	1354	-13.308	<.001	-0.52

Note. *Equal variance was not assumed, with a Mann-Whitney U=4031249.5, and p<.001. The T Test compares the means of could not see doctor due to cost in comparison to general health and days health not good.

Table 11

Chi Square Test: Inability to See Doctor Because of Cost

			No	Yes	Total	Chi Square	Phi	*P*
Gender	Female	Count	2059	566	2625	21.902	-0.066	<.001
		Expected	2124.3	500.7	2625			
	Male	Count	2031	398	2429			
		Expected	1965.7	463.3	2429			
	Total		4090	964	5054			
Insurance	No	Count	609	514	1123	891.266	-0.35	<.001
		Expected	945	178	1123			
	Yes	Count	5530	642	6172			
		Expected	5194	978	6172			
	Total		6139	1156	7295			

Diabetes Diagnosis	Yes	Count	1033	177	1210	9.662	0.036	0.022
		Expected	1017.7	191.3	1210			
	During Pregnancy	Count	47	17	64			
		Expected	53.9	10.1	64			
	No	Count	4974	935	5909			
		Expected	4974.6	934	5909			
	No, pre/borderline diabetes	Count	100	27	127			
		Expected	106.9	20.1	127			
	Total		6154	1156	7310			
Pre-Diabetes Diagnosis	Yes	Count	546	122	668	4.174	0.027	0.124

		Expected	560.1	107.9	668
	During Pregnancy	Count	46	13	59
		Expected	49.5	9.5	59
	No	Count	4085	766	4851
		Expected	4067.4	783.6	4851
	Total		4677	901	5578

Note. Chi-square tests are essential to the study because they allow comparison of observed and expected frequencies due to it not always being apparent by visual. The higher the chi square score, the more significant it is, which in turn means we are more likely to reject the null hypothesis and decide the variables are related to one another.

Table 12

Logistic Regression *95% Confidence Interval*

Model 1	**Variable**	**B**	***P***	***Odds Ratio***	***Lower***	***Upper***
	Constant	-1.339	0.002	0.262	---	---
	Health	0.302	<.001	1.353	1.237	1.480
	Days of Poor Health	0.035	<.001	1.035	1.026	1.045
	Insurance	-1.665	<.001	0.189	0.156	0.229
	Time since last checkup: Within the past year (baseline/reference)	---	<.001	---	---	---
	Within past 2 years	0.718	<.001	2.050	1.572	2.675
	Within past 5 years	0.882	<.001	2.415	1.773	3.290
	5 year or more	0.990	<.001	2.691	1.992	3.634
	Never	0.294	0.446	1.341	0.631	2.851
	Pre-Diabetes Diagnosis: Yes	---	0.754	---	---	---

	(baseline/reference)					
	During pregnancy	-0.180	0.633	1.151	0.513	2.584
	No	-0.353	0.461	0.848	0.646	1.114
	Diabetes Diagnosis:	---	0.381	---	---	---
	During pregnancy (baseline)					
	No	0.141	0.733	0.835	0.398	1.751
	Pre/Borderline diabetes	-0.165	0.236	0.703	0.275	1.796
	Variable	**B**	***P***			
Model 2						
	Constant	-1.557	<.001	0.211	---	---
	Health	0.304	<.001	1.355	1.237	1.484
	Days of Poor Health	0.034	<.001	1.034	1.024	1.044
	Insurance	1.583	<.001	0.205	0.169	0.249
	Time since last checkup:	---	<.001			
	Within the past year			---	---	---

	(baseline/reference)					
	Within past 2 years	0.817	<.001	2.265	1.731	2.962
	Within past 5 years	1.008	<.001	2.741	1.994	3.767
	5 year or more	0.921	<.001	2.512	1.838	3.432
	Never	0.484	0.209	1.623	0.763	3.452
Model 3	**Variable**	**B**	***P***			
	Constant	-1.090	<.001	0.336	---	---
	Health	0.235	<.001	1.265	1.150	1.392
	Days of Poor Health	0.030	<.001	1.031	1.021	1.041
	Insurance	-1.415	<.001	0.243	0.197	0.299
	Time since last checkup: Within the past year (baseline/reference)	---	<.001	---	---	---
	Within past 2 years	0.811	<.001	2.250	1.710	2.960
	Within past 5 years	1.066	<.001	2.905	2.096	4.026

	5 year or more	1.056	<.001	2.874	2.079	3.972
	Never	0.634	0.106	1.885	0.873	4.067
	Gender: Male	-0.446	<.001	0.640	0.534	0.768
	Education: Grade 1-8 (Elementary) (baseline/reference)		0.245	---	---	---
	Grade 9-11 (Some High School)	0.197	0.379	1.218	0.785	1.890
	Grade 12 or GED (High School Graduate)	0.126	0.529	1.134	0.767	1.676
	College, 1-3 years (Some College)	0.331	0.104	1.392	0.934	2.075
	College, 4 or more years (College Graduate)	0.353	0.105	1.423	0.929	2.180
	Income: Less than $25,000		<.001	---	---	---

	(baseline/reference)					
	$25,000-$50,000	-0.227	0.054	0.797	0.633	1.004
	$50,000-75,000	-0.642	<.001	0.526	0.412	0.673
	More than $75,000	-1.344	<.001	0.261	0.191	0.356
Model 4	**Variable**	**B**	***P***			
	Constant	-0.862	<.001	0.422	---	---
	Health	0.219	<.001	1.245	1.135	1.366
	Days of Poor Health	0.031	<.001	1.031	1.021	1.041
	Insurance	-1.369	<.001	0.254	0.208	0.311
	Time since last checkup: Within the past year (baseline/reference)	---	<.001	---	---	---
	Within past 2 years	0.805	<.001	2.238	1.704	2.938
	Within past 5 years	1.056	<.001	2.875	2.078	3.979
	5 year or more	1.082	<.001	2.951	2.140	4.069

	Never	0.575	0.124	1.777	0.853	3.701
	Gender: Male	-0.484	<.001	0.616	0.515	0.737
	Income: Less than $25,000 (baseline/reference)		0.117	---	---	---
	$25,000-$50,000	-0.181	<.001	0.835	0.666	1.046
	$50,000-75,000	-0.598	<.001	0.550	0.432	0.699
	More than $75,000	-1.234	<.001	0.291	0.217	0.390

Note. * $\chi 2$ (8) = 821.640, p < .001 and Nagelkerke r^2 = .290. The (---) means the number was not applicable for that cell. For if they have insurance, its binary, so 1 means Yes they have insurance, and 0 means no they do not have insurance. For gender, 0 means females, and 1 means males. The logistic regression assesses whether this relationship remains after controlling for the covariates. The logistic regression confirms that there is still a relationship with general health, days health was not good, insurance and time since last checkup after controlling gender, education, and income.

Summary

Spearman correlations involve either ordinal or scale variables converted to ordinal form. If the *p* value is below .05, it is significant, if above its not significant. The Spearman correlations in Figure 13 included variables that were binary. For days of poor

health, this table shows in the regression, the more days of poor health they had, the more likely they were to not see a doctor.

Those who said they had an inability to see a doctor because of costs, had more poor days of health. The coefficient values scale 0-1, the higher the number the stronger the predictor. Anything below .2 is considered weak, while .3 to .4 is moderate and anything higher is considered strong. Insurance was the best predicator with a coefficient of -.35.

The T Test looked at if there were differences in the numerical values based on if participants had an inability to see a doctor because of costs. People who said they could not see a doctor due to cost have worse health and more days of bad health. A Mann-Whitney was run, which showed significance between variables. Sample size was large, which means it was more likely to conclude significant results. Due to this, Cohens D tells how different the results were. Cohens d is a standardized effect size which gauges the diversity amongst two group means. Results from the Cohens D tells how big of a difference there was, with -0.526 considered the median or moderate effect size.

General health and days of poor health are significant predicators showing cost is a significant predictor of health. Chi square analysis looked at the individual relationships between each variable. The categorical variables, gender, shows which sex depicted they could not see doctor because of costs compared to how many were expected if everything was equitable. For females if equitable, there would have been 501, but there were only 566 participants meaning females disproportionally have this problem. Phi value is the effect size, the larger the number, the better the effect size.

The phi value was -0.0666, meaning there were differences between males and females. Having insurance does make a difference, as, a phi value of -0.35 shows it affected them in terms of not being able to see a doctor. For diabetes diagnosis, the relationship was significant in terms of not seeing a doctor because of cost and having diabetes, with a *p*-value of 0.022 (see Table 12). That means the phi value is 0.036. For pre-diabetes diagnosis, the *p*-value was .12, meaning there is no relationship between cost of seeing a doctor and individuals having prediabetes, so it is not significant in relationship. Chapter 5 details the discussion of the results from the data, the conclusion and recommendations based on the results concluded from the data.

Chapter 5: Discussion, Conclusions, and Recommendations

BRFSS data from 2019 were evaluated to address the impact of diabetes on low-income populations in Georgia. It was analyzed if socioeconomic factors were relevant in terms of the delays in diagnosis for those living in low-income neighborhoods in Georgia. Also examined, was if the delay of diagnosis of diabetes was linked to not seeing a healthcare provider. In 2017, the state of Georgia spent $237 billion went toward the cost of diabetes and another $90 billion was spent due to decreased productivity (Khan et al., 2021). Those who are diagnosed with diabetes spend 2.3 times more on medical costs compared to people without the disease (Khan et al., 2021).

Adults diagnosed with diabetes are two to three times more at risk for CVD (Dal Canto et al., 2019). There is a 75% increase in mortality rates for adults with diabetes and cardiovascular disease makes up a large part of that percentage (Dal Canto et al., 2019). The BRFSS dataset provided information for 7,354 individuals who were 18 and older. Among those, 37.3% of the respondents reported having health care coverage. There were 4.7% participants who responded to the income level question and .3% responded to the education level.

Participants responded, 15.8%, saying they could not see a doctor in the past 12 months due to the costs. Less than 10% of the participants made less than $35,000 per year, 10.3% made less than $75,000 per year and 24% made $75,000 or more per year. Of the respondents, less than 34% had 1 year to 3 years (some college or technical school), and 26.5% only completed grade 12 or their GED (high school graduate). There are many of individuals who fall into the low-income socioeconomic category and lack the ability to pay for the appropriate amount of care and knowledge of care.

Interpretation of Findings

The logistic regression combined relationships between variables. There were four models to display the strength of the predictor variable, independent variables, and covariates. Model 1 was run with all variables, with the chi square showing if the model was significant or not. The model was statistically significant ($p < 0.001$). Twenty four percent of the variation in the outcome was explained by the independent variables.

Model 2 was run without pre-diabetes and diabetes diagnosis as they were not statistically significant in Model 1. This is addressing the primary hypothesis, in case of general health, days of poor health was not significant, insurance and time since last checkup were significant predictors. Pre-diabetes and diabetes diagnosis were not significant predictors in terms of predicting delay of diagnosis. Model 3 consisted of covariates; the variables that were being controlled.

Other variables added were gender, education, and income. When including covariates into the model, other variables remained statistically significant. This means the health, the days of poor health, insurance and time since last checkup are still significant predicators and still strong for a person that said they did not see the doctor because of costs, even after controlling for gender, education, and income.

Gender and income were significant predictors, but education was not. Thus, education was omitted from Model 4. Model 4 is the final version with $R^2 = .29$. All predictors were significant. As the years go on, the number becomes more significant in those who have not seen a doctor ranging for 2 to 5 years, but those who have never seen the doctor report not having many health-related issues. The higher the income the less likely they are to have issues seeing a doctor. This is saying, it can be predicted that a

person's probability of not seeing a doctor is due to costs. The equation used for the model was: (e to the power of (-.862 + .219 (health) + .031 (days) – 1.319 (insurance) + .805 (2 years) + 1.056 (5 years) + 1.082 (more than > 5 years) + .575 (never) - .484 (male) - .181 ($25k-50k) - .598 ($50k-$70k) – 1.234 (over $75k) / 1 + e to the power of (-.862 + .219 (health) + .031 (days) – 1.319 (insurance) + .805 (2 years) + 1.056 (5 years) + 1.082 (more than > 5 years) + .575 (never) - .484 (male) - .181 ($25k-50k) - .598 ($50k-$70k) – 1.234 (over $75k)). This equation came directly from the results, the coefficients table, which is how it was determined.

With medcost as the dependent variable, you can see in the tables mentioned, there was a chi-square value of 21.902, *p*-value <.001 and phi value of .066, meaning females were more likely to not see a doctor because of costs compared to males. Income had a chi-square value of 393.484, *p*-value <.001, and phi value of 262, meaning there was a general pattern that participants were less likely to report yes, and cost was not an issue in terms of seeing a doctor as income increased. For education, the chi-square value was 183.419, *p*-value <.001, and phi value .159, meaning participants are more likely to say yes during all levels of education except college graduates. Insurance had a chi square of 891.266, p<.001, and phi value of -.350, which shows participants without insurance were more likely to affirm costs being a barrier in terms of seeing a doctor. Time since last checkup had a chi-square value of 371.445, *p*-value <.001, and phi value of .227, which means the longer the period since an individual last had a checkup, the more likely to affirm costs of care was an issue.

For general health, those answered no had a median of 2.61, and a standard deviation of 1.1. For the same variable, those who answered yes, had a median of 3.19,

standard deviation of 1.1, *p*-value of <.001, and deviation of -.526. Days of poor health was not significant among those who said no, with a median of 4.41, and standard deviation of 9.31, while those who answer yes had a median of 9.31 and standard deviation of 11.5. Presence of diabetes had a chi-square value of 9.662, *p*-value of .022 and phi of .036 meaning people with diabetes are less likely to answer yes, by a small margin. The prediabetes variable of chi-square had a value of 4.174, *p*-value.124 meaning there was no significant difference.

Limitations of the Study

The dataset used for the study is secondary meaning data is archival. The use of correlations was useful in the study and the study was not experimental. That can infer some causation when reporting the results. The data is self-reported, and individuals answered the questions based on how the questions were presented and how the individuals perceived the questions on the survey, which can also be deemed as a limitation. With such a large sample size, several models were run to compare results and assess the predicator and covariate values.

The variable education with the category of an individual reporting they had never attended school had to be omitted due to small count. The result had a chi-square of -183.419, a *p*-value of <.001. With such a value it displays people are more likely to say yes at all levels of education except for those that were categorized as college graduates. The age variable was invalid because all entries were entered as over 18 or missing. The number of times seen a health professional for diabetes variable was also invalid but there were no valid responses for the Georgia dataset.

Recommendations

The organs of the body can be damaged if glucose levels are too high. Small microvascular and large macrovascular blood vessels can be damaged from severely increased blood glucose levels which can cause issues with the body's gums, kidneys, feet, eyes, and nerves. Diabetes is the body not creating enough insulin or not utilizing insulin appropriately. Cells no longer respond to insulin when the body lacks it or when there is more than enough blood sugar in the blood. With such a condition, long-term, it causes health concerns such as vision issues, heart disease, and kidney disease.

Those that carry the burden of chronic diseases such as diabetes many times fall into a low socioeconomic status. Many of those same individuals also carry the burden of being unable to afford medical care, medication, they lack access to care as well as transportation. The socioeconomic status (SES) references to an individual's income, field of employment and education level. It is depicted as either low-class, medium-class, or high-class. Those that fall into the low-class socioeconomic status are the individuals that are not financially stable and lack social and health resources in comparison to the middle and higher-class levels. Socioeconomic status is a determinant that determines the risk level and is a major player in the role of diabetes.

Epidemiological studies in various countries have been working to improve health, as well as research in Canada and the United States has provided evidence that low-income, single and minority status, and low education are factors that affect diabetes management. While there have been individual-level risk factors highlighted, researchers still work to highlight the role of the community itself. Diabetes is an illness that must be continuously monitored by health professionals and the individuals diagnosed to

effectively treat the condition through healthy lifestyle behaviors and medication management. With routine checkups, healthy behaviors, and responsible medication management, an individual with type 2 diabetes can live a long and healthy life. Unfortunately, there are factors that exist such as socioeconomic status which is a contribution to negative health outcomes.

This includes but is not limited to lack of access to health care and preventive care recommended, distress psychologically, and poor metabolic control (Hirsch et al., 2021). There should be more studies that focus on the link between social determinants of health and health status. If more studies focused on such an issue, more prevention programs can be created to target these communities and fight the barriers these communities face. To receive assistance, the government must have data that shows these areas are considered priority populations. The only way to know such a thing, is by studying such an issue and showing statistics that prove social determinants of health is a possible cause to poor health status for individuals living in low-income and rural communities.

Implications for Social Change

Sociologists define social change as the changes that come from interactions between humans and the relationships humans hold that turn into cultural and social institutions. These changes happen over a course of time and usually have impactful and long-term effects for society. Currently, the CDC and Georgia Department of Public Health reports created on a state level gathering material and data for analysis and evaluation. The conclusions on progression in the state towards minimizing chronic illnesses such as diabetes has led to Georgia developing interventions that assist those that fall into the low-income bracket. Additional conclusions are drawn from the Health

Savings Accounts (HSA) surveys for a larger data analysis. With the new strategies for increased access to diabetes self-management education and support (DSMES), there has been an increase in patients seeking healthcare and pharmacist patient care processes that promote medication management for people with diabetes. The number of pEACHealth pharmacies has increased from 31 to 46 pharmacy sites within the years of the new Georgia statewide healthcare implementation (Georgia Department of Public Health, 2022).

Providers are looking to include telephonic education soon to increase expansion of care and enrollment. Health care organizations in Georgia are now appointing a health professional who will educate other providers on the benefits and best practices of establishing protocol-based partnerships with physicians and pharmacists through webinar opportunities, success story completion, and conference presentations. Such initiatives assist providers in enrolling individuals with diabetes and utilizing their diabetes registries. COVID-19 created some barriers and challenges in the implementation of the strategies to mitigate diabetes in surrounding Georgia communities and organizations. During the pandemic, implementation of medication therapy management (MTM) has continued at pharmacy sites through the pEACHealth program.

Pharmacy students have continued to work closely with pharmacists at the pEACHealth pharmacy sites. During the early days of the pandemic, the pharmacies were initially focused on shifting their business practices to continue to serve patients safely. The sites have been transitioning to the “new normal” mode of operating and serving patients. The pharmacies are currently in varying stages of reopening and providing services inside their pharmacies. During the pandemic, some of the pharmacies shifted to

providing more telephonic medication therapy management (MTM) services, though they have not been using video telehealth.

The findings from program records and state reports, as well as future findings from the health savings account (HSA) survey, provides valuable feedback in informing future efforts of Georgia Department of Public Health to provide relevant resources and training to healthcare physicians and pharmacists in increasing the availability of DSMES and MTM services (Georgia Department of Public Health, 2022). The data, as well as any barriers and common themes identified among physicians, clinical staff, and pharmacists, will serve as essential information to ensure adequate resources are provided that will facilitate improvements made in the delivery of DSMES and MTM and used to ensure continuous quality and programmatic improvement. The Health Systems Assessment tool was completed and dispersed. Based on findings from the assessment, the Diabetes Program Manager has utilized this information to assist in identifying technical assistance needs for partnering health care organizations (HCOs) to ensure the improvement of implementing systems to identify people with prediabetes and the increasing of referrals to CDC-recognized lifestyle change programs (Georgia Department of Public Health, 2022). There has been progress in the strategy to increased access to lifestyle change program for people with prediabetes and increased community clinical links that facilitate referrals and provide support to enroll and retain participants in the National DPP lifestyle change program.

Through process evaluation and focusing on the core evaluation area of approach the previously mentioned initiatives have and continue to generate findings and

conclusions that have been made to ensure continuous quality and programmatic improvement.

Summary

The amount of people burdened by diabetes has doubled in the U.S since 1993. Most people have Type 2 diabetes, but Type 1 is most common among the youth. Type 2 diabetes is preventable, and if not prevented by those affected, can be managed via proper medication management, as well as healthy eating and exercise behaviors. Getting screened by one's doctor is essential to monitoring one's health, but practicing healthy behaviors is as important to extending quality of life.

It should be the responsibility of local, state, and other affiliated entities to create environments for proper access to care, resources, and tools to successfully live healthier lives no matter one's socioeconomic level, race, or education level. As health professionals, it is important to inspire people to care about their health. To inspire them, health professionals must first show them they care enough to inspire and lead to change. It is important to bring forth issues that address health disparities. By addressing those barriers and making changes in terms of policies and laws, this will assist those burdened by those barriers.

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