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Routine Care Visits, Quality of Diet, and Type 2 Diabetes Risk Perception Among Older Adults

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
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Walden University
2024

Abstract

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by

Abigail Delich

MA, Cleveland University Kansas City, 2015

BS, University of Kansas, 2010

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Education and Promotion

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Abstract

The rate of Type 2 diabetes (T2D) among older adults is expected to double within the next decade. Severe complications and health care costs for older adults with T2D are anticipated. In many cases, older adults have a low perceived risk for developing diabetes. Health behaviors such as routine care and improved quality of diet can be opportunities to address perceived risk for developing T2D in older adults. The purpose of this quantitative cross-sectional study was to investigate whether a relationship exists between routine care visits, quality of diet, and T2D risk perception in adults age 65 years and older in the United States. The predictive value of routine care visits and quality of diet on diabetes risk perception was also examined. The study was guided by the health belief model. Secondary data from the National Health and Nutrition Examination Survey 2017–2018 (N = 1,500) were analyzed using binary and linear regression. Results indicated no statistically significant relationships between routine care visits and diabetes risk perception or quality of diet and routine care visits. A statistically significant relationship was found between quality of diet and diabetes risk perception. Routine care was not found to be a statistically significant predictor of diabetes risk perception; however, quality of diet was. Findings may increase knowledge, awareness, and understanding of the role health care providers play in T2D risk perception. This may inform the development of tools to improve health outcomes and decrease the negative impact of T2D complications.

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Dedication

To my grandparents, Homer and Gladys Abbott, who laid the foundation and opportunity for my education. My hope is that you are proud of me and my accomplishments. Thank you for seeing the skills I possessed but never knew I had at a young age. I will and have always loved you both. I am forever indebted to your generosity.

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Second, I would like to thank my past and present committee members, Dr. Graf and Dr. Saindon. Thank you, Dr. Graf, serving first as my chair, then as a committee member. Although you are not here today, I am grateful for your participation in my journey! Thank you, Dr. Saindon, for embracing my work and jumping in to help me finish strong! My committee members provided valuable feedback and helped shape my dissertation into a great final product.

Lastly, I would like to thank my family for supporting me through the years. Though it was a long road full of sacrifices, my family always encouraged me and expressed how proud they were of my hard work and determination. My family continued to cheer me on despite setbacks and challenges. My husband, John, is the best partner and friend I could ever ask for. I would not be the student, mother, wife, or career woman I am today without him. I love you!

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Chapter 1: Introduction to the Study

The current and future state of America's growing Type 2 diabetes (T2D) population are essential areas of research for many reasons. Panton et al. (2018) estimated that over the next 20 years T2D rates and costs will double and result in over 100 million cases with an associated multi-billion-dollar cost. Despite progress in disease management, high rates of T2D-related complications such as stroke, heart attack, amputation, blindness, and kidney failure remain a high-priority public health concern (Cannon et al., 2018; Gregg et al., 2019; Visaria et al., 2020. Recent comprehensive research suggested that self-care activities such as quality of diet can help prevent T2D and reduce complications but is underperformed (da Rocha et al., 2020; Rouyard et al., 2018). An important field of study in self-care activities is risk perception. Results from recent studies underscored a positive relationship between self-care activities (e.g., quality of diet) and risk perception (Ammouri et al., 2017; Calhoun et al., 2020; Nie et al., 2018; Rouyard et al., 2018).This evidence provides warning that if substantial effort is not made to reduce and prevent T2D, crippling economic and societal consequences are imminent. To reduce this burden, improving self-care activities such as quality of diet is essential, but risk perception also plays an important role. Diabetes risk perception might have predictive value, which also has the potential to increase self-care activities such as quality of diet. Researchers in the field agreed that relationships exist between diabetes risk perception and quality of diet (Ammouri et al., 2017; Calhoun et al., 2020; Nie et al., 2018; Rouyard et al., 2018); this supports the need for further research on this topic to better understand other associated factors.

Background of the Study

Globally, T2D is the leading cause of kidney disease and is directly connected to a significant number of cardiovascular complications (Koye et al., 2018). At present, approximately 20 million adults in the United States have T2D (Bullard et al., 2018). Adults age 65 years and older account for the most significant percentage of T2D diagnoses in the United States (Bellary et al., 2021). Lin et al. (2018) estimated that the number of adults with T2D will increase from approximately 10 million to 20 million within the next decade and reach 35 million by 2060. According to the American Diabetes Association (ADA; 2018b), the monetary costs of T2D in the United States in 2017 exceeded USD 300 billion. Lin et al. identified a need for more targeted approaches to addressing lifestyle as a population health-level strategy in adults with T2D. Based on this, there is no doubt that older adults are more at risk T2D, facing more challenges and costs of T2D than any other group. Moreover, T2D incidence continues to increase at a rapid pace at exorbitant cost. T2D prevalence and cost projections add a heighted sense of urgency to act. Necessary action includes addressing disease management from a self-care perspective to educate and promote behaviors that prevent complications.

Role of Self-Care in T2D

Self-care activities are a part of T2D management. Self-care activities such as diet help to prevent T2D (Jannoo & Mamode Khan, 2018). Medication adherence is effective in lowering blood sugar levels and preventing cardiovascular complications (Schlender et al., 2017). Improving diet and exercise can have a positive impact on clinical indicators such as cholesterol and blood sugar, which are important in preventing disease (Albalawi

et al., 2017; Borror et al., 2018; Huntriss et al., 2017; Meng et al., 2017). Medication adherence is among the highest reported self-care activities, while diet and exercise are the least reported even though they are the most beneficial to blood sugar control (Mogre et al., 2017; Saad et al., 2018). This evidence suggested that although important, medication adherence alone is insufficient in preventing T2D. Diet and exercise rank as the lowest cost, most effective, and safest treatment forms for T2D, but least performed. There is a need for more focus on identifying factors that improve diet and exercise self-care as a part of T2D prevention.

Role of Risk Perception in T2D

Risk is a common topic in health. For T2D, risk perception is self-reported as the degree to which a person perceives the likelihood of developing T2D or complications (Ferrer et al., 2018). Assessing risk perception is considered an important element in both T2D prevention and management; however, evidence suggested that perceived risk levels for developing T2D and complications are grossly underestimated (Kowall et al. 2017; Rouyard et al., 2017; Yang et al., 2018). T2D risk perception and self-care study results indicated that higher risk perception yields better self-care, particularly in diet behaviors (Ammouri et al., 2017; Nie et al., 2018; Shreck et al., 2013; Yang et al., 2018.) Low risk perception for developing T2D and related complications can stem from optimistic bias, ineffective messaging, or inconsistent measurement tools (Beeney & Fynes-Clinton, 2019; Orom et al., 2017; Timm et al., 2019). This information showed the established relationship between risk perception for T2D and health promoting behaviors. This research was important to the current study because it provided evidence that further

investigation into risk perception and self-care is beneficial in health education, promotion, and behavior change. Moreover, a large body of evidence supported the need to further investigate other factors related to risk perception that might impact its relationship with self-care behaviors such as diet.

Role of Routine Care Visits in T2D

Regular doctor visits are an important part of managing T2D. According to the ADA (2020), regular T2D assessment and monitoring by health care teams is critical to proper management and ideal health outcomes. Consistent use of routine health care helps prevent T2D complications (Kiran et al., 2016) and, although debated by researchers, may be associated with decreased hospital and emergency room visits (P. G. Lee & Halter, 2016; Wolters al., 2017). DuGoff et al. (2016) studied older adults with T2D and found that as multiple chronic conditions worsen, routine care becomes more valuable in avoiding serious complications. This information highlighted the critical role of health care providers in the management of T2D. Regular oversight and engagement during routine care visits can provide an important safety net before complications arise or progress. Understanding what factors are associated with regular care can help bridge the gap between management inside and outside of office walls.

Problem Statement

T2D is a growing and severe problem in U.S. older adults and increases the risk of costly and dangerous complications (Kalyani et al., 2017). Self-care activities such as improving quality diet are beneficial for preventing T2D (Lanhers et al., 2017). Despite its effectiveness, improving quality diet is among the least performed T2D prevention

activities (Mogre et al., 2017; Saad et al., 2018). Research suggested that risk perception plays a significant role in T2D prevention, but overall risk perception for T2D is low (Rouyard et al., 2017). Previous research on this topic addressed factors such as depression, demographics, and self-efficacy in relationship to risk perception, T2D complications, and self-care (Imai et al., 2020). No known studies had addressed T2D risk perception, routine care visits, and quality of diet.

Purpose of the Study

The purpose of the current study was to investigate whether a relationship exists between routine care visits, quality of diet, and T2D risk perception in adults age 65 years and older in the United States. The current study was a quantitative study that tested the relationship between routine care visits, quality of diet, and T2D risk perception. Routine care visits and quality of diet were also tested as predictors for T2D risk perception. The problem is that older adults have low T2D risk perception and do not perform self-care activities such as good quality of diet and routine care visits at the level needed to effectively manage their T2D risk (Kowall et al. 2017; Mogre et al., 2017; Rouyard et al., 2017; Saad et al., 2018; Yang et al., 2018). The results of the current study may help identify opportunities for intervention at the health care provider level. A limitation of previous studies (Hsueh et al., 2019; Murillo et al., 2019; Yang et al., 2018) was an investigation of routine care visits and T2D risk perception. Demographic variables were the primary focus of research on U.S. adults and T2D risk perception. The current study may provide needed and relevant findings addressing the gap between routine care visits and T2D risk perception. While building on previous research of the role quality of diet

plays in T2D risk perception, the present study was conducted to understand whether routine care visits or quality of diet have predictive value for diabetes risk perception. This information might be valuable to better understand whether increasing routine care visits or improving risk communication messaging at the health care provider level on quality of diet is a better approach to increase T2D risk perception in U.S. older adults.

Research Questions and Hypotheses

RQ1: Is there a relationship between routine care visits and T2D risk perception in older U.S. adults?

H_o1: There is no relationship between routine care visits and T2D risk perception in older U.S. adults.

H_a1: There is a relationship between routine care visits and T2D risk perception in older U.S. adults.

RQ2: Is there a relationship between quality of diet and T2D risk perception in older U.S. adults?

H_o2: There is no relationship between quality of diet and T2D risk perception in older U.S. adults.

H_a2: There is a relationship between quality of diet and T2D risk perception in older U.S. adults.

RQ3: Is there a relationship between quality of diet and routine care visits in older U.S. adults?

H_o3: There is no relationship between quality of diet and routine care visits in older U.S. adults.

H_a3: There is a relationship between quality of diet and routine care visits in older U.S. adults.

RQ4: To what extent does quality of diet and routine care visits predict T2D risk perception in older U.S. adults?

H_o4: Quality of diet and routine care visits do not predict T2D risk perception in older U.S. adults.

H_a4: Quality of diet and routine care visits predict T2D risk perception in older U.S. adults.

Theoretical Foundation

The health belief model (HBM) is used to predict health behaviors. For example, Glanz (2014) stated "they theorized that people's beliefs about whether they were susceptible to disease, and their perceptions of the benefits of trying to avoid it, influenced their readiness to act" (p. 24). The theory was created to increase preventive screenings and has since been expanded to lifestyle modification (Janz & Becker, 1984; Siddiqui et al., 2016). The major theoretical propositions of the HBM center around individuals' health behaviors in response to their perceptions; as perceptions change, so do health behaviors (Glanz, 2014). As shown in Figure 1, the HBM focuses on behavior change through five main constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy (Rosenstock et al., 1988; Shabibi et al., 2017). Zare et al. (2020), through a systematic review, found that the HBM is one of the most effective theories for behavior change. A more detailed description of the HBM along with recent literature findings is provided in Chapter 2.

Figure 1

Health Belief Model

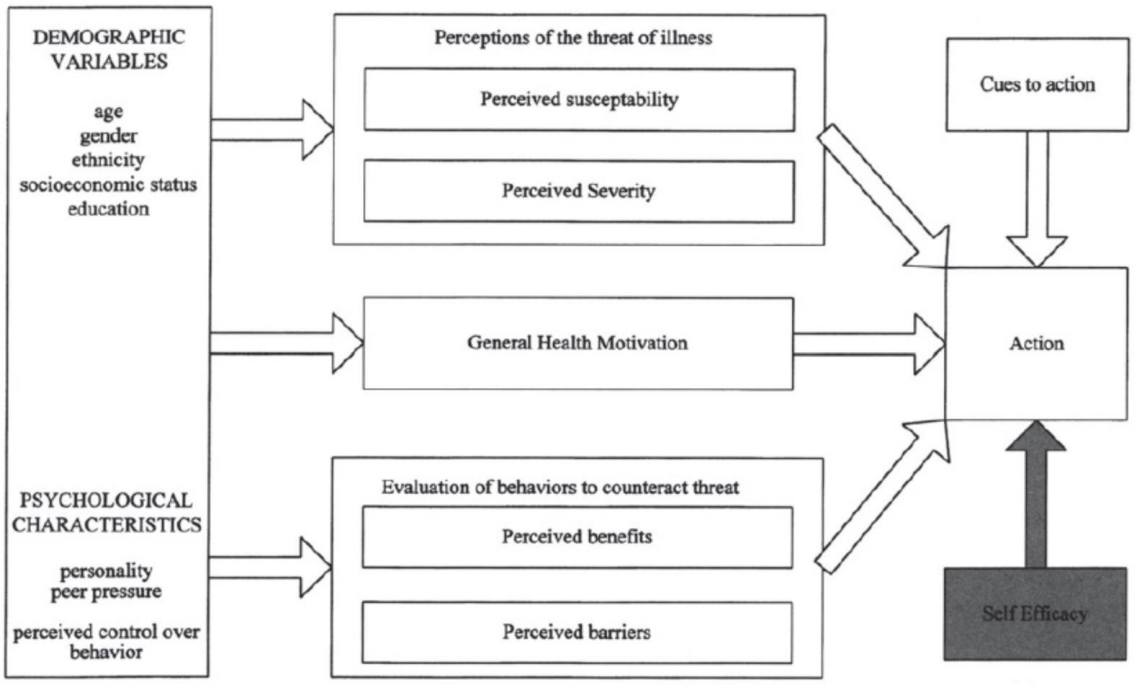


Figure 1. The health belief model [the model with self-efficacy represents the modified HBM suggested by Rosenstock et al. (1998)].

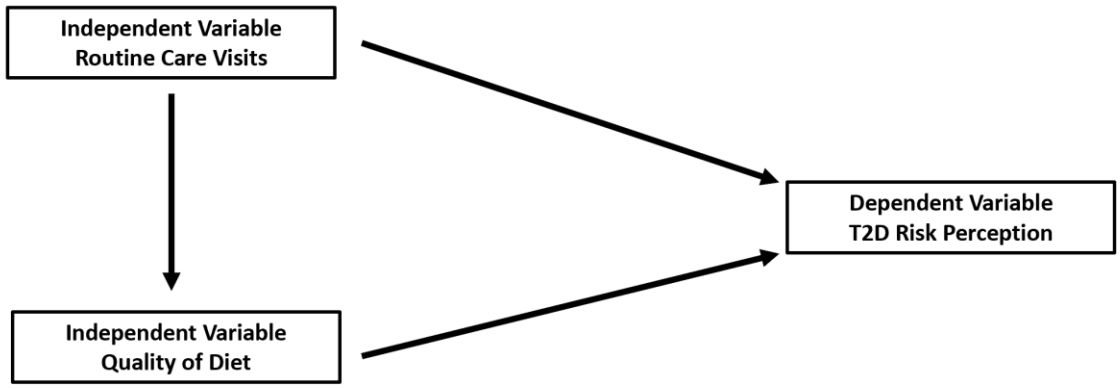
The HBM was the most appropriate model to use for the current study because of its predictive nature. The construct of perceived susceptibility was closely related to this study's variable of risk perception. Additionally, proper T2D prevention is dependent on diet. The HBM provides the appraisal (cost) of changing diet is based on cost (risk) of not changing it. Therefore, understanding the role of poor diet in predicting other health behaviors through the HBM could be essential in improving health behavior outcomes. Understanding perceived susceptibility or perceived risk of diet's connection to the perceived threat of T2D risk may provide understanding of patients' engagement during routine care visits.

Nature of the Study

The nature of the current study was quantitative because this was the most appropriate way to answer the research questions, which addressed the relationships between routine care visits, quality of diet, and T2D risk perception among U.S. older adults. If assumptions were met, the relationship of routine care visits (independent variable) and quality of diet (independent variable) on T2D risk perception (dependent variable) was tested, as shown in Figure 2. Assumptions for multiple regression include a continuous dependent variable, two or more independent variables (either categorical or continuous), independence of observations (residuals), linearity of the dependent variable and each one of the independent variables, linearity of the dependent and independent variables collectively, homoscedasticity of residuals (equal error variances), multicollinearity not shown, no outliers, and residual errors evenly distributed (Baron & Kenny, 1986). Because this required a predictive design, a quantitative approach was appropriate for the current study. Secondary data from the 2017–2018 National Health and Nutrition Examination Survey (NHANES) was used. The data were analyzed using Statistical Package for the Social Sciences (SPSS) Version 28.

Figure 2

Current Study Model



Definitions

Baby boomer: People born between 1940 and 1960 (Litchman et al., 2018).

Doctor: The term refers to medical doctors (MDs) and osteopathic physicians (DOs). It includes general practitioners as well as specialists. It does not include people who do not have an MD or DO degree, such as dentists, oral surgeons, chiropractors, podiatrists, Christian Science healers, opticians, optometrists, and psychologists (National Center for Health Statistics [NCHS], 2012).

Older adults: Adults age 65 and older (World Health Organization, 2013).

Quality of diet: How healthy a diet is (e.g. excellent, poor, etc.; NCHS, 2012).

Routine care visits: The number of times seeing doctors or other health professionals in the past 12 months. This not include times hospitalized overnight, visits to emergency rooms, home visits, or telephone calls (NCHS, 2012).

T2D: A condition in which insulin production occurs but inadequately, requiring either oral medication or diet and lifestyle modification; this type of diabetes is usually diagnosed in older adults and is considered preventable (ADA, 2018a).

T2D risk perception: Acknowledgement that the individual feels they are at risk for T2D (NCHS, 2012).

Assumptions

A primary assumption in the current study was that all participants were using health care to manage their condition. Also, because the current study included secondary data, some variables were used as proxy measures. For example, risk perception was assumed to measure the risk of T2D, not other forms of diabetes such as Type 1. To address this assumption, I used inclusion and exclusion criteria to ensure that only adults over 65 years of age at the time of the survey were included because T2D diabetes is the most prevalent type of diabetes for that age group. I also assumed that other factors such as demographics (gender, race, socioeconomic status) and family history would not confound results. To address this assumption, demographics and family history were controlled during data analysis. Additional assumptions were that the frequency of interaction within the health care system was similar among participants and that participants had access to health care. Another assumption was that participants had knowledge, awareness, and understanding of the behaviors necessary to manage their disease and could recall and report behaviors honestly. All participants were assumed to be honest and truthful in their responses when completing the survey. All participants

were assumed to have a genuine interest in participating in this study and were not motivated by biased factors.

Scope and Delimitations

I examined the relationship between routine care visits, quality of diet, and T2D risk perception in U.S. adults age 65 and older. Additionally, I explored the predictive relationship between routine care visits and quality of diet on T2D risk perception in U.S. older adults. This study was delimited to U.S. older adults (age 65 and older) participating in the 2017–2018 NAHES cohort. The results were generalizable to U.S. older adults depending on sample size power and strength, statistical criteria and assumptions, and statistical significance.

Limitations

There were potential limitations to the current study. First, the cross-sectional nature of the study design limited implications for the results because causal relationships could not be determined. The participant inclusion and exclusion criteria limited the ability to generalize the findings to those outside the study population. The use of nonrandom convenience sampling to collect data also limited the generalizability of the findings. Finally, self-reported data depends on participants' ability to recall behaviors and report with truthfulness; therefore, the findings of this study were limited by the assumption that participants could accurately recall and report with honesty. The use of secondary data was another limitation. The secondary data were not created and collected with the intention of aligning to the theoretical model used in the current study. Therefore, the use of certain questions to test certain constructs may not have been as

reliable had the questions been created with the HBM in mind. Therefore, the research questions in the current study may or may not be a best fit for the data. These limitations should be considered when interpreting study findings. Nevertheless, these findings may contribute to research and address the problem of low T2D risk perception in older U.S. adults by identifying potential relationships between routine care visits, quality of diet, and T2D risk perception.

Significance of the Study

The current study was significant to the population studied and the field of health education and promotion because the findings may contribute to the existing body of knowledge on educating and promoting self-management behaviors for T2D prevention. This study addressed the role of routine care visits in T2D risk perception and bridged the gap in the literature by understanding whether routine care visits along with quality of diet are predictors. The insights may be used to develop interventions for promoting quality of diet during doctor visits to improve T2D risk perception in older U.S. adults.

Current study findings may increase knowledge, awareness, and understanding of the role health care providers play in T2D risk perception. This may inform the development of tools to improve health outcomes and decrease the negative impact of T2D complications. T2D risk perception and quality of diet are driving factors of overall health outcomes related to the disease, and health care providers have a vested interest and responsibility in promoting this health behavior (Sami et al., 2017). T2D contributes a high percentage of annual health care provider visits to manage the disease (Virnig et al., 2014). Understanding the interactions between routine care visits and T2D risk

perception may help pinpoint opportunities such as communication or patient engagement for targeted interventions, especially regarding quality of diet communication and interventions.

Current study information could contribute to positive social change by educating and promoting the influence findings may have to prevent T2D. The findings may spur additional research on this topic to uncover other unknown aspects of health care that influence preventive T2D self-care activities (e.g., improving quality of diet) and behaviors in this population. Additionally, the ADA (2018) emphasized that reducing T2D burden can lead to significant improvements in economic and quality of life for society. With this information, health care providers may redesign their current approach to improve risk perception and, as a result, improve preventive T2D self-care activities such as improving quality of diet.

Summary and Transition

Low T2D risk perception is a significant problem for those at most risk of developing T2D complications (older adults). Improving prevention strategies at the health care provider level is necessary to create positive change and decrease the burden of T2D on the individual, society, and economy. A relationship between T2D risk perception and T2D self-care activities had been identified; however, the role of routine care visits in the relationship was unknown. Identifying this potential relationship could provide valuable insight for improving T2D prevention and health outcomes. Chapter 2 offers a rigorous review and synthesis of older and recent literature on the study topic.

Chapter 2: Literature Review

T2D complications are a problem in the United States and may be associated with low-risk perception. The purpose of the current study was to investigate whether a relationship exists between routine care visits, quality of diet, and T2D risk perception in adults age 65 years and older. I also tested the predictive relationship of routine care visits and quality of diet on T2D risk perception. An extensive literature review was conducted on topics of the current study. The literature review included historical and recent research to identify themes and gaps in the literature and to provide evidence for the significance of the topic. This review focuses on T2D in older adults because this population faces the highest rates, costs, and complications of the disease (see Jain & Paranjape, 2013). As the baby boomer generation (age 65 years and older) has continued to age, chronic disease trends have increased to epidemic proportions, and there is growing concern regarding the impact of T2D on older adults in good health (Kean & Keeping-Burke, 2015). Improving self-care activities to prevent T2D is an area of interest because of low cost and clinical effectiveness (Ricci-Cabello et al., 2014). This review provides valuable information on T2D at the macro and micro level, painting a picture of the current landscape as well as providing evidence for factors that may change it.

Literature Search Strategy

Multiple health science databases were used to conduct a thorough search of literature. The scholarly databases searched included PubMed, CINAHL, Medline, SAGE, and PsycINFO. Statistical information was obtained from government databases such as the Centers for Disease Control and Prevention and the World Health

Organization. Google Scholar was also used to sweep for any remaining articles not identified through the scholarly databases. A combination of keywords was used to locate the articles.

The keywords included *type 2 diabetes*, *self-management*, *self-care*, *older adults*, *seniors ages 65 years and older*, *health belief model*, *perceived susceptibility*, *perceived risk*, *risk perception*, *routine care*, *healthcare utilization*, *primary care*, *diet*, *nutrition*, *diabetes prevalence*, *diabetes cost*, *type 2 diabetes treatment*, *diabetes complications*, and *diabetes self-management behaviors*. A date range filter of 2017 to 2022 captured recent research. A search with no date restriction returned historical articles on the theoretical framework. This review was performed to identify older and recent research on the topic.

Theoretical Foundation

Diabetes research would not be the same without the HBM. Since its inception in the 1950s, a plethora of research has been based on the concepts of the HBM. The main concepts of the HBM are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy to predict health behaviors (Becker & Maiman, 1975). As perceived susceptibility, perceived severity, perceived benefits, and self-efficacy improve, so do self-care behaviors; similarly, as perceived barriers decrease, self-care increases (Karimy et al., 2016). Hsieh et al. (2016) found that addressing perceived susceptibility and perceived barriers during routine care can help to prevent T2D complications such as diabetic retinopathy and foot ulcers. Rosenstock (1966) explained that the basis of the theory rests on five assumptions that if an individual believes it to be true it will likely lead to a positive health behavior change. For example,

an individual is susceptible to a severe health outcome, the benefits of changing behavior are more significant than barriers associated with change, and the individual is confident that change is possible. Janz and Becker (1984) identified perceived barriers as the most reliable predictor in general health behaviors, perceived susceptibility in preventative behaviors, and perceived benefits in changing behaviors after the onset of illness. Carpenter (2010) found similar evidence; however, the author added that perceived susceptibility, perceived severity, perceived benefits, and the behavior change vary by the lag in measurement time, but perceived barriers do not. This finding indicated it is more likely to see behavior change longer after HBM assessment compared to shortly after, except for perceived barriers.

Perceived barriers appear independent of time. Although a person's thoughts on risk and benefits are likely to change over time, their perceived barriers are not. As one of the most valuable theories for improving T2D self-care, HBM can help increase T2D self-care activities. HBM constructs, such as perceived barriers and perceived susceptibility, also play important roles in preventing T2D-related complications.

The HBM has been often used in T2D research. Researchers have applied the HBM in predicting behaviors and as a health promotion tool in T2D education (Dehghani-Tafti et al., 2015; Solhiet al., 2014; Shabibi et al., 2017). Substantial evidence supports HBM's value in improving T2D self-management behaviors, particularly in the use of its concepts on T2D self-management program development (Karimy et al., 2016). Researchers have also begun to investigate the role of time in changing attitudes and beliefs in the T2D population. Ağralı and Akyar (2014) found that as age increases,

thoughts and perceptions about T2D become more cynical, and barriers increase. Additionally, Sansbury et al. (2014) found perceived susceptibility to be a potent mediator in medication adherence while perceived severity was not. This evidence suggested that many opportunities exist in understanding the potential impact the HBM might have on mitigating the health and economic burden of T2D. In addition, HBM constructs can differ in length of diagnosis, emphasizing the need for research in older adults with T2D. Although previous research such as Sulat et al. (2018) suggested time as a potential weakness in predictive strength, time is a strong moderator. This evidence suggested using time to pinpoint individuals for whom the HBM would be most effective. For example, Sansbury et al. highlighted the need for using interventions targeted at perceived susceptibility instead of perceived severity to increase medication adherence. These examples further support the strengths of using the HBM as a framework for T2D research.

The HBM has been used in recent T2D research as well. Calhoun et al (2020) based a recent study on the HBM by investigating the relationship between demographics and risk perception. A clear relationship between race/ethnicity and risk perception was found. Antwi et al. (2020) also used the HBM, researching the difference between college students' clinical risk for T2D and their perceived risk of developing T2D. Study results were disproportionate; those with the highest clinical risk had low risk perception. Finally, E. Li et al. (2021) leveraged secondary NHANES data to determine whether adults with known prediabetes have increased risk perception using the HBM. They found those with known prediabetes had higher risk perception, and their level of

risk perception did not change their health behaviors, such as diet and physical activity. Hwang et al. (2020) found that T2D educational needs for behavior change are highest in people with the highest risk perception. These examples of recent literature reinforce the complex relationship of T2D risk perception relative to behavior. Based on this evidence, risk perception can vary by factors such as age, gender, and race, which suggests tailored approaches are needed. For those with high-risk perception, fulfilling educational needs is critical to changing behavior that leads to good T2D management. The current study was conducted to add insight into the impact routine care and diet have on risk perception using the HBM.

The current study may increase knowledge and awareness among health care providers regarding the relationship of how risk perception, routine care, and diet correlate with T2D management. Identifying perceived barriers in T2D self-care may reveal opportunities for intervention rooted in the HBM framework. These intervention opportunities could inform health education and promotion strategies for all stakeholders. This new knowledge and awareness could lead to strategic initiatives that target improving risk perception, routine care, and diet as components of overall T2D disease management and treatment.

Literature Review

Definition of Diabetes Mellitus

More than one type of diabetes exists. According to the ADA (2018), diabetes is a chronic disease that affects blood sugar control. T2D is the most common form of diabetes, affecting 21 million Americans compared to Type 1, which affects only 1

million (Bullard et al., 2018). Other forms are less prevalent and include gestational diabetes and specific types of diabetes due to other causes. In Type 1 diabetes, there is a lack of insulin production from damaged pancreas cells requiring daily insulin injections; this type is usually diagnosed in children or young adults and is considered nonpreventable (ADA, 2018). In T2D, insulin production occurs but inadequately, requiring either oral medication or diet and lifestyle modification; this type is usually diagnosed in older adults and is considered preventable (ADA, 2018). This information provides evidence that T2D is a growing concern due to high incidence and prevalence. The influence of modifiable lifestyle behavior changes on T2D makes it a prime candidate for research and intervention. Addressing root causes such as diet is valuable in proper T2D management.

Historical and Recent Literature on Diabetes Mellitus

The problem of T2D has grown over time. Of the various types of diabetes, T2D is the most common and occurs more often in racial minorities (non-Hispanic Black and Hispanic), people over the age of 65 years, and people with lower levels of education (Bullard et al., 2018). The number of people with T2D increased by about 3% during the early to late 2000s (Caspard et al., 2017; M. Sharma et al., 2017). In a more extensive study, Han et al. (2017) found that T2D prevalence increased by almost 6% from the mid-1990s to 2014. Although the rates are beginning to level off compared to the peak during the late 2000s, they remain at alarming levels. The shifting of demographic subgroups and vulnerable populations also emphasizes the need for tailored interventions.

The current rates for T2D are concerning. Almost 10% of the U.S. population, that is over 20 million Americans, live with the disease (Bullard et al., 2018). Rowley et al. (2017) estimated that in the next 15 years the number of people with T2D will more than double. Over 50 million Americans could be living with the disease and costing more than USD 600 billion. Others project similar rates, adding that in the coming years T2D will affect younger age groups (Gaytán-Hernández et al., 2018). T2D is not only a current problem but is also one that has implications for the future of the world in terms of health, economy, and quality of life. The current projections of disease rates underscore the need for immediate action. Those actions must include interventions that address the root causes.

Causes of T2D

Lifestyle choices such as diet and activity level play a role in the cause of T2D. Although continued injury of the pancreatic beta cells is the ultimate cause of the disease, that injury typically occurs through environmental factors such as poor nutrition, lack of physical activity, and socioeconomic status (Kolb & Martin, 2017). Additionally, plant-based diets, low sugar-sweetened beverage consumption, and regular exercise have shown protective and therapeutic effects for T2D (Borror et al., 2018; Jannasch et al., 2017; Schwingshackl et al., 2017; Wen et al., 2017). Fostering good habits for daily choices on what to eat or drink and physical activity levels can influence the prevention of T2D. However, they can also act as robust treatment strategies for current diabetics. Interventions focused on diet and physical activity can address the root causes of the

disease and serve as modifiable environmental factors. Early intervention could prevent the common and dangerous complications of T2D.

Comorbidities and Complications of T2D in Older Adults

The price of T2D extends beyond financial costs for older adults. For older adults, T2D complications are amplified due to the coupling effects of the natural aging process (P. G. Lee & Halter, 2017). Cardiovascular complications can be severe and life-threatening. Clua-Espuny et al. (2017) found that more than half of older adults with multiple chronic conditions have T2D. Newly diagnosed older adults with T2D are twice as likely to die from other chronic diseases such as lung disease, heart disease, and cancer (Chi et al., 2017). Additionally, older adults with T2D are more likely to be hospitalized, have a longer length of stay, and more subsequent complications (Davis et al., 2020). Moreover, older adults with long-standing T2D increase their risk of death by 50% (Tang et al., 2020). As older adults continue to age, they are more likely to be diagnosed with T2D and develop dangerous complications from the disease. T2D poses a threat to the quality of life and health outcomes of the aging population. Current and projected rates of T2D, patient interaction, and experience with the health care system are important considerations of public health, economic, and societal management of the disease.

Cost of T2D

The health care costs associated with T2D are high. The economic impact of T2D is well-documented, projected to increase exponentially, and must be addressed (ADA, 2018; Bommer et al., 2018; O'Connell & Manson, 2019). Most T2D health care costs are spent on older adults (ADA, 2018, Cannon et al., 2018, Glantz et al., 2019). Annual T2D

cost is estimated at almost USD 20,000 per individual (Riddle & Herman, 2018), with health care expenditures for people with T2D being over twice as much compared to those of nondiabetics (Fitch et al., 2017). The costliest T2D-related complication are advanced kidney disease, amputations, and stroke or heart attack (Fitch et al., 2017; Kähm et al., 2018). This evidence demonstrated that T2D contributes to a substantial amount of health care spending. It also highlighted the need to address T2D and its economic implications.

The economic implications of T2D have been addressed throughout the literature. The current T2D rates and projections have severe implications on the economy and society due to high cost and reduced health outcomes (Panton et al., 2018). Future economies and societies will be unable to withstand the volume of people living with the disease or how much it will cost to take care of them (Akushevich et al., 2018). Diabetes management interventions must be strategically aligned with increasing quality outcomes while maintaining or decreasing costs (Turner et al., 2018). Diabetes health education and self-management programs might help to mitigate cost. However, more research is needed to establish best practices for financial impact (Whitehouse et al., 2021). This information may provide insight into how education can encourage patients to obtain needed care quickly. The patient's ability to self-manage is an important topic in T2D.

Quality of Diet

Modifiable risk factors such as diet are an important part of T2D prevention. Researchers agreed that lifestyle interventions such as improving quality of diet are beneficial in T2D prevention (Asaad et al., 2016; Evert & Riddell, 2015; Gallé et al.,

2017; Lynch et al., 2014). Improving quality of diet for people with T2D can improve T2D outcomes and help reverse effects (Huntriss et al., 2017; Meng et al., 2017; Rinaldi et al., 2016). In T2D, improving quality of diet ranks as one of the lowest cost, most effective, and safest treatment forms for T2D preventions and treatment. This form, however, is usually the most difficult to adhere to due to the level of behavior modification required. Interventions focused on self-management skills are becoming more popular for fostering healthier lifestyle choices.

Researchers continue to explore the relationship between quality of diet and T2D risk perception. While initial diagnosis of pre-T2D can spark short-term behavior change in quality of diet, the long-term commitment to maintaining the change is often seen as too difficult (Timm et al., 2019). Despite low T2D risk perception, those that do know they are at risk are able to identify poor diet as one of the top three risk factors (Yang et al., 2018). Rouyard et al. (2018), found that primary care offices that used risk perception to nudge patients with T2D into engaging in modifying diet not only saw risk perception increase but diet behaviors continued for three months after the intervention. Based on this evidence, it is clear quality of diet plays an important role in T2D risk perception. The current study builds upon previous research to better understand what role routine care visits playin diabetes risk perception.

Predictors of T2D Risk Perception

Predictors of T2D risk perceptions are important research topics. Quality of diet plays an important role in T2D risk perception (Ammouri et al., 2018; Yang et al., 2018; Timm et al., 2019). Exploring potential predictive relationships between quality diet and

T2D risk perception provides better insight on ways to leverage opportunities for health education & promotion.

Routine Care Visits

Routine care visits are an important part of healthcare. For older adults, annual wellness exams can provide valuable opportunities to engage patients in conversations about disease risk and prevention (Simpson & Kovich, 2019). The American Diabetes Association (2018) recommends at least one comprehensive annual wellness exam each year, with additional follow-up visits throughout the year. Follow-up visits serve as an extension of the annual exam to continuously assess, monitor, and track health outcomes. Myerson et al. (2018) found that once patients are assessed and previously unknown health issues are identified, follow-up doctors' visits increase throughout the year. Once patients know they are at risk, they become more engaged in their healthcare and visit the doctor regularly. Additionally, patients with a known T2D diagnosis are more likely to report changing their behavior and asking more questions during their doctor visit (Abdelgadir et al., 2021). This evidence suggests that doctor's visit preparation might be an important part of visit engagement to improve health behavior and outcomes (Grant et al., 2017). Shah et al. (2015) found that patients with T2D who saw their doctor regularly, were more likely to have healthy blood sugar, blood pressure, and cholesterol levels. In sum, T2D prevention begins in the doctor's office but is managed outside the office walls. To ensure T2D prevention is on track, regular doctor's visits serve as a check point to communicate and adjust care plans. Regular doctor-patient interaction can ultimately lead to better T2D prevention.

Without proper prevention, T2D-related complications can occur. Routine care visits on engagement, utilization, and oversight are essential for preventing or managing T2D complication in individuals as well as populations (Mao et al., 2019). In a 2017 study Lee et al. (2016), found that patients that had and visited a regular doctor had significantly less emergency room visits. Similarly, Wolters et al. (2017), found that more frequent doctor's visits resulted in better blood sugar control, and subsequently lower hospital admissions. Pan et al. (2017) found the higher number of visits with primary care doctors, the lower rates of complications and death for patients with T2D. From this evidence the importance of routine care visits in preventing T2D and complications is clear. Routine care visits can lead to better blood sugar control and lower hospitalizations.

Summary and Conclusions

The information and flow of Chapter 2 provides strong evidence that thorough research and rigorous content knowledge mastery occurred during the review. In the case of the current study, the problem of low T2D risk perception and related complication is highlighted. Moreover, the problem of low T2D risk perception and the need for further research through the current study is explained in detail. Finally, the connection between current study independent variables (routine care visits and quality of diet) and T2D risk perception is made with reasoning and logic. Current study research design is discussed in the next chapter.

Chapter 3: Research Method

The purpose of the current quantitative cross-sectional study was to investigate whether a relationship exists between routine care visits, quality of diet, and T2D risk perception in U.S. adults 65 years and older. I also tested whether routine care visits and quality of diet are predictors of T2D risk perception. Discussed in this chapter are the elements and outline of the research design and process, including research questions, data collection and management, instrumentation, and data analysis plans. These sections provide detailed explanations to support the logic and rationale, research participants, sample size, and setting. Other considerations such as the role of the researcher, ethical considerations, and protection of participants are covered to ensure compliance.

Research Design and Rationale

The current study's dependent variable was T2D risk perception, and the independent variables were routine care visits and quality of diet. To test the relationship between these variables, I used a quantitative cross-sectional design. The cross-sectional design was appropriate for this study because it allowed for fast and easy data collection, lower cost, and criteria-specific populations. I used secondary data from the NHANES between 2017 and 2018. Because the data set was public, there were minimal time and resource constraints related to obtaining the data. A quantitative design was consistent with previous research such as Calvin et al. (2011), Rovner et al. (2014), Shreck et al. (2013), and Imai et al. (2020), and provided an opportunity to build on current research through testing routine care visits and quality of diet as predictive variables. These studies employed a quantitative design to investigate T2D risk perception and looked at

different relationships that exist between T2D risk perception and numerous factors. The current study design and rationale extended these previous studies by adding prediction testing to known relationships between routine care visits, quality of diet, and T2D risk perception.

Methodology

Population

The population eligible for this study was adults age 65 years and older. As part of the NHANES 2017–2018 cohort, eligible participants must have completed the Hospital Utilization & Access to Care (HUQ), Diet Behavior & Nutrition (DBQ_J), and Diabetes (DIQ) questionnaires.

Sampling and Sampling Procedures

I used secondary NHANES data collected using probabilistic and cluster sample methodology (see Chen et al., 2020). Advantages of cluster sampling include less time and fewer resources, reduced variability, and easier implementation for large populations (G. Sharma, 2017). Disadvantages of cluster sampling are cluster bias (if population chosen has bias, so will cluster) and sampling errors that come with more advanced sampling techniques such as cluster (G. Sharma, 2017). NHANES sampling procedures and inclusion/exclusion criteria represent the noninstitutionalized civilian population residing in the 50 states and the District of Columbia, and multiyear, stratified, clustered four-stage samples with data release in 2-year cycles (Chen et al., 2020). The sample is further broken down into geographies, census blocks, households, and individuals where screenings occur (Chen et al., 2020).

The current study sample size requirement was determined using G-Power analysis software. The type of statistical test used was linear bivariate regression between two groups with different slopes and a priori power analysis. The alpha level was set to 0.05, which calculated a power level of 0.95 and effect size of 392 (see Faul et al., 2009). Sample size, power, and alpha level were chosen to help minimize Type I and Type II errors. These errors inappropriately accept or reject the null hypotheses, and selecting a larger sample size can reduce these errors (Banerjee et al., 2009; Frankfort-Nachmias & Nachmias, 2008; Gerstman, 2015). Alpha level of 0.05 and power level of 0.95 were selected based on research standards (Gerstman, 2015).

Procedures for Recruitment, Participation, and Data Collection

Participants were recruited and data were collected through the NHANES multiphase process. First, all U.S. counties were broken into 15 groups, and one county from each group was selected for the survey. Second, each selected county was divided into 20–25 subgroups based on neighborhood. Approximately 30 households from each neighborhood were selected to contact for survey participation. If the household agreed to participate, all household members were surveyed and screened (Centers for Disease Control and Prevention, 2021). Data were available for public use after collection and processing.

No official permission to use NHANES data is needed; however, users must abide by the data user agreement. Terms and conditions of the data user agreement include using data for statistical purposes only and ensuring confidentiality and anonymity of data. A copy of the NHANES survey consent form can be found in the appendix.

Instrumentation and Operationalization of Constructs

I used data from NHANES 2017–2018 cycle measured with the demographic variables (DEMO_J), HUQ_J, DBQ_J instruments, and DIQ_J. These instruments collect different information based on participants. DEMO_J collects basic demographic information on each participant, such as age, race, gender, education, language, and ethnicity. DIQ_J collects data on diabetes through personal in-home interviews. Questions asked address prediabetes/diabetes status, risk factors, and self-care. The dependent variable for this study was risk perception measured by DIQ172 (feel could be at risk for diabetes). HUQ_J collects data on where and how often participants go for health care through personal in-home interviews. One of the independent variables for this study was routine care visits measured by HUQ051 (number of times received health care over past year). The other independent variable was quality of diet measured by DBQ_J (how healthy is diet). This instrument collects data on food choices, preferences, and attitudes.

The dependent variable of T2D risk perception was measured by the self-reported question: {Do you/Does SP} feel {you/he/she} could be at risk for diabetes or prediabetes? Risk perception was a categorical nominal variable coded as yes = 1, no = 2. The independent variable of routine care visits was measured by the self-reported question: How many times {have you/has SP} seen this doctor or other health professional in the past 12 months? Routine care was a continuous variable because respondents provided a number. The independent variable of quality of diet was measured by the self-reported question: Next I have some questions about {your/SP? s}

eating habits. In general, how healthy is {your/his/her} overall diet? Quality of diet was an ordinal variable in which response options were excellent, very good, good, fair, and poor.

The NHANES study has been conducted with civilians of all ages across the United States for several years. There were no validity and reliability studies using the coding for the variables that were used in the current study. Therefore, reliability and validity testing was conducted as a part of the analysis process for this study.

Data Analysis Plan

SPSS Version 28 was used for the current study data analysis. Before data analysis began, data were cleaned in SPSS. Cleaning procedures included removing missing, duplicate, and irrelevant observations; fixing data structure; filtering outliers; and ensuring data normality and linearity (Van den Broeck et al., 2005). Missing data were addressed through the most common process of listwise deletion, ensuring that power was strong enough to mitigate bias (see Kang, 2013). After data cleaning, data modeling was completed.

For RQ1 binary logistic regression, in SPSS under the analyze tab regression was selected then binary logistic. In the Logistic Regression dialogue box, the dependent variable (T2D risk perception) and the independent variable (routine care visits) were selected. The options box was then clicked and the following selected: classification plots, Hosmer-Lemeshow goodness-of-fit, casewise listing of residuals, confidence intervals (set at 95%), outliers outside set to two standard deviations, display at last step, probability for stepwise entry set to 0.05 and removal set to 0.10, classification cutoff set

to 0.5, maximum iterations set to 20, and include constant in model. The continue button on the Logistic Regression dialogue box was clicked. The Logistic Regression: Save dialogue box was opened and the following selected: probabilities and include the covariance mix. The continue button on the Logistic Regression: Save dialogue box was clicked. This OK was clicked to the run the test. Once all steps were completed, output was generated to analyze.

For RQ2 binary logistic regression, in SPSS under the analyze tab regression was selected then binary logistic. In the Logistic Regression dialogue box, the dependent variable (T2D risk perception) and the independent variable (quality of diet) were selected. The options box was then clicked and the following selected: classification plots, Hosmer-Lemeshow goodness-of-fit, casewise listing of residuals, confidence intervals (set at 95%), outliers outside set to two standard deviations, display at last step, probability for stepwise entry set to 0.05 and removal set to 0.10, classification cutoff set to 0.5, maximum iterations set to 20, and include constant in model. The continue button on the Logistic Regression dialogue box was clicked. The Logistic Regression: Save dialogue box was opened and the following selected: probabilities and include the covariance mix. The continue button on the Logistic Regression: Save dialogue box was clicked. This OK was clicked to the run the test. Once all steps were completed, output was generated to analyze.

For linear regression, in SPSS under the analyze tab regression was selected then linear. In the linear regression dialogue box, the dependent variable (routine care) and the independent variable (quality of diet) were selected. Next the linear regression statistics

box was selected. In the regression coefficients area, estimates and confidence intervals (set at 95%) were selected. In the residuals area, Durbin-Watson and Casewise diagnostics were set to three standard deviations. Finally, model fit, descriptives, part and partial correlations, and collinearity diagnostics were selected. Next in the linear regression plot dialogue box, the histogram, normal probability plots, and produce all partial plots were selected. After saving, in the linear regression save dialogue box the unstandardized box in the predicted values area was selected. In the distances area, Cook's and leverage values boxes were selected. In the residuals area, studentized and studentized deleted were selected. Once all steps were completed, output was generated to analyze.

For RQ4 binary logistic regression, in SPSS under the analyze tab regression was selected then binary logistic. In the Logistic Regression dialogue box, the dependent variable (T2D risk perception) and the independent variables (routine care visits and quality of diet) were selected. The options box was then clicked and the following selected: classification plots, Hosmer-Lemeshow goodness-of-fit, casewise listing of residuals, confidence intervals (set at 95%), outliers outside set to two standard deviations, display at last step, probability for stepwise entry set to 0.05 and removal set to 0.10, classification cutoff set to 0.5, maximum iterations set to 20, and include constant in model. The continue button on the Logistic Regression dialogue box was clicked. The Logistic Regression: Save dialogue box was opened and the following selected: probabilities and include the covariance mix. The continue button on the Logistic

Regression: Save dialogue box was clicked. This OK was clicked to run the test. Once all steps were completed, output was generated to analyze.

Research Questions and Hypotheses

RQ1: Is there a relationship between routine care visits and T2D risk perception in older U.S. adults?

H_o1: There is no relationship between routine care visits and T2D risk perception in older U.S. adults.

H_a1: There is a relationship between routine care visits and T2D risk perception in older U.S. adults.

RQ2: Is there a relationship between quality of diet and T2D risk perception in older U.S. adults?

H_o2: There is no relationship between quality of diet and T2D risk perception in older U.S. adults.

H_a2: There is a relationship between quality of diet and T2D risk perception in older U.S. adults.

RQ3: Is there a relationship between quality of diet and routine care visits in older U.S. adults?

H_o3: There is no relationship between quality of diet and routine care visits in older U.S. adults.

H_a3: There is a relationship between quality of diet and routine care visits in older U.S. adults.

RQ4: To what extent does quality of diet and routine care visits predict T2D risk perception in older U.S. adults?

H_o4: Quality of diet and routine care visits do not predict T2D risk perception in older U.S. adults.

H_a4: Quality of diet and routine visits care predict T2D risk perception in older U.S. adults .

RQ1, RQ2, and RQ4 hypotheses were tested using binary logistic regression. Assumptions included a continuous dependent variable, two or more independent variables (either categorical or continuous), independence of observations (residuals), linearity of dependent variable and each one of the independent variables, linearity of the dependent and independent variables collectively, homoscedasticity of residuals (equal error variances), multicollinearity not shown, no outliers, and residual errors evenly distributed. If the continuous dependent variable and two or more independent variable assumptions had been violated, a different statistical test would have been used. If the independence of observations assumption had been violated during the Durbin-Watson statistic, a different statistical test would have been used instead of multiple regression. If linearity had been violated during scatter and partial regression plots, data could have been transformed to coax linearity. If homoscedasticity of residuals had been violated during plotting of studentized and unstudentized residuals, transformation or weighted least squares regression could have been used. If multicollinearity had been violated, inspection of correlation coefficients and Tolerance/VIF values could have been used. If the outlier assumption had been violated during Casewise

diagnostics and studentized deleted residuals, filter-out outliers and rerun regression could have been used. If the residual errors normal distribution assumption had been violated during histogram with superimposed normal curve and a P-P Plot or Normal Q-Q Plot of the studentized residuals, data transformation could have occurred or run regardless due to robustness of nonnormality. Results were interpreted as statistically significant at the a = 0.05 level (95% confidence).

RQ3 hypothesis was tested using linear regression. Assumptions for linear regression included both independent and dependent variables are continuous, a linear relationship, there is independence of observations and homoscedasticity, no significant outliers, and normal distribution of residuals. If the continuous dependent and independent variable assumptions had been violated, a different statistical test would have been used. If the independence of observations assumption had been violated during the Durbin-Watson statistic, a different statistical test would have been used instead of multiple regression. If linearity had been violated during scatter and partial regression plots, data would have been transformed to coax linearity. If homoscedasticity of residuals had been violated during plotting of studentized and unstudentized residuals, transformation or weighted least squares regression would have been used. If multicollinearity had been violated, inspection of correlation coefficients and Tolerance/VIF values would have been used. If the outlier assumption had been violated during case wise diagnostic, studentizedresiduals would have been deleted, outliers filtered out and regression rerun. If the residual errors normal distribution assumption had been violated during histogram with superimposed normal

curve and a P-P Plot or Normal Q-Q Plot of the studentized residuals, data transformation could haveoccurred or run regardless due to robustness of non-normality. Results were interpreted as statistically significant at the a=0.05 level (95% confidence).

Threats to Validity

External Validity

External validity is the capacity to which the study is reproducible (Garattini et al., 2016). Threats to external validity include sample size bias, the interaction of testing, multiple testing, and interaction of multiple effects. (Campbell & Stanley, 2015). In the current study, secondary data was used. There are specific threats to validity when using secondary data as Boo and Froelicher (2012) pointed out. Often secondary data is collected with intentions and methods different from the researchers that eventually use them which can skew data analysis (Boo & Froelicher, 2013). External threats to the current study included the use of secondary data. Furthermore, Potential threats to validity exist for all research studies, as no study is perfect and can account for all threats.

Internal Validity

Internal validity is the extent to which the outcome has the potential to be considered accurate, and external validity is the capacity to which the study is reproducible (Garattini et al., 2016). Threats to internal validity: external events are occurring to both researchers and participants during the study, instrumentation decision fatigue, loss of participants, placebo effect, contamination effect, Hawthorne effect, and researcher bias (Campbell & Stanley, 2015). Internal validity threats to the current study

were that the instrumentation and collection of data was not developed with the current study in mind. More specifically, variables such as risk perception and diet were used as proxy data. Conclusions drawn from the current study may not be generalizable to the population from which the data was collected.

Ethical Procedures

The current study follows safeguard procedures during the planning, execution, and conclusion to ensure that proper due diligence of the ethical protection of human participants. Ignacio and Taylor (2013) identified three domains that pose the greatest threats to research ethics, including researcher–participant relationships, informed consent and confidentiality, and privacy. A copy of NHANES informed consent is shown in appendix. Due to the fact the NHANES original study included informed consent, this study did not require additional informed consent for secondary data analysis. All NHANES data is de-identified which mitigates ethical protection concerns of future researchers using the secondary data (Tripathy, 2013). Even with de-identified data, Ross, Iguchi, and Panicker (2018) caution that the use of secondary data can violate participants' original consent as they have no way of knowing or opting out of future studies that use their data. This study underwent evaluation and received approval from Walden University Institutional Review Board (IRB).

Summary

The purpose of the current quantitative cross-sectional study was to investigate if a relationship exists between routine care, diabetes risk perception, and quality of diet in U.S. older adults.. Inclusion criteria for this study was set to adults ages 65 years and over

that participated in the NHANES 2017-2018 surevy cycle.. The current study used secondary dataand ethical considerations were addressed through informed consent and privacy safeguards in the primary study. Discussed in Chapter 4 are the results of data collection and analysis.

Chapter 4: Results

The purpose of the current quantitative cross-sectional study was to investigate whether a relationship exists between routine care visits, diabetes risk perception, and quality of diet in adults 65 years of age and older. I also tested whether routine care visits and quality of diet predict diabetes risk perception in older adults. Discussed in this chapter are the data collection process, variables, statistical tests, and study results. These sections provide detailed descriptions of data collection time frames, discrepancies, descriptive statistics, external validity, statistical test results and assumptions, probability values, confidence intervals, and effect sizes. Associated tables and figures are presented.

Data Collection

The time frame for data collection was 2017–2018 as part of the NHANES survey. NHANES sampling procedures and inclusion/exclusion criteria represent the noninstitutionalized civilian population residing in the 50 states and the District of Columbia, including multiyear, stratified, clustered four-stage samples (Chen et al., 2020). The sample is further broken down into geographies, census blocks, households, and individuals where screenings occur (Chen et al., 2020). Response rates for the 2017–2018 cycle included 16,211 recruitments across 30 survey locations. Study participants included 9,254 interviews and 8,704 examinations, as well as recruitment and response rates.

Descriptive Data and Sample Demographics

For the current study, there were 1,500 participants over the age of 65 who completed the survey tools listed in Chapter 3. Men and women were represented equally

among the participants: 50.6% men and 49.4% women (see Table 1). This was consistent with the full NHANES 2017–2018 cycle distribution: 49.2% male and 50.8% female. Current study participants self-identified as the following race and ethnicities: non-Hispanic White (49.4%), non-Hispanic Black (21.7%), non-Hispanic Asian (9.1%), Mexican American (8.4%), other Hispanic (7.6%), and other race including multiracial (3.8%, see Table 1). This differed slightly from the full NHANES 2017–2018 cycle distribution where non-Hispanic White percentages were lower at 34%. Mexican American and non-Hispanic Asian percentages were slightly higher at 14.8% and 12.6%.

Table 1

Gender and Race

Race/Hispanic origin	Male	Female	Total
Mexican American	648	719	1,367
Other Hispanic	400	420	820
Non-Hispanic White	1,583	1,567	3,150
Non-Hispanic Black	1,032	1,083	2,115
Other race including multiracial	894	908	1,802
Total	4,557	4,697	9,254

Study Results

This section details the statistical analysis results for each research question. Statistical assumptions and findings are explained. Data for each research question are displayed in tables.

Research Question 1

RQ1: Is there a relationship between routine care visits and diabetes risk perception in older U.S. adults?

H_o1: There is no relationship between routine care visits and diabetes risk perception in older U.S. adults.

H_a1: There is a relationship between routine care visits and diabetes risk perception in older U.S. adults.

RQ1 data analysis was conducted to determine whether there is a relationship between the independent variable routine care visits and dependent variable diabetes risk perception. RQ1 was tested using ordinal regression. Assumptions for binary logistic regression included an ordinal dependent variable; independent variable being continuous, ordinal, or categorical; no multicollinearity; and proportional odds. No assumptions were violated. Table 2 displays descriptive statistics for RQ1 with a sample size of 1,500 cases total, with 1,016 cases included in the analysis. A cumulative odds ordinal logistic regression with proportional odds was run to determine the effect of routine care visits on diabetes risk perception. The odds of routine care visits affecting diabetes risk perceptions were .963 (95% CI, .898 to 1.032); however, this finding was not statistically significant at a *p* value of .284, as shown in Table 3. This finding indicated that routine care visits and diabetes risk perception were not associated; therefore, the alternative hypothesis was rejected and the null hypothesis was accepted.

Table 2

Case Processing Summary

Unweighted case[a]	Category	*N*	Percentage
Selected cases	Included in analysis	1,016	67.7
	Missing cases	484	32.3
	Total	1,500	100
Unselected cases		0	0
Total		1,500	100

[a]If weight is in effect, see classification table for the total number of cases.

Table 3

Routine Care Visits on Diabetes Risk Perception

								95% C.I. EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Routine care visits	-.038	.036	1.147	1	.284	.963	.898	1.032
	Constant	1.177	.130	82.046	1	<.001	3.244		

[a.]Variable(s) entered on step 1. Routine care visits

Research Question 2

RQ2: Is there a relationship between quality of diet and diabetes risk perception in older U.S. adults?

H_o2: There is no relationship between quality of diet and diabetes risk perception in older U.S. adults.

H_a2: There is a relationship between quality of diet and diabetes risk perception in older U.S. adults.

RQ2 data analysis was conducted to determine whether there is a relationship between the independent variable quality of diet and dependent variable diabetes risk perception. RQ2 was tested using ordinal regression. Assumptions for ordinal regression

included an ordinal dependent variable; independent variable being continuous, ordinal, or categorical; no multicollinearity; and proportional odds. No assumptions were violated. Table 4 displays descriptive statistics for RQ1 with 1,018 cases included in the analysis. A cumulative odds ordinal logistic regression with proportional odds was run to determine the effect of quality of diet visits on diabetes risk perception. The odds of quality of diet affecting diabetes risk perceptions were .854 (95% CI, .744 to .982) with a beta value of -.157. This finding was statistically significant at a *p* value of .027, as shown in Table 5. On average, diabetes risk perception increased 15% for each standard of deviation for quality of diet decrease. As quality of diet decreased, diabetes risk perception increased. This finding indicated that quality of diet and diabetes risk perception were associated; therefore, the alternative hypothesis was accepted and the null hypothesis was rejected.

Table 4

Case Processing Summary

Unweighted case[a]	Category	Number	Percentage
Selected cases	Included in analysis	1,018	67.9
	Missing cases	482	32.1
	Total	1,500	100
Unselected cases		0	0
Total		1,500	100

[a]If weight is in effect, see classification table for the total number of cases.

Table 5

Quality of Diet on Diabetes Risk Perception

								95% C.I. EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Quality of diet	-.157	.071	4.916	1	.027	.854	.744	.982
	Constant	1.502	.213	49.927	1	<.001	4.492		

[a.]Variable(s) entered on step 1. Quality of diet.

Research Question 3

RQ3: Is there a relationship between quality of diet and routine care visits in older U.S. adults?

H_o3: There is no relationship between quality of diet and routine care visits in older U.S. adults.

H_a3: There is a relationship between quality of diet and routine care visits in older U.S. adults.

RQ3 was tested using linear regression. Assumptions for linear regression included continuous independent and dependent variables, a linear relationship, independence of observations and homoscedasticity, no significant outliers, and normal distribution of residuals. No assumptions were violated. A linear regression test was run between quality of diet and routine care visits. Table 6 displays descriptive statistics for RQ3 with a sample size of 1,495 cases included in the analysis. There was not a statistically significant correlation between quality of diet and routine care visits (p =

.193), as shown in Table 7. This finding indicated that quality of diet and routine care visits were not associated; therefore, the alternative hypothesis was rejected and the null hypothesis was accepted.

Table 6

Descriptive Statistics

Category	*M*	*SD*	*N*
Routine care visits	3.21	2.037	1,495
Quality of diet	2.83	1.021	1,495

Table 7

Quality of Diet on Routine Care Visits

		Unstandardized		Standardized			95% C.I. for B	
Model		B	S.E.	Beta	t	Sig.	Lower	Upper
1	(Constant)	3.020	.155		19.462	<.001	2.715	3.324
	Quality of diet	.067	.052	.034	1.303	.193	-.034	.168

[a.] Dependent Variable: Routine care visits

Research Question 4

RQ4: To what extent does quality of diet and routine care visits predict T2D risk perception in older U.S. adults?

H_o4: Quality of diet and routine care visits do not predict T2D risk perception in older U.S. adults.

H_a4: Quality of diet and routine care visits predict T2D risk perception in older U.S. adults.

RQ4 was tested using binary logistic regression. Assumptions for binary logistic regression included a dichotomous dependent variable, two or more independent variables (either categorical or continuous), independence of observations (residuals), the categories of the dichotomous dependent variable and all nominal independent variables being mutually exclusive and exhaustive, minimum of 15 cases per independent variable, linearity of dependent variable and each one of the independent variables, no multicollinearity, and no outliers. No assumptions were violated. Table 8 displays descriptive statistics for RQ4 with 1,015 cases included in the analysis. The odds of quality of diet affecting diabetes risk perceptions were .854 (95% CI, .743 to .981) with a beta value of -.158. This finding was statistically significant at a *p* value of .026, as shown in Table 9. The odds of routine care visits affecting diabetes risk perceptions were .963 (95% CI, .898 to 1.033) with a beta value of -.037. This finding was not statistically significant at a *p* value of .297, as shown in Table 9. These findings indicated that routine care visits was not a significant predictor of diabetes risk perception; however, quality of diet was. Therefore, the alternate hypothesis was accepted and the null hypothesis was rejected.

Table 8

Case Processing Summary

Unweighted case[a]	Category	Number	Percentage
Selected cases	Included in analysis	1,015	67.7
	Missing cases	485	32.3
	Total	1,500	100
Unselected cases		0	0
Total		1,500	100

[a]If weight is in effect, see classification table for the total number of cases.

Table 9

Quality of Diet and Routine Care Visits on Diabetes Risk Perception

								95% C.I. EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Quality of diet	-.158	.071	4.976	1	.026	.854	.743	.981
	Routine care visits	-.037	.036	1.088	1	.297	.963	.898	1.033
	Constant	1.613	.239	45.565	1	<.001	5.018		

[a.] Variable(s) entered on step 1. Quality of diet, Routine care visits.

Summary

This chapter addressed the data analysis for the current study. Results showed that routine care visits and diabetes risk perception had low correlation that was not statistically significant. Quality of diet and diabetes risk perception were moderately correlated and statistically significant. There was not a statistically significant correlation between routine care visits and quality diet. Quality of diet was shown to be a predictor of diabetes risk perception that was statistically significant. Routine care visits was shown not to be statistically significant predictor of diabetes risk perception. In Chapter 5, interpretation of the results, study limitations, study implications, and recommendations for future research are discussed.

Chapter 5: Discussion, Conclusion, Recommendations

The purpose of this study was to investigate whether a relationship exists between routine care visits, quality of diet, and diabetes risk perception in U.S. adults age 65 years and older. As discussed in Chapter 4, the results of the study showed routine care visits had no significant relationship to quality of diet or diabetes risk perception. A relationship was identified between quality of diet and diabetes risk perception, with quality of diet being a statistically significant predictor of diabetes risk perception. The lower the quality of diet, the higher the diabetes risk perception in older adults.

Interpretation of Findings

The finding of routine care visits having no relationship with diabetes risk perception conflicts with previous research that suggested routine care visits play an important role in diabetes risk perception. Simpson and Kovich (2019) described routine care visits as an essential opportunity to assess and discuss disease risk. Additionally, some researchers suggested that once risk perception is addressed, patients are more likely to become engaged in taking action, and routine care visits serve as critical engagement opportunities for risk perception (Abdelgadir et al., 2021; Myerson et al., 2018). Although routine care visits function as a mechanism to manage population health outcomes (Mao et al., 2019), the current study provided evidence that routine care visits may not play as much of a role in improving diabetes risk perception in older adults. This finding may be due to health care providers discussing diabetes risk perception with protective health behaviors during routine care visits, as Yilmaz et al. (2022) suggested. Mainous et al. (2019) also found that most U.S. adults are not told they are at risk for

diabetes. Based on this information, the problem of low diabetes risk perception should be addressed during routine care visits.

The finding of a strong relationship between quality of diet and diabetes risk perception adds to the existing body of research that indicated that quality of diet plays an important role in diabetes risk perception (Ammouri et al., 2017; Timm et al., 2019; Yang et al., 2018). Previous research found that when quality of diet is used as a focal point in risk assessment, diabetes risk perception improves and patients who normally modify diet temporally sustain better diet behavior longer (Rouyard et al., 2018; Timm et al., 2019; Yang et al., 2018). The current study also adds to finding that the healthier a person perceives themselves and their diet, the lower they perceive their risk for T2D (Khan et al., 2020). The current study helped to strengthen the research on this topic by addressing the predictive relationship between quality of diet diabetes risk perception in older adults. Low risk perception for developing T2D and related complications can stem from optimistic bias, ineffective messaging, or inconsistent measurement tools (Beeney & Fynes-Clinton, 2018; Orom et al., 2017; Timm et al., 2019). The current study suggests that although quality of diet is important in preventing T2D, an individual's perception of their diet is important to consider when engaging in diabetes risk conversations.

Current study findings also relate to the field of health behavioral theory, including the HBM. The HBM continues to serve as a basis for much of the research on diabetes risk perception with mixed findings regarding whether perceived risk is enough to create behavior change (E. Li et al., 2021). Studies designed with HBM as the framework consistently found connections between diabetes risk perception and health

behaviors but acknowledged the shortcomings of effective interventions to create change (Antwi et al., 2020). Evidence suggested that perceived risk has an important downstream effect on health behaviors (West et al., 2019); however, many studies cited communication and cultural considerations as barriers in promoting protective health behaviors (Hsueh et al., 2019; Joiner et al., 2022; Mainous et al., 2019). The current study findings indicated similar connections in that routine care visits alone did not impact diabetes risk perception. This may be due to communication issues that are widely known .

Limitations of the Study

There were several limitations to the current study. First, the cross-sectional study design represented a single moment in time and population sample (NHANES participants 2017–2018); therefore, the findings cannot be generalized broadly. Other study limitations included participant inclusion and exclusion criteria, the use of nonrandom convenience sampling, and self-reported data. As discussed in Chapter 1, the use of secondary data was another limitation because the original data collection methodology did not have the same theoretical basis as the current study. The secondary data were not created and collected with the intention of aligning to the theoretical model used in the current study. Therefore, the use of certain questions to test certain constructs may not have been as reliable had the questions been created with the HBM in mind. Therefore, the research questions in the current study may be misaligned to the original purpose for the data. These limitations should be considered when interpreting findings. Nevertheless, these findings contribute to research and address the problem of low T2D

risk perception in U.S. older adults by identifying potential relationships with routine care visits, quality of diet, and T2D risk perception.

Recommendations

There are several recommendations for future research based on the current study. The first recommendation is to use primary data. As with similar studies on diabetes risk perception using NHANES data, use of these data limits the ability to draw inferences between risk perception and health behaviors (Chu et al., 2023; Joiner et al., 2022; Murillo et al., 2019). The use of more dynamic diabetes risk perception assessments is another recommendation. As previous studies noted, the use of NHANES dichotomous diabetes risk perception variable does not capture degrees of risk perception, which may lead to bias (Heidemann et al., 2019; Joiner et al., 2022). Although the current study provided valuable insight into the relationship between routine care visits, quality of diet, and diabetes risk perception, more research is needed on this topic. One recommendation for future research aligns with Calhoun et al.'s (2019) suggestion that time as a variable of quality of diet and diabetes risk perception needs further investigation. Because the current study was cross-sectional, a longitudinal study design might help to determine whether quality of diet predictiveness of diabetes risk perception changes over time.

Another recommendation for focused research is investigating quality of diet as a predictor of diabetes risk perception among a specific race or ethnicity. Yang et al. (2018) found an interesting correlation between non-Hispanic Blacks and Hispanics that suggests these groups underestimate their risk for diabetes because of misperception of risk factors such as weight and quality of diet. This finding may be due to insufficient

communication and messaging around diabetes risk perception (Joiner et al., 2022). To address this, health care providers should prioritize and implement diabetes risk perception discussions into routine care visits. Future qualitative research should aim to understand how diabetes risk perception messaging varies by culture and the most effective way to communicate. Finally, exploring diabetes messaging as it relates to quality of diet and diabetes risk perception could be valuable. Beeney et al. (2019) found that how diabetes risk messaging is framed plays a role in diabetes risk perception. Although studies showed that diabetes risk perception increases when a health care provider tells an individual they are at risk, it is unclear how the doctor–patient relationship needs to be leveraged to better communicate diabetes risk and promote health behaviors (Heidemann et al., 2019; Mainous et al., 2019). More research on health care provider communication and messaging could help identify the best approach to engaging patients in diabetes risk conversation.

Implications

The current study is significant to the field of health education and promotion for T2D prevention. This study added valuable findings on the importance of quality of diet in diabetes risk perception. Although routine care visits should remain a staple in T2D prevention, the visits are not enough.

The findings from RQ1 suggest that routine care does not play a role in diabetes risk perception, which may be an important consideration for health care professionals. This finding may be due to poor communication or lack thereof (Mainous et al., 2019; Yilmaz et al., 2022). Norddal et al. (2022) found that although patients value expert

information, the way in which it is presented is important for diabetes risk perception. For example, patients who receive diabetes screenings are more likely to return for routine care when diabetes risk is coupled with reassurance that therapies are successful. Health care providers should implement more conversations and better messaging when discussing diabetes risk with patients.

The findings from RQ2 suggest that quality of diet plays a role in diabetes risk perception, which may be an important consideration for health care professionals. This finding may be because a person's perception of how healthy their diet is does influence their risk perception about developing diabetes (see Khan et al., 2020). This finding could be useful to health care providers to leverage when engaging patients in diabetes risk conversations. Hashim et al. (2022) found that the more personal and positive short-term benefits of protective dietary changes are discussed with patients at risk for T2D, the more likely patients are to begin behavior change. Health care providers should focus less on communicating severity of potential consequences and emphasize how small changes can improve total health and wellness sooner than patients think.

The findings from RQ3 suggest that quality of diet does not play a role in routine care, which may be an important consideration for health care professionals. Mainous et al. (2019) found that most U.S. adults are not told they are at risk for diabetes, which could explain this finding. Sivakumar et al (2023) found competency-based intervention to be effective and easily implemented into practice to address diabetes risk perception and behavior change. Competency-based intervention empowers the patient as a learner and helps to facilitate multiple types of learning across diverse individuals. Health care

providers should assess current workflows to address diabetes risk perception and implement interventions proven to be effective.

The finding from RQ4 suggests that although routine care does not predict diabetes risk perception, quality of diet does. This may be an important consideration for health care professionals to address. Low risk perception for developing T2D and related complications can stem from optimistic bias, ineffective messaging, or inconsistent measurement tools (Beeney & Fynes-Clinton, 2018; Orom et al., 2017; Timm et al., 2019). To address this, Plant et al. (2022) suggested that the use of visuals and numbers during diabetes risk conversations can be effective in building a more personal connection between the patient and the information. Additionally, Silarova et al. (2018) acknowledged that diabetes risk assessments and conversations are dynamic and health care providers should tailor approaches and interventions to each patient.

The current study may contribute to positive social change by underscoring the importance of incorporating quality of diet conversations into routine care visits. Doing so could improve T2D risk perception and could create more opportunities to provide quality diet support and resources to empower patients. Improving T2D risk perception could lead to better health behavior and reduced T2D burden, leading to significant improvements in quality of life. Current study findings support increasing knowledge, awareness, and understanding of the role health care providers play in T2D risk perception. This contribution comes from the finding that routine care visits alone appear not to have a significant impact on diabetes risk perception. Understanding the interactions between routine care visits and T2D risk perception may help pinpoint

opportunities such as communication or patient engagement for targeted interventions, especially regarding quality of diet and interventions.

Summary

Older U.S. adults are at increased risk of T2D and have low diabetes risk perception. Through improved diabetes risk perception in older adults, T2D incidence and prevalence may be decreased through health behavior changes such as improved quality of diet. The current study provided evidence that older adults who perceive their lower quality of diet also perceive a greater risk of developing T2D. Furthermore, this study extends knowledge on the impact of routine care visits on diabetes risk perception and highlights that they have little to no predictive value. The findings from this study suggest what health care providers can do to engage older adults in prevention efforts by addressing quality of diet in diabetes risk conversations. Health care providers can implement more robust quality-of-diet assessment tools during routine care visits and leverage results to create more dynamic conversations around diabetes risk perception. Health care providers should begin to leverage more quality-of-diet conversations into routine care visits to increase diabetes risk perception and support T2D prevention efforts.

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Appendix: Survey Consent Form

#1

OMB # 0920-0950

NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY
HOME INTERVIEW CONSENT

Print name of person questioned _____ _____ _____
First Middle Last

You have been chosen to take part in the National Health and Nutrition Examination Survey (NHANES), conducted by the National Center for Health Statistics, part of the Centers for Disease Control and Prevention (CDC). This research tells us about the health and nutrition of people in the United States. It combines an interview with a health exam. Our interviewer will ask questions about you and your family. Some questions are about your work and general health. Others are about health problems and other health topics. Health research using NHANES can be enhanced by combining your survey records with other data sources. The data gathered are used to link your answers to vital statistics, health, nutrition, and other related records. The questions today will take about one hour. We may contact you to check the work of your interviewer. We may contact you again for further studies.

Data gathered in this survey are used to study many health issues. We are required by law (read box below) to use your information for statistical research only and to keep it confidential.

You may take part in this survey or not. The choice is yours. You will not lose any benefits if you say no. If you choose to take part, you don't have to answer every question and you can stop the interview at any time.

We can do additional health research by linking the interview and exam data of everyone listed under "SP NAME" in the gray box below to vital statistics, health, nutrition, and other related records. May we try to link these survey records with other records?

☐ Yes ☐ No ☐ N/A

Do you have more questions about the survey? You can make a toll-free call to the Senior Medical Officer at 1-800-452-6115, Monday-Friday, 7:30 AM-4:30 PM ET. If you have questions about your rights about being in the survey, call the Research Ethics Review Board at the National Center for Health Statistics, toll free, at 1-800-223-8118. Please leave a brief message with your name and phone number. Say that you are calling about Protocol # 2011-17. Your call will be returned as soon as possible.

SIGNATURE OF PERSON ANSWERING QUESTIONS:

I have read the information above. I agree to proceed with the interview.

_____ _____
Date

IF PERSON ABOVE IS 16 OR 17 YEARS OLD, A PARENT/GUARDIAN MUST ALSO SIGN BELOW:
(Unless participant is an emancipated minor ☐)

_____ _____
Signature of parent/guardian Date

I observed the interviewer read this form to the person named above and he/she agreed to participate by signing or marking this form.

_____ _____
Witness (if required) Date

Name of staff member present when this form was signed: _____

HOUSEHOLD ID ___ ___ ___ ___ ___ ___ ___ ___ ___ FAMILY # ___ ___

Which questionnaire(s) did person respond to? FAMILY ☐ SP ☐ (IF CHECKED, PRINT BELOW)

SP NAME	SP ID	SP NAME	SP ID

Assurance of Confidentiality: We take your privacy very seriously. All information that relates to or describes identifiable characteristics of individuals, a practice, or an establishment will be used only for statistical purposes. NCHS staff, contractors, and agents will not disclose or release responses in identifiable form without the consent of the individual or establishment in accordance with section 308(d) of the Public Health Service Act (42 U.S.C. 242m(d)) and the Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA, Title 5 of Public Law 107-347). In accordance with CIPSEA, every NCHS employee, contractor, and agent has taken an oath and is subject to a jail term of up to five years, a fine of up to $250,000, or both if he or she willfully discloses ANY identifiable information about you. In addition, NCHS complies with the Federal Cybersecurity Act of 2015 (6 U.S.C. §§ 151 & 151 note). This law requires the federal government to protect federal computer networks by using computer security programs to identify cybersecurity risks like hacking, internet attacks, and other security weaknesses. If information sent through government networks triggers a cyber threat indicator, the information may be intercepted and reviewed for cyber threats by computer network experts working for, or on behalf of, the government.