Doi: 10.32481/djph.2026.03.13

Snapshot of Diabetes Risk, Risk Awareness, and Lifestyle Change Factors in Older Adults Attending Delaware Senior Centers

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Abstract

Diabetes prevalence increases with age. Senior centers offer an opportunity to reach community-dwelling older adults to educate them about diabetes and its prevention. **Objective**. The objective of the study was to examine diabetes/pre-diabetes occurrence, risk factors, and awareness, and lifestyle behaviors; and compare lifestyle behaviors in three diabetes risk-related subgroups (diabetes, lower risk; higher risk) in older adults attending senior centers. **Methods**. A single occasion cross-sectional self-report survey was conducted at two Delaware senior centers. A total of 159 individuals participated in the survey. **Results**. Demographic characteristics were: 76.08 years old on average (SD = 7.89); 77.4% female; 1.9% Hispanic/Latino/Latinx; 84.2 White, and 13.3% Black/African American. Of this sample, 20.0% self-reported a diabetes diagnosis, 66.3% without known diabetes may have increased risk, and 29.8% were aware of their diabetes risk. Furthermore, more than half reported a lack of knowledge about pre-diabetes. For lifestyle behaviors, 73% reported being in the action/maintenance stages of change for physical activity, 53%-72% across areas of healthy eating, and 93% were nonsmokers. No significant differences were found between risk groups for these lifestyle areas. **Conclusions/Policy Implications**. These findings suggest potential gaps in older adults' awareness of diabetes risk and opportunities for promoting healthy lifestyle behaviors. Senior centers offer a convenient opportunity to reach older adults, to offer tailored approaches to address gaps in their awareness of pre-diabetes and diabetes risk, and to link individuals with current senior center, state, and other programs to further support diabetes prevention in older adults.

Introduction

Diabetes increases with age, and estimates indicate that 28.8% (2023) of people 65 or older have diabetes.[1] In addition, it has been estimated (2021-2023) that 52.1% of this age group have prediabetes and only 19.8% of adults are aware of their prediabetes.[1] In Delaware (2023),13.3% of the adult population had been diagnosed with diabetes, and 14.5% reported being told they have prediabetes.[2] In addition, it is estimated that 4,800 are newly diagnosed with diabetes each year.[2] Adults over age 65 have the highest rates of diabetes (23.7%) compared with adults 55-64 years old (21.0%), and 45-54 years old (13.7%). The "Impact of Diabetes in Delaware 2025" report identifies adults 55 and older as a high-risk population.[2]

These statistics underscore the importance of focusing on this public health challenge, particularly through raising awareness and providing tailored interventions to address modifiable risk factors in older adults who are at higher risk of diabetes. Overweight and obesity are risk factors for the development of diabetes. The Diabetes Prevention Program research[3] demonstrated that a one-year intensive lifestyle intervention incorporating dietary changes, physical activity and weight loss (5-7%), reduced the risk of developing type 2 diabetes mellitus by 58% in high-risk individuals overall and 71% for adults over 60. Furthermore, a lower

diabetes incidence continued for the lifestyle group at 10-year and 15-year follow-ups.[4,5] The National Diabetes Prevention Program (NDPP) is a national initiative developed by the Centers for Disease Control and Prevention (CDC) to disseminate the effective one-year intensive lifestyle intervention.[6] This program has also been endorsed by the Centers for Medicare and Medicaid Services.

Delaware currently has multiple organizations, including the University of Delaware, listed in the CDC registry of diabetes prevention programs with availability of both in-person and distance learning options. In-person delivery options are currently available in each county, and some organizations offer their program in multiple locations. In addition, the Medicare Diabetes Prevention Program is now available to specifically reach older adults, and multiple organizations in Delaware are Medicare Diabetes Prevention Program suppliers.

Given the greater risk of diabetes in older adults and the positive impact of the DPP lifestyle intervention, tailored efforts are needed to reach older adults to educate them about risk factors and connect them with available programs and services (e.g., NDPP). Senior centers offer a convenient location to reach community-dwelling older adults to raise awareness about diabetes and its prevention. Research is needed to better understand risk and risk awareness in older adults to maximize the potential opportunity to reach and impact older adults in Delaware at risk of diabetes. Therefore, the purpose of this study was to better understand diabetes risk, risk awareness, and relevant lifestyle behaviors in older adults attending Delaware senior centers.

Methods

Study Objectives

The primary study objectives were (1) to examine diabetes/pre-diabetes occurrence, risk factors, and lifestyle behaviors; (2) to examine lifestyle behaviors and attitudes across diabetes risk subgroups, including those with diabetes, at higher risk for diabetes, and at lower risk for diabetes; and (3) to examine the awareness of diabetes risk and current efforts to address risk.

Design

This study used a single occasion cross-sectional self-report survey.

Recruitment and Participants

Individuals were recruited through electronic newsletters, sent by the senior center directors, fliers posted at the center sites, and through in-person recruitment at two Delaware senior centers in New Castle County. All senior center members, staff, and guests over 60 years of age who were interested were eligible to take part in the survey. Individuals were informed of the survey's purpose and that it was anonymous and voluntary. Participants were provided with a $10 gift card to a local store for participation in the survey. The study protocol was reviewed by the University of Delaware Institutional Review Board and determined to be exempt.

Survey and Implementation. The self-report survey included questions about sociodemographic characteristics, diabetes risk factors; diabetes or hypertension diagnosis; health status; lifestyle behaviors; awareness of diabetes risk factors and Diabetes Prevention Lifestyle intervention.

Demographics. Demographic and health status items were generally taken or adapted from the Behavioral Risk Factor Surveillance System.[7]

Diabetes Risk. The American Diabetes Association (ADA)/CDC's Risk Test question responses were collected and used to calculate the participants' risk scores. The Risk Test is based on seven questions related to age, gender, family history of diabetes, physical activity, weight, hypertension, and personal history of gestational diabetes.[8] Zero to three points are assigned based on the presence of each risk factor, and points are summed to create the score. The scoring indicates that an individual who scores 5 or higher is at increased risk for having pre-diabetes and at high risk for type 2 diabetes. For this study, those with scores below 5 were identified as "lower risk" and those with scores of 5 or greater were identified as "higher risk". Research on pre-diabetes/diabetes risk tests has demonstrated the utility and validity of these screening tools in various populations.[9–11]

Stages of Change for Lifestyle Factors. Stage of change questions based on the Transtheoretical Model[12,13] were used to examine participant's intentions or engagement in each health behavior. Questions addressed the following behaviors: eat five or more fruits and vegetables per day, eat whole grains, avoid high fat proteins, avoid high fat dairy, avoid sugary drinks, and engage in 30 minutes of physical activity per day. Participants were asked to select one of the following responses related to intention or engagement in each behavior: "No, and I do not intend to start in the next six months" (i.e., precontemplation stage); "No, but I intend to start sometime in the next six months (i.e., contemplation stage); "No, but I intend to start in the next month" (i.e., preparation stage); "Yes, I have been but for less than 6 months" (i.e., action stage); and "Yes, I have been for 6 months or more" (i.e., maintenance stage).

Lifestyle Factors and Risk Awareness. The following open-ended question addressed knowledge of pre-diabetes: "What do you know about pre-diabetes?". Participants were also asked "If you were told by a healthcare professional that you are at risk of diabetes, did you try any of the following. Check all that apply". Checklist responses included: lose weight, get more physical activity, eat less, eat more fruits and vegetables, eat less fried foods, dine out less, eat less fast food, eat smaller portions, cut back on fat intake, cut back on calorie intake, drink less sugary beverages, drink more water, read nutrition labels, get more aerobic exercise, walk more, and sit less. Several questions about lifestyle behaviors were also taken from the Summary of Diabetes Self-Care Activities measure.[14] These questions focused on the number of days per week that the individual followed a healthful eating plan, ate at least 5 fruits and/or vegetables, ate high fat foods, and engaged in 30 minutes of physical activity. In addition, for those informed of diabetes risk by a provider, survey questions addressed their engagement in lifestyle change strategies to address diabetes risk.

Survey Implementation

The brief voluntary anonymous self-report survey was administered in two senior centers during the winter of 2022-2023 by research staff using an iPad-delivered Qualtrics[15] survey or a paper survey, as preferred by the participant.

Data Management and Analysis

The majority of participants completed the survey electronically through Qualtrics. Paper surveys were entered into Qualtrics, checked for accuracy by a second person, and errors were corrected; all data was reviewed by investigators and cleaned to eliminate any outliers. The

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quantitative analyses were conducted using SPSS.[16] Descriptive analyses were used to summarize the survey data as appropriate (e.g., frequencies, means). Analysis of Variance (ANOVA) and Chi-Square analyses were used to examine differences across the three groups (reported diabetes diagnosis, risk score < 5; risk score ≥ 5). Body Mass Index (BMI) was determined using the standard formula.

Qualitative data was reviewed and summarized by two team members using thematic content analysis[17] to deductively identify codes and themes based on the primary lifestyle and self-care-related areas of this study (e.g. Healthy Eating; Physical Activity; weight management). Themes were reviewed by team members, and discrepancies were resolved through discussion.

Results

A total of 159 individuals participated in the survey across the two senior centers. The sociodemographic characteristics of the sample were: 76.08 years old on average (SD = 7.89, range = 60-96); 77.4% female; 1.9% Hispanic/Latino/Latinx; 84.2% White, 13.3% Black/African American (See Table 1). There was representation across levels of education and income. A little less than half were married or in a domestic partnership (43.4%), and the majority were retired (85.5%).

Table 1. Participant Background Characteristics

Characteristic	N (%) or Mean (SD, Range)
Age	76.08 (7.89, 60-96) years
Sex (Frequency) Male Female	 36 (22.6%) 123 (77.4%)
Hispanic/LatinX/Spanish Yes No	 3 (1.9%) 156 (98.1%)
Race White Black/African American American Indian/Alaska Native Asian Native Hawaiian/Pacific Islander	 133 (84.2%) 21 (13.3%) 1 (0.7%) 3 (1.8%)
Highest Degree <HS Diploma HS Degree or Equivalent Some College (no degree) Associate's Degree Bachelor's Degree Master's, Doctorate, or Professional Degree	 6 (3.8%) 61 (38.4%) 36 (22.6%) 11 (6.9%) 28 (17.6%) 17 (10.6%)
Marital Status Single (Never Married) Married/Domestic Partnership Widowed Divorced	 10 (6.3%) 69 (43.4%) 61 (38.4%) 17 (10.7%)

Separated	2 (1.3%)
Employment status	
Employed Full-Time, Part-Time, or Self-Employed	14 (7.8%)
Unemployed	3 (1.9%)
Retired	136 (85.5%)
Homemaker	5 (3.1%)
Unable to Work	1 (0.6%)
Household income	
<$25,000	39 (24.8%)
$25-34,999	17 (10.8%)
$35-49,999	23 (14.6%)
$50-74,999	28 (17.8%)
≥$75,000	24 (15.3%)
Don't know/not sure	26 (16.6%)

Table 2 presents the descriptive findings for health status/access, diabetes related topics, and health behaviors and outcomes. Of this sample, 20% stated they had a diabetes diagnosis, with the majority of this group indicating that they were diagnosed with Type 2 (93.4%). Results from the risk test scoring indicated that 66.3% had scores of five or greater, suggesting increased risk, while 29.8% reported being told of high diabetes risk or pre-diabetes by their health care provider.

With respect to family-related factors, 35.4% reported they had a close family member with diabetes, and approximately 18.4% reported having a household member with diabetes. Regarding other risk factors, only 1.6% reported a history of gestational diabetes, the average BMI was 28.26, 63.9% reported a diagnosis of hypertension, and 86.5% reported being physically active. The majority (88.7%) reported good to excellent perceived health, having had a routine medical checkup within the past year (97.4%), and no cost-related health care access challenges (94.8%). The average reported days with poor mental or physical health in the prior 30 days was 1.34. Participant responses to stage of change questions for healthy lifestyle areas indicated that the majority were in the action/maintenance stages for physical activity (72.8%), avoiding high-fat protein foods (72.3%), avoiding high-fat dairy foods (69.8%), and over half for fruit and vegetable intake (52.6%). In addition, participants reported the following average number of days per week for each of the following: 4.26 for following a healthy eating plan, 3.78 for eating at least 5 fruits and vegetables, 2.10 for eating high-fat foods, and 4.05 for getting 30 minutes of physical activity. Participants reported getting 7 hours of sleep on average, and the majority also reported being nonsmokers (93.4%).

For those who reported being told by a healthcare provider that they either have pre-diabetes or are at higher risk for diabetes (n= 45; 29.8%), their responses to the checklist of strategies tried to reduce risk include (rank-ordered):

- 71.1% (n=32) eat more fruit and vegetables
- 66.7% (n=30) lose weight
- 62.2% (n=28) get more physical activity
- 57.8% (n=26) drink more water
- 48.9% (n=22) drink less sugary beverages

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- 46.7% (n=21) walk more
- 37.8% (n=17) eat less fried foods
- 35.6% (n=16) eat smaller portions
- 28.9% (n=13) eat less fast food
- 26.7% (n=12) cut back on calorie intake
- 26.7% (n=12) read nutrition labels
- 24.4% (n=11) cut back on fat intake
- 22.7% (n=10) sit less
- 20.0% (n=9) get more aerobic exercise
- 20.0% (n=9) eat less
- 15.6% (n=7) dine out less

Table 2. Health Related Characteristics

Topics	**N (%) or Mean (SD; range)**
Gestational Diabetes History in Females	
Yes	2 (1.6%)
No	123 (98.4%)
Close Family Member with Diabetes	
Yes	56 (35.4%)
No	102 (64.6%)
Household members with diabetes	
0	129 (81.6%)
1	26 (16.5%)
2	2 (1.3%)
3 or More	1 (0.6%)
Diabetes Diagnosis	
Yes	31 (20.0%)
No	122 (78.7%)
Don’t know/not sure	2 (1.3%)
Diabetes Type	
Type 1	2 (6.6%)
Type 2	26 (93.4%)
Perceived Health Status	
Excellent	16 (10.1%)
Very good	59 (37.1%)
Good	66 (41.5%)
Fair	18 (11.3%)
Poor	0 (0%)
Last routine checkup	
Within past year	152 (97.4%)
1-2 years	2 (1.3%)
2-3 years	1 (0.6%)

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Don't know/Not sure	1 (0.6%)
Days with Poor Physical/Mental Health (past 30)	1.34 (3.95; 0-25)
Unable to Access Healthcare due to cost (past yr) Yes No Prefer not to say	 3 (1.9%) 147 (94.8%) 5 (3.2%)
BMI Overweight Obese	28.26 (5.90, 18.30-43.45) 52 (32.7%) 58 (36.5%)
Hypertension Diagnosis Yes No	 101 (63.9%) 57 (36.1%)
Physically Active Yes No	 134 (86.5%) 21 (13.5%)
Pre-Diabetes Risk Score Cut-off scores <5 5 or greater	5.47 (1.6; 3-9) 32 (33.7%) 63 (66.3%)
HCP Told of High Diabetes Risk/Pre-Diabetes Yes No Don't know/not sure	 45 (29.8%) 96 (63.6%) 2 (1.3%)
Stage of Change-Physical Activity Pre-Contemplation Contemplation Preparation Action Maintenance	 17 (11.3%) 17 (11.3%) 7 (4.6%) 26 (17.2%) 84 (55.6%)
Stage of Change-Fruits and Vegetables Pre-Contemplation Contemplation Preparation Action Maintenance	 29 (19.1%) 23 (15.1%) 20 (13.2%) 21 (13.8%) 59 (38.8%)
Stage of Change-Avoid High Fat Protein Foods Pre-Contemplation Contemplation Preparation Action Maintenance	 29 (19.1%) 9 (5.9%) 4 (2.6%) 16 (10.5%) 94 (61.8%)
Stage of Change-Avoid High Fat Dairy Foods Pre-Contemplation Contemplation Preparation	 32 (21.1%) 11 (7.2%) 3 (2.0%)

Action Maintenance	15 (9.9%) 91 (59.9%)
Days/Week Followed Healthful Eating Plan	4.26 (2.57, 0-7)
Days/Week Ate ≥5 Fruits/Vegetables	3.78 (2.47, 0-7)
Days/Week Ate High Fat Foods	2.10 (1.84, 0-7)
Days/Week Engaged in 30 Minutes of Physical Activity	4.05 (2.53, 0-7)
Smoke Yes No	 10 (6.6%) 141 (93.4%)
Average Sleep Hours/Night	7.09 (1.43; 4-16)

Table 3 presents the descriptive results for health behaviors for the three risk groups. For stages of change, the majority (59-84%) across groups reported being in action/maintenance stages for physical activity, avoiding high-fat protein intake (68-87%), and avoiding high-fat dairy foods (66-81%). A smaller proportion of participants reported being in the action/maintenance stages for fruit and vegetable intake, ranging from 41% (diabetes group) to 58% (lower risk group). The lower-risk group consistently reported greater numbers in action and maintenance than the other two groups. Chi-square comparisons did not identify any statistically significant differences between groups; however, physical activity was approaching significance (<.054). Examination of the days per week that individuals engaged in various health behaviors showed that the lower risk group reported the greatest engagement with each positive health behavior. For frequency of following a healthful eating plan, a one-way ANOVA comparison with follow-up Bonferroni post-hoc tests identified significant differences between the lower risk and higher risk groups ($F(2,144) = 3.84$, $p = .024$). The lower risk group also reported lower rates of smoking, although not statistically significant.

Table 3. Health Behaviors by Risk Group

Topics	**Diabetes (%/Mean, SD, n)**	**Risk Test Score ≥5**	**Risk Test Score <5**
Stage of Change-Physical Activity			
Pre-Contemplation	13.8 (4)	8.9 (7)	7.9 (3)
Contemplation	13.8 (4)	11.4 (9)	7.9 (3)
Preparation	13.8 (4)	3.8 (3)	0 (0)
Action	24.1 (7)	20.3 (10)	5.3 (2)
Maintenance	34.5 (10)	56.7 (44)	78.9 (30)
Stage of Change-Fruits and Vegetables			
Pre-Contemplation	34.5 (10)	17.5 (14)	7.9 (3)
Contemplation	17.2 (5)	13.8 (11)	18.4 (7)
Preparation	6.9 (2)	13.8 (11)	15.8 (6)
Action	10.3 (3)	17.5 (14)	10.5 (4)
Maintenance	31.0 (9)	37.5 (30)	47.4 (18)

Stage of Change-Avoid High Fat Protein Foods			
Pre-Contemplation	20.7 (6)	21.3 (17)	13.2 (5)
Contemplation	3.4 (1)	8.8 (7)	0 (0)
Preparation	3.4 (1)	2.5 (2)	0 (0)
Action	20.7 (6)	8.8 (7)	5.3 (2)
Maintenance	51.7 (15)	58.8 (47)	81.6 (31)
Stage of Change-Avoid High Fat Dairy Foods			
Pre-Contemplation	20.7 (6)	21.0 (17)	13.5 (5)
Contemplation	10.3 (3)	8.6 (7)	2.7 (1)
Preparation	3.4 (1)	1.2 (1)	2.7 (1)
Action	13.8 (4)	7.4 (6)	13.5 (5)
Maintenance	51.7 (15)	61.7 (50)	67.6 (25)
Days/Week Followed Healthful Eating Plan	4.07 (2.31, 29)	3.95 (2.74, 81)	5.30 (2.07, 37)
Days/Week Ate ≥5 Fruits/Vegetables	3.37 (2.53, 27)	3.60 (2.42, 80)	4.67 (2.47, 36)
Days/Week Ate High Fat Foods	2.64 (1.91, 28)	2.08 (1.83, 77)	1.89 (1.80, 36)
Days/Week Engaged in 30 Minutes of Physical Activity	3.86 (2.49, 28)	3.91 (2.57, 80)	4.84 (2.29, 37)
Smoke	26 (89.7%)	75 (92.6%)	35 (97.2%)
Yes	3 (10.3%)	6 (7.4%)	1 (2.8%)
No			

Note: Response interpretation for "Days/Week Ate High Fat Foods" is the opposite direction of other items in this question group.

The responses to the question "What do you know about pre-diabetes?" indicated that the majority reported knowing little to nothing (56%) with main themes of responses focused on knowledge of lifestyle factors (e.g., diet, weight), impact of diabetes on the body (e.g., A1C, pancreas functioning), and an awareness of diabetes risk (e.g., reversible, leads to diabetes).

Discussion

In this study, we examined reported diabetes/pre-diabetes occurrence, risk factors, and lifestyle behaviors in older adults attending two senior centers in Delaware. In addition, lifestyle behaviors and intentions for behavior change were examined across three diabetes risk subgroups (diabetes diagnosis, lower risk, and higher risk). Lastly, awareness of diabetes risk and efforts to address risk were examined for those told of their risk by a healthcare provider.

Our findings revealed that 20% of participants reported being told by a healthcare provider that they have diabetes. These findings are similar to rates found for adults over 65 in Delaware (23.7%).[2] In addition, 29.8% reported being told by a provider that they had pre-diabetes or were

at higher risk of diabetes. Since this is self-report data, the actual number of those informed of their status or risk is unclear. Of those who did not report being told they had diabetes or pre-diabetes in our study, 66.3% were identified as potentially at higher risk for diabetes based on their risk test scores. The finding that over half of responses (56%) noted knowing little to nothing when asked what they know about pre-diabetes suggests an important gap exists in their knowledge about diabetes risk. Addressing this gap might help facilitate lifestyle changes to support diabetes prevention in this higher-risk group. One positive finding is that those who reported being told of their risk by a healthcare provider also reported engaging in key lifestyle strategies to reduce their risk. For example, over 60% noted that they focused on aspects of healthy eating (e.g., eating fruits and vegetables), getting physical activity, and losing weight, which represent central diabetes prevention messages. In contrast, only a small proportion of individuals reported engaging in other helpful, healthy eating and physical activity behaviors, such as sitting less and reading food labels. Therefore, there is room for continued education about the variety of behaviors that may support diabetes prevention.

These findings are consistent with those of a recent study examining national data on adults with body mass indices in the overweight/obese range and HbA1c in the prediabetes range.[18] The Demosthenes et al study[18] found that close to a third (31.6%) reported being told by a provider that they had pre-diabetes and/or were at risk for diabetes. While only 18.3% indicated they were told to lose weight, those individuals informed of either pre-diabetes or risk of diabetes were more likely to try to lose weight than other individuals. These findings underscore the benefits of communicating about both pre-diabetes and risk of diabetes in facilitating lifestyle change. This is especially important within patient-provider interactions but may also extend to other potential health education opportunities for older adults, such as health-related screenings or health education events offered at senior centers.

Most of our survey participants reported that they engaged in regular physical activity and multiple healthy eating behaviors. However, nearly half reported that they were not regularly eating five fruits and vegetables per day, and 27-30% were not in the action/maintenance stages of change for the other behaviors examined. In contrast, when asked how many days per week they engaged in healthy lifestyle behaviors, they reported doing so an average of about 4 days per week. It may be that these individuals are participating in physical activity or exercise classes while at the senior centers, but not engaging in much physical activity at other times. Similarly, with healthy eating behaviors, our participants seem to be engaging in some healthy behaviors but still may have room for improvement. This suggests that while they are engaging in healthy lifestyle behaviors some of the time, there is still an opportunity to educate about and promote healthy behaviors that may help lower the risk for pre-diabetes and diabetes.

Furthermore, a comparison of risk groups suggests that the lower risk group may engage in more healthy behaviors than the higher risk group, although statistically significant differences were only found for following a “healthful eating plan”. These findings emphasize the value of raising awareness of diabetes risk and healthy lifestyle behaviors that may reduce risk, especially in those at higher risk.

Limitations

This study should be interpreted within the context of its limitations. In particular, this study included self-report measures and represents a sample of convenience within two senior centers in Delaware. Therefore, the study is vulnerable to common biases of self-report data (e.g., social-

desirability, recall) and limited generalizability based on the inclusion of only two senior centers in one state. Future research is needed and would benefit from including a measure of blood glucose and collecting data from a larger number of senior centers across Delaware and, ideally, other states. These strategies would help further expand our understanding of this population and setting in relation to diabetes prevention and would support broader generalizability of the findings.

Conclusion

This study describes the patterns of diabetes occurrence, risk factors, and lifestyle behaviors in individuals attending two senior centers in Delaware. Potential gaps in older adults' awareness of pre-diabetes and diabetes risk were identified. As noted in the introduction, there are currently multiple educational opportunities available in Delaware for people with and at risk of diabetes. For example, Delaware Health and Social Services offers the Diabetes Self-Management Program in community sites, including senior centers, across the state of Delaware to provide education for people with diabetes. There are also Diabetes Prevention Programs across Delaware to support diabetes prevention efforts, including the expansion of Medicare coverage for the Diabetes Prevention Program to support diabetes prevention efforts in older adults. In addition, senior centers in Delaware currently offer many types of health and lifestyle programs for their members that address aspects of diabetes prevention. Senior centers provide a convenient opportunity to reach older adults to offer tailored educational approaches to raise awareness of diabetes risk, and link individuals with current senior center, state, and other programs to further support diabetes prevention in this population.

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Acknowledgements

The content of this paper is solely the responsibility of the authors.

The authors would like to thank and acknowledge the staff and members of the Howard Weston and Mid-County Senior Centers. We would also like to thank the numerous students who supported this work, especially Qiulin (Shirley) Chen, Sophia Kayatta, Rachel Sampson, and Megan Fitzpatrick.

References

1. Centers for Disease Control and Prevention. (2026, Jan). National diabetes statistics report website. https://www.cdc.gov/diabetes/php/data-research/index.html
2. Delaware Department of Health and Social Services. (2025). The impact of diabetes in Delaware 2025. Division of Public Health, Diabetes and Heart Disease Prevention and Control Program and Division of Medicaid & Medical Assistance; and Delaware Department of Human Resources, Statewide Benefits Office. https://dhss.delaware.gov/wp-content/uploads/sites/10/2025/07/2025-Impact-of-Diabetes-in-DE_FINAL.pdf
3. Knowler, W. C., Barrett-Connor, E., Fowler, S. E., Hamman, R. F., Lachin, J. M., Walker, E. A., & Nathan, D. M., & the Diabetes Prevention Program Research Group. (2002, February 7). Reduction in the incidence of type 2 diabetes with lifestyle intervention or

metformin. *The New England Journal of Medicine*, *346*(6), 393–403. https://doi.org/10.1056/NEJMoa012512 PubMed

4. Diabetes Prevention Program Research Group. Knowler, W. C., Fowler, S. E., Hamman, R. F., Christophi, C. A., Hoffman, H. J., Brenneman, A. T., Brown-Friday, J. O., Goldberg, R., Venditti, E., & Nathan, D. M. (2009). 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. *Lancet (London, England), 374*(9702), 1677–1686. https://doi.org/10.1016/S0140-6736(09)61457-4
5. Diabetes Prevention Program Research Group. (2015, November). Long-term effects of lifestyle intervention or metformin on diabetes development and microvascular complications over 15-year follow-up: The Diabetes Prevention Program Outcomes Study. *The Lancet. Diabetes & Endocrinology*, *3*(11), 866–875. https://doi.org/10.1016/S2213-8587(15)00291-0 PubMed
6. Gruss, S. M., Nhim, K., Gregg, E., Bell, M., Luman, E., & Albright, A. (2019, August 5). Public health approaches to type 2 diabetes prevention: The US national diabetes prevention program and beyond. *Current Diabetes Reports*, *19*(9), 78. https://doi.org/10.1007/s11892-019-1200-z PubMed
7. Centers for Disease Control and Prevention. (2020). Behavioral risk factor surveillance system survey questionnaire. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.
8. Centers for Disease Control and Prevention. (n.d.). ADA/CDC prediabetes risk test. https://www.cdc.gov/diabetes/prevention/pdf/Prediabetes-Risk-Test-Final.pdf
9. Chima, C. C., Anikpezie, N., Wade, B. C., Pongetti, L. S., Powell, T., & Beech, B. (2020). Validity of the American Diabetes Association diabetes risk test in a low-income African-American population. Diabetes, 69 (Supplement 1),1442-P https://doi.org/10.2337/db20-1442-P
10. Kim, M. M., Kreider, K. E., Padilla, B. I., & Lambes, K. (2023). Implementation of a prediabetes risk test for an underserved population in a federally qualified health center. *Clinical Diabetes*, *41*(1), 102–109. https://doi.org/10.2337/cd21-0057 PubMed
11. Poltavskiy, E., Kim, D. J., & Bang, H. (2016, August). Comparison of screening scores for diabetes and prediabetes. *Diabetes Research and Clinical Practice*, *118*, 146–153. https://doi.org/10.1016/j.diabres.2016.06.022 PubMed
12. Prochaska, J. O., & Velicer, W. F. (1997, September-October). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, *12*(1), 38–48. https://doi.org/10.4278/0890-1171-12.1.38 PubMed
13. Ruggiero, L. (2000). Helping people with diabetes change behavior: From theory to practice. *Diabetes Spectrum*, *13*, 125132.
14. Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000, July). The summary of diabetes self-care activities measure: Results from 7 studies and a revised scale. *Diabetes Care*, *23*(7), 943–950. https://doi.org/10.2337/diacare.23.7.943 PubMed
15. Qualtrics© (2024). Provo, Utah. https://www.qualtrics.com

16. Corp, I. B. M. Released 2022. IBM SPSS Statistics for Windows, Version 29.0. Armonk, NY: IBM Corp.

17. Hsieh, H. F., & Shannon, S. E. (2005, November). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687 PubMed

18. Demosthenes, E. J., Freedman, J., Hernandez, C., Shennette, L., Frisard, C. F., Lemon, S. C., . . . Amante, D. J. (2024, August 11). Preventing diabetes: What overweight and obese adults with prediabetes in the United States report about their providers' communication and attempted weight loss. *Preventive Medicine Reports*, *46*, 102859. https://doi.org/10.1016/j.pmedr.2024.102859 PubMed