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DODGE<sup>®</sup> Diabetes: Prediabetes Awareness and Increasing Attendance at Diabetes Prevention

Programs

A dissertation submitted in partial satisfaction of the

requirements for the degree

Doctor of Nursing Practice

by

Sonia Ildelisa Betancourt

2023

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## ABSTRACT OF THE DISSERTATION

DODGE<sup>®</sup> Diabetes: Prediabetes Awareness and Increasing Attendance at Diabetes Prevention  
Programs

by

Sonia Betancourt

Doctor of Nursing Practice

University of California, Los Angeles, 2023

Professor Catherine Carpenter

**Background:** Prediabetes places individuals at higher risk of developing type 2 diabetes (T2DM), cardiovascular disease, and stroke. One-third of US adults have prediabetes. Nationwide, there have been missed opportunities where eligible patients were not screened, diagnosed, or treated for prediabetes. The Diabetes Prevention Program (DPP) is a highly effective intervention for diabetes prevention, yet attendance at DPP is often incomplete. This dissertation builds on DPP with an intervention that promotes prediabetes awareness through telephone outreach and encourages DPP attendance, called DODGE<sup>®</sup> Diabetes (DODGE<sup>®</sup>-

**Drink water-** avoid sugary drinks; **Optimize sleep;** **Daily mindfulness;** **Get active:** 150 minutes per week; and **Enjoy more fruits and vegetables).** DODGE<sup>©</sup> compliments the existing DPP through group classes on prediabetes, weekly text reminders, and monthly one-on-one coaching.

**Objectives:** DODGE<sup>©</sup> aims to increase awareness in adults with prediabetes (hemoglobin A1C between 5.7% to 6.4%) and promote attendance at DPP. **Methods:** In a clinic in California, adults with a body mass index (BMI) greater than 25 kg/m<sup>2</sup> and prediabetes were outreached through a telephone call and invited to DODGE<sup>©</sup>. Fourteen adults participated in DODGE<sup>©</sup>. The intervention included getting additional information about prediabetes, attending the existing 16 weekly DPP, receiving weekly reminders to attend the DPP, and monthly one-on-one calls. DODGE<sup>©</sup> implemented the Transtheoretical Model (TTM) by promoting lifestyle behavior change to participants and evaluating the five stages of change experienced by the DODGE<sup>©</sup> participants. A quasi-experimental design with pre-and post-measurement was collected to compare DODGE<sup>©</sup> and non-DODGE<sup>©</sup> DPP participants. Descriptive statistics characterized variable distributions; t-tests and Chi-Square were used to evaluate group differences. **Results:** On average, the fourteen DODGE<sup>©</sup> participants attended 80 % of the weekly Healthy Balance (DPP) classes compared to non- DODGE<sup>©</sup> of 55% (p-value= 0.02). Participants reported that text messages were helpful reminders to attend the DPP classes. Thirteen DODGE<sup>©</sup> participants progressed in the TTM from the contemplation to the action phases, and one continued in the maintenance phase. **Conclusion:** Telephone outreach and additional education increased prediabetes awareness. The prediabetes education group classes, weekly text reminders, and monthly calls promoted DPP attendance and adherence.

The dissertation of Sonia Betancourt is approved.

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2023

This dissertation is dedicated to my loving and supportive family, friends, colleagues, professors, and classmates. As a woman of faith, I trust God supplied all my needs and provisions to get me through this project. My lifelong companion and spouse, Miguel Betancourt, thank you for insisting I pursue my dream of attending UCLA and for your unwavering support. Thank you for reminding me that getting a doctorate is not easy and to keep going. My children, Stephanie, and Miguel, for being my cheerleaders and for your unconditional love and support. I appreciate your willingness to help me whenever I need your assistance. I am grateful to my mom, Minnie, for her constant encouragement. The long 3–4-hour drives from UCLA were tolerable thanks to my dad, Eduardo Buelna, and Araceli, my stepmom, for keeping me company on the phone. I would have settled for any doctorate school if it were not for Jennifer Keller. She planted the seed for me to pursue my dream of attending UCLA, and I am forever grateful. To my dear friend, Teresa Grady, for the frequent messages and uplifting calls. To my colleagues, Tracy Eddins, Josh Chodakaukas, Dr. Ismail, and Dr. Sgambelluri, who stood up for me to facilitate this project. I also dedicate this dissertation to my DNP cohort, Korie, Kathy, Sarah, Bernice, Tiffany, Maki, Carina, Kate, Simona, Christine, and Terri. I would be remiss if I did not dedicate this dissertation to Dr. Catherine Carpenter, Dr. Nancy-Jo Bush, Dr. Theresa Brown, and Soo Kwon, who devoted countless hours to guiding, coaching, and inspiring me to take this project to the highest level.

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## CHAPTER ONE: INTRODUCTION

In the U.S., approximately one-third of adults have prediabetes (Hemoglobin A1C between 5.7%- 6.4%); 80% are unaware they have prediabetes and consequently are at risk for type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), and stroke (Centers for Disease Control and Prevention, n.d.). Risk factors associated with prediabetes include a body mass index (BMI) greater than 25 kg/m<sup>2</sup> (overweight) or a BMI greater than 30 kg/m<sup>2</sup> (obesity) and a sedentary lifestyle (Bays & McCarthy, 2021). Obesity, an underlying determinant of prediabetes, is associated with roughly 200 comorbid disorders, complications, and more than \$300 billion annually in medical costs (Alva et al., 2022; Gruss et al., 2019). Obesity is also the second leading cause of preventable deaths in the U.S. (Wang et al., 2020; Ward et al., 2019). Comparably, T2DM places individuals at higher risk for serious health complications (heart disease, blindness, kidney disease, and limb amputations) and \$327 billion/year in diabetes-related healthcare costs (American Diabetes Association, 2018; Chobot et al., 2018).

Obesity and T2DM are recognized as epidemics by the World Health Organization (WHO) (Chobot et al., 2018). The World Obesity Federation identified a correlation between increased body weight and the risk for T2DM (Bray et al., 2017). The rising prevalence of obesity and T2DM in the U.S. represent a significant public health concern due to the cascade of detrimental health outcomes and escalating annual healthcare costs (Gruss et al., 2019; Wang et al., 2020). Racial and ethnic minorities and those with low socioeconomic status (SES) are more likely to be affected by T2DM and unhealthy weight (Wang et al., 2020). Race and ethnicities at higher risk for prediabetes include African Americans, Hispanics/Latinos, American Indians, Pacific Islanders, and some Asian Americans (Centers for Disease Control and Prevention, n.d.). Public health can be improved through data-driven objectives.

Healthy People 2030 sets data-driven objectives to improve the nation’s health over the next decade to ameliorate the health outcomes of individuals affected by unhealthy weight and risk for T2DM. Healthy People 2030 objectives related to diabetes prevention include raising awareness of prediabetes among at-risk adults and increasing attendance at the Diabetes Prevention Programs (DPP) (Office of Disease Prevention and Health Promotion, n.d.-a, n.d.-b). The objective related to obesity is to reduce the proportion of adults with obesity from 41.8% to 36% (Office of Disease Prevention and Health Promotion, n.d.-c). As an evidence-based lifestyle change program, DPP aims to improve the nation’s health by implementing interventions to promote weight loss and reduce the risk of developing T2DM (CDC, n.d.).

**Prediabetes, Diabetes, and Obesity Recommendations**

The American Diabetes Association (ADA) recommends prediabetes and T2DM screening and diagnosing at-risk adults, as shown in Table 1 and Table 2 (American Diabetes Association Professional Practice Committee, 2022). The U.S. Preventive Services Task Force (USPSTF) also recommends screening for prediabetes and T2DM in adults classified as overweight or obese with referrals to preventive interventions (USPSTF et al., 2018). Similarly, the USPSTF recommends that clinicians offer or refer individuals with a BMI  $\geq 30$  kg/m<sup>2</sup> to behavioral interventions. Table 3 shows classifications of body composition based on an individual’s BMI, waist circumference, and percent of body fat (Bays & McCarthy, 2021).

**Table 1:** *Diagnosing Prediabetes and Diabetes (clinical cut points)*

	<b>Hemoglobin A1C (percent)</b>	<b>Fasting Plasma Glucose (mg/dL)</b>	<b>Oral Glucose Tolerance Test (mg/dL)</b>
<b>Normal</b>	$\leq 5.6$	$\leq 99$	$\leq 139$
<b>Prediabetes</b>	5.7-6.4	100-125	140-199
<b>*Diabetes</b>	$>6.5$	$>126$	$\geq 200$

\*To diagnose diabetes, repeat the test on a separate day.

(American Diabetes Association Professional Practice Committee, 2022)



**Table 2: Criteria for screening for diabetes or prediabetes in asymptomatic adults**

<p>1. Testing should be considered in adults with overweight or obesity (BMI <math>\geq 25</math> kg/m<sup>2</sup> or <math>\geq 23</math> kg/m<sup>2</sup> in Asian American individuals) who have one or more of the following risk factors:</p> <ul style="list-style-type: none"> <li>• First-degree relative with diabetes</li> <li>• High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)</li> <li>• History of CVD</li> <li>• Hypertension (<math>\geq 130/80</math> or on therapy for hypertension)</li> <li>• HDL Cholesterol level <math>&lt; 35</math> and/or triglyceride level <math>&gt; 250</math> mg/dl</li> <li>• Individuals with polycystic ovarian syndrome</li> <li>• Physical inactivity</li> <li>• Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)</li> </ul> <p>2. People with prediabetes (A1C <math>\geq 5.7\%</math>, IGT, or IFG) should be tested yearly.</p> <p>3. People who were diagnosed with GDM should have lifelong testing at least every 3 years.</p> <p>4. For all other people, testing should begin at age 35 years.</p> <p>5. If results are normal, testing should be repeated at a minimum of 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.</p> <p>6. People with HIV</p>
<p>CVD (cardiovascular disease); GDM (gestational diabetes); IFG (impaired fasting glucose); IGT (impaired glucose tolerance); HIV (human immunodeficiency virus)</p>

(American Diabetes Association Professional Practice Committee, 2022)

**Table 3: Classification of Body Composition**

	<b>Underweight</b>	<b>Normal Weight</b>	<b>Overweight</b>	<b>Obesity Class 1</b>	<b>Obesity Class II</b>	<b>Obesity Class III</b>
<b>BMI Kilograms/meter square</b>	$< 18.5$ kg/m <sup>2</sup>	18.5- $< 25$ kg/m <sup>2</sup>	$\geq 25.0$ -29.9 kg/m <sup>2</sup>	30 to $< 35$ kg/m <sup>2</sup>	35 to $< 40$ kg/m <sup>2</sup>	$> 40$ kg/m <sup>2</sup>
<b>Male Waist Circumference</b>				$\geq 102$ cm If Asian: $\geq 90$ cm.		
<b>Female Waist Circumference</b>				$\geq 88$ cm. If Asian: $\geq 80$ cm.		
<b>Male percent body fat</b>		18-24%		$\geq 25\%$		
<b>Female percent body fat</b>		25-31%		$\geq 32\%$		

(Bays & McCarthy, 2021)

Healthcare providers are encouraged to screen and test for prediabetes and refer high-risk individuals to lifestyle modification programs (Gruss et al., 2019; Nhim et al., 2018). The Look AHEAD (Action for Health in Diabetes) seminal studies are multicenter, randomized control trials which evaluated the effects of lifestyle interventions of intentional weight loss of individuals with T2DM and CVD health outcomes (Knowler et al., 2002; The Look AHEAD Research Group, 2014; “The Look AHEAD Study,” 2006). The lifestyle intervention goals were for participants to achieve a  $\geq 5\text{-}7\%$  initial weight loss from their baseline weight and increase physical activity to  $\geq 175$  minutes per week. Research has shown that a healthy lifestyle and weight loss of 5-7% can delay or prevent T2DM by 58% and improve secondary health outcomes (Cannon et al., 2020; Gruss et al., 2019; Ritchie et al., 2019; Uusitupa et al., 2019).

Although lifestyle modification shows improved health outcomes in individuals with unhealthy weight and at high risk for T2DM, studies show missed opportunities in diabetes prevention in the U.S. healthcare system (Ali et al., 2019; Mainous et al., 2022). In a study of 21,448 persons eligible for prediabetes screening, 62.8% received prediabetes screening, 25.5% screened positive for prediabetes, 94.6% did not receive a diagnosis, and 185 received the diagnosis (Mainous et al., 2022). Of those 185 with a prediabetes diagnosis, none received treatment after receiving a positive prediabetes diagnosis.

In a study by Ali et al. (2019), 50,912 persons were at high risk for diabetes and found major gaps in getting lifestyle modification advice or referrals to DPP by healthcare providers. Studies also stress that individuals didn't seek lifestyle education because they were unaware of their prediabetes diagnosis, and information on available DPP has jeopardized the population health (Javed et al., 2022; Lim et al., 2020; Nhim et al., 2018; Valero-Elizondo et al., 2019).

## **Population Health**

Population health in Riverside, California, continues to be of significant concern due to the increased prevalence of obesity, diabetes, and the community's social determinants of health (SDOH), placing them at risk for disease (SHAPE, 2021). Adults in Riverside County are negatively affected by SDOH, including a low SES, limited education, increased unemployment, access to care, unsafe neighborhoods, and lack of social support. Predominantly African Americans and Hispanics reside in Riverside County (KFH-Riverside, 2020). Racial and ethnic minorities often experience delays in access to care, timeliness of care, and poor health outcomes placing individuals at greater risk for obesity and diabetes (Agency for Health Care Research and Quality, n.d.; Wang et al., 2020).

Delays in access to care can be due to weight bias and fat shaming, both of which impede successful obesity management (Cassin et al., 2019; Hill et al., 2021). Weight bias is ethically important in terms of harmful stereotypes insinuating that people affected by obesity are lazy and lack willpower (Cassin et al., 2019). Weight stigma can lead clinicians to stereotype, social exclusion, and devalue individuals based on their weight (Hill et al., 2021). Additionally, weight stigma can result in public health consequences such as disregarding genetic, environmental, and societal contributors to obesity and, in turn, increased health disparities and the provocation of social inequalities (Hill et al., 2021). To promote effective treatment, a patient-centered approach to obesity management uses person-first language and respectful communication (Fastenau et al., 2019). To maintain consistency, unhealthy weight, as a term, will be used in this manuscript to describe overweight and obesity.

## **Problem Statement**

Diabetes and obesity are recognized as serious epidemics by the WHO and a threat to the nation's economy (Chobot et al., 2018). Research shows that DPP is the most effective intervention for diabetes prevention, yet, the attendance of DPP participants is inadequate and leads to suboptimal weight loss (Alva et al., 2022; Knowler et al., 2002; The Look AHEAD Research Group, 2014; "The Look AHEAD Study," 2006). Despite evidence of the effectiveness of lifestyle modifications in preventing T2DM, referrals to DPP by U.S. healthcare providers remain suboptimal (Ali et al., 2019; Mainous et al., 2022). There is higher diabetes prevalence in ethnic minorities, and the fragmentation of the healthcare system leads to missed opportunities in high-risk populations (Alva et al., 2022).

The DPP is implemented differently in different healthcare systems. In a large Health Maintenance Organization (HMO) in Riverside, California, the Center for Healthy Living (CHL) specializes in evidence-based practice (EBP), lifestyle, and behavior change programs (Center for Healthy Living, n.d.). Interprofessional collaboration facilitates the HMO's DPP. Healthy Balance, a 16-weekly group weight loss program (phase 1), and Wellness Coaching, six monthly one-on-one support calls (phase 2), are the interprofessional programs offered by CHL. The CDC and the Diabetes Prevention Recognition Program (DPRP) recognize Healthy Balance and Wellness Coaching by Phone programs as the HMO's DPP. The CHL collaborates with Preventive Medicine and comprises an interprofessional weight-loss team. Nurse practitioners (NP) specifically working in Preventive Medicine are well-placed to close the gaps in diabetes prevention and weight-management strategies by promoting the DPP.

## **Gap Analysis**

A gap analysis of data from July 2022 concluded that the participants in the HMO needed to meet the attendance criteria listed in the DPRP standards (CDC, 2021). To meet DPRP standards, the CHL's DPP must retain at least five completers in the cohort who attended at least eight out of 16 sessions in the first six months. The report showed that one participant in the cohort attended at least eight out of 16 sessions. The participant's behaviors of unsatisfactory attendance and not achieving the weight loss goal of greater than 5% or a decrease in A1C by 0.2% placed the DPP participants at risk of developing T2DM. According to the HMO's DPRP monitoring report, retention and attendance at Healthy Balance classes have been identified as inadequate. Poor retention and not attaining the required attendance criteria increase the chances of the HMO's DPP losing funding provided by the CDC. Not meeting the DPRP's Standards of Practice (SOP) requirements can be attributed to poor health experienced by the population in Riverside County. The gap analysis identified an opportunity to innovate a strategy to promote clinical prevention and improve population health by promoting prediabetes awareness, attendance to the DPP, and encouraging a healthy lifestyle.

## **DNP Leadership Role in Evidence-Based Practice**

As a Doctor of Nursing Practice (DNP) prepared leader and DODGE<sup>®</sup> Diabetes (DODGE<sup>®</sup>) facilitator, DODGE<sup>®</sup> was designed with the DNP Essential VII in mind. Essential VII focuses on clinical prevention and population health to improve the Nation's health (*The Essentials of Doctorate Education for Advanced Nursing Practice*, 2006). DODGE<sup>®</sup> is an intervention for improving population health by facilitating increased knowledge of prediabetes, promoting better adherence to DPP, encouraging weight loss, and preventing or delaying T2DM through EBP implementations.

## **DODGE Diabetes<sup>®</sup>**

DODGE<sup>®</sup> is a marketing strategy and quality improvement (QI) project created by Sonia Betancourt, NP, to promote prediabetes awareness and attendance at DPP. DODGE<sup>®</sup> is the acronym for **D**rink water- avoid sugary drinks; **O**ptimize sleep; **D**aily mindfulness; **G**et active: 150 minutes per week; and **E**njoy more fruits and vegetables. The development of DODGE<sup>®</sup> was inspired by the word dodge, as in to avoid something and the game dodgeball. DODGE<sup>®</sup> is also built upon the fundamental constructs of the HMO DPP, known as Healthy Balance, and the core curriculum of the National DPP (CDC, 2021). DODGE<sup>®</sup> aims to promote prediabetes awareness and adherence to the DPP through outreach, prediabetes education group class, weekly text reminders, and monthly one-on-one coaching.

DODGE<sup>®</sup> comes at a critical time for the health of the U.S. population, especially in Riverside County, California. DODGE<sup>®</sup>'s objectives align with the CDC, National DPP, and the HMO's DPP of promoting attendance to the DPP to prevent or delay T2DM. DODGE<sup>®</sup> supports the HMO's DPP in encouraging EBP, patient-centered nutritional counseling, physical activity, and behavior therapy.

DODGE<sup>®</sup> is also in alignment with the HMO's commitment to improving the health of its members by providing high-quality care (Kaiser Permanente, n.d.). The HMO provides first-rate care and ensures health equity by increasing access to DPP among vulnerable populations. Like the HMO, DODGE<sup>®</sup> proposes to eliminate racial disparities by addressing the inequities of structural racism and injustices that occur among the community's most vulnerable populations. To align with the HMO's commitment to high-quality, affordable care, research was used to guide the DODGE<sup>®</sup> interventions.

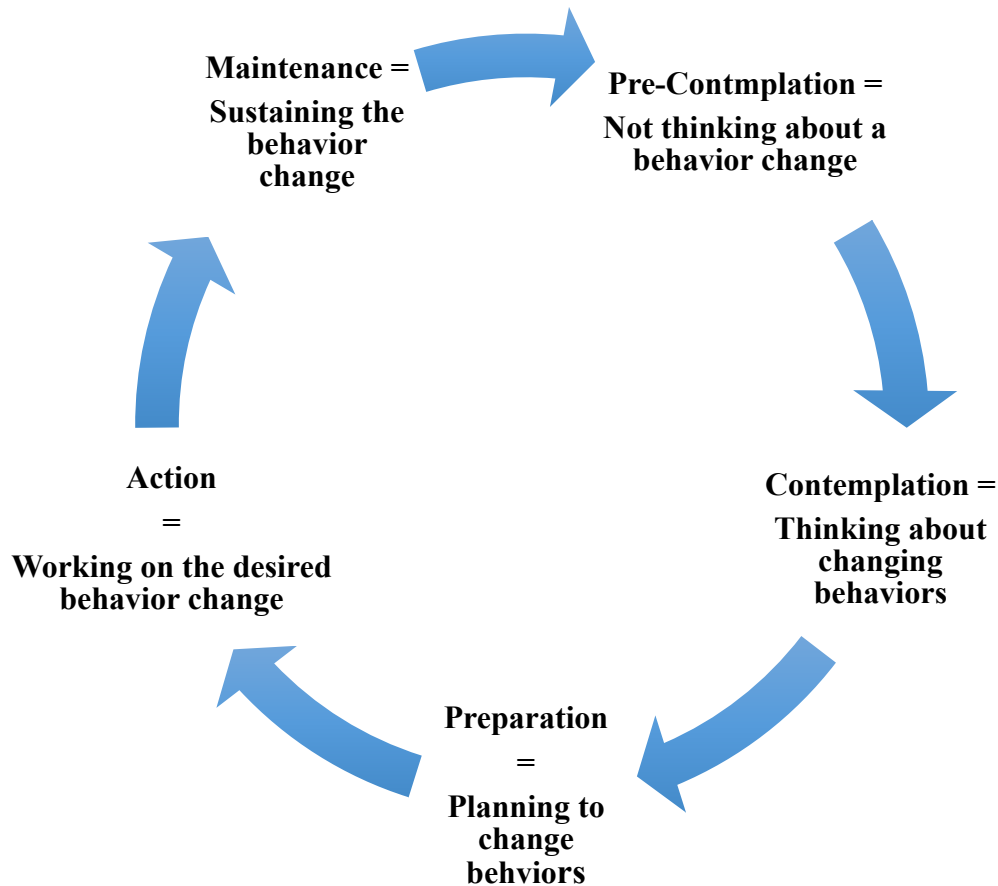
## **PICOT Question**

A clinical research question using the mnemonic PICOT (patient, intervention, comparison, outcome, and time) was developed to find the best EBP for an intervention to improve attendance at DPP. The PICOT question used to elicit a suitable theoretical framework and literature search is: In adults with a BMI > 25 kg/m<sup>2</sup> and considered prediabetic (P), how does incorporating the DODGE<sup>®</sup> intervention into the DPP (I) compared to the current standard practice of not using DODGE<sup>®</sup> (C) affect the attendance and participation, and health status in the DPP Healthy Balance classes (O) within four months after beginning the program (T)?

## **CHAPTER TWO: THEORETICAL FRAMEWORK**

Attendance and participation at the DPP require behavior change. The Transtheoretical Model (TTM) of behavioral change is an effective weight management intervention (de Freitas et al., 2020; Prochaska & DiClemente, 1983). Since individuals are in different stages of change and readiness, altering behavior is not a coincidence but a process (Hashemzadeh et al., 2019). Pre-contemplation, contemplation, preparation, action, and maintenance are the five stages of the TTM (Tong, 2022). The TTM stages of change are effective weight management interventions and describe the individual's intention and commitment toward the desired health-related behavior change (de Freitas et al., 2020). Figure 1 shows the TTM of behavior changes commonly used to determine an individual's readiness to change. DODGE<sup>®</sup> intended to facilitate the participants to progress from the pre-contemplation, contemplation, or preparation stages to the action and maintenance stages. The purpose of the one-to-one calls was to use motivational interviewing to identify potential impeding behavior change and attendance.

**Figure 1:** *Transtheoretical Model Stages of Behavior Change*



For DODGE<sup>®</sup>, a short survey, including the S-Weight questionnaire, was included in the intake questionnaire (Appendix A) during the initial group education class. The S-Weight questionnaire determines which TTM stage of change the individual is in when attempting to lose weight (de Freitas et al., 2020). Ideally, individuals need to be in contemplation (thinking about it), preparation (making plans), or the action (doing something) stage to participate in DODGE<sup>®</sup>. The S-Weight questionnaire was repeated eight weeks from the initial questionnaire and upon completion at the sixteen-week mark. The goal of the monthly check-ins was to prevent relapse and promote the progression of the TTM to the maintenance stage.



## CHAPTER THREE: REVIEW OF LITERATURE

### Search Strategy

The approach for the literature search was conducted through CINAHL, Google Scholar, EMBASSE, PubMed, and other search engines from September 23, 2022, and continued through April 30, 2023. Study inclusion criteria from the database searches were limited to published dates: January 1, 2017, and May 2023 (except for seminal studies), English language, and age group (adults: 19-44 years, middle-aged: 45-64, and age: 65+). The exclusion criteria were animal studies, chapter books, and abstracts of scientific events. The titles of the literature were screened for relevancy. Articles containing medications for weight loss, diabetes, or prediabetes were excluded. The search was conducted for T2DM prevention in adults with BMI  $\geq 25$  kg/m<sup>2</sup>. The literature review aimed to find relevance and EBP to support DODGE<sup>®</sup>. The literature chosen exemplifies EBP interventions of behavior change in T2DM prevention and weight loss. Keywords and Boolean/phrases included: prediabetes, diabetes prevention, overweight, obesity, lifestyle modification, weight loss, and behavior change.

After reading the abstracts, articles that exemplified EBP interventions in prediabetes prevention and weight management were selected for review. The literature review intended to appraise, synthesize, and present the evidence to support the DODGE<sup>®</sup>. The Table of Evidence exemplifies the literature findings' purpose, sample, setting, methods, results, discussion, interpretation, and limitations. All the journals reviewed showed the value of lifestyle behavior change in promoting weight loss and preventing or delaying the development of T2DM. The studies also identified attendance at DPP as problematic and various interventions to ameliorate the inadequate attendance challenge.

## Literature Review

Gaps leading to low overall participation in DPP-like programs include prediabetes awareness, access to DPPs, and engagement (Ackermann & O'Brien, 2020). Ackerman et al. recognized challenges and opportunities for improvement in DPPs. A significant challenge identified was that despite having over 1500 organizations delivering DPP-like programs, total participation had reached approximately 0.4%. Descriptive statistics showed that most attendees were women and non-Hispanic whites, urging the need to engage in high-risk groups. The study determined that 11.8% of adults with prediabetes reported being told by their provider of their high-risk status, yet only one in 20 were referred to DPP. Of those being referred to DPP, only 40% participated in DPP. An opportunity for improvements was found in marketing approaches to increase program participation by high-risk individuals.

A randomized control trial conducted in Thailand between June 2020-September 2020 evaluated the effects of text messaging on promoting lifestyle changes in adults with prediabetes (Bootwong & Intarut, 2021). The study analyzed 322 (control= 162; intervention = 160) participants and concluded that automated text message self-management support was a feasible behavioral intervention that promoted physical activity. The study's primary outcome measured the intensity of physical activity, and the secondary outcomes measured included weight, BMI, waist circumference, and blood pressure. The study concluded that the intervention group had higher physical activity at eight weeks but no significant difference at 12 weeks. The secondary outcomes showed no significant differences. The limitation of the analysis is that the study consisted mostly of rural farmers interested in physical activity rather than the representative general population.

A nurse-led three-session motivational interviewing (MI) study using the TTM of behavior change assessed the efficacy of women with unhealthy weight and prediabetes (Kao et al., 2021). Approximately 52% (n=12) were unaware of their prediabetes diagnosis or associated consequences. The six-week study measured women (n=23) using pre-and post-test behavior change based on TTM and outcomes on A1C, blood pressure (BP), and waist circumference (WC). Despite the small sample size, the study noted no significant change in A1C (mean 5.98 vs. 5.97,  $p=0.83$ ) but did show a decreased systolic BP of 3.27 and diastolic BP of 2.77. A significant decrease in WC was noted ( $p = 0.01$ ,  $d=0.606$ , 95% CI = 0.144-1.056). Over 90% of the participants reported that MI-based sessions helped them change their eating habits and improve physical activity levels, expressing the desire to continue a healthier lifestyle.

A mixed-method, interventional research study examined the effects of a text messaging weight loss intervention on motivation, stage of change for weight loss, and BMI. Ninety-five emerging adults (ages 18-29 years) were included in the data analysis. Emerging adults have the highest incidence of unhealthy weight; this age group also has the highest attrition rate in DPP (Keating & McCurry, 2019). The study emphasizes the USPSTF recommendation of behavior modifications consisting of dietary changes, increased physical activity, individual counseling, and group interventions. The TTM of behavior change was used in the study as the basis for an intervention that used text messaging to increase motivation for weight loss. Emerging adults are comfortable using technology for communication and are less motivated by face-to-face weight loss interventions (Keating & McCurry, 2019). A daily text message was sent to the participants containing fundamental constructs of lifestyle modifications for weight loss. The authors concluded that text messaging complements counseling on lifestyle modifications, support, and reminders for weight loss in emerging adults.

More than 40% of emerging adults (ages 18-25) meet the criteria for unhealthy weight and are at risk for developing conditions such as diabetes (LaRose et al., 2020). LaRose et al. (2020) examined the use of motivational interviewing to enhance emerging adults' engagement in weight loss. A parallel control pilot trial assigned participants to the motivational interviewing-enhanced behavior weight loss (MIBWL) and standard care behavior weight loss (BWL) groups. Both groups had identical 12-week evidence-based BWL programs and contact schedules. The MIBWL group received motivational interviewing sessions one and two. While the research results did not reach a significance level, participants in the MIBWL demonstrated greater engagement in the program (77 % vs. 61%,  $p=0.11$ ; Cohen  $h = 0.47$ ), improved retention (71% vs. 48%,  $p = 0.1$ ; Cohen  $d = 0.26$ ) compared to the BWL group.

In Singapore, a mixed-methods study concluded a low education frequency for patients with prediabetes (Lim et al., 2020). Lim et al. (2020) assessed factors associated with prediabetes education and communication between primary care providers (PCPs) and patients with prediabetes. Of 433 adults ages 21-79 with prediabetes, 318 did not receive prediabetes education. The study found that a common denominator for individuals not receiving prediabetes education was attributed to needing to be informed of their diagnosis and not being referred by their provider. Providers seldom discuss prediabetes or refer them to DPP due to heavy patient load, poor understanding, or needing more skills or confidence (Lim et al., 2020). Participants reported seldom seeking education due to a lack of awareness of their prediabetes diagnosis or being unaware of available DPP programs. The limitations associated with the study included that the transcript needed to be shown to participants to ensure accuracy in documentation, and the self-reported data may have resulted in bias.

Nhim et al. (2018) assessed the association between providers' awareness of the CDC-recognized DPP and prediabetes screening, testing, and referrals to lifestyle change programs (LCP). The study sampled 1,256 primary care providers (PCP), including physicians and NPs, through a cross-sectional 144-question survey, the 2016 DocStyle. The study included the utilization of the STAT toolkit to promote prediabetes management. The STAT toolkit is an acronym for the three key steps: (1) Screen for prediabetes; (2) Test for prediabetes; (3) Act Today by referring patients to DPP (Nhim et al., 2018). The PCPs who had heard of the STAT toolkit screened for prediabetes and were likelier to test for prediabetes and refer patients to LCP. The findings concluded that 38% of PCPs were aware of DPPs, 27% screened persons with a high-risk test for diabetes, and 19% were aware of the STAT toolkit. According to Nhim et al., there's an opportunity to increase PCPs' prediabetes awareness and management through using the STAT toolkit and referral to LCP.

In a longitudinal cohort study in a Denver healthcare system, Ritchie et al. (2019) analyzed 75 out of 1140 participants in a DPP who received a pre-session protocol. The pre-session protocol included awareness of diabetes risks, motivational interviewing to participate in the DPP, and problem-solving around barriers (Ritchie et al., 2019). The study measured the duration and intensity of DPP attendance and weight loss. Pre-session participants stayed in the DPP 99.8 days longer ( $p < .001$ ) and attended 14.3% more sessions ( $p < .001$ ) compared to those without a pre-session. Pre-session participants were 3.5 times more likely to have > 5% weight loss. The study concluded that pre-sessions might improve DPP outcomes by increasing perceived risk, promoting readiness to change and self-efficacy, and helping cope with potential barriers.

A mixed-methods study collected qualitative information from patient and clinician surveys to assess patient and clinician perceptions of prediabetes in an academic family medicine practice (Roper et al., 2019). The analysis aimed to increase the use of DPP in individuals at risk for developing T2DM, as defined by their most recent hemoglobin A1C result within 5.7%-6.4%. The study included qualitative data from three of 15 focus groups using thematic analysis and quantitative data from Likert-scaled surveys from clinicians (n=31). A semi-structured interview guide was used to facilitate discussions. Of the 15 focus groups, more than 50% were unaware of their prediabetes status. Roper et al. (2019) concluded that increased patient prediabetes awareness and patient-centered education are needed to overcome barriers to prediabetes care.

Provider lifestyle modification counseling in persons with prediabetes and diabetes was examined between 2016 and 2017 using the National Health Interview Survey (NHIS) data. The study describes how prediabetes and diabetes often co-exist with unhealthy weight, and the first step in management is lifestyle modification (Valero-Elizondo et al., 2019). The study included 52,268 adults who met the criteria of having prediabetes or diabetes and unhealthy weight. Valero-Elizondo et al. (2019) found that 75-78% of those counseled said the advice was related to calorie restriction, and 64-70 % was related to increasing physical activity. Two-thirds of the individuals surveyed reported not receiving advice related to a referral to a weight loss program. The survey concluded that providers must follow the USPSTF recommendations of screening and counseling all adults with BMI  $\geq$  30 kg/m<sup>2</sup> for the LCP (USPSTF et al., 2018; Valero-Elizondo et al., 2019).

## Synthesis of Literature Review

The ten selected studies employed various study designs and methodologies. The literature synthesis supports the DODGE interventions of promoting prediabetes awareness, education, text messaging, and facilitating progression in the TTM in promoting lifestyle behavior change. The studies reviewed emphasized the value of EBP programs in lifestyle behavior change in the prevention of T2DM and weight loss (Ackermann & O'Brien, 2020; Bootwong & Intarut, 2021; Kao et al., 2021; Keating & McCurry, 2019; LaRose et al., 2020; Lim et al., 2020; Nhim et al., 2018; Roper et al., 2019; Valero-Elizondo et al., 2019). Five studies emphasized prediabetes awareness and education, three highlighted the use of text messaging, and four showed the value of one-to-one coaching in promoting attendance to DPP.

The importance of prediabetes awareness and educating individuals at high risk of developing T2DM was stressed by Ackerman & O'Brien (2020), Lim et al. (2020), Nhim et al. (2018), Roper et al. (2019) and Valero-Elizondo et al. (2019). The authors demonstrated the value of increased patient prediabetes awareness, and clinicians should clearly communicate risks, treatment, and referrals to DPP. Provider involvement includes awareness of prediabetes, individual counseling, screening, testing, and referrals to DDP-like programs (Lim et al., 2020; Nhim et al., 2018; Valero-Elizondo et al., 2019). Bootwong et al. (2021) Keating & McCurry (2019), Kao et al. (2021), and LaRose et al. (2020) concluded that text messaging containing the fundamental construct of the DPP increased motivation for lifestyle behavior change. In their studies, Keating & McCurry, Lim et al., Nhim et al. Ritchie et al., and Valero-Elizondo, et al. showed that motivational interviewing was instrumental in promoting behavior change and diabetes prevention.

## CHAPTER FOUR: METHODS

A quasi-experimental design with pre-and post-measurements was used for the DODGE<sup>®</sup>. As an intervention, DODGE<sup>®</sup> provided an infrastructure to promote awareness through outreach, patient education on prediabetes, and an increased understanding of the significance of weight loss through group classes, weekly text reminders, and monthly one-on-one coaching. A pre-and post-S-Weight “Stages of Change” questionnaire in weight management determined the individual’s readiness to progress to healthier behaviors. As a secondary objective, we evaluated whether outcomes related to prediabetes, such as BMI, A1C, and blood pressure changes, as a function of the DODGE<sup>®</sup> intervention. Implementation occurred throughout Phase 1, and the 16-weekly Healthy Balance classes were delivered in person and virtually.

### **Ethical Considerations/Protection of Human Subjects**

The University of California, Los Angeles (UCLA) School of Nursing (SON) and the organization’s Institutional Review Board (IRB) approval was obtained before initiating the DODGE QI project. Approval was obtained from the HMO’s Area Research Chair, the CHL Chief of Service, the Chief Nurse Executive, and the Department Administrator before applying to the HMO’s IRB. The HMO’s IRB guidelines included mandatory training through the Collaborative Institutional Training Initiative (CITI) program on Biomedical basic training on Human Subject Protection, a comprehensive application, and completion of mandatory training modules, including the Health Insurance Portability and Accountability Act (HIPPA). The official IRB Determination form was submitted to the HMO’s IRB, and the study received approval in late November 2022. The HMO and UCLA SON requirements, standards, and



guidelines for implementing the DNP QI project were observed throughout the process. All DODGE<sup>®</sup> participants provided verbal consent and were informed they could opt out anytime.

### **Study Site and Population**

DODGE<sup>®</sup> was implemented at an HMO's CHL ambulatory clinic in Riverside, California, from December 8, 2022, through May 26, 2023.

### **Recruitment of Participants**

A report from the HMO's CHL listing 1,173 adults ages 18-73 with various HbA1C and BMIs was used to recruit participants. Targeted phone calls to patients with HbA1C of 5.7%-6.4% and BMI > 25 kg/m<sup>2</sup> commenced in late October 2022 through November 2022. A total of 285 adults were informed of their prediabetes status using a telephone script (Appendix A). The call informed the person that they had been identified as being at risk for developing T2DM based on their A1C. Information on the DODGE<sup>®</sup> study was provided, inviting those meeting criteria to sign up for the prediabetes education group class. Preventive Medicine providers also recruited people meeting the criteria to attend the prediabetes group class between December 2022 to January 2023. Individuals interested in DODGE<sup>®</sup> were scheduled to attend one of the designated prediabetes group education classes.

### **Baseline Information and Measurements**

Baseline information and measurements were collected from the participant's electronic medical record (EMR). The participant's EMR measurements included weight, BMI, and A1c. Pre-intervention survey questions (Appendix B) included 1) how they learned about the DODGE<sup>®</sup>, 2) if their provider discussed prediabetes with them, 3) if the prediabetes diagnosis concerns them, 4) if they would be interested in receiving weekly text on dodging diabetes, and

5) the S-weight questionnaire to determine their stage of behavior change. This step was critical as a measure of comparison in evaluating the project.

### **Healthy Balance (current DPP practice)**

Healthy Balance is the institutional name of the DPP program, and classes are consistent with the CDC's National DPP curriculum. Sessions are 16-weekly 90-minute sessions and include topics on healthy eating habits, physical activity, and behaviors to promote weight loss. The Healthy Balance class facilitator records the participants' reported weight and weekly physical activity minutes each week. The participants' attendance is recorded in the participant's EMR. Participants that miss three consecutive sessions get terminated from the program.

### **Maintenance Component of DODGE<sup>©</sup>: Weekly Text Messaging**

As a component of DODGE<sup>©</sup>, weekly text messages were sent on the day of the participant's scheduled Healthy Balance session. The goal of the text message was to serve as a reminder to attend the weekly Healthy Balance session and to reinforce behavior change. Each week, a different component of the DODGE<sup>©</sup> acronym was sent in a text message via the HMO's notification system.

### **DODGE<sup>©</sup> Support: Monthly One-on-one Counseling by Phone**

The DNP NP-led monthly one-on-one counseling by phone included MI to promote progression in the TTM stages of change. The one-on-one counseling served as an opportunity to identify patient-centered barriers, challenges, and goals. Data was collected to track each participant's updated weight, the number of minutes of physical activity per week, the number of attended Healthy Balance sessions, any barriers to attendance, personal challenges to adherence to lifestyle modifications, and take-away points from the classes.

## **Final Evaluation**

The post-intervention survey (Appendix B) was collected in May 2023 during the last contact with the participant. The post-intervention survey included what motivated the participant to complete Healthy Balance and to describe their current weight loss journey. Additional data from EMR collected included BMI, weight, the number of Healthy Balance sessions the participant completed, and the participant's most recent Hgb A1C. The final step was critical as a measure of comparison in evaluating the project, which was analyzed in the fourth week of May 2023.

## **Survey Results**

The results of the pre-intervention (including the S-Weight questionnaire) survey (Appendix A, part 1) did not have a comparison group. Instead, the end of the intervention survey was compared to the baseline survey to determine whether DODGE<sup>®</sup> 'changed' participants' motivation to engage and attend weekly Healthy Balance sessions. The S-weight questionnaire (Appendix A, parts 1, 2, and 3) was used to compare the first orientation meeting results to the eight-week session and again at the end of the 16-weekly sessions.

## **Analysis of Attendance**

Attendance of participants in the HMO's DPP program (Healthy Balance) who participated in DODGE<sup>®</sup> was compared to patients in the HMO's DPP who did not participate in DODGE<sup>®</sup>. The period of 16 weeks was measured starting December 2022 through May 2023. To comply with DPRP retention criteria and to maintain DPRP recognition, a minimum of 50% attendance at the beginning of the fourth month after starting the first session is required (CDC, 2021). Attending at least eight classes within the 16-weekly classes would suffice for recognition by the DPRP.

## **DPP-related outcomes measure pre-intervention and post-intervention variables**

Various measurements derived from the DPP were used to evaluate the performance of the DODGE<sup>®</sup>. The S-Weight questionnaire was used to examine the stage of change of participants in behavior change in weight loss interventions. The S-Weight questionnaire was asked upon initiating the DODGE, repeated at weeks eight and sixteen. A data analyst assisted with providing the data collected from non-DODGE participants.

### **Data Collection Procedure**

Qualitative data was collected from participants' pre- and post-qualitative surveys, in addition to implementing an S-Weight questionnaire. The data provided information on needs assessment and the individual's readiness to change health behaviors. Quantitative data collected for DODGE<sup>®</sup> participants included age, pre-and post-Healthy Balance weight, BMI, blood pressure, and the number of Healthy Balance classes attended. The HMO's data analysts provided the report of adults eligible for DODGE<sup>®</sup> who were over 18 years with a BMI greater than 25 kg/m<sup>2</sup> and HgbA1C of 5.7%-6.49%. The report included the individual's age, number of Healthy Balance sessions attended, and pre-Healthy Balance BMI and Hgb A1C.

### **Data Analysis**

The DODGE<sup>®</sup> data was collected and analyzed using t-tests and Chi-square in EXCEL.

**Evaluation for Readiness to Change:** Data from the surveys, including the S-Weight questionnaire, was used to measure the stages of change (Appendix D, parts 1, 2, and 3) in DODGE<sup>®</sup> participants. The surveys were assessed by comparing post-intervention to pre-intervention responses. A qualitative assessment categorized individuals who improved from the baseline from those who did not. Individuals who participated in the DODGE<sup>®</sup> were compared to individuals who simultaneously took Healthy Balance and did not participate in the DODGE<sup>®</sup>.

**Determination of Adherence:** Attendance records (frequency and the number of DPP classes attended) for members who participated in DODGE<sup>®</sup> and DPP were compared using the t-test to the non-DODGE<sup>®</sup> and DPP participants' attendance. The hypothesis addressed whether the proportion of members who attended the DPP was the same for participating in DODGE<sup>®</sup> or not participating in DODGE<sup>®</sup>.

## CHAPTER FIVE: RESULTS

The DODGE<sup>®</sup> participant sample consisted of fourteen adults ages 21-73 years (mean age of 50.79 SD= 14.59). The population for DODGE<sup>®</sup> included 12 females (86%) and two males (14%). The ethnic background of DODGE<sup>®</sup> participants included African American (n=5), Hispanic (n=5), and White (n=4) with a BMI greater than 25 kg/m<sup>2</sup>, an A1C between 5.7%-6.4%, enrolled in Healthy Balance, and residing in Riverside County. DODGE<sup>®</sup> participants' mean age was 50.78 years, and non- DODGE<sup>®</sup> participants' was 51.90 years.

### **Prediabetes awareness**

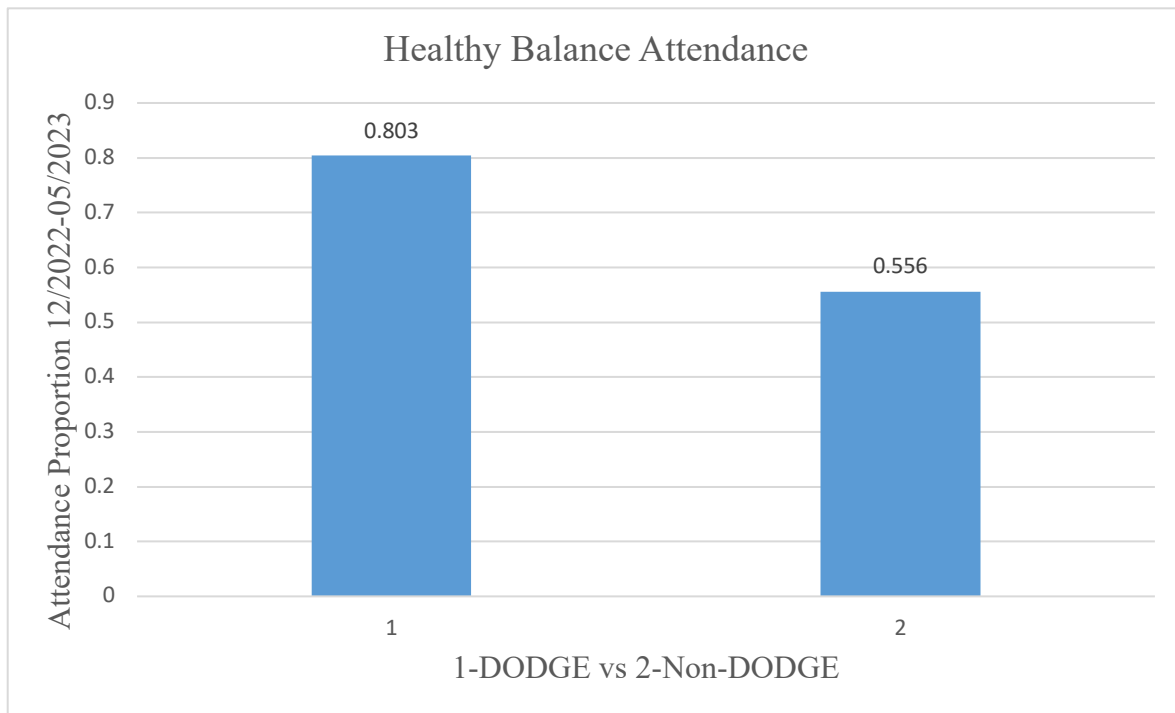
Of the 1,173 individuals with a BMI > 25 kg/m<sup>2</sup> or HgbA1C of 5.7%-6.49%, 285 (24%) were informed of their prediabetes status. Twenty-four individuals attended the DODGE<sup>®</sup> prediabetes education group class. Eight were excluded due to not meeting prediabetes criteria or having a BMI ≤ 25 kg/m<sup>2</sup>. Sixteen eligible individuals signed up for Healthy Balance, the 16 weekly classes, weekly text messages, and monthly phone calls. Of the 16 participants recruited to DODGE<sup>®</sup>, 81% (n=13) reported not being informed by their provider of having prediabetes.

### **Attendance at DPP**

Two of the 16 DODGE<sup>®</sup> participants withdrew from participating in DODGE<sup>®</sup>. Both participants attended the first six classes. One participant reported that her spouse became ill and passed and needed time to grieve. The other participant switched from Healthy Balance to the

pre-bariatric surgery classes. On average, the fourteen DODGE© participants attended 80 % of the weekly Healthy Balance classes compared to non- DODGE© of 55% (p-value= 0.02), as shown in Figure 2. Fourteen participants reported that text messages were helpful reminders to attend the Healthy Balance classes. Fourteen said that the monthly calls assisted with motivation to implement a healthier lifestyle and attend DPP classes. Of the 102 non-DODGE© participants, 15 did not attend a single class, and seventeen attended seven or fewer classes.

**Figure 2:** *DODGE vs. Non-DODGE participant attendance.*



### **Transtheoretical Model: Stages of Behavior Change**

The qualitative assessment tool, the S-Weight questionnaire, was collected on the DODGE© participants before and after the intervention for comparison. The first S-Weight questionnaire was administered before the prediabetes education group class. The S-Weight results showed that one participant had no intentions of losing weight; six participants had

thought about it; two participants had plans to do something about their weight; four reported actively trying to lose weight for less than six months; and one participant reported trying to lose weight for over six months. At eight and 16 weeks of participating in DODGE<sup>®</sup>, 13 participants remained in the action stage of behavior change, and the participant who had reported actively trying to lose weight continued in the maintenance stage of change. Pre-intervention survey results showed that two participants reported not thinking about prediabetes, five reported being somewhat concerned, and nine reported being very worried about learning they have prediabetes. Post-intervention survey results showed that all participants found the outreach, the group class, the Healthy Balance classes, and on-to-one calls helpful in attendance and adherence to the DPP.

## CHAPTER SIX: DISCUSSION

DODGE<sup>®</sup> is an intervention that can contribute to behavior change by enhancing the current DPP. The study identified that attendance and adherence to DPP can prevent or delay T2DM, yet many individuals with prediabetes are unaware of DPP or its potential benefits. The HMO's DPP is underused primarily due to the PCPs' lack of awareness of screening, testing, counseling, and referring at-risk T2DM individuals to CHL. Another identified implication identified by the research is at-risk individuals' retention and adherence to DPP classes. The incorporation of the DODGE<sup>®</sup> program can improve the current DPP-based program attendance by increasing awareness among individuals at-risk of developing T2DM. DODGE<sup>®</sup> includes telephone outreach to at-risk individuals, prediabetes group classes, weekly text reminders, and one-on-one monthly calls that have been demonstrated to promote retention, attendance, and weight loss in individuals with prediabetes and unhealthy weight. These EBP interventions showed that delaying or preventing T2DM and achieving a weight loss of more than five percent

can improve patient outcomes and lessen the economic burden associated with T2DM and unhealthy weight.

### **Implications for Practice**

DODGE<sup>®</sup> is a practical implementation of a clinical prevention and population health approach that strengthens the current DPP by increasing prediabetes awareness. DODGE<sup>®</sup> is also a promising quality improvement intervention that may improve prediabetes individuals' participation in and adherence to the current DPP by incorporating close follow-ups with weekly text and monthly phone calls. Incorporating DODGE<sup>®</sup> can promote retention and attendance at DPP and encourage weight loss in individuals with prediabetes and unhealthy weight. Preventing T2DM and achieving a weight loss of more than 5% through enhanced DPP-based programs such as DODGE can help improve patient outcomes and lessen the economic burden associated with T2DM and unhealthy weight in Riverside County.

### **Limitations**

The small sample size for DODGE<sup>®</sup> was attributed to time constraints and short staff to outreach individuals with prediabetes. The DODGE<sup>®</sup> study received approval from the organization's IRB in late November 2022, resulting in a limited time for outreach. There was only one person and one provider making outreach calls and no one to send out DODGE<sup>®</sup> flyers. Therefore, the flyers were not used in the study. Due to the holiday season and the surge in respiratory conditions, staffing was limited. The outreach was also limited to individuals within a 15-mile radius of the HMO's DPP. The post-measurements on A1C, weight, and blood pressure were unavailable for DODGE<sup>®</sup> and non-DODGE<sup>®</sup> participants. The post-intervention measurements on A1C, weight, and blood pressure were unavailable because the data analyst of the institution study site had insufficient time after the last subject finished the study to collate



the sample. Despite the small sample size, the preliminary results observed in the study provide pilot data for a larger investigation. The future investigation will involve additional institutional sites with funding set aside for data collection and analysis. The future study's strength is reliance upon collected data as a function of clinical care. However, these post-intervention measurements that we failed to obtain in the present study will be included in the future published manuscript. Given the increased adherence to the DPP, the measurements are anticipated to improve significantly among DODGE<sup>®</sup> participants compared to non-DODGE<sup>®</sup>.

## CONCLUSION

Lifestyle behavior change and maintaining weight loss for preventing or delaying T2DM can be attained through attendance in DPP (Centers for Disease Control and Prevention, n.d.). Maintaining weight loss requires individuals to uphold a sustainable lifestyle change (de Freitas et al., 2020). Lifestyle modifications promoted by DPP include nutritional counseling, physical activity, and behavior therapy. Lifestyle modifications can decrease the incidence of T2DM by 58% and help lower cardiovascular events when maintaining a weight loss of 5-7% (Kao et al., 2021; Ritchie et al., 2019). Interventions such as DODGE<sup>®</sup> can ameliorate diabetes prevention by promoting prediabetes awareness and increased attendance at DPP.

The impact of the DODGE<sup>®</sup> intervention in increasing attendance at DPP and implementing the TTM for behavior change can promote individuals to be active participants in a healthier lifestyle. The DPP study shows that maintaining a  $\geq 5\%$  weight loss and a healthier lifestyle can reduce T2DM incidence by 58% and improve patient outcomes. Improving patient outcomes and reducing co-morbid conditions associated with T2DM and unhealthy weight can decrease T2DM and unhealthy weight-related healthcare costs.

The DODGE<sup>®</sup>'s objectives align with the CDC, National DPP, USPSTF, and the HMO's DPP of promoting attendance to the DPP to prevent or delay T2DM. DODGE supports the HMO's DPP in encouraging EBP, patient-centered nutritional counseling, physical activity, and behavior therapy. DODGE<sup>®</sup> is also in alignment with the HMO's commitment to improving the health of its members by providing high-quality care in an underserved community.

## APPENDICES

## Appendix A

### DODGE Telephone Script

Study title: DODGE Diabetes Challenge (DODGE)

#### **Opening statement:**

“Hello, is this a good time to talk? My name is [name of caller and title]. I am calling from the Kaiser Permanente Riverside Center for Healthy Living Department. You had a blood test that shows you are at risk for diabetes, and we would like to find out if you might agree to attend an information session on how to delay or prevent diabetes. These questions are for a voluntary research study. The questions you answer as part of this research project are done for research purposes only.”

**Ask:** "Would you like to hear more about this study?" If the response is no, thank the person for his/her time and end the phone call.

If the response is yes, proceed with the following information:

“We want to collect information to help determine if this additional support is effective and if it leads to increase participation in the Diabetes Prevention Program.”

“Your participation is completely voluntary. You do not have to answer any questions you do not want to answer, which affect the care provided by the Riverside Medical Center medical staff. At any point during the phone call, you may decline to provide us with the information we are asking you for.”

“Please understand that your decision not to participate in this study does not affect your continued or future care at Kaiser Permanente. If you decide to participate, all your identifying information will be kept confidential.”

**Ask:** "Would you be interested in attending the information session to decide if you wish to participate in the study?" If the response is no, thank the person for his/her time and end the phone call. If the response is yes, proceed with asking the person the following question(s):

If you have any questions about this research study, please call Sonia Betancourt, Nurse Practitioner at 951-352-0292 or 1-866-883-0119. If you have any additional questions regarding the conduct of this study or your rights as a study subject, you may contact: Armida Ayala, Ph.D., Director, Human Research Subjects Protection Office at (626) 405-3665 or

[Armida.Ayala@kp.org](mailto:Armida.Ayala@kp.org)

Closing instructions:

Note to the caller: Before ending the call, inquire what questions the participant has about the study that you may answer. Also, thank the person for his/her contribution and time.

## Appendix B

### DODGE Diabetes Surveys

Directions: Bubble in your response.

#### Part 1 Survey completed during initial Prediabetes Education Group Class

1. How did you hear about DODGE Diabetes?
  - Phone call
  - Primary provider
  - Preventive Medicine Provider
  - Other
  
2. Has your primary provider talked to you about prediabetes?
  - Yes
  - No
  - I don't remember
  
3. How concerned are you about prediabetes?
  - I have not thought about it
  - Not concerned
  - Somewhat concerned
  - Very concerned
  
4. Would you be interested in attending the 16-weekly diabetes prevention program?
  - Yes
  - No
  - Maybe at a later time

5. Would you be interested in receiving weekly text reminders?
- Yes
  - No
  - Maybe at a later time
6. Would you be interested in receiving monthly calls?
- Yes
  - No
  - Maybe at a later time
7. Are you trying to lose weight (bubble in one)?
- No. I am not doing anything to lose weight, and I have no intention of trying.
  - No. I am not doing anything to lose weight, but I intend to do something in the next six months.
  - I haven't done anything during the last year to lose weight, but I plan to do something over the next 30 days.
  - I have been trying to lose weight for less than six months.
  - I have been trying to maintain my weight for more than six months.

## Part 2 Survey completed at 8 weeks of DODGE mid-point

1. What part of the DODGE Diabetes has been the most helpful (bubble in all that apply)?
  - Group class on weight loss and prediabetes education
  - Healthy Balance classes
  - Weekly text messages
  - Monthly call
  - Other (please specify): \_\_\_\_\_
  
2. Please describe your current weight loss journey (bubble in one).
  - I am not doing anything to lose weight, and I have no intention of trying.
  - I am not doing anything to lose weight, but I intend to do something in the next six months.
  - I haven't done anything during the last year to lose weight, but I plan to do something over the next 30 days.
  - I have been trying to lose weight for less than six months.
  - I have been trying to maintain my weight for more than six months.

### Part 3 Survey completed at completion of DODGE study

1. What part of the DODGE Diabetes motivated you to complete Healthy Balance (bubble in all that apply)?
  - Group class on weight loss and prediabetes education
  - Healthy Balance classes
  - Weekly text messages
  - Monthly call
  - Other (please specify): \_\_\_\_\_
  
2. Please describe your current weight loss journey (bubble in one).
  - I am not doing anything to lose weight, and I have no intention of trying.
  - I am not doing anything to lose weight, but I intend to do something in the next six months.
  - I haven't done anything during the last year to lose weight, but I plan to do something over the next 30 days.
  - I have been trying to lose weight for less than six months.
  - I have been trying to maintain my weight for more than six months.



TABLE OF EVIDENCE

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Ackermann, R. T., &amp; O'Brien, M. J. (2020). Evidence and challenges for translation and population impact of the Diabetes Prevention Program. <i>Current Diabetes Reports</i>, 20(3), 9. <a href="https://doi.org/10.1007/s11892-020-1293-4">https://doi.org/10.1007/s11892-020-1293-4</a></p>	<p>Identify challenges &amp; opportunities for improvement in DPP programs</p>	<p>Sample: 1500 NDPP providers</p> <p>65,007 adults with pre-DM &amp; BMI ≥ 25; 53,956 had health care visits with provider; 7,671 made aware of pre-DM</p> <p>376 referred to DPP-like program</p> <p>149 participated in DPP</p> <p>Setting: Intermountain healthcare DPP</p>	<p>RE-AIM framework</p> <p>Adults meeting the criteria for pre-DM were attributed to a PCP.</p> <p>Narrative review-literature summary organized according to key implementation priorities &amp; concerns of different stakeholder groups</p>	<p>Public health-Support research, communicate evidence, promote screening, build capacity, conduct economic surveillance &amp; surveilling DPP-like programs</p> <p>Healthcare-perform screening, communicate risks, &amp; refer to DPP.</p> <p>DPP providers/community-Implement EBP, minimize costs, engage individuals into groups, collect DPP data, offer high demand programs.</p>	<p>300,000 Americans have been reached but represent a small fraction of the targeted population</p> <p><sup>3</sup>/<sub>4</sub> see a provider</p> <p>1 in 9 reports having been informed on Pre-DM</p> <p>On 1 in 20 have been referred to DPP</p> <p>Of those only 40% take part</p>

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Bootwong, P., &amp; Intarut, N. (2021). The effects of text messages for promoting physical activities in prediabetes: A randomized controlled trial. <i>Telemedicine and E-Health</i>, tmj.2021.0303. <a href="https://doi.org/10.1089/tmj.2021.0303">https://doi.org/10.1089/tmj.2021.0303</a></p>	<p>To test the effects of text messaging on promoting physical activity in adults with prediabetes.</p>	<p>Sample: Adults aged: 40-60 years with prediabetes Total n=324 Intervention n=162 Control n=162</p> <p>Setting: 2 primary care units in Huai Thap, Thailand</p>	<p>Randomized control trials between June 2020-September 2020</p> <p>Intervention: 12 weeks of automated text messaging</p> <p>Primary out- come was a two-sided T-test.</p> <p>Secondary outcome was analyzed using chi-squared tests and simple linear regression.</p>	<p>Physical activity energy change from baseline: Week 8- moderate physical energy was statistically significant and adjusted mean difference was 256.40 MET/min/week (95% CI: 17.20, 495.63, p=0.040). Week 12 not statistically significant.</p> <p>The secondary outcomes showed no significant differences.</p>	<p>Discussion: Delivery of behavioral intervention is feasible.</p> <p>Interpretation: Automated text message self-management support promoted physical activity at 8 weeks in the intervention group but no significant difference at 12 weeks.</p> <p>Limitations: Study only included people using a phone and consisted of people with prediabetes, mostly farmers who live in rural areas with interest in physical activity. The study did not measure the acceptability of text messages.</p>

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<p>Kao, T.-S., Born, A. L., &amp; Ling, J. (2021). Ameliorating Prediabetes With Healthy Lifestyles: A Stage-Tailored Motivational Interviewing Pilot. <i>The Journal for Nurse Practitioners</i>, 17(7), 860–864. <a href="https://doi.org/10.1016/j.nurpra.2021.04.003">https://doi.org/10.1016/j.nurpra.2021.04.003</a></p>	<p>Assess feasibility, acceptability, and efficacy of a 3-session motivational interviewing (MI) program on overweight/obese females with prediabetes.</p>	<p>Sample: N=23 Overweight or obese with African American, Caucasian &amp; Hispanic women</p> <p>Setting: Primary care office in Midwestern United States.</p>	<p>Design: Pretest-posttest</p> <p>Intervention: Nurse-led MI program using transtheoretical Model (TTM) of behavior change via 20–30-minute call every 2 weeks over 6-week period.</p> <p>Measures: change behaviors based on TTM and outcomes on A1C, blood pressure, and waist circumference in 6 weeks.</p>	<p>&gt;90% reported MI-based sessions helped change eating habits and improve physical activity levels &amp; expressed desire to continue healthier lifestyle.</p> <p>A1C: mean 5.98 vs. 5.97, p=.83</p> <p>Mean systolic blood pressure decreased by 3.27 (SD= 6.92m, p=.038, 95% confidence interval</p>	<p>Discussion: 52% were unaware of their prediabetes diagnosis or associated consequences.</p> <p>Interpretation: Learning about prediabetes status encouraged readiness to make healthier lifestyle changes.</p> <p>Limitations: Small convenience sample</p> <p>Behavior was not assessed long term</p> <p>Culture variations were not evaluated</p>

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Keating, S. R., &amp; McCurry, M. (2019). Text messaging as an intervention for weight loss in emerging adults. <i>Journal of the American Association of Nurse Practitioners</i>, 31(9), 527–536. <a href="https://doi.org/10.1097/JXX.00000000000000176">https://doi.org/10.1097/JXX.00000000000000176</a></p>	<p>A mixed method, 8-week interventional research study examined the effects of a text messaging weight loss intervention on motivation, stage of change for weight loss, and body mass index (BMI) compared to standard weight loss treatment.</p>	<p>Sample: Ages 18-29 BMI: &gt;25 Able to read and write English, access to the study web via the internet, and a cell phone capable of receiving text messages.</p> <p>Enrolled n=188 Completed n=95 Women: 76%</p> <p>Setting: Health service office at a large 4-year university</p>	<p>Design: Three-point data collection.</p> <p>8-week Intervention: Daily text messaging Measures: Motivation- single question using a seven-point Likert scale to assess level of motivation. Diet readiness test (DRT) was used as a secondary evaluation.</p> <p>Stage of change (SOC): S-Weight questionnaire</p> <p>BMI: based on height and weight.</p>	<p>Repeated measures analysis of variance (RM-ANOVA) and descriptive analysis using a 0.50 value, an <math>\alpha</math> level of 0.05, with estimated effect of 0.30 and power of 0.80.</p> <p>Motivation: Decreased from baseline to week 4, increased from weeks 4-8 SOC for weight loss: both groups had a significant increase in SOC at week 8; 97.8% reported advanced stage.</p> <p>BMI: both group's BMI decreased (p=0.825)</p>	<p>Discussion: Nurse practitioners are well positioned to provide innovative interventions.</p> <p>Interpretation: The findings support using an alternative method, such as text messaging and web-based information is effective at increasing the SOC for weight loss.</p> <p>Limitations: The sample may not represent adults who do not use text messaging, email, or social media. Study participants were mostly white, single college students. Timing was around major holidays and final college exams, and self-reported data risk for inaccuracy.</p>

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>LaRose, J. G., Gorin, A. A., Fava, J. L., Bean, M. K., Lanoye, A., Robinson, E., &amp; Carey, K. (2020). Using motivational interviewing to enhance emerging adults' engagement in weight loss: The Live Well RVA pilot randomized clinical trial. <i>Obesity Science &amp; Practice</i>, 6(5), 460–472. <a href="https://doi.org/10.1002/osp4.435">https://doi.org/10.1002/osp4.435</a></p>	<p>To test feasibility and efficacy of Motivational Interviewing (MI) to promote engagement, retention, and weight loss.</p>	<p>Sample: N=47 Ethnic minority Adults ages 18-25 Body mass index (BMI)= 33.2 ±4.6 kg/m<sup>2</sup></p> <p>Setting: Commonwealth University School of Medicine, Richmond, Virginia</p>	<p>Design: Parallel randomized controlled pilot trial 12 week-intervention: MI-BWL received MI sessions 1 &amp; 2</p> <p>Identical 12-week evidence-based BWL and contact schedule for both groups.</p> <p>Measures: IBM SPSS Statistics</p> <p>Effect size calculation reported as Cohen d statistic for continuous variable &amp; Cohen h statistic for chi-square</p>	<p>A 5% weight loss: 53% in MIBWL vs. 45% in BWL, p=.70</p> <p>Attendance: MIBWL 77% vs BWL 61% (p=.11; Cohen d=.48)</p> <p>Perception of autonomy support post-treatment in the MI-BWL was higher than the standard BLW (102 ± 6.7 vs. 94 ± 14.8, p=08)</p>	<p>Discussion: Data indicate that 18 to 25-year-olds are absent from BWL programs. Effective intervention in emerging adults is critical and can have a significant public health implication in decreasing individual and social costs associated with obesity.</p> <p>Interpretation: Improvement in adherence to BWL program and weight loss is observed when MI has been added to BWL programs</p> <p>Limitations: Small sample size and retention rate.</p>

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Lim, R. B. T., Wee, W. K., For, W. C., Ananthanarayanan, J. A., Soh, Y. H., Goh, L. M. L., Tham, D. K. T., &amp; Wong, M. L. (2020). Health education and communication needs among primary care patients with prediabetes in Singapore: A mixed methods approach. <i>Primary Care Diabetes, 14</i>(3), 254–264. <a href="https://doi.org/10.1016/j.pcd.2019.08.008">https://doi.org/10.1016/j.pcd.2019.08.008</a></p>	<p>Assess factors associated with prediabetes education, health education, and communication between primary care providers (PCPs) and patients with prediabetes.</p>	<p>Sample: 433 adults (ages 21-79) with prediabetes.</p> <p>Setting: 8 polyclinics (public healthcare institutions) in Singapore</p>	<p>Design: Mixed methods, with a cross-sectional survey</p> <p>Intervention: Quantitative phase-cross-sectional survey</p> <p>Qualitative phase-in-depth interviews</p> <p>Measures: July 2017-January 2018 Poisson regression model</p>	<p>Did not receive prediabetes education n=318</p> <p>Received prediabetes education n=115</p> <p>P value= 0.99</p>	<p>Discussion: Low prevalence of patients with prediabetes receiving education.</p> <p>Interpretation: A common reason for not receiving education on prediabetes and lifestyle changes was not being referred by PCP</p> <p>Limitations: The transcript was not shown to participants to ensure accuracy documented; self-reported data may have resulted in bias; casual relationships couldn't be inferred; unable to differentiate passive vs. active education being sought.</p>

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Nhim, K., Khan, T., Gruss, S. M., Wozniak, G., Kirley, K., Schumacher, P., Luman, E. T., &amp; Albright, A. (2018). Primary Care providers' prediabetes screening, testing, and referral behaviors. <i>American Journal of Preventive Medicine</i>, 55(2), e39–e47. <a href="https://doi.org/10.1016/j.amepre.2018.04.017">https://doi.org/10.1016/j.amepre.2018.04.017</a></p>	<p>Assess the association between primary care providers (PCP) in prediabetes screening, testing, referrals, and awareness of the CDC Diabetes Prevention Programs (DPP) lifestyle change program (LCP).</p>	<p>Sample: Physicians n=1,003 Nurse practitioners (NP) n=253 Total n=1,256</p> <p>Setting: Web-based survey in the US</p> <p>Included if they had been practicing for ≥ 3 years in the US, actively seeing patients, and working inpatient or outpatient setting.</p>	<p>Design: Multivariate logistic regression</p> <p>Intervention: 2016 DocStyle survey asked 144 questions</p> <p>Measures: 2016 DocStyle cross-sectional survey, CDC STAT toolkit</p>	<p>Pearson chi-square tests assessed univariate &amp; bivariate association. <math>p &lt; 0.05</math> considered statistically significant</p> <p>PCPs referring to LCP more likely to screen (55% vs 18.2%, <math>p &lt; 0.001</math>) and test (99.7% vs 95.8%, <math>p = 0.001</math>)</p> <p>PCPs who had heard of STAT toolkit screened for prediabetes were more likely to test (99.7% vs 95.6%, <math>p &lt; 0.001</math>) and refer to LCP (47.5% vs 14.1%, <math>p &lt; 0.001</math>) than those that didn't screen.</p>	<p>Discussion: 2016 DocStyle showed 38% PCP aware of DPP; 19% aware of STAT toolkit; 27% screened w/ a risk test; 97% ordered blood tests; 23% made referrals</p> <p>Interpretation: there's an opportunity to increase PCP awareness of the CDC- LCP and STAT toolkit</p> <p>Limitations: PCP awareness was self-reported, and results may be subject to the bias of what is recommended in practice. Survey results may not be generalizable to all PCP in the US. Limits also exist in web-based survey platforms.</p>

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Ritchie, N. D., Kaufmann, P. G., Gritz, R. M., Sauder, K. A., &amp; Holtrop, J. S. (2019). Presessions to the National Diabetes Prevention Program may be a promising strategy to improve attendance and weight loss outcomes. <i>American Journal of Health Promotion, 33</i>(2), 289–292. <a href="https://doi.org/10.1177/0890117118786195">https://doi.org/10.1177/0890117118786195</a></p>	<p>Improve engagement in diabetes prevention programs (DPP)</p>	<p>Sample: 1140 adults with diabetes risk factors. Hispanic 58.9% Non-Hispanic black 61.8%</p> <p>Setting: Safety net health-care system</p>	<p>Design: Longitudinal cohort study</p> <p>Intervention: Pre-session protocol (awareness, motivational interviewing, problem-solving around barriers)</p> <p>Measures: Duration and intensity of DPP attendance and weight loss</p>	<p>Pre-session participants stayed in in the DPP 99.8 days longer (<math>p&lt;.001</math>) and attended 14.3% more session (<math>p&lt;.001</math>) compared to those without a pre-session</p> <p>Pre-session participants were 3.5 times likely to have &gt; 5% weight loss.</p>	<p>Pre-sessions may improve DPP outcomes by increasing perceived risk, promoting readiness to change, self-efficacy, and help cope with potential barriers.</p> <p>Limitations: Results are not fully generalizable Pre-sessions did not address cultural needs, or to evaluate racial/ethnic differences.</p>



CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Roper, K. L., Thomas, A. R., Hieronymus, L., Brock, A., &amp; Keck, J. (2019). Patient and clinician perceptions of prediabetes: A mixed-methods primary care study. <i>The Diabetes Educator</i>, 45(3), 302–314.  <a href="https://doi.org/10.1177/0145721719845347">https://doi.org/10.1177/0145721719845347</a></p>	<p>Assess patient and clinician perceptions of prediabetes</p>	<p>Sample:            Patients n=23            Ages 39-78 years             Clinicians, Physicians &amp; advanced practice NP n=31             Setting: single academic FMP clinic</p>	<p>Design:            mixed-methods study by collecting qualitative information from patient focus groups and clinician surveys             Intervention:            Prediabetes patient focus group questions included framed questions             Measures:            Standards for Reporting Qualitative Research Framework</p>	<p>Among 15 focus groups, more than half were not aware of prediabetes diagnosis             Patients expressed the perceptions that clinicians were not forthcoming about necessary behavior change             31 clinicians concurred that patients lack awareness of prediabetes awareness</p>	<p>Discussion: Tailored interventions such as, guidance for clinicians, emphasize on prediabetes awareness, minimizing barriers to DPP attendance &amp; offering multiple classes to increase access creates a supportive environment.             Limitations:            Study conducted in single primary care department with a high prevalence of diabetes, limiting generalizability to other practices &amp; patient populations.</p>

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
<p>Valero-Elizondo, J., Aneni, E. C., Osondu, C. U., Grandhi, G. R., Virani, S. S., &amp; Nasir, K. (2019). Gaps in provider lifestyle counseling and its adherence among obese adults with prediabetes and diabetes in the United States. <i>Preventive Medicine, 129</i>, 105815. <a href="https://doi.org/10.1016/j.ypmed.2019.105815">https://doi.org/10.1016/j.ypmed.2019.105815</a></p>	<p>Examined patterns of lifestyle counseling by providers on diet, physical activity, weight loss, and adherence to healthier lifestyles by patients affected by prediabetes and diabetes.</p>	<p>Sample: N=52,268 non-institutionalized adults, &gt; 18 years, affected by prediabetes or diabetes and unhealthy weight</p> <p>Setting: US through the National Health Interview Survey (NHIS).</p>	<p>Design: 2016-2017 Data from NHIS, annual survey, cross-sectional, multistage sampling</p> <p>Intervention: a survey to assess lifestyle counseling by a provider</p> <p>Measures: unadjusted and adjusted logistic regression models</p>	<p>N=52,268 surveyed</p> <p>1 in 3 with mild obesity and 1 in 4 with severe obesity reported lack of lifestyle change counseling from a provider.</p>	<p>Discussion: Regardless of prediabetes or diabetes status and unhealthy weight, 2 in 3 reported a lack of referral/counsel (diet, physical activity, weight loss programs)</p> <p>Interpretation: gaps in the implementation of obesity management, specifically those with metabolic disease</p> <p>Limitations: Weight was self-reported, with the possibility of underreporting weight. Estimated prevalence of prediabetes is significantly lower.</p>

## REFERENCES

- Ackermann, R. T., & O'Brien, M. J. (2020). Evidence and challenges for translation and population impact of the Diabetes Prevention Program. *Current Diabetes Reports*, 20(3), 9. <https://doi.org/10.1007/s11892-020-1293-4>
- Agency for Health Care Research and Quality. (n.d.). (Racial/Ethnic Minorities). <https://www.ahrq.gov/topics/racial-ethnic-minorities.html>
- Ali, M. K., McKeever Bullard, K., Imperatore, G., Benoit, S. R., Rolka, D. B., Albright, A. L., & Gregg, E. W. (2019). Reach and Use of diabetes prevention services in the United States, 2016-2017. *JAMA Network Open*, 2(5), e193160. <https://doi.org/10.1001/jamanetworkopen.2019.3160>
- Alva, M. L., Chakkalakal, R. J., Moin, T., & Galaviz, K. I. (2022). The diabetes prevention gap and opportunities to increase participation in effective interventions. *Health Affairs (Project Hope)*, 41(7), 971–979. <https://doi.org/10.1377/hlthaff.2022.00259>
- American Diabetes Association. (2018). Economic Costs of Diabetes in the U.S. in 2017. *Diabetes Care*, 41(5), 917–928. <https://doi.org/10.2337/dci18-0007>
- American Diabetes Association Professional Practice Committee. (2022). Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes—2022. *Diabetes Care*, 45(Supplement\_1), S17–S38. <https://doi.org/10.2337/dc22-S002>
- Bays, H. E., & McCarthy, W. (2021). *2021 Obesity algorithm eBook*. Obesity Medicine Association. <https://www.obesityalgorithm.org>
- Bootwong, P., & Intarut, N. (2021). The effects of text messages for promoting physical activities in prediabetes: A randomized controlled trial. *Telemedicine and E-Health*, tmj.2021.0303. <https://doi.org/10.1089/tmj.2021.0303>

- Bray, G. A., Kim, K. K., Wilding, J. P. H., & on behalf of the World Obesity Federation. (2017). Obesity: A chronic relapsing progressive disease process. A position statement of the World Obesity Federation: Position Paper. *Obesity Reviews*, *18*(7), 715–723.  
<https://doi.org/10.1111/obr.12551>
- Cannon, M. J., Masalovich, S., Ng, B. P., Soler, R. E., Jabra, R., Ely, E. K., & Smith, B. D. (2020). Retention Among Participants in the National Diabetes Prevention Program Lifestyle Change Program, 2012–2017. *Diabetes Care*, *43*(9), 2042–2049.  
<https://doi.org/10.2337/dc19-2366>
- Cassin, S. E., Buchman, D. Z., Leung, S. E., Kantarovich, K., Hawa, A., Carter, A., & Sockalingam, S. (2019). Ethical, stigma, and policy implications of food addiction: A scoping review. *Nutrients*, *11*(4), 710. <https://doi.org/10.3390/nu11040710>
- CDC. (2021). *Centers for Disease Control and Prevention Diabetes Prevention Recognition Program Standards and Operating Procedures*.  
<https://www.cdc.gov/diabetes/prevention/pdf/dprp-standards.pdf>
- Center for Healthy Living. (n.d.). *Healthy Balance*. <https://centerforhealthyliving-southern-california.kaiserpermanente.org/our-programs/healthy-balance/>
- Centers for Disease Control and Prevention. (n.d.). *Prediabetes-your chance to prevent type 2 diabetes*. Retrieved November 2, 2022, from  
<https://www.cdc.gov/diabetes/basics/prediabetes.html#:~:text=What%20Is%20Prediabetes%3F,t%20know%20they%20have%20it.>
- Chobot, A., Górowska-Kowolik, K., Sokołowska, M., Jarosz-Chobot, P., Górowska-Kowolik, K., & Jarosz-Chobot, P. (2018). Obesity and diabetes-Not only a simple link between two

- epidemics. *Diabetes/Metabolism Research & Reviews*, 34(7), 1–1. CINAHL Complete.  
<https://doi.org/10.1002/dmrr.3042>
- de Freitas, P. P., de Menezes, M. C., dos Santos, L. C., Pimenta, A. M., Ferreira, A. V. M., & Lopes, A. C. S. (2020). The transtheoretical model is an effective weight management intervention: A randomized controlled trial. *BMC Public Health*, 20(1), 652.  
<https://doi.org/10.1186/s12889-020-08796-1>
- Fastenau, J., Kolotkin, R. L., Fujioka, K., Alba, M., Canovatchel, W., & Traina, S. (2019). A call to action to inform patient-centered approaches to obesity management: Development of a disease-illness model. *Clinical Obesity*, 9(3), e12309. <https://doi.org/10.1111/cob.12309>
- Gruss, S. M., Nhim, K., Gregg, E., Bell, M., Luman, E., & Albright, A. (2019). 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>
- Hashemzadeh, M., Rahimi, A., Zare-Farashbandi, F., Alavi-Naeini, A., & Daei, A. (2019). Transtheoretical model of health behavioral change: A systematic review. *Iranian Journal of Nursing and Midwifery Research*, 24(2), 83.  
[https://doi.org/10.4103/ijnmr.IJNMR\\_94\\_17](https://doi.org/10.4103/ijnmr.IJNMR_94_17)
- Hill, B., Bergmeier, H., Incollingo Rodriguez, A. C., Barlow, F. K., Chung, A., Ramachandran, D., Savaglio, M., & Skouteris, H. (2021). Weight stigma and obesity-related policies: A systematic review of the state of the literature. *Obesity Reviews*, 22(11).  
<https://doi.org/10.1111/obr.13333>
- Javed, Z., Valero-Elizondo, J., Maqsood, M. H., Mahajan, S., Taha, M. B., Patel, K. V., Sharma, G., Hagan, K., Blaha, M. J., Blankstein, R., Mossialos, E., Virani, S. S., Cainzos-

- Achirica, M., & Nasir, K. (2022). Social determinants of health and obesity: Findings from a national study of US adults. *Obesity, 30*(2), 491–502.  
<https://doi.org/10.1002/oby.23336>
- Kaiser Permanente. (n.d.). *About Kaiser Permanente*. Retrieved April 24, 2022, from <https://about.kaiserpermanente.org/>
- Kao, T.-S., Born, A. L., & Ling, J. (2021). Ameliorating Prediabetes With Healthy Lifestyles: A Stage-Tailored Motivational Interviewing Pilot. *The Journal for Nurse Practitioners, 17*(7), 860–864. <https://doi.org/10.1016/j.nurpra.2021.04.003>
- Keating, S. R., & McCurry, M. (2019). Text messaging as an intervention for weight loss in emerging adults. *Journal of the American Association of Nurse Practitioners, 31*(9), 527–536. <https://doi.org/10.1097/JXX.0000000000000176>
- KFH-Riverside. (2020). *Kaiser Foundation Hospital (KFH)-Riverside*.  
[https://community.kp.org/downloads/DS-1347\\_%2807-21%29\\_ADA%28Riverside%29.pdf](https://community.kp.org/downloads/DS-1347_%2807-21%29_ADA%28Riverside%29.pdf)
- Knowler, W. C., Barrett-Connor, E., Fowler, S. E., Hamman, R. F., Lachin, J. M., Walker, E. A., Nathan, D. M., & Diabetes Prevention Program Research Group. (2002). 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>
- LaRose, J. G., Gorin, A. A., Fava, J. L., Bean, M. K., Lanoye, A., Robinson, E., & Carey, K. (2020). Using motivational interviewing to enhance emerging adults' engagement in weight loss: The Live Well RVA pilot randomized clinical trial. *Obesity Science & Practice, 6*(5), 460–472. <https://doi.org/10.1002/osp4.435>

- Lim, R. B. T., Wee, W. K., For, W. C., Ananthanarayanan, J. A., Soh, Y. H., Goh, L. M. L., Tham, D. K. T., & Wong, M. L. (2020). Health education and communication needs among primary care patients with prediabetes in Singapore: A mixed methods approach. *Primary Care Diabetes, 14*(3), 254–264. <https://doi.org/10.1016/j.pcd.2019.08.008>
- Mainous, A. G., Rooks, B. J., Wright, R. U., Sumfest, J. M., & Carek, P. J. (2022). Diabetes Prevention in a U.S. Healthcare System: A Portrait of Missed Opportunities. *American Journal of Preventive Medicine, 62*(1), 50–56. <https://doi.org/10.1016/j.amepre.2021.06.018>
- Nhim, K., Khan, T., Gruss, S. M., Wozniak, G., Kirley, K., Schumacher, P., Luman, E. T., & Albright, A. (2018). Primary Care providers' prediabetes screening, testing, and referral behaviors. *American Journal of Preventive Medicine, 55*(2), e39–e47. <https://doi.org/10.1016/j.amepre.2018.04.017>
- Office of Disease Prevention and Health Promotion. (n.d.-a). *Healthy People 2030- Prediabetes* (Reduce the Proportion of Adults Who Don't Know They Have Prediabetes — D-02). <https://health.gov/healthypeople/objectives-and-data/browse-objectives/diabetes/reduce-proportion-adults-who-dont-know-they-have-prediabetes-d-02>
- Office of Disease Prevention and Health Promotion. (n.d.-b). *Healthy People 2030-Diabetes* (Diabetes). <https://health.gov/healthypeople/objectives-and-data/browse-objectives/diabetes>
- Office of Disease Prevention and Health Promotion. (n.d.-c). *Healthy People 2030-Obesity* (Reduce the Proportion of Adults with Obesity). <https://health.gov/healthypeople/objectives-and-data/browse-objectives/overweight-and-obesity/reduce-proportion-adults-obesity-nws-03/data>

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51(3), 390–395. <https://doi.org/10.1037//0022-006x.51.3.390>

Ritchie, N. D., Kaufmann, P. G., Gritz, R. M., Sauder, K. A., & Holtrop, J. S. (2019). Presessions to the National Diabetes Prevention Program may be a promising strategy to improve attendance and weight loss outcomes. *American Journal of Health Promotion*, 33(2), 289–292. <https://doi.org/10.1177/0890117118786195>

Roper, K. L., Thomas, A. R., Hieronymus, L., Brock, A., & Keck, J. (2019). Patient and clinician perceptions of prediabetes: A mixed-methods primary care study. *The Diabetes Educator*, 45(3), 302–314. <https://doi.org/10.1177/0145721719845347>

SHAPE. (2021). *Adults who are obese*. <https://www.shaperivco.org/indicators/index/view?indicatorId=54&localeId=270&localeChartIdxs=1|2|4#>

*The Essentials of Doctorate Education for Advanced Nursing Practice*. (2006). American Association of Colleges of Nursing. <https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf>

The Look AHEAD Research Group. (2014). Eight-year weight losses with an intensive lifestyle intervention: The look AHEAD study. *Obesity*, 22(1), 5–13. <https://doi.org/10.1002/oby.20662>

The Look AHEAD study: A description of the lifestyle intervention and the evidence supporting it. (2006). *Obesity*, 14(5), 737–752. <https://doi.org/10.1038/oby.2006.84>

Tong, R. (2022). *Philosophies and theories for advanced nursing practice* (J. B. Butts & K. L. Rich, Eds.; Fourth edition). Jones & Bartlett Learning.



- USPSTF, Curry, S. J., Krist, A. H., Owens, D. K., Barry, M. J., Caughey, A. B., Davidson, K. W., Doubeni, C. A., Epling, J. W., Grossman, D. C., Kemper, A. R., Kubik, M., Landefeld, C. S., Mangione, C. M., Phipps, M. G., Silverstein, M., Simon, M. A., Tseng, C.-W., & Wong, J. B. (2018). Behavioral weight loss interventions to prevent obesity-related morbidity and mortality in adults: US Preventive Services Task Force recommendation statement. *JAMA*, *320*(11), 1163.  
<https://doi.org/10.1001/jama.2018.13022>
- Uusitupa, M., Khan, T. A., Viguiliouk, E., Kahleova, H., Rivellese, A. A., Hermansen, K., Pfeiffer, A., Thanopoulou, A., Salas-Salvadó, J., Schwab, U., & Sievenpiper, J. L. (2019). Prevention of Type 2 Diabetes by Lifestyle Changes: A Systematic Review and Meta-Analysis. *Nutrients*, *11*(11), 2611. <https://doi.org/10.3390/nu11112611>
- Valero-Elizondo, J., Aneni, E. C., Osondu, C. U., Grandhi, G. R., Virani, S. S., & Nasir, K. (2019). Gaps in provider lifestyle counseling and its adherence among obese adults with prediabetes and diabetes in the United States. *Preventive Medicine*, *129*, 105815.  
<https://doi.org/10.1016/j.ypmed.2019.105815>
- Wang, Y., Beydoun, M. A., Min, J., Xue, H., Kaminsky, L. A., & Cheskin, L. J. (2020). Has the prevalence of overweight, obesity and central obesity levelled off in the United States? Trends, patterns, disparities, and future projections for the obesity epidemic. *International Journal of Epidemiology*, *49*(3), 810–823.  
<https://doi.org/10.1093/ije/dyz273>
- Ward, Z. J., Bleich, S. N., Cradock, A. L., Barrett, J. L., Giles, C. M., Flax, C., Long, M. W., & Gortmaker, S. L. (2019). Projected U.S. state-level prevalence of adult obesity and severe

obesity. *New England Journal of Medicine*, 381(25), 2440–2450.

<https://doi.org/10.1056/NEJMsa1909301>