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Mexicano, Elvia

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Implementing Pequeños Cambios Diarios: Culturally Tailored Nutrition Counseling to Improve
Waist to Height Ratio and Self-Efficacy in Hispanic Women

A dissertation submitted in partial satisfaction of the
requirements for the degree
Doctor of Nursing Practice

by

Elvia Mexicano

2026

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ABSTRACT OF THE DISSERTATION

Implementing Pequeños Cambios Diarios: Culturally Tailored Nutrition Counseling to Improve Waist to Height Ratio and Self-Efficacy in Hispanic Women

by

Elvia Mexicano

Doctor of Nursing Practice

University of California, Los Angeles, 2026

Professor Carol L Pavlish

Background: Hispanic women experience disproportionately high rates of insulin resistance (IR), metabolic syndrome (MetS), and related cardiometabolic complications, yet they remain underrepresented in early screening and prevention initiatives. Central adiposity and obesity-related risks are disproportionately high, with a (91%) increase in all-cause mortality risk in Hispanic and Latino adults, especially among women. This disparity underscores the urgency of identifying more sensitive, economical, and tailored educational resources in Federally Qualified Health Centers (FQHCs), where health inequities are most pronounced. Traditional primary care screening relies heavily on body mass index (BMI) and serum markers; however, BMI does not

adequately capture central adiposity and fails to identify metabolically at-risk individuals. Emerging evidence suggests that the waist-to-height ratio (WHtR) is a sensitive and practical anthropometric indicator of cardiometabolic risk. Central obesity measures are strongly associated with mortality among Hispanic and Latino adults, particularly women, compared to BMI alone. Similarly, it is reported that stronger associations between WHtR and full cardiometabolic risk exist than those between BMI and full cardiometabolic risk. These findings supported integrating WHtR into routine screening to improve early risk identification in high-risk populations. **Objectives:** The purpose of the *Pequeños Cambios Diarios* quality improvement project was to implement culturally tailored nutrition counseling in an FQHC to improve WHtR and self-efficacy for healthy lifestyle behaviors among Hispanic women aged 35–65 years with BMI ≥ 25 kg/m². **Methods:** This quasi-experimental, single-site pilot project used a pre-test/post-test design over an 8-week period. Ten eligible participants with a BMI ≥ 25 kg/m² were recruited from a primary care clinic serving a predominantly Hispanic population. Participants with elevated BMI received culturally tailored counseling, which emphasized small lifestyle modification changes to promote a focus on waist circumference (WC) rather than a weight scale. WHtR, in which values ≤ 0.5 indicate increased cardiometabolic risk, was measured at baseline and at 8 weeks post-intervention as the primary outcome measure. Self-efficacy for healthy meal planning and dietary behaviors was measured at baseline and at 8 weeks using a validated Self-Efficacy Scale for Health Meals questionnaire. **Results:** The Wilcoxon Signed-Rank Test was carried out for primary outcome measures for completed cases (N = 8). There was statistically significant improvement in self-efficacy total score between baseline (Median) = 31.00, and post-intervention (Median = 42.50), $Z = -2.316$, $p = .021$, and a large effect size ($r = 0.82$), suggesting significant positive change. There were no statistically significant changes in

WHtR from baseline (Median = 0.78) to post-intervention (Median = 0.80), $Z = -0.254$, $p = .799$, $r = 0.09$. **Conclusions:** Introducing culturally tailored nutrition counseling and support to Hispanic women with a BMI ≥ 25 kg/m² in a primary care setting was a feasible and effective intervention in promoting self-efficacy. Post-intervention self-efficacy scores increased, suggesting greater participant confidence in healthy meal planning and dietary behaviors after completing the program. Unchanged WHtR from baseline to 8 weeks in the majority of participants in the 8-week intervention period could have been insufficient to create biological change due to short time frame.

The dissertation of Elvia Mexicano is approved.

Nancy Jo Bush

Dante Anthony Tolentino

Carol L Pavlish, Committee Chair

University of California, Los Angeles

2026

This dissertation is dedicated to the youngest version of myself who dared to dream, to the present version of myself who dared to persevere, and to oldest version of myself who will be allowed to reminisce in gratitude on a journey worth taken. I dedicate it to myself for persevering amidst sacrifices, with faith and science, with love for my profession, and in honor of ancestral memories.

It is dedicated to my husband and best friend, Victor Manuel Mexicano; my children, Adrián Josué Mexicano, Marisol Isabel Mexicano, Julián Andrés Mexicano, and Carlos Santiago Mexicano.

Se lo dedico a mis padres, Filemón y Cristina Rivas; a mi hermanito, Carlos Rivas; y a mi cuñado, Josh Torres-Rivas.

Se lo dedico a mi abuelita Herlinda Ramos Cárdenas (q.e.p.d.), “Mi Linda,” y a mi abuelita María del Refugio Flores Rodríguez (q.e.p.d.), “Abuelita Cuca;” a todas las hijas de Dios, hijas de la tierra y del maíz, who came before and after me, who carried early signs of metabolic syndrome, went unseen and untreated, and suffered complications or a premature departure to the afterlife.

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To promote transparency in the preparation of this Doctor of Nursing Practice scholarly project, the author acknowledges the use of several AI assisted tools 2025-2026. Grammarly was used to review grammar, spelling, punctuation, and writing clarity. Google NotebookLM was used to organize and summarize literature that had already been identified by the author to support review of the evidence. ChatGPT (OpenAI) was used intermittently to assist with formatting tables and figures and improving sentence structure provided by the author.

These tools were used solely as writing and organizational aids and were not used to replace the author's scholarly judgment. All literature searches, study selection, interpretation of evidence, data collection, statistical analyses, project implementation, and final conclusions were completed and critically reviewed by the author, who accepts full responsibility for the accuracy, integrity, and originality of this scholarly work.

VITA

ELVIA MEXICANO DNPc, MSN, APRN, FNP-C

EDUCATION

Doctor of Nursing Practice [DNP]	University of California, Los Angeles	2026
Master of Science in Nursing [MSN]	California State University, Los Angeles	2022
Family Nurse Practitioner [FNP]	California State University, Los Angeles	2022
Bachelor of Science in Nursing [BSN]	California State University, Los Angeles	2016
Associate of Science in Nursing [ADN]	East Los Angeles College	2015
Licensed Vocational Nurse [LVN]	Glendale Career College	2005

LICENSURE & CERTIFICATIONS

California	Registered Nurse #95075782	Exp 06/2027
	Nurse Practitioner #95021277	Exp 06/2027
	Furnishing #95021277	Exp 06/2027
American Academy of Nurse Practitioners [AANP]	Family Nurse Practitioner, Board Certified [FNP-C] #F09220207	Exp 09/2027
California State University, Los Angeles	Applied Gerontology Certificate Program	06/2016

PROFESSIONAL EXPERIENCE

09/2022 – Present	Family Nurse Practitioner <i>Family Practice</i>	AltaMed Healthcare Medical Group, Huntington Park, CA
10/2019 – 04/2021, 08/2016 – 12/2016	Registered Nurse <i>Emergency Department</i>	Community Hospital of Huntington Park, CA
10/2009 – 12/2016	Licensed Vocational Nurse	Kaiser Permanente Medical Office East Los Angeles, CA

PROFESSIONAL SERVICE

07/2024 – Present	Preceptor for NP Fellows	AltaMed Medical Group
01/2017 – 08/2019	Coordinator, Cross-cultural Symposiums	Iwakuni Nursing School Iwakuni, Yamaguchi, Japan
08/1998 – 06/2002	Volunteer	LAC + USC Medical Center

CONTINUING EDUCATION

06/2025	Women’s Wellness and Neurodiversity: Sexual Health, Hormones, ADHD, and Autism	The Elite Nurse Practitioner
06/2023	Definitive Medical Weight Loss Clinic Course	The Elite Nurse Practitioner
04/2025	Foundational Functional Medicine Course	The Elite Nurse Practitioner
05/2021	Certificate in Curanderismo <i>Traditional Healing Using Plants; Traditional Healing of the Body; Traditional Healing of the Mind, Energy, and Spirit; Global & Cultural Influences of Traditional Healing</i>	University of New Mexico (via Coursera)

HONORS and AWARDS

2026	Gorman Centennial Fellowship in Nursing Scholarship
2023	<i>CA-46 Congressional Recognition Outstanding Woman Leaders</i>
2021	AltaMed Advanced Nursing Education Workforce Scholarship

RESEARCH GRANTS and FELLOWSHIPS

2022 - 2023	<i>Nurse Practitioner Fellowship, AltaMed Health Services [2nd Cohort]</i>
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SCHOLARLY and CREATIVE WORKS

2026	“Implementation Pequeños Cambios Diarios: Culturally Tailored Nutrition Counseling to Improve Waist to Height Ratio and Self-Efficacy in Hispanic Women" [DNP Scholarly Project] Chair: Dr. Carol Pavlish; Committee members: Dr. Nancy Jo Bush, Dr. Anthony Tolentino
2026	Over the Counter Supplements and Nutraceuticals: Evidence Safety, and Clinical Application [PowerPoint Presentation; Staff Education]
2025	Insulin Resistance Testing and Treatment: An Evidence Based Approach to Early Diagnosis, Treatment, and Disease Prevention [PowerPoint Presentation; Staff Education]

CHAPTER ONE: INTRODUCTION

Metabolic syndrome (MetS) is a cluster of cardiometabolic risk factors strongly associated with the development of multiple chronic conditions, including type 2 diabetes mellitus (T2DM), chronic kidney disease (CKD), non-alcoholic fatty liver disease/metabolic dysfunction-associated steatosis liver disease (NAFLD/MASLD), cardiovascular disease (CVD), and polyendocrine metabolic ovarian syndrome (PMOS) formerly known as polycystic ovary syndrome (PCOS) (Freeman et al., 2023; Obeidat et al., 2025; Teede et al., 2026). Despite clinical significance, MetS has remained underrecognized in primary care, as traditional screening practices often focus on individual diagnoses, such as hypertension, dyslipidemia, or elevated glucose, rather than identifying the broader pattern of metabolic risk consistent with MetS, which could hamper prevention efforts and early intervention.

Background

MetS affects nearly one-quarter of the global population and has become a major public health concern worldwide. Prevalence is projected to increase due to nutritional intake habits and physical inactivity (Obeidat et al., 2025). MetS is generally higher among men before age 50, while rates among women increase substantially after age 50, often equaling or surpassing those of men in older age groups. High rates of MetS have been reported across diverse populations, including Western, Asian, African, and Middle Eastern communities (Obeidat et al., 2025).

MetS often overlaps multiple comorbidities and treated as individual conditions rather than a multifaceted syndrome (Obeidat et al., 2025) The standardized definition of MetS is based on global comparisons and results from a complex interaction of genetic and lifestyle factors, including obesity, poor diet, physical inactivity, and smoking (Obeidat et al., 2025). Patients are generally treated for hypertension, obesity, and mixed hyperlipidemia as separate conditions

rather than being evaluated through a comprehensive metabolic syndrome framework, as there is no standard treatment for MetS due to its complexity. The National Cholesterol Education Program Adult Treatment Panel III (ATP III) and International Diabetes Federation (IDF) guidelines define MetS by the presence of at least three of the following clinical features: elevated WC, increased triglycerides, reduced high-density lipoprotein cholesterol, high blood pressure, and elevated fasting glucose (Freeman et al., 2023; Obeidat et al., 2025). MetS significantly increases the risk of serious chronic conditions such as T2DM and CVD; early identification and intervention are essential. Lifestyle and clinical interventions can slow, halt, or even reverse disease progression, improve health outcomes, and reduce the burden on healthcare systems. Unfortunately, routine screening and proactive educational efforts on MetS in primary care are often limited by financial costs, workflow demands, and time constraints.

Clinical Statement

Hispanic and Latino populations in the United States and worldwide experience disproportionately high rates of cardiometabolic disease which are frequently underrecognized in both clinical research and routine medical practice (Reeves et al., 2022; Zhang et al., 2024). This disparity is influenced by the cumulative physiological effects of chronic and socioeconomic inequities, often described as “weathering,” which may contribute to earlier disease progression and increase cardiometabolic burden (Reeves et al., 2022). In the cross-sectional study by Reeves et al. (2022), 6521 women were screened for eligibility. Approximately 59.5% of Hispanic women were excluded from enrollment because they were younger than 42 with a documented chronic disease, indicating earlier onset of chronic disease (Reeves et al., 2022). Reliance on body mass index (BMI) alone may also result in substantial misclassification of Hispanic women. For example, 91% of women in the study by Zhang et al. (2024) had

significant abdominal adiposity, WC above 80 centimeters, which is associated with increased cardiometabolic complications and mortality risk.

The 2025 federal reconciliation legislation, known as the “One Big Beautiful Bill Act” (U.S. Congress H.R.1 Public Law 119-21, 2025), introduced a substantial reduction, estimated at \$911 billion, in federal Medicaid cuts. The policy changes may disproportionately affect low-income and medically vulnerable populations receiving care in FQHCs. As of January, 1, 2026, these reductions affected the Department of Health Care Services (DHCS) in California, and coverage for weight loss medication is no longer covered to treat obesity, enforcing the need for non-pharmacological and cost-effective interventions to address MetS before becoming MASLD (California Department of Health Care Services [DHCS], n.d.).

This Doctor of Nursing Practice (DNP) Scholarly Project employed a Quality Improvement (QI) approach to evaluate a culturally tailored lifestyle nutrition counseling and support intervention to Hispanic women receiving care in a FQHC, where funding for bloodwork such as fasting insulin, Homeostasis Model Assessment of Insulin Resistance (HOMA-IR), Triglyceride-Glucose Index (TyG), Quantitative Insulin Sensitivity Check Index (QUIKI) can incur costs. WHtR was used as a practical, non-laboratory marker to measure central adiposity correlating with MetS risk (Ma et al., 2022; Montoya Castillo et al., 2025). The project also evaluated self-efficacy pre- and post-intervention to examine whether culturally tailored care improves participant perceived confidence in their ability to maintain long-term dietary and lifestyle behavior changes.

Clinical Question

This QI project applied the Population, Intervention, Comparison, Outcome, and Time (PICOT) framework. The PICOT question guiding this project was: In Hispanic adult women

aged 35–65 years with a BMI $\geq 25\text{kg/m}^2$ receiving care in a FQHC (P), how did participation in a culturally tailored lifestyle nutrition counseling program, *Pequeños Cambios Diarios* or “*Small Daily Changes*” (I), compared with standard primary care without culturally tailored nutrition counseling (C), affect waist-to-height ratio as an early marker of metabolic syndrome risk and self-efficacy as a component for healthy eating behaviors (O) over an 8-week period (T)?

This practice-focused question addressed a critical screening and prevention gap by incorporating a scalable, low-cost intervention to support population health improvement among Hispanic women which could promote health equity for this understudied group. By focusing on WHtR as an outcome measure (Montoya Castillo et al., 2025; Zhang et al., 2024), the project aligned with the realities of primary care practice in an underserved FQHC setting where laboratory testing is not always financially feasible. The inclusion of self-efficacy as an outcome measure recognizes the behavioral component of the intervention’s effectiveness because lifestyle change requires not only patient education but also confidence in the ability to apply small daily changes within the context of culture, family, food access, finances, and daily routines.

Purpose and Objectives

The purpose of this project was to address the disproportionate rate at which early onset of MetS risk occurs among Hispanic women which is a real-world health disparity (Reeves et al., 2022). The objective was to evaluate whether participation in the *Pequeños Cambios Diarios* culturally tailored nutrition and lifestyle intervention improved WHtR and healthy eating self-efficacy following the 8-week intervention within a resource-limited primary care setting. This DNP project incorporated routine WHtR measurement as an early, low-cost method for MetS screening rather than using more expensive laboratory-dependent tests or relying solely on the

more traditional BMI measure which could fail to capture actual risk (Zhang, 2024). The project employed an educational intervention to teach participants about healthy eating portions and sequencing, reduced-time window for eating, and the importance of body movement after a primary meal.

DNP Essentials

This project aligns directly with AACN Essentials Domain 4: Scholarship for the Nursing Discipline, specifically competencies 4.1k and 4.1m. Essential 4.1k emphasizes the translation of evidence into practice for the improvement of health outcomes, which is central to this project's aim of implementing nutritional counseling and evidence-based screening tools to reduce the risk of cardiometabolic conditions in primary care. Essential 4.1m underscores the importance of engaging faculty mentors and clinical preceptors in scholarly practice change (American Association of Colleges of Nursing [AACN], 2021). The DNP lead collaborated closely with both constructs, ensuring that the project was grounded in scholarly rigor and aligned with institutional priorities. By integrating current evidence, leveraging real-world clinical settings, and partnering with experienced mentors, this project advances doctoral-level nursing scholarship and promotes sustainable, equity-focused innovations in primary care.

Early identification of MetS is critical to preventing the progression of chronic diseases, moving from a disease treatment to a disease prevention culture in the organization where the project will be implemented. Current primary care screening practices often fall short in detecting this condition at its earliest stages, particularly in underserved populations, let alone women (Sima et al., 2024). The DNP project addresses this gap by application of a culturally tailored educational program supported by research evidence, and applied a low-cost tool, such as WHtR that has early predictive value compared to traditional measures.

CHAPTER TWO: THEORETICAL FRAMEWORK

The theoretical foundation of the project was guided by a revised Social Cognitive Theory (SCT) by Bandura (1986) with a biological component (SCT+B) (Anton et al., 2021) (Appendix A). SCT (Bandura, 1986) emphasizes that behavior change is shaped by reciprocal interactions among personal factors including cognition, emotions, and self-efficacy; environmental factors, such as social and clinical support; and health-related behaviors.

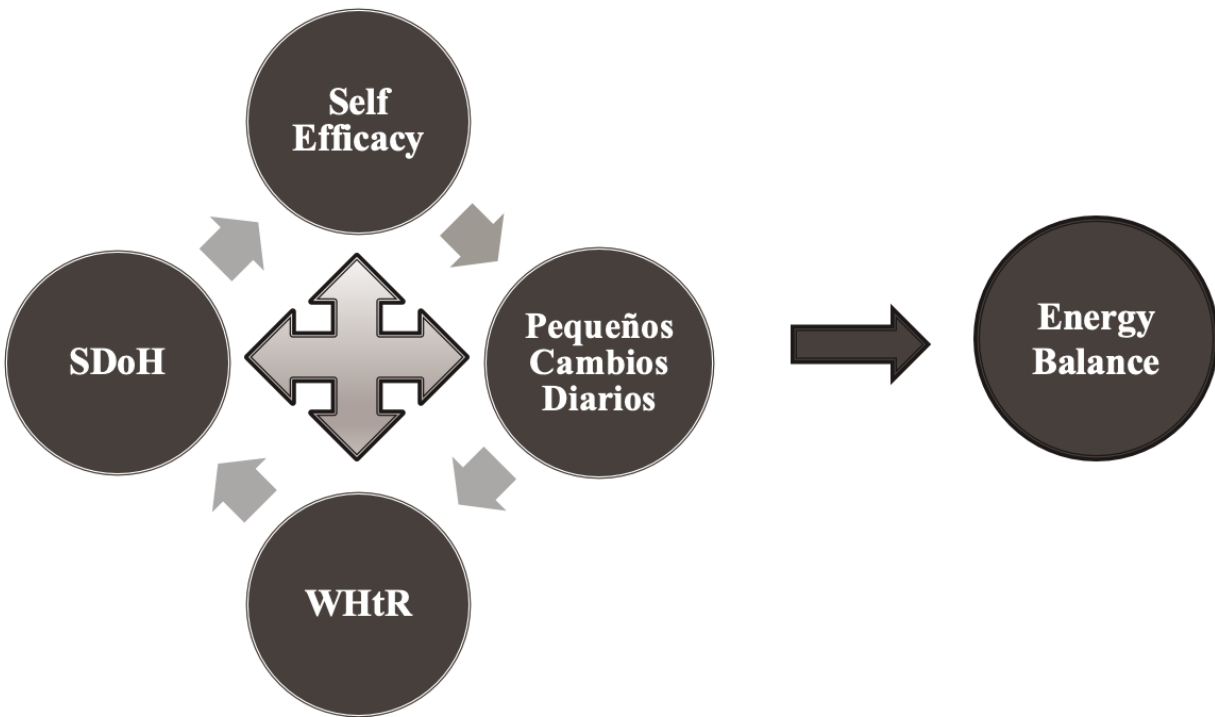
The revised model (SCT+B) explains how individuals learn, adopt, and sustain behavior change within the dynamic interaction of personal, behavioral, environmental, and biological influences. The revised framework has been widely applied in lifestyle and weight management interventions, where building self-efficacy and leveraging social and environmental support are central strategies for sustainable behavior change (Anton et al., 2021). While SCT has demonstrated utility in promoting short-term behavior change, critics suggest that it may be less effective in sustaining long-term adherence in weight management interventions because it traditionally overlooks biological drivers such as hunger, satiety, metabolic adaptation, and IR (Anton et al., 2021). Anton and colleagues expanded SCT into SCT+B by integrating biological factors with personal, behavioral, and environmental determinants. This broadens SCT's relevance to weight management by recognizing the need to consider both psychological and physiological factors for lasting change.

Application of SCT+B to Pequeños Cambios Diarios

In this project, SCT+B framed how Hispanic women at risk for metabolic syndrome may adopt and sustain lifestyle changes with tailored support (Figure 1). The *Pequeños Cambios Diarios* intervention used SCT+B by incorporating all three factors of Bandura's (1986) original

SCT plus a fourth factor which is the biologic component for energy balance (Anton et al., 2021),

Figure 1: *Pequeños Cambios Diarios' Application of Social Cognitive Theory with Biologic Component*



Note. Adapted from New Model of Reciprocal Determinism Illustrating the Multiple and Interactive Factors Affecting Energy Balance (Anton et al., 2021)

Personal Factors

The first component addresses personal factors such as knowledge deficit on how current lifestyle (e.g., diet and exercise) can impact WHtR and how lifestyle choices can increase or decrease cardiometabolic risk. Addressing personal factors may be measured by self-efficacy after completion of the program, an important component of both original and adapted SCT (Anton, et al., 2021; Bandura, 1986).

Environmental Factors

Social Determinants of Health (SDoH) fall under environmental factors acknowledging that access to culturally tailored, one on one counseling, and bilingual providers to teach lifestyle changes may reduce the risk of MetS. Recognizing environmental factors such as fears of leaving the home, housing instability, or food insecurity illustrate the interconnected impact that population demographics have on personal behavior.

Behavioral Factors

Behavioral factors also guided development of the program, *Pequeños Cambios Diarios*. The DNP project recognized that the impact of small daily interventions, such as choosing a 9-inch plate recommended by the ADA and following portion sizes of macronutrients, may reduce the risk of MetS. The program also promoted food order, movement after a meal, and narrowing the eating window.

Biological Factors

Consistent with Anton et al. (2021), the intervention also addressed biological drivers by encouraging protein and fiber intake before carbohydrates to blunt glucose spikes, along with light post-meal activity to aid metabolic regulation (Dyńska et al., 2023, Shulka et al., 2023). The biological component accounts for age, gender, BMI, hormonal impacts of IR in perimenopausal and menopausal women, and insulin and glucose spikes associated with MetS (Blum et al., 2021; Sima et al., 2024).

CHAPTER THREE: REVIEW OF LITERATURE

Literature Search

Using PubMed, a literature search was conducted to identify current evidence on screening tools and early interventions for persons at risk for MetS and cardiometabolic conditions. Search terms included “waist-to-height ratio,” “metabolic syndrome,” “cardiometabolic,” “women,” “Hispanic,” and “midlife.” The search strategy was progressively narrowed to focus on studies examining the relationship between WHtR and cardiometabolic risk in women, particularly Hispanic and midlife populations. Initial broad searches for “waist to height ratio” yielded 7,982 results, while more focused combinations such as “(waist to height ratio) AND (metabolic syndrome) AND (women)” yielded 130 results, and “(waist to height ratio) AND (women) AND (Hispanic)” yielded 45 results. Additional searches combining (HOMA-IR) AND (metabolic syndrome) AND (treatment) AND (nutrition recommendation) and (nutrition interventions) AND (dietary patterns) yielded 4 results to assess precautions for hypoglycemia and effects of lifestyle modifications. A total of 179 records were identified.

Following the removal of 19 duplicate records, 160 unique records remained and underwent title and abstract screening. Of these, 139 records were excluded for not meeting inclusion criteria. Criteria for inclusion were: being published between 2021 and 2026; pertinent to WHtR, MetS, women, Hispanic populations; and the effects of various lifestyle modifications such as nutrition-based interventions and physical activity. Twenty-one full-text articles were retrieved and assessed for eligibility. Fourteen studies were subsequently excluded due to limited clinical relevance, use of animal populations, or due to a primary focus on molecular mechanisms unrelated to clinical care. Seven studies met the inclusion criteria and were retained

from the database search. Four additional studies were referred by committee members to the project lead and were also reviewed and included. A total of 11 articles were included in the final literature review.

The 11 articles included three cross-sectional studies (Blum et al., 2021; Ma et al., 2022; Montoya Castillo et al., 2025), one prospective study (Sima et al., 2024), one longitudinal cohort study (Reeves et al., 2022), a population-based cohort study (Zhang et al., 2024), a crossover dietary study (Tettamanzi et al., 2021), and two randomized controlled trials (RCTs) (Charatcharoenwithaya et al., 2021; Shukla et al., 2023). Two narrative reviews were also included in the literature review (Dyńska et al., 2023; Dyńska et al., 2025). A PRISMA-style flow diagram was used to organize and summarize the study selection process (Appendix B).

MetS Risk and Consequences

Blum et al. (2021) conducted a cross-sectional study of 242 (71 with PCOS and 171 without PCOS) overweight premenopausal women with a BMI $\geq 25\text{kg/m}^2$. Participants were required to be free of eating disorders and free of major organ disease. Although the focus was on using biomarkers to detect early IR in perimenopausal women with and without PCOS, the authors emphasized that both groups could benefit from early identification for prevention of metabolic disease (Blum et al., 2021). These biomarkers are triglyceride/HDL cholesterol ratio (TG/HDL-C) which encompass two of the five indicators of MetS. In the non-PCOS group, the triglyceride/HDL cholesterol ratio (TG/HDL-C) was the most effective marker with an area under the receiver-operating-characteristic curve (AUROC) of 0.73 and an optimal diagnostic cut-point of 1.9 (Blum et al., 2021). For the PCOS group, TG/HDL-C, the cholesterol/HDL-C ratio (TC/HDL-C), and HDL-C alone all performed well (AUROC > 0.80), with an optimal

TG/HDL-C cut-point of 1.3. These findings suggest identifying IR early is a critical step in preventing progression to T2DM and CVD.

The authors also discussed the importance of clinicians intervening early to treat obese and overweight women in a poor metabolic state. Limitations included small sample size and lack of ethnic diversity. Although the study prioritized laboratory-based screening methods, this aligns with the importance of early identification and targeting appropriate prevention strategies for pre- and post-menopausal women at-risk for metabolic associated conditions.

Sima et al. (2024) conducted a prospective study on 100 perimenopausal women age 45-50 with abnormal uterine bleeding (AUB), elevated BMI and A1C, and fasting glucose. The study purpose was to determine the association of hyperplasia in obese women with AUB and insulin levels (Sima et al., 2024). There were 140 participants divided into three groups. Group I consisted of 66 participants with AUB and a BMI above 30, Group II were 34 participants with AU and BMI less than 30, and Group III was the control group, 40 asymptomatic women (no AUB). The study found women with a BMI greater than 30 had significantly elevated HOMA-IR values and were 8x more likely to have endometrial hyperplasia (Sima et al., 2024).

The incidence of hyperinsulinemia in the observation group (Groups I & II) with AUB was 70.77%, which was substantially higher than the 8.06% observed in the asymptomatic control group (Sima et al., 2024). The study also evaluated several markers associated with metabolic syndrome across the three groups. Elevated systolic blood pressure (SBP) (≥ 130 mmHg) was prevalent in both AUB groups, affecting 81.8% of Group I and 82.4% of Group II, compared with 15.0% of the control group.

Elevated diastolic blood pressure (DBP) (≥ 85 mmHg) was present in 72.7% of Group I and 50.0% of Group II. Regarding lipid abnormalities and obesity-related measures, elevated

triglyceride levels (≥ 1.7 mmol/L) were identified in 51.5% of Group I and 35.3% of Group II, while low HDL cholesterol (< 1.29 mmol/L) was observed in 56.1% of Group I. Increased abdominal circumference (≥ 88.9 cm) was present in 60.6% of Group I, but was nearly absent in Group II (0%) and the control group (2.5%). All elevated SBP, DBP, elevated lipids, and increased truncal obesity are indicators of MetS.

These findings suggest that obese perimenopausal women with AUB may benefit from early MetS screening and intervention to prevent hyperplastic and potentially malignant endometrial changes. Limitations include the single-site design, modest sample size, only white women, and lack of control for confounding metabolic variables. This study contributes to the current pilot project by reinforcing the importance of early MetS screening and intervention for overweight, perimenopausal women with an elevated BMI, a population similarly targeted in the current project to prevent downstream complications such as endometrial hyperplasia and MetS.

Reeves et al. (2022) conducted a longitudinal cohort study using data from the Study of Women's Health Across the Nation (SWAN) study. The cohort study, which included 3,302 women age 42-52 years was designed to evaluate racial and ethnic disparities regarding the age of cardiometabolic disease onset. Outcomes included onset age of hypertension, IR, and diabetes. The following ethnic groups were studied: Black, Chinese, Japanese, Hispanic, and White. The participants were within the targeted age group for this project.

Findings revealed that Black and Hispanic women developed adverse metabolic outcomes substantially earlier than White women, with onset occurring up to a median of 11.3 years earlier. The findings also revealed notable racial and ethnic differences, with both Black and Hispanic women experiencing hypertension at younger ages than White women. The adjusted median age of onset was 50.3 years (95% CI, 48.7–52.0) among Black women and 50.3

years (95% CI, 48.1–52.4) among Hispanic women, highlighting an earlier burden of hypertension in these populations (Reeves et al., 2022).

Baseline WC differed significantly across racial and ethnic groups ($p < .001$). Black women exhibited the highest mean WC at 93.1 cm, followed by Hispanic women at 88.2 cm. White women had a mean WC of 85.7 cm, which was similar to the overall study average of 86.4 cm. These results underscore the importance of incorporating central adiposity measures, such as WC or WHtR, into early screening practices for high-risk populations so interventions to decrease risk for these groups can be implemented at younger ages. Some socioeconomic and individual behaviors were accounted for during the cohort study but there may be other extraneous factors affecting study results such as those already diagnosed with other cardiometabolic diseases.

Cost Effective Measurement Techniques

Ma et al. (2022) conducted a cross-sectional, real-world study to evaluate the association between WHtR and MetS and to determine whether WHtR can serve as a simple, practical alternative to WC for identifying MetS in patients with T2DM. The study population comprised 8,488 hospitalized T2DM patients from a center in China, including 3,719 women (aged 18–94) and 4,769 men (aged 18–91). Statistical findings indicated that the prevalence of MetS by WHtR was 79.4% in women and 68.6% in men, figures similar to those from traditional WC measurements (82.6% and 68.3%, respectively).

There was a consistency between WC-based and WHtR-based prevalence MetS classification, as indicated by Kappa values of 0.929 for men and 0.874 for women. Logistic regression analysis further showed that WHtR was independently and significantly associated with the presence of MetS in both genders [Odds Ratio (OR) = 4.821 for men; OR = 3.096 for

women] after adjusting for confounding factors (Ma et al., 2022). WHtR also demonstrated a significant positive correlation with IR as measured by HOMA2-IR.

Ma et al. (2022) further documented participants' use of insulin or insulin analogs (IIAs) and accounted for this variable in their analysis. Among men, approximately 70% to 71% of participants were using IIAs, regardless of WHtR classification. Among women, insulin use was slightly more common among those with a higher WHtR (≥ 0.52), with 72.4% reporting IIA use compared to 68.8% among those with a lower WHtR. Because insulin therapy can influence metabolic outcomes, the researchers treated IIA use as a potential confounding variable and adjusted for its effects during statistical analysis to improve the accuracy of the study findings.

The study noted several limitations, including that the results were derived from a specific T2DM population, so they may not be fully applicable to the general population or other ethnic groups. Because the data came from a single-center hospital, the findings might not comprehensively represent the overall health status of all T2DM patients.

In Montoya Castillo et al. (2025), a cross-sectional study evaluated 29,236 adults enrolled in a chronic disease prevention program in Medellín, Colombia, to determine the relationship between adiposity markers and full cardiometabolic risk (FCMR), defined as the concurrent presence of elevated glycemia, hypertension, and dyslipidemia. The study sample was predominantly female, with women accounting for 73.2% of participants ($n = 21,410$), and 97.6% of the sample were older than 40 years. Sex-specific criteria were used to classify cardiometabolic risk factors, with abdominal obesity defined as a WC ≥ 80 cm in women and ≥ 90 cm in men. Low HDL cholesterol was defined as < 50 mg/dL in women compared to < 40 mg/dL in men.

Among the anthropometric measures evaluated, WHtR emerged as the strongest predictor of cardiometabolic risk (Montoya Castillo et al., 2025). The median WHtR for the population was 0.6, with an interquartile range (IQR) of 0.6–0.7. Participants with an elevated WHtR (>0.5) had more than three times the odds of experiencing FCMR [OR = 3.04 (95% CI: 2.45–3.77)] compared to those with normal values. Although increased WC and obesity were associated with approximately double the odds of FCMR, WHtR remained the most robust predictor after adjustment for other adiposity measures.

Limitations to be considered were a single healthcare institution in Medellín, which limits generalizability to other populations, although it did include differentiating between Afro descendant, Indigenous, and subethnicities. Nearly all participants were older than 40 years, so the findings may not apply to younger adults. Physical activity data were obtained through self-report. This introduces the potential for reporting bias, and residual confounding variables may not have been fully accounted for in the analysis.

Zhang et al. (2024) reported on an ongoing population-based cohort study which analyzed data from over 15,000 Hispanic and Latino adults and found that central obesity, as measured by WC or WHR, was a stronger predictor of mortality than BMI alone, particularly among women. The primary objective was to investigate the associations between general obesity (BMI, body fat percentage) and central obesity (WC, WHR) among Hispanic and Latino individuals (Zhang et al., 2024). The study analyzed data from 15,773 Hispanic and Latino adults between 18 and 74 years of age and found important sex-specific differences in the relationship between obesity and mortality.

An elevated WHR, defined as ≥ 0.90 for men and ≥ 0.85 for women, emerged as the strongest predictor of mortality overall, nearly doubling the risk of death statistically measured in

this study by hazard ratio (HR) (HR = 1.91, 95% CI, 1.28–2.86). The impact of central adiposity was particularly pronounced in women, as an unhealthy WHR was associated with a more than twofold increase in mortality risk (HR = 2.41, 95% CI, 1.45–3.99), compared with a weaker association observed in men (HR = 1.58, 95% CI, 0.95–2.63) (Zhang et al., 2024). In contrast, severe obesity, defined as a BMI of 35 kg/m² or greater, was more strongly associated with mortality among men (HR = 1.94, 95% CI, 1.24–3.04) than women (HR = 1.19, 95% CI, 0.72–1.97) (Zhang et al., 2024).

Severe obesity was associated with a 55% higher risk of mortality compared with normal weight individuals (HR = 1.55, 95% CI, 1.08–2.22) (Zhang et al., 2024). An unhealthy WC alone (>102 cm for men and >88 cm for women) was not significantly associated with increased mortality risk after adjustment for sociodemographic, lifestyle, and family history factors (HR = 1.35, 95% CI, 0.98–1.85). In contrast, an unhealthy WHR (≥ 0.90 for men and ≥ 0.85 for women) was associated with a 91% higher risk of mortality (HR = 1.91, 95% CI, 1.28–2.86), and remained significantly associated with mortality after adjustments for baseline comorbidities such as T2DM, CVD, and cancer, suggesting WHR may be a more robust mortality predictor than WC alone (Zhang et al., 2024).

These findings highlight the limitations of relying solely on BMI, especially in Hispanic women, who may be metabolically unhealthy despite having a “normal” BMI. Limitations include the observational design and low reported mortality rate due to censorship of data during the first two years of collection, reason not stated.

Lifestyle Approaches to Decrease Risk

Tettamanzi et al. (2021) conducted an inpatient crossover dietary study to compare the effect of a high protein (HP diet) versus a Mediterranean (M) diet on WHR and metabolic

biomarkers for 20 obese women with IR. The purpose of the study was to compare different macronutrient ratios and the impact on IR in obese women.

The baseline WHR was 0.86 (± 0.07) for the group starting with the HP diet and 0.91 (± 0.12) for the group starting with the M diet. Participants following the high-protein diet experienced a reduction in HOMA-IR of -0.996 (95% CI: $-2.11, 0.12$), whereas HOMA-IR increased slightly in the M diet group ($+0.32$; 95% CI: $-0.32, 0.96$). The adjusted mean difference between the two dietary interventions was -1.78 (95% CI: $-3.03, -0.52$; $p = 0.009$) indicating a significantly greater improvement in IR among participants consuming the high-protein diet. This study underscores the importance of nutritional interventions for women at risk for MetS, which is the population selected for this pilot project.

Limitations included the small inpatient sample, short intervention duration, and absence of long-term follow-up. The study did not measure WHR pre- and post- intervention between the two dietary interventions, only at baseline.

In an RCT, Charatcharoenwittaya et al. (2021) evaluated the effects of moderate-intensity aerobic exercise versus resistance training combined with dietary counseling in individuals with NAFLD. The majority were female medical personnel ($n = 27$ out of $n = 35$). Participants were randomly assigned to either 12 weeks of aerobic exercise or 12 weeks of resistance training with nutritional counseling. Outcome measures included anthropometrics, cardiorespiratory fitness, biochemistry changes (total cholesterol, high and low-density lipoprotein cholesterol, triglycerides, and glucose tolerance) measured at baseline and 12 weeks post-intervention.

Both groups showed a significant reduction in hepatic fat content ($p < 0.001$), with a mean relative reduction of 10.3% in the aerobic group and 12.6% in the resistance group. When

the data from both groups were combined, several factors were significantly associated with the absolute reduction of hepatic fat post intervention: (a) HOMA-IR, significant improvement over time in both groups ($p = 0.046$), (b) Exercise Frequency ($r = 0.52$; $p = 0.001$), exercise at least three times weekly led to the remission of hepatic steatosis in over 70% of participants, and (c) WC ($r = 0.48$; $p = 0.004$), and (d) Visceral Fat Rating ($r = 0.61$; $p < 0.001$) measured using a multifrequency bioelectrical impedance analyzer (TANTITA BC-418), (Charatcharoenwittaya et al., 2021).

There was a notable distinction in the findings between the WHR and WC. While the ratio remained stable in WHR, the absolute WC was significantly reduced in both aerobic exercise and resistance exercises ($p = 0.006$) (Charatcharoenwittaya et al., 2021). This suggests that while participants lost inches around their waists, one of the five MetS criteria, the proportional relationship between their waist and hip measurements did not shift significantly during the study period. Although the author did not provide height to calculate WHtR, WC focuses specifically on the abdominal region, supporting alternative measures to weight alone or BMI as clinical markers for NAFLD.

Limitations included the small convenience sample of medical personnel who might be more motivated to engage in exercise and nutrition counseling than a wider population. Although not exclusive to women, the female-majority sample, and the study results on exercise and structured dietary counseling reveal the potential for behaviorally supportive environments to facilitate exercise adherence and metabolic improvement.

Shukla et al. (2023) conducted an open label, randomized controlled pilot study with 45 adults who were overweight or obese. The participants were divided into two different groups, Group C (Standard Counseling) with 24 participants and Group FO (Food Order) with 21

participants who received the same counseling as group C, with additional counseling to consume carbohydrates last. The purpose of the study was to examine feasibility and impact on consuming carbohydrates last at every meal.

The cohort had a mean age of approximately 60, with females representing 66.7% of the FO group and 47.6% of the control group. The FO group achieved a significant reduction in weight ($p = 0.017$) compared to the control group ($p = 0.102$). Participants in the FO group demonstrated significant improvements in dietary intake, increasing their daily vegetable consumption by an average of 1.0 ± 1.6 cups ($p = 0.019$) and their daily protein intake by 2.5 ± 5.1 -ounce equivalents ($p = 0.050$). Fruits and vegetables are fundamental to a healthy diet and reduction of CVD and mortality (Shulka et al., 2025)

Although self-efficacy was not measured, an exit survey was obtained where 94% of the participants reported they were likely to continue the FO intervention. No significant changes noted in glucose tolerance and modest improvements in HbA1c ($p = 0.054$) were observed. Limitations included the small, primarily White sample and short duration. The study was elected for this project due to the intervention's simplicity and feasibility for integration into nutritional education at FHQCs.

Finally, narrative reviews by Dyńska et al. (2023) and Dyńska et al. (2025) informed the lifestyle counseling recommendations incorporated in the DNP project, as both emphasized patients using insulin to require medication adjustment or close monitoring during a fasted state. Dyńska et al. (2023) synthesized evidence on the safety and efficacy of intermittent fasting (IF) and reviewed individual lifestyle interventions, including postprandial physical activity, that improved glycemic regulation and metabolic health. Dyńska et al. (2025) expanded on this body of evidence by incorporating more recent RCTs, meta-analyses, and systematic reviews

examining IF as an adjunctive lifestyle strategy to improve IR, which is a contributing factor to MetS. Together, the reviews summarized evidence supporting lifestyle modifications for individuals with T2DM, prediabetes, obesity, and MetS.

Various fasting protocols were discussed in the Dyńka et al. (2023) narrative review, including time-restricted eating (14:10, 16:8, and 10-hour eating windows), alternate-day fasting, and twice-weekly fasting and how fasting can improve glycemic control (reductions in fasting glucose and HbA1c), enhance insulin sensitivity, promote weight and waist reductions, and in some studies favorably affect blood pressure and lipids (Dyńka et al., 2025).

Across the reviewed studies in Dyńka et al., (2025), IF was associated with significant improvements in metabolic markers. The review reported an RCT by Sukkriang and Buranapin (2024, as cited in Dyńka et al., 2025).) with reductions in fasting glucose of 30.91 mg/dL with a 16:8 fasting window and 28.06 mg/dL with a 14:10 fasting window, compared with a 9.09 mg/dL reduction in a control group who did not use IF. A1C decreased by approximately 0.5% in both fasting groups, and body weight decreased by 4.02% and 3.15%. In Khalafi et al. (2024, as cited in Dyńka et al., 2025) conducted a systemic review and meta-analysis of 14 randomized RTCs involving 1,101 adults with prediabetes or T2DM to evaluate the effects of IF on body composition and cardiometabolic health and found reductions in body weight (−4.56 kg), BMI (−1.99 kg/m²), HbA1c (−0.81%), fasting glucose (−0.36 mmol/L), and triglycerides (−0.14 mmol/L), two of which are a criteria in the diagnosis of MetS.

In a randomized crossover design by Myette-Côté et al. (2018 as cited in Dyńka et al., 2023) had 11 participants with T2DM follow a 4-day GL (low-fat, low glycemic) controlled eating protocol separated by 9-14 days of their normal diet, viewed as a washout period, before starting a 4-day LC diet protocol (low-carbohydrate high-fat diet) followed by another 9-14 day

washout period. The final 4-day eating protocol (LC+Ex) was an LC diet with three daily 15-minute post-prandial walk (Myette-Côté et al., 2018). The LC+Ex diet demonstrated better 24-hour glucose control than either the LC diet alone or by the GL diet (Myette-Côté et al., 2018). Strategically timing physical activity shortly after the main meal in this DNP pilot project may assist with postprandial hyperglycemia and improve 24-hour glucose control.

Both reviews by Dyńska et al., 2023 and Dyńska et al., 2025 emphasized the need for safety measures including close monitoring during fasting periods for patients who use IF and are currently taking insulin or sulfonylurea due to increased risk of hypoglycemia. Medication adjustments, glucose monitoring, and provider supervision were recommended when implementing fasting protocols, an important aspect of the project as the lead can adjust medications as an FNP. Dyńska et al. (2025) highlighted the value of continuous glucose monitoring (CGM) technologies to safely support fasting interventions. Since close monitoring of participants and CGMs were not part of the current DNP project, participants on sulfonylureas and insulin were excluded (Dyńska et al., 2023; Dyńska et al., 2025).

Limitations in the evidence synthesized by Dyńska et al. (2023) and Dyńska et al. (2025) did not evaluate similar fasting protocols, participant characteristics, and study methodologies, making direct comparisons across studies challenging. Several RTC included relatively small sample sizes and short follow-up periods, limiting conclusions regarding the long-term sustainability of IF interventions. Both reviews primarily synthesized evidence from adults with established T2DM, with comparatively limited evidence from the targeted population in this project.

Synthesis of the Literature Review

A gendered analysis of the literature reinforces the need for early MetS, particularly those cost-saving measures such as WC, WHR, and WHtR screening tailored to women, in all life stages. The studies by Blum et al. (2021), Sima et al. (2024) focused on IR as the primary metabolic disturbance. The studies by Blum et al. (2021) and Sima et al. (2024) showed how cardiac risk, metabolic dysfunction, and reproductive health were interrelated. Reeves et al. (2022) compared relative risk of cardiometabolic conditions among ethnic groups which indicates the importance of developing and testing interventions for specific understudied groups. Metabolic markers such as TG/HDL-C and HOMA-IR can incur laboratory costs. Using noninvasive markers may be especially useful in reproductive and perimenopausal populations where IR, increased WC contribute to conditions like PCOS, endometrial hyperplasia, CVD, and NAFLD.

Dietary and lifestyle interventions were shown to be effective in Charatcharoenwitthaya et al. (2021) and Shukla et al. (2023), emphasizing the value of structured, behaviorally informed care models that resonate with health promotion, and their population was predominantly women. Tettamanzi et al. (2021) addresses dietary changes influence cardiometabolic markers such as fasting glucose. Exercise reduces visceral adiposity, known to cause NAFLD, a late manifestation of MetS (Charatcharoenwitthaya et al., 2021). Incorporating lifestyle modifications could decrease the risk of CVD and metabolic disorders (Charatcharoenwitthaya et al., 2021; Shulka et al., 2023; Tettamanzi et al., 2021; Dyńska et al. 2023). In addition, Ma et al. (2022), Montoya Castillo et al. (2025) and Zhang et al. (2024) emphasized that anthropometric markers are stronger predictors of mortality in women than BMI alone. WHtR can be used as a practical screening alternative for MetS in primary care (Ma et al., 2022; Montoya Castillo et al., 2025).

Limitations in the Literature

Despite limitations such as small sample sizes, limited ethnic diversity, and short durations, the collective evidence supports the use of simple anthropometric and biochemical screening tools to detect and treat MetS early in women. Integrating WHtR and metabolic markers into routine screening in primary care and developing proactive interventions could close the existing gaps in cardiometabolic prevention among female patients. The current DNP project aims to address this gap by initiating a lifestyle educational intervention and studying its effect on WHtR as a measure of cardiometabolic risk and self-efficacy for healthy eating.

CHAPTER FOUR: METHODS

Ethical Considerations

This QI pilot project was implemented within an established primary care clinic. An Institutional Review Board (IRB) exemption was obtained prior to initiation (IRB-25-2710-AM-002) (Appendix C). No experimental treatment was tested during this project, and all procedures fell within standard preventive health measures. Informed consent was provided using an IRB-approved consent script. Participants were informed of the purpose, voluntary nature, and potential benefits of the program. Data were de-identified to maintain patient confidentiality in accordance with the Health Insurance Portability and Accountability Act (HIPAA). Results were stored on the FQHC's secure network with a virtual private network (VPN) and password-protected servers, with access limited to project personnel.

Special attention was given to the participation of Spanish-speaking Hispanic women in perimenopause and menopause, ensuring that cultural and linguistic needs were respected using a bilingual provider and bilingual educational materials. At the FQHC, the Patient Health

Questionnaire-9 (PHQ-9) is administered at every primary care visit for members aged 12 years and older, providing an ongoing measure of depressive symptoms.

In this project, the PHQ-9 was included as part of participant demographics. The routine screening was relevant to the proposed nutrition and lifestyle-modification intervention, since individuals experiencing depression could represent a more vulnerable subpopulation while simultaneously could benefit from structured support. Depression was not an exclusion criterion for participation; however, it could have influenced retention rates and participant engagement or results. The project lead was a board-certified Family Nurse Practitioner (FNP) licensed to assess and treat depression and refer patients to behavioral health services if indicated.

Project Design

The project was a quasi-experimental, single-site pilot project using a pre-test/post-test design to evaluate the effect of targeted nutrition and lifestyle counseling (i.e., small daily modifications in diet and activity) on WHtR measurements and self-efficacy for healthy meals among Hispanic women aged 35–65 years. The design mirrored approaches used in prior metabolic and lifestyle intervention research in which anthropometric and clinical measures were combined with culturally tailored counseling to evaluate changes in cardiometabolic risk over time (Shukla et al., 2023).

Setting and Sample

The project was implemented in an outpatient primary care setting within an FQHC in Los Angeles County serving predominantly Hispanic and medically underserved populations. The clinic provides preventive and chronic disease management services and offers bilingual English- and Spanish-language care. Hispanic women in the perimenopausal and menopausal

age ranges were selected because women in this age group have higher ratios for adverse clinical outcomes (Reeves et al., 2022).

Instruments

The primary instrument was a measuring tape to assess the WHtR, calculated by dividing WC in centimeters by height in centimeters. A WHtR ≥ 0.5 was used as the threshold for increased cardiometabolic risk, consistent with established evidence in Hispanic and Latino populations (Ma et al., 2022; Montoya Castillo et al., 2025). WC was measured using a non-stretchable measuring tape at the midpoint between the lower rib and iliac crest, with the patient standing and breathing normally, following World Health Organization (WHO, 2008) protocols published in Ostechega et al. (2019) WC methodology study. This anthropometric measure has demonstrated strong predictive validity for MetS across ethnicities, including in Hispanic populations (Zhang et al., 2024). This measurement was obtained by the same individual, the project lead, for all participants at baseline and again at the eight-week post-intervention assessment.

Perceived confidence in maintaining healthy eating behaviors was assessed using an 11-item self-efficacy questionnaire administered before and after the intervention (Appendix D). The instrument, Self-Efficacy Scale for Health Meals (Macias-Navarro et al., 2025) was used to evaluate participants' perceived confidence in their ability to make and sustain healthy dietary choices before and after completing the *Pequeños Cambios Diarios* program. There were two subscales in the instrument: Situational Barriers (Q2,3,5,8,9,10,11) and Resource Barriers (Q1,5,6,7). Self-efficacy is recognized as an important factor influencing the adoption and maintenance of long-term health behavior change as emphasized by the behavioral component in the SCT+B theory (Anton et al., 2021; Bandura, 1986). As authors of the scale, Macias-Navarro

et al., (2025) noted that criteria for its use should include an obesity diagnosis and at least one cardiometabolic abnormality, which is relevant to the population for this DNP project.

Intervention

The intervention bundle, titled *Pequeños Cambios Diarios* (“*Small Daily Changes*”), integrated four practical lifestyle strategies: (a) use of the American Diabetes Association (ADA) Plate Method to support balanced meal composition, (b) reduced time-window eating (intermittent fasting; IF), (c) dietary sequencing in which protein and non-starchy vegetables were consumed before carbohydrates to improve postprandial glycemic response (food order; FO), and (d) light physical activity such as walking or movement for ten minutes after the largest meal of the day instead of remaining sedentary (American Diabetes Association [ADA], 2024 Charatcharoenwitthaya et al., 2021; Dyńska et al., 2023; Shukla et al., 2023) (Appendix E). Culturally tailored nutrition materials were given to participants courtesy of My Healthy Plate from The Institute for Family Health (Appendix F). To provide visual representation, images from Shulka et al (2023), adapted from USDA MyPlate were included in the educational materials to assist with FO (Appendix G). Examples of IF from the FQHC where the project was held were provided (Appendix H) along with examples of light physical activity (Appendix I).

All educational materials were provided in the participants’ preferred language, English and/or Spanish, to support comprehension and implementation of the recommended behaviors. The evidence-based intervention was delivered individually, followed by a follow up phone visit every two weeks to answer questions and provide support, and an in-person reassessment at 8 weeks post-intervention for repeat anthropometric measurements (WHtR), and Self-Efficacy for Healthy Meals Scale.

Procedures

During a provider meeting at the clinic, a brief overview of the project was presented to guide the providers in screening potential participants for the project. The information session included a handout from Obesity Association, a division of ADA which recognizes that BMI alone is not an accurate measure for adiposity and recommends including WHtR (The Obesity Association, n.d.) (Appendix J).

Recruitment

Eligible participants were identified by clinic providers during a routine visit using the inclusion and exclusion criteria given at the provider meeting. IRB approved recruitment flyers were also placed in the exam rooms. Those who were interested in the project were sent to the project lead through a soft hand off via secure chat incorporated in the electronic health record system.

Implementation

Since participants were at a routine visit, blood pressure, height, weight, social determinants of health, and PHQ-9 had already been collected. After reading an IRB approved informed consent script and gaining participant consent, the project lead obtained WHtR and administered the Self-Efficacy for Healthy Eating Scale. Participants then received the *Pequeños Cambios Diarios* intervention during the individual education session in their preferred language. A follow-up contact via phone visit occurred every two weeks to reinforce intervention concepts, address participant questions, and provide support. At eight weeks, participants returned for repeat WHtR measurement and completion of the post self-efficacy questionnaire.

The 8-week duration was chosen to provide participants with adequate time to implement and practice the recommended dietary and lifestyle modifications while allowing for the

assessment of short-term changes in WHtR and healthy eating self-efficacy. Evidence from nurse-led interventions suggests that programs lasting 5 to 8 weeks are associated with meaningful improvements in health-related outcomes and participant engagement (Crowe et al., 2015).

Data Analysis

Descriptive statistics were employed to describe the initial demographics and social determinants of health characteristics of all 10 participants (pre-intervention). Eight participants completed all steps of the program. Paired data were reported as median and interquartile range (IQR). The nonparametric methods of inferential analysis were chosen to be the most conservative and appropriate analysis due to the small pilot project sample size completed ($N = 8$). A Wilcoxon Signed-Rank Test was carried out for primary outcome measures for complete cases for pre- and post-intervention of WHtR and Self-Efficacy. A Wilcoxon Signed-Rank Test was used item-by-item for each of the 11 questions in the Self-Efficacy Scale for Healthy Meals. SPSS V31 MAC Student License was used. A significance level of $p < .05$ was used for all inferential analyses.

Financial Considerations

The project was supported by the Gorman Centennial Fellowship in Nursing, awarded through the UCLA School of Nursing DNP Practice Program for the 2025-2026 academic year. The scholarship enabled the project lead to reduce clinical work hours and dedicate protected time during the implementation process. The \$5,500 fellowship provided funding to provide participants who completed the 8-week program a token of appreciation of a \$25 gift card, approximately \$21 in printing costs for recruitment flyers, and low-cost project supplies, including non-stretch measuring tape (less than \$2) used for anthropometric measurements.

CHAPTER FIVE: RESULTS

Patient Characteristics

Ten Hispanic/Latina women included in the baseline sample met the project's target population inclusion criteria and had a mean age of 46.50 ($SD = 10.08$) years. All participants enrolled had a BMI ≥ 25 kg/m and when WC was obtained at baseline, they also met the elevated cardiometabolic risk criteria (WHtR ≥ 0.5) at baseline.

None of the participants who completed the program scored 10 or above in the PHQ-9, meaning none had severe or moderate depression pre- or post-intervention. Post intervention, two participants scored between 0-4, considered "watchful wait," one participant scored between 5-9, indicating mild depression, and all three had a scheduled follow up with primary care.

The majority (70%) of the cohort worked full-time, and 60% were enrolled in Medi-Cal. Most of the cohort (80%) reported stable housing, and 60% of participants reported no regular physical activity at baseline, demonstrating a need for a lifestyle intervention. None of the participants reported food insecurity, making them eligible to complete the Self-Efficacy Scale for Healthy Meals (Table 1). Eight of the 10 participants who enrolled in the 8-week *Pequeños Cambios Diarios* pilot project completed the intervention, resulting in an 80% completion rate.

Table 1: *Baseline Demographic and Social Determinants of Health Characteristics (N = 10)*

Characteristic	n (%)
Age (years), Mean $\pm$ SD (Range)	46.50 $\pm$ 10.08 (35 - 61)
Ethnicity	
Hispanic/Latina	10 (100.0%)
Primary Language	
English	4 (40.0%)
Spanish	3 (30.0%)
Both English and Spanish	3 (30.0%)
Education Level	

College degree	3 (30.0%)
High school	3 (30.0%)
Less than high school	4 (40.0%)
Employment Status	
Full-time	7 (70.0%)
Part-time	2 (20.0%)
Homemaker	1 (10.0%)
Marital Status	
Married	5 (50.0%)
Single	5 (50.0%)
Insurance Type	
Medi-Cal	6 (60.0%)
Private	3 (30.0%)
Medi-Cal and Private	1 (10.0%)
Social Determinants of Health (SDOH)	
No Food Insecurity	10 (100.0%)
No Transportation Difficulty	9 (90.0%)
Stable Housing	8 (80.0%)
Baseline Cardiometabolic Risk	
Elevated Risk (WHtR ≥ 0.5)	10 (100.0%)
Baseline Physical Activity	
None	6 (60.0%)
3-4 days/week	1 (10.0%)
5+ days/week	3 (30.0%)
Smoking Status	
Never	7 (70.0%)
Former	2 (20.0%)
Current	1 (10.0%)
Alcohol Use	
None	9 (90.0%)
Occasional	1 (10.0%)

Inferential Statistical Results

WHtR

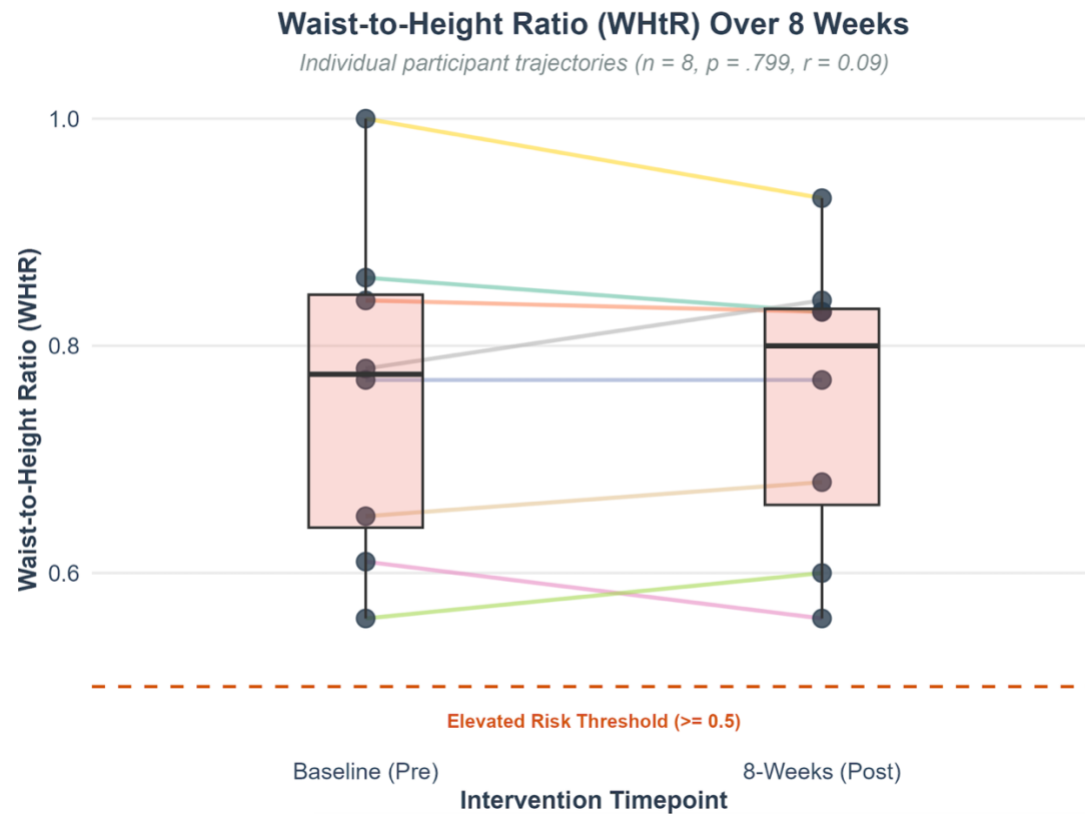
A Wilcoxon Signed-Rank Test was conducted on the project's primary outcome measure for complete cases ($N = 8$) (Table 2). There was no statistically significant change in WHtR (Mdn = 0.78 [0.24] vs. 0.80 [0.22], $Z = -0.254$, $p = .799$, $r = 0.09$).

Table 2: Primary Outcomes: Changes in WHtR from Baseline to 8-Weeks ($N = 8$)

Primary Outcome	Pre-Intervention Median [IQR]	Post-Intervention Median [IQR]	Z	p-value	Effect Size (r)
WHtR	0.78 [0.24]	0.80 [0.22]	-0.254	.799	0.09

Note. $N = 8$ represents complete cases. IQR = Interquartile Range. The Wilcoxon Signed-Rank Test was utilized. Effect size (r) is interpreted as: .10 = small, .30 = medium, .50 = large.

Figure 2: Primary Outcomes: Changes in WHtR Over 8-Weeks ($N = 8$)



Self-Efficacy for Healthy Meals

Self-efficacy was measured using a Wilcoxon Signed-Rank Test. There was a statistically significant improvement in self-efficacy total score between baseline (Median = 31.00, [15] and post-intervention (Median = 42.50, [11.75] $Z = -2.316$, $p = .021$, and a large effect size ($r = 0.82$) suggesting significant positive change (Table 3) (Figure 3).

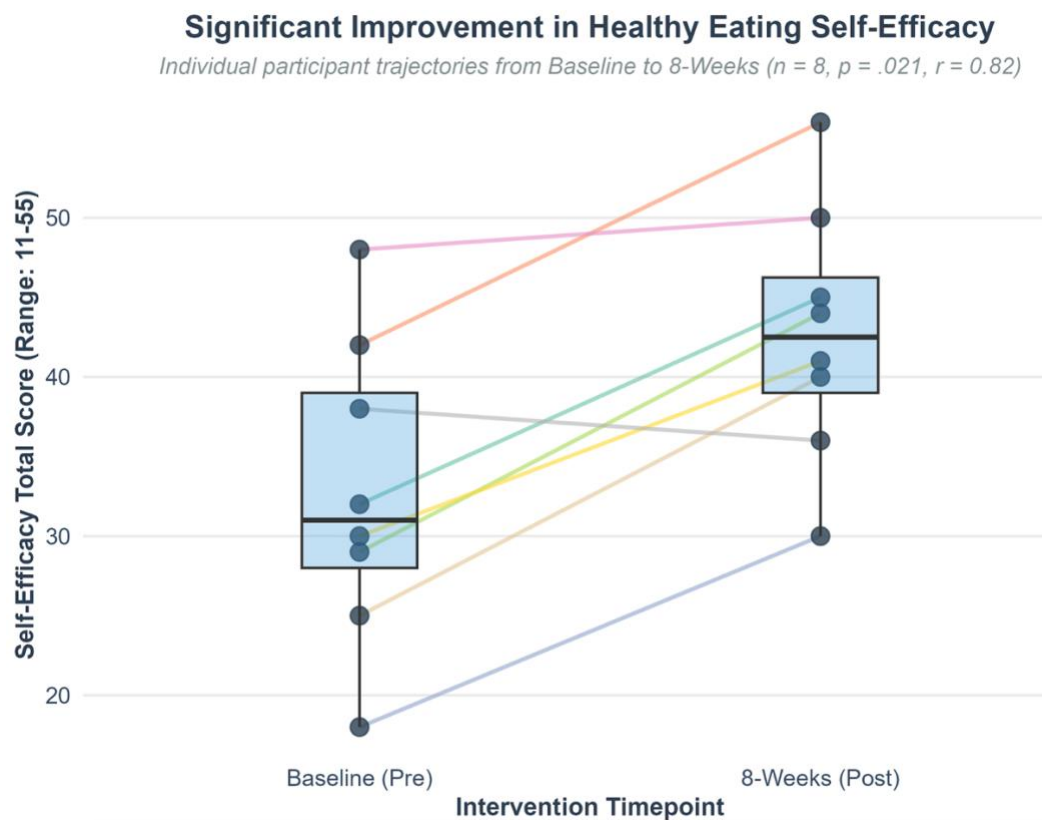
Table 3: *Secondary Outcomes: Changes in Self-Efficacy from Baseline to 8-Weeks (N = 8)*

Secondary Outcome	Pre-Intervention Median [IQR]	Post-Intervention Median [IQR]	Z	p-value	Effect Size (r)
Self-Efficacy Total Score	31.00 [15]	42.50 [11.75]	-2.316	.021*	0.82

Note. N = 8 represents complete cases. IQR = Interquartile Range. The Wilcoxon Signed-Rank

Test was utilized. Effect size (r) is interpreted as: .10 = small, .30 = medium, .50 = large.

Figure 3: *Significant Improvement in Self-Efficacy for Healthy Eating*



Itemized Results for Questions in the Self-Efficacy Scale

Results of conducting an item-by-item Wilcoxon Signed-Rank Test on the Self-Efficacy Scale demonstrated that there were statistically significant improvements on three of the self-efficacy behavior items (Table 4). Question 11 (Situational Barrier) experienced the most significant improvement (Mdn = 1.50 to Mdn = 3.50) with $Z = -2.444$, $p = 0.015$, $r = 0.86$, a very large effect size. Question 8 (Situational Barrier) showed a significant improvement, though to a slightly lesser degree than Question 11 (Mdn = 2.00 to Mdn = 3.50) with $Z = -2.121$, $p = 0.034$, $r = 0.75$, a very large effect size. Question 6 (Resource Barrier) also demonstrated a significant improvement (Mdn = 4.00 to Mdn = 5.00) with $Z = -2.060$, $p = 0.039$, $r = 0.73$, again a very large effect size (Table 4). While not statistically significant, Questions 5, 7, and 10 indicated a trend towards improvement in participant's confidence ($p < 0.10$). These itemized results suggest the *Pequeños Cambios Diarios* program was effective in increasing participants' confidence regarding the healthy eating behaviors represented by Questions 6, 8, and 11 (Appendix D).

Table 4: Wilcoxon Signed-Rank Test Results for Individual Self-Efficacy Questionnaire Items ($N = 8$)

Questionnaire Item	Pre-Intervention Median [IQR]	Post-Intervention Median [IQR]	Z	p-value	Effect Size (r)
Q1	4.00 [1.25]	4.00 [3.00]	-0.378	.705	0.13
Q2	2.00 [1.50]	4.00 [2.00]	-1.709	.088	0.60
Q3	2.50 [1.25]	3.00 [1.75]	-0.557	.577	0.20
Q4	3.00 [2.25]	4.00 [2.00]	-1.342	.180	0.47
Q5	3.50 [3.25]	5.00 [1.00]	-1.841	.066	0.65
Q6	4.00 [3.25]	5.00 [1.50]	-2.060	.039*	0.73
Q7	4.00 [3.00]	5.00 [0.75]	-1.857	.063	0.66
Q8	2.00 [3.25]	3.50 [2.00]	-2.121	.034*	0.75
Q9	3.00 [3.25]	5.00 [2.00]	-1.342	.180	0.47

Q10	2.50 [4.00]	5.00 [2.00]	-1.890	.059	0.67
Q11	1.50 [1.25]	3.50 [2.00]	-2.444	.015*	0.86

Note. N = 8 represents complete cases. Effect size (r) is interpreted as: .10 = small, .30 = medium, .50 = large.

Informal Participant Feedback Post Intervention

During the final visit, some participants verbalized feedback which may be helpful for future projects. An adherence calendar was given to all ten participants to assist with tracking their progress and only one completed it. Several participants recommended using technology, such as an app, to track their adherence to each element of the *Small Daily Changes* program, which may be beneficial for a project measuring adherence in future research. One participant experienced substantial difficulty adhering due to caregiving and occupational responsibilities, including employment in three jobs, weekend caregiving for an elderly parent, and nighttime childcare for a grandchild. These competing demands made it challenging to adhere to the physical activity portion of the intervention, as travel between jobs often replaced the opportunity for postprandial activities.

One participant mentioned her children and family were picky eaters, but she learned to prioritize her nutrition by defrosting frozen vegetables to add to the meal being prepared for the family, which did not contain vegetables. The same participant learned to freeze leftover vegetables for another occasion in single serving size for a “quick fix” of a plate that did not have vegetables. Another participant mentioned she had two special needs children who were also picky eaters, but she also learned to visually assess her plate portions first. A participant verbalized in Spanish her pants were “looser around the waist.” Important feedback included how easy it was to start moving after dinner rather than sitting and incorporating more vegetables

to a meal being prepared for the rest of the household where vegetables would not have usually been included.

CHAPTER SIX: DISCUSSION

WHtR remained relatively unchanged over the eight-week intervention period. The lack of measurable improvement in WHtR may reflect the project's short duration. Unlike behavioral outcomes, which may respond more readily to education and increase confidence in performing health-promoting eating behaviors, changes in anthropometric measures depend on sustained behavioral and physiological changes over time. The *Pequeños Cambios Diarios* program emphasized practical lifestyle modifications, rather than a standardized weight-loss or calorie-restriction protocol; therefore, changes in confidence and behavioral practices may reasonably precede measurable reductions in WC.

Significant improvements were observed in participants' confidence related to recipe use (Q6), family preferences (Q8), and food waste management (Q11). Confidence in preparing healthy meals using recipes increased significantly indicating greater self-efficacy in applying meal-preparation skills. Participants also demonstrated greater confidence in preparing healthy meals despite family preferences, indicating improved ability to navigate social and household barriers to healthy eating. The largest improvement was observed in food waste management, where confidence increased reflecting a substantial gain in participants' perceived ability to utilize food efficiently while maintaining healthy meal practices.

Macias-Navarro et al. (2025) identified recipe use, family preferences, and food waste as important components of healthy meal self-efficacy. The authors proposed using the scale to assess the effectiveness of educational and culinary medicine interventions designed to improve self-efficacy related to healthy meal preparation, such as this educational pilot project (Macias-

Navarro et al., 2025). This QI project used patient education to provide practical strategies through its four components around eating behaviors. Incorporating bi-weekly check-ins provided opportunities to address situational barriers and help women incorporate each of the project's four components.

This QI project extended the application of the Self-Efficacy Scale by using this instrument to obtain a baseline and post-intervention score to evaluate changes in participants' self-efficacy following a tailored lifestyle nutrition education intervention. During the baseline assessment of self-confidence, participants in the *Small Daily Changes* program demonstrated the greatest confidence in their ability to prepare healthy meals despite increased food prices, in the absence of a recipe, and limited ingredients at home (Q1, Q6, and Q7). Similarly, participants in the Macias-Navarro study (2025) rated greatest confidence in their ability to prepare healthy meals when prices are increasing (Q1) and when no recipe is available (Q6). The lower baseline confidence for participants in the DNP study was observed for barriers related to time constraints, accommodating family preferences, cleaning after cooking, stress, and regarding food waste (Q11, Q2, Q8, Q3, Q10). Similarly, participants (primarily Hispanic women) in the Macias-Navarro study (2025) indicated low confidence in preparing healthy meals when stressed (Q3) and when there is limited time (Q2). Recognizing the two barriers that were common in both studies could inform future work on lifestyle interventions.

Although Shulka et al. (2023) did not utilize a formal theoretical framework to measure self-efficacy, applying the SCT+B lens to their findings reveals a similar pattern to this QI project, suggesting behavior changes may occur prior to measurable biological changes. In their 16-week food-order program, Shulka et al. (2023) administered a 12-question exit survey to capture participants' experiences with consuming vegetables and protein before carbohydrates.

Participants reported intention to continue with food-order strategy and increase their vegetable consumption. This pattern aligns with the current QI project, in which improvement in self-efficacy reflected in the behavioral component of SBT+C, while the absence of change in WHtR reflected biological component of SBT+C).

Anthropometric findings differed between the two projects. Shulka et al. (2023) reported modest reduction in body weight in the FO group ($p = 0.048$) compared to standard nutrition alone. The shorter eight-week duration of the DNP project, compared with the 16-week intervention by Shulka et al. (2023), may have limited the opportunity to observe anthropometric change in WHtR. The current DNP project may have benefited by including other anthropometric measurements, such as weight and BMI pre- and post- intervention for comparison.

Charatcharoenwitthaya et al. (2021) found that a 12-week structured exercise program comparing moderate-intensity aerobic exercise with resistance training, combined with dietary counseling, significantly reduced WC. Because participants had varying physical activity capabilities, which could not be monitored, the *Pequeños Cambios Diarios* program did not incorporate a structured, supervised exercise program. Instead, the project emphasized an accessible approach to postprandial physical activity.

Charatcharoenwitthaya et al. (2021) observed a significant reduction in WC while WHR remained unchanged during the study period. The differences in exercise intensity, structure, and intervention duration may help explain the absence of measurable anthropometric change in the current QI project. A longer intervention incorporating more structured or progressive physical activity may have provided greater opportunity to change WHtR in the DNP project.

Strengths

Although the intervention did not produce a significant reduction in WHtR over the 8-week period, participants experienced a significant increase in some aspects of self-efficacy, indicating enhanced confidence in their ability to engage in healthy eating behaviors such as ADA plate, FO, and lifestyle modifications such as IF and postprandial activity. These findings suggest that behavioral and cognitive changes may occur before measurable anthropometric improvements and could support the use of nutrition-focused interventions to promote long-term metabolic health.

Limitations

Due to limited recruitment time and a lapse in access to electronic health records at the implementation site, this project had a small sample size. To mitigate recruitment challenges, the project lead regularly reminded team providers about the project once access to electronic health records was established during provider meetings, notified clinic staff when recruitment was occurring on-site, reviewed patient charts to identify potentially eligible participants, and communicated with providers through secure chat for live handoffs.

The pilot study was also a single-site project without a control group, which limits the generalizability of the findings; however, as a pilot QI project, the findings provided preliminary data, including informal participant-reported experiences and outcomes, that may inform future implementation and evaluation in larger population samples. Future projects conducted across multiple clinic sites, with large sample sizes and a comparison group, will strengthen the evaluation of intervention outcomes.

The project's data collection did not identify whether women were on hormone replacement therapy or on medications such as metformin and/or GLP-1 analogues or had a

history of bariatric surgery, identified as important variables in Blum et al. (2021). This project also did not focus on body weight changes, BMI, or laboratory tests to measure pre- and post-metabolic changes, which could have been beneficial to further assess the biological component of change since WHtR was unchanged during the eight-week intervention.

The Self-Efficacy questionnaire was self-reported pre- and post- intervention, subject to bias. The findings reflect participants perceived confidence in performing health eating behaviors, where incorporating an app to track daily changes, as recommended by some participants, may give objective data to compliment subjective measures of behavior change.

Clinical Implications for Future Practice and Research

The improvement in self-efficacy suggests that brief, small everyday micro-habits in nutrition and activity may be a valuable strategy for supporting behavior change for Hispanic women with an elevated BMI in primary care settings. Increased confidence in healthy eating behaviors may contribute to long-term improvements in metabolic health and chronic disease prevention. Bringing awareness to early diagnosis and treatment of MetS may also promote awareness of the need for funding, future research, and early introduction of medications by primary care providers.

Future research should include the effects of reproductive health in women with MetS since there is evidence that PMOS has both metabolic and cardiometabolic features (Teede et al., 2026). It is important to provide funding to study whether follicular disturbances during adolescent and reproductive age have sequelae for perimenopause and menopausal women and cardiometabolic health (Teede et al., 2026).

MetS is complex and the effects are noted at the cellular level with inflammatory markers (Dyńska et al 2023; Ma et al., 2022; Montoya Castillo et al., 2025; Teede et al., 2026; Tettamanzi

et al., 2021). These markers that include necrosis factor-alpha, interleukin-6, and c-reactive protein disrupt insulin signaling pathways leading to adipose dysfunction, HTN, hyperglycemia, and dyslipidemia (Teede et al., 2026). Addressing truncal obesity is merely scratching the surface in MetS, as excess visceral adipose tissue can produce inflammation and place the person in a prothrombic and proinflammatory state (Ma et al., 2022). Considering coagulation and inflammatory markers for future research may help understand early metabolic risks, autoimmune conditions, and cancers associated with obesity.

Similar to the findings in the DNP project, other studies expressed time as a limitation in research and emphasized the need for measuring the effect of nutrition and meal sequencing on long-term metabolic impacts (Shulka et al, 2023, Tettamanzi et al, 2021). Although this project focused on women, men with obesity have lower concentrations of anti-inflammatory adiponectin (Zhang et al., 2024) and should be included in future projects that address MetS. This project focused on perimenopausal and menopausal women. Longitudinal studies will help produce multigenerational data to follow the lifespan effects of MetS. Children should also be considered in future research due to the rise in pediatric obesity and MetS prevalence. Approximately 25.8 million children and 35.5 million adolescents could be affected globally (Noubiap et al., 2022).

Investigating the effect of small daily changes towards decreasing MetS risk among additional marginalized groups at risk for MetS is essential. Teede et al. (2026) acknowledged the necessity of considering gender-diverse individuals within the diagnostic and management framework for this condition, marking a shift toward more inclusive terminology in the broader medical community as many women, born female or transitioned, may have gone through hormonal changes during gender affirming care and MetS may affect them differently.

Consideration of the biological components of the SCT+B model (Anton et al., 2021) could lead to additional ideas for early interventions that prevent complications associated with MetS. Identifying IR women with or without PMOS/PCOS may allow for additional conjunctive therapies and for future insurance coverage to address MetS, MASLD and central adiposity (Blum et al., 2021; Teede et al., 2026).

CONCLUSION

This QI evidence-based project addressed the clinical question by evaluating whether participation in the culturally tailored *Pequeños Cambios Diarios* intervention influenced WHtR and healthy eating self-efficacy among Hispanic women at increased risk for metabolic syndrome. Changes in WHtR were not statistically significant during the eight-week pilot; however, participants demonstrated improvements in healthy eating self-efficacy and reported that individualized, culturally tailored counseling was valuable in supporting dietary and lifestyle behavior changes. These findings suggest that personalized education may promote confidence in adopting and maintaining healthier behaviors, even when measurable anthropometric changes are not immediately observed.

The literature review provided support for implementing culturally tailored lifestyle interventions aimed at reducing cardiometabolic risk among Hispanic women. Consistent with SCT-B, the intervention emphasized self-efficacy, behavioral capability, and ongoing support to facilitate sustainable changes in health behaviors among women disproportionately affected by metabolic risk factors.

The literature also revealed important gaps, including the need for larger and more diverse samples, longer follow-up periods, and additional research evaluating the effectiveness of culturally tailored interventions in primary care settings. Future studies should examine

whether improvements in self-efficacy translate into sustained behavioral changes and long-term reductions in cardiometabolic risk indicators.

Family nurse practitioners with doctoral education play a role in translating evidence into clinical practice to close these gaps. This QI pilot provided a culturally responsive, low-cost intervention designed for implementation within a resource-limited primary care setting.

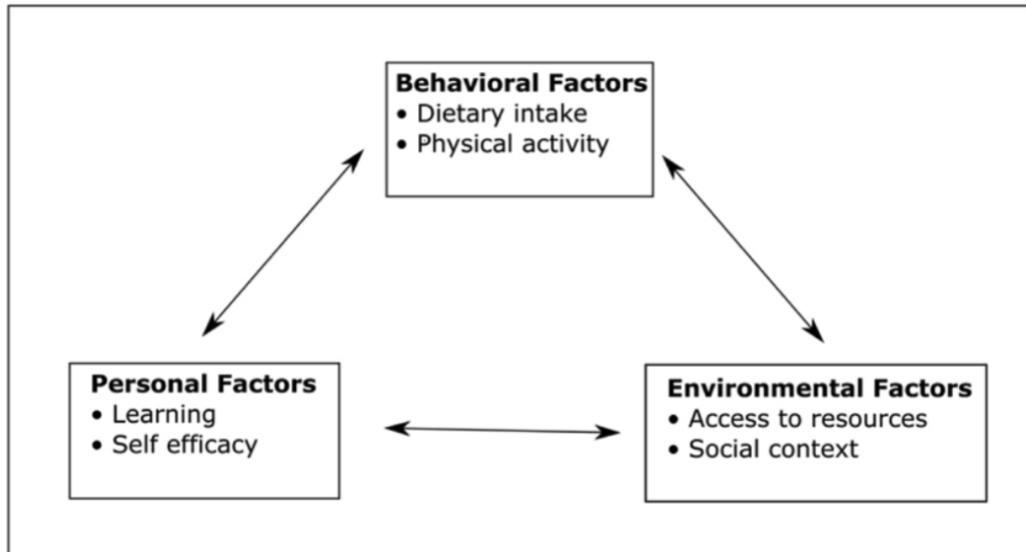
Collaboration among the project lead, clinical mentor, and chairperson reflected scholarly partnership and practice innovation, while the evaluation of participant outcomes supported outcomes-focused scholarship. By piloting this intervention in a primary care setting serving Hispanic women, the project contributes to health equity, supports informed clinical decision-making, and offers a scalable, advanced practice nurse-led approach to promoting healthy lifestyle behaviors and reducing cardiometabolic risk.

APPENDICES

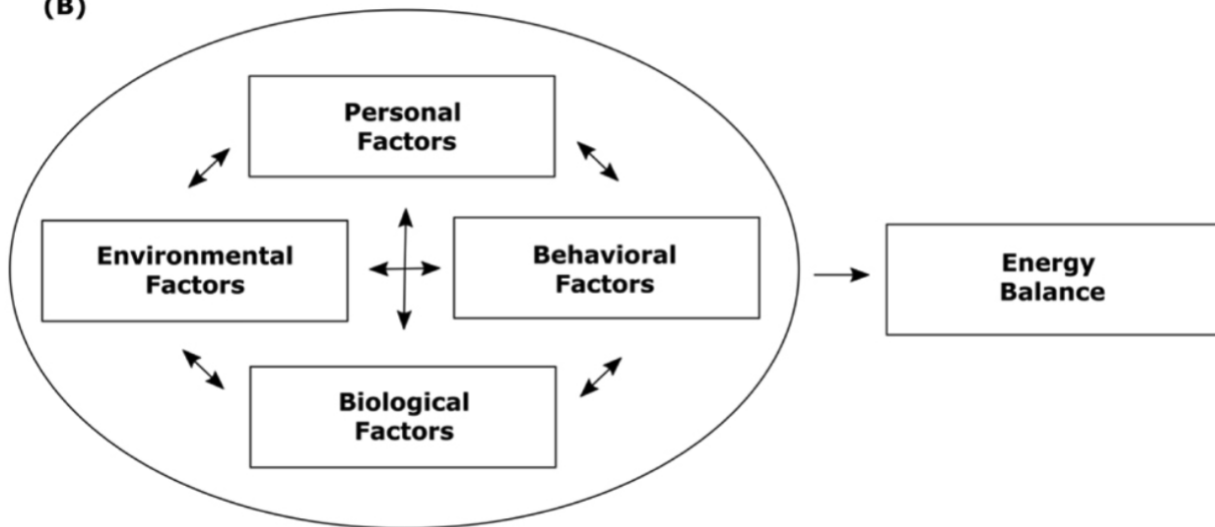
Appendix A

(A) Traditional model of reciprocal determinism in social cognitive theory. (B) New model of reciprocal determinism illustrating the multiple and interactive factors affecting energy balance

(A)

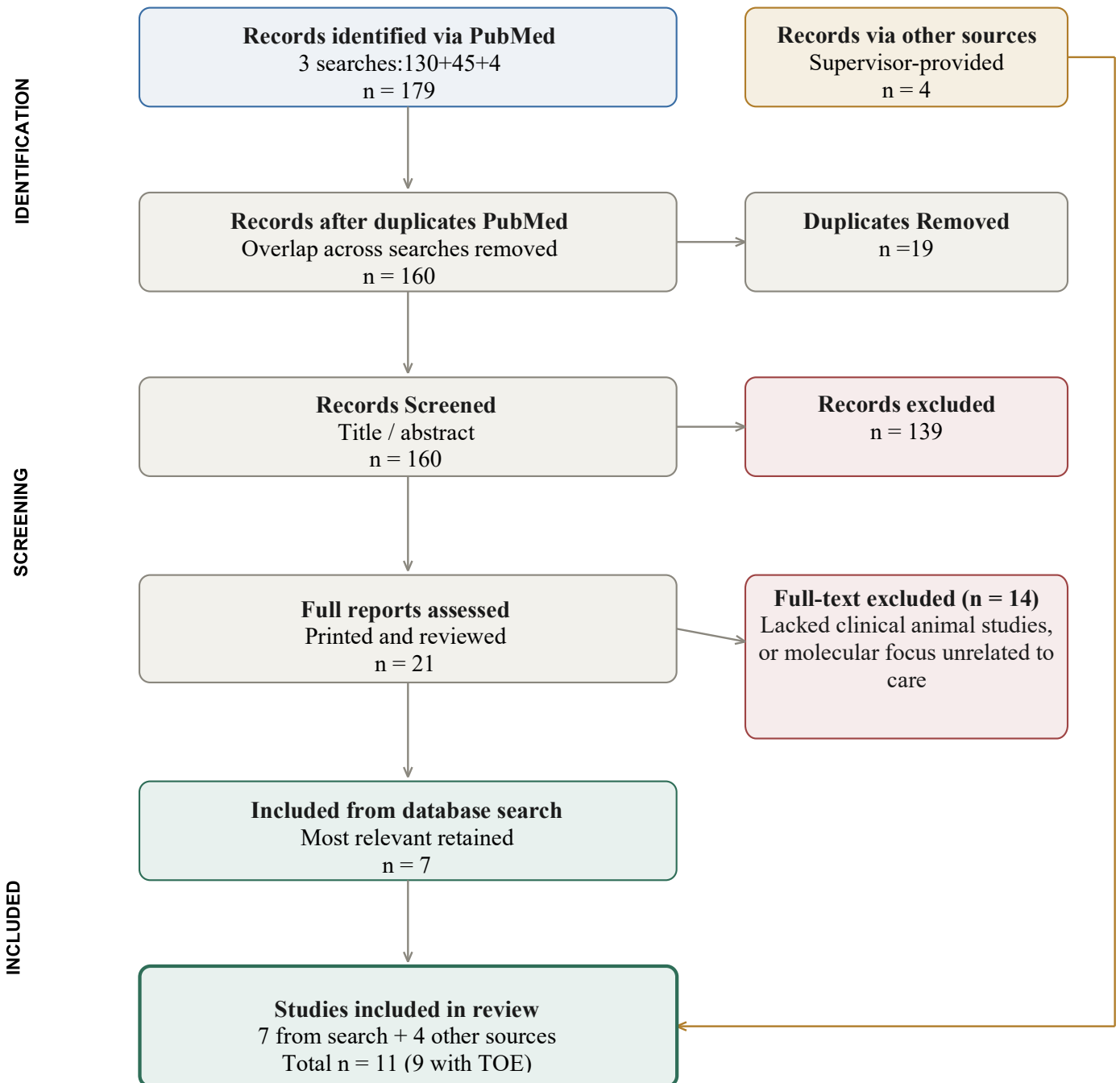


(B)



Appendix B

PRISMA 2020 flow diagram



Note. The 179 records represent the union of three progressively narrowed PubMed searches (WHtR + metabolic syndrome + women, 2021–2026 = 130; WHtR + women + Hispanic = 45; HOMA-IR + metabolic syndrome + treatment + nutrition = 4). Overlapping records (n = 19) were removed at the duplicate stage. Full-text exclusion reasons were recorded by category; a per-reason count was not logged. Adapted from the PRISMA 2020 statement.

Appendix C



Research Administration Human Research Protection Program

University of California Los Angeles
10889 Wilshire Blvd, Suite 830 Los Angeles,
CA 90095-1406 <https://ohrpp.research.ucla.edu/>

(310) 825-5344
General Campus IRB: gcirb@research.ucla.edu
Medical IRB: mirb@research.ucla.edu

CERTIFICATION OF EXEMPTION

Date:	February 4, 2026
To:	PI: ELVIA MEXICANO SCHOOL OF NURSING Faculty Sponsor: Carol Pavlish, PhD, RN SCHOOL OF NURSING
From:	Gencie Turner, PhD Administrator, South General Institutional Review Board
RE:	IRB-25-2710-AM-002 Study: Pequeños Cambios Diarios for Hispanic Women Modification: Modification / Update #2 for Study Pequeños Cambios Diarios for Hispanic Women

Submission and Review Information

Type of Review	Exempt
Review Date	2/4/2026
Expiration Date of the Study	None
Funding Source(s)	None

Review Determinations

- **Exempt Certification** - This research has been certified as exempt from IRB review per 45 CFR 46.104 category 1.
- --The UCLA exemption determination does not cover the involvement of non-UCLA affiliated investigators who are subject to the oversight of another IRB office. External researchers who are affiliated with institutions that have their own IRB must also obtain certification of exemption or IRB approval (as determined by their institution) from their own institution's IRB prior to engaging in research activities involving human subjects.

Important Note: IRB approval or certification of exemption does not, in and of itself, constitute approval for the implementation of this project. Other UCLA clearances and approvals or other external agency or collaborating institutional approvals may be required before activities are initiated. Research or clinical use undertaken in conjunction with outside entities, such as drug or device companies, are typically contractual in nature and require an agreement between the University and the entity.

As indicated in the Initial-CR PI Assurances as part of the requirements for IRB approval or certification of exemption, the PI has ultimate responsibility for the conduct of the study, the ethical performance of the project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the IRB.

The PI and study team will comply with all UCLA policies and procedures, as well as with all applicable Federal, State, and local laws regarding the protection of human subjects in research, including, but not limited to, the following:

- The PI has ultimate responsibility for the conduct of this project, the ethical performance of the project, the protection of the rights and welfare of human participants, and strict adherence to any stipulations imposed by the IRB.
- The PI will comply with all federal laws, state laws, and UCLA policies that apply to my project.
- The PI will comply with all OHRP, FDA, and UCLA reporting requirements, including serious and unexpected adverse events.
- The PI will ensure adequate resources to protect research participants (i.e., personnel, funding, time, equipment and space) are in place before implementing the research project, and that the research will stop if adequate resources become unavailable.
- All research utilizing drugs and biologics will be managed through the UCLA Department of Pharmaceutical Services. Once ancillary annotations are completed in Oncore, your study will be reviewed by the Investigational Drug Pharmacy and a pharmacist will complete a budget assessment of services. Provide your assurance that you will provide all necessary documents and include pharmacy in study activation procedures.
- All key personnel (involved in human subjects research) [financial conflicts of interest](#) related to the research are disclosed.
- The PI will ensure that all individuals to whom a task is delegated are qualified by education, training, and experience (and state licensure where relevant) to perform the delegated task. Most clinical/medical tasks require formal medical training and may also have licensing or certification requirements. Licensing requirements may vary by jurisdiction (e.g., states). Investigators should take such qualifications/licensing requirements into account when considering delegation of specific tasks.

Appendix D

Self-Efficacy for Healthy Meals Scale

Encuesta de autoconfianza para preparar comidas saludables

¿Qué tan segura(o) se siente de poder cocinar una comida saludable en casa de manera regular CUANDO:

1. El precio de los alimentos saludables aumenta?
2. No tiene suficiente tiempo para preparar comidas saludables?
3. Se siente estresada(o)?
4. Es más fácil comprar comida ya preparada que cocinar en casa?
5. No sabe qué alimentos son considerados saludables?
6. No tiene una receta que seguir?
7. Tiene pocos ingredientes disponibles en casa?
8. Es difícil satisfacer las preferencias alimenticias de su familia?
9. No ha planeado sus comidas para la semana?
10. Tiene que limpiar después de cocinar?
11. Le preocupa comprar alimentos que se puedan desperdiciar?

Opciones de respuesta: 1 = nada segura(o); 2 = poco segura(o); 3 = neutral; 4 = segura(o); 5 = extremadamente segura(o).

Self-Efficacy for Healthy Meals Scale

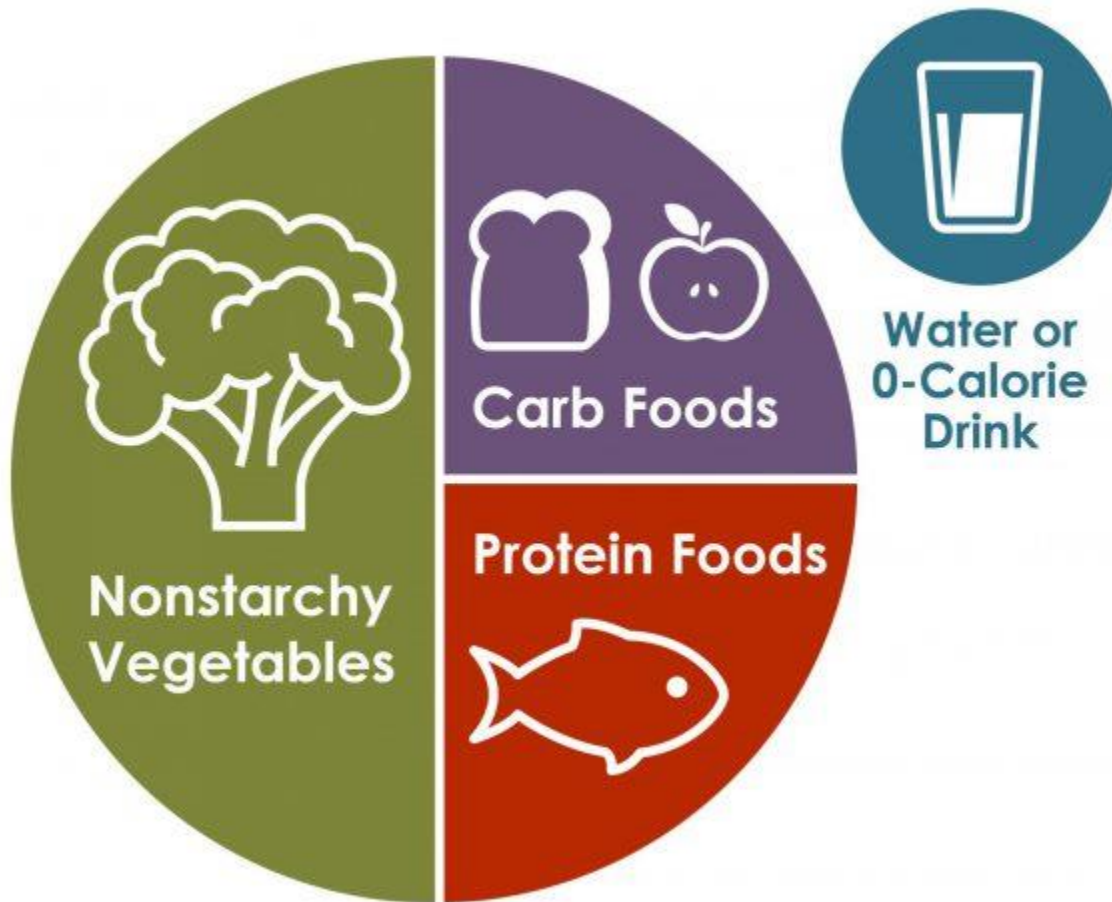
How confident are you that you can cook a healthy meal at home on a regular basis WHEN:

1. The price of healthy food goes up.
2. You do not have enough time to prepare healthy meals.
3. You are feeling stressed.
4. It is easier to buy fast food than cook at home.
5. You don't know what food is healthy.
6. You don't have a recipe to follow.
7. You have limited ingredients at home.
8. It is difficult to cater to your family's preferences.
9. You haven't planned your meals for the week.
10. You have to clean up after cooking.
11. You are concerned about purchasing foods that will go to waste.

Response options: 1 = not at all confident; 2 = not very confident; 3 = neutral; 4 = confident; 5 = extremely confident.

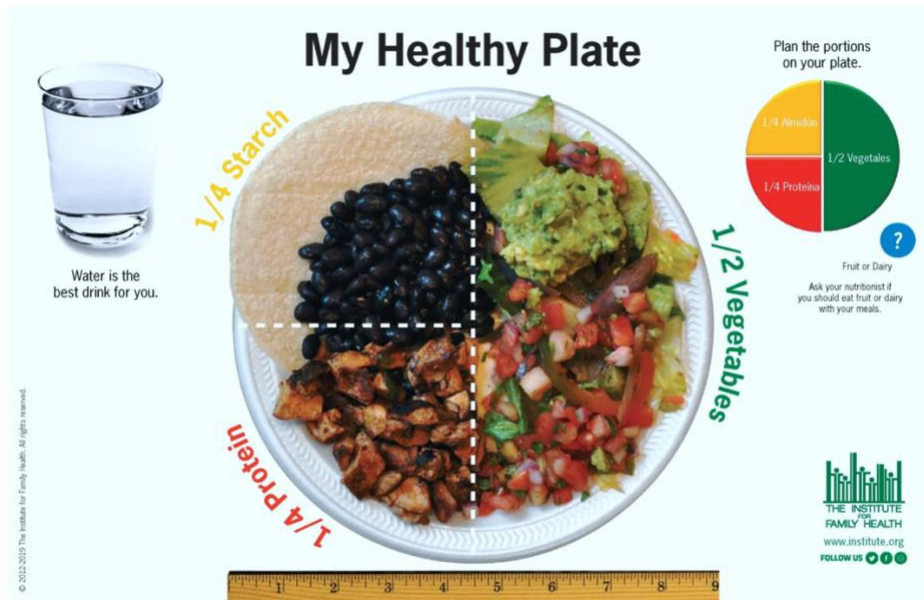
Appendix E

American Diabetes Association Plate

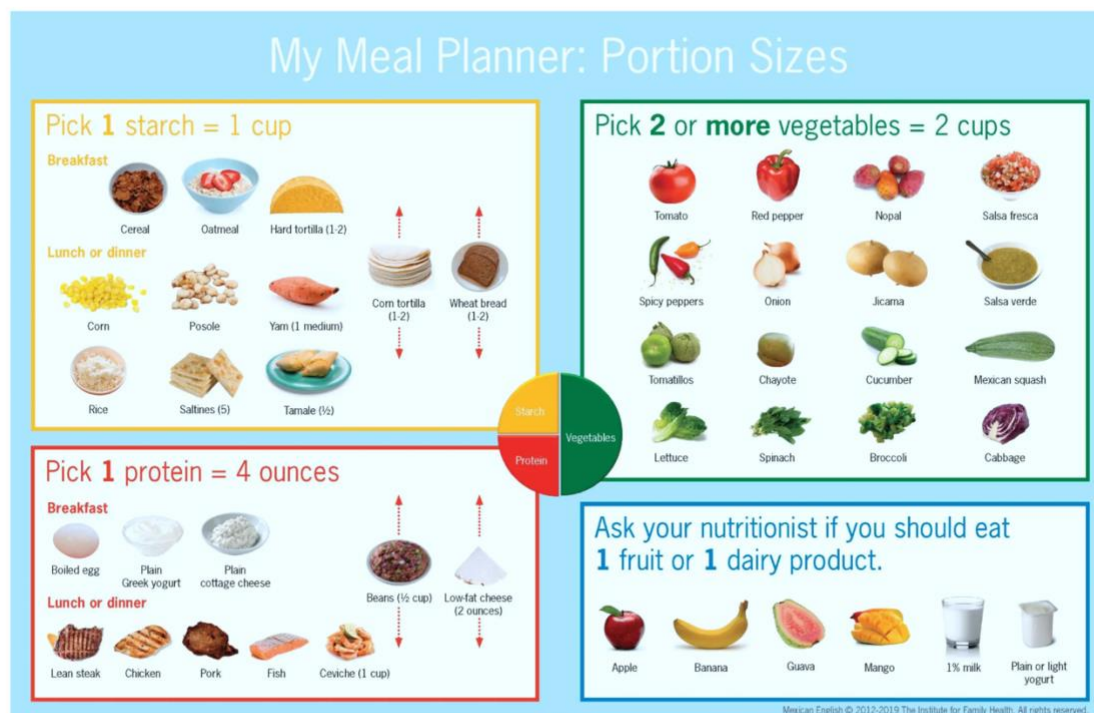


Appendix F

The Institute for Family Health: Healthy Mexican Plate



Healthy Mexican Plate

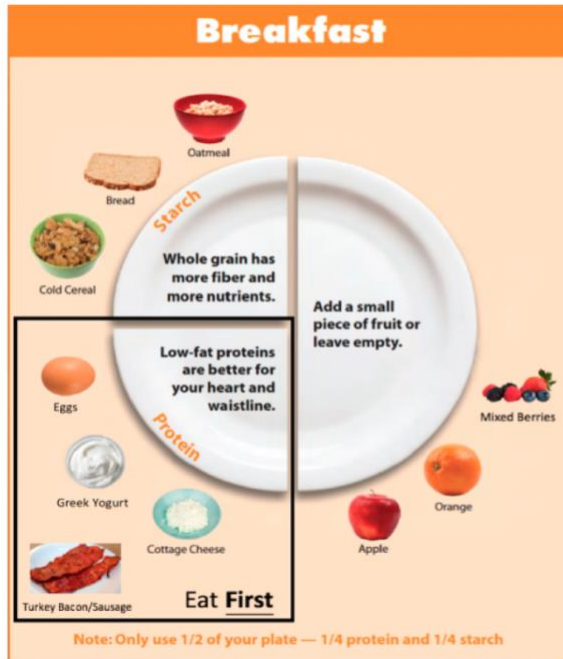


Healthy Mexican Plate – Options

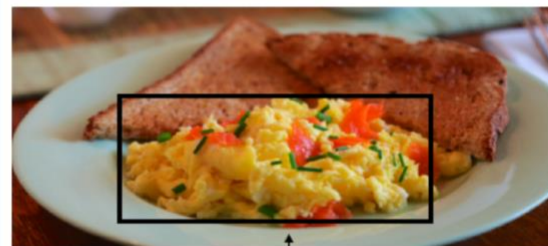
Appendix G

Food Order Example from Shulka et al., 2023 using USDA MyPlate

Let's Plan Your Meal Order - Breakfast

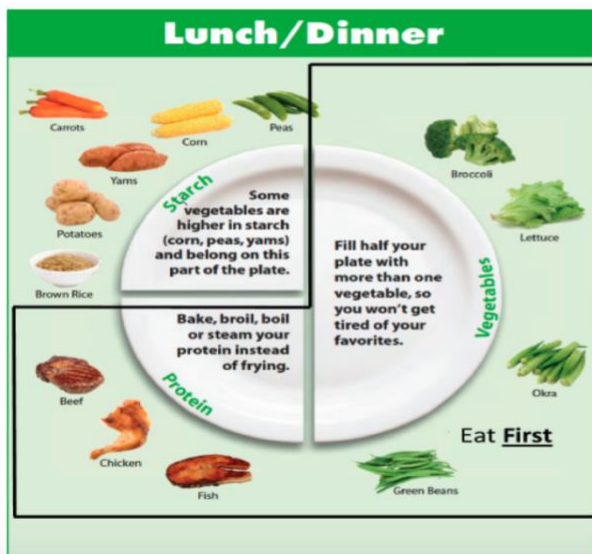


Eat your **protein first**

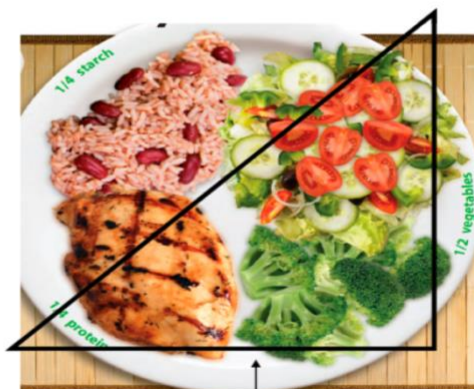


Eat **First**

Let's Plan Your Meal Order – Lunch/Dinner Option 1



Eat your **vegetables and protein first**



Eat **First**

Appendix H

AltaMed: What to Know About Intermittent Fasting

Fasting Options

There's plenty of options available should you want to give intermittent fasting a try. Here are some of the **more popular options** for healthy fasting:

1. **Alternate-day fasting** — Eat a normal diet one day and then fast completely or eat 500-600 calories the next.
2. **5:2 fasting** — Eat a normal diet five days a week and fast for two days.
3. **16/8 method** — You only eat during a set **eight hours**. For the remaining 16 you're limited to water, plain coffee, or tea.
4. **Eat-stop-eat** — Go without eating for 24 hours once or twice a week. Go from dinner one day to dinner the next.

Opciones de Ayuno

Hay muchas opciones disponibles en caso de que quiera probar el ayuno intermitente. Estas son algunas de las **opciones más comunes** para un ayuno saludable:

1. **Ayunar un día alterno** — Lleve una dieta normal un día y luego ayune por completo o coma de 500 a 600 calorías al siguiente.
2. **Ayuno 5:2** — Lleve una dieta normal cinco días a la semana y ayune durante dos días.
3. **Método 16/8** — Solo coma durante un período determinado de **ocho horas**. Para los 16 restantes, está limitado a agua, café o té.
4. **Comer-parar-comer** — No coma durante 24 horas una o dos veces por semana. Pase de la cena de un día a la cena del siguiente.

Appendix I

List of Suggested 10 Minute Activities

ONLY 10 MINUTES!!

Light Activity (easy breathing, can talk comfortably)

Slow walk around the block or inside the house (hallways, yard, or parking lot)

Light housework: sweeping, dusting, folding laundry while standing

Gentle stretching or mobility exercises (neck, shoulders, hips, back)

Watering plants or light gardening

Easy dancing to a few songs at a relaxed pace

Moderate Activity (heart rate up, breathing faster but still able to talk)

Brisk walking for 10 minutes (outside or on a treadmill)

Walking stairs at a steady pace

Dancing (faster music, continuous movement)

Marching in place or walking in place while watching TV

Light cycling (stationary or outdoors on flat ground)

Body-weight moves done gently but continuously (sit-to-stands, wall push-ups, step-backs)

SOLO 10 MINUTOS!!

Actividad ligera (*respiración fácil, puede hablar cómodamente*)

Caminar despacio alrededor de la cuadra o dentro de la casa (pasillos, patio o estacionamiento)

Quehaceres ligeros del hogar: barrer, limpiar el polvo, doblar ropa de pie

Estiramientos suaves o ejercicios de movilidad (cuello, hombros, caderas, espalda)

Regar plantas o hacer jardinería ligera

Bailar suavemente con algunas canciones a un ritmo relajado

Actividad moderada (*el corazón late más rápido, respira más rápido pero aún puede hablar*)

Caminar a paso rápido por 10 minutos (afuera o en caminadora)

Subir y bajar escaleras a un ritmo constante

Bailar con música más rápida y movimiento continuo

Marchar en su lugar o caminar en su lugar mientras ve televisión

Andar en bicicleta ligera (estacionaria o al aire libre en terreno plano)

Ejercicios con el peso del cuerpo, suaves pero continuos (sentarse y levantarse de una silla, lagartijas en la pared, pasos hacia atrás)

Appendix J

Provider Educational Handout

RESOURCES FOR PROFESSIONALS



Obesity Association
A division of the American Diabetes Association*

Obesity Basics

Obesity is a chronic disease that causes an excessive accumulation of fat presenting a risk to a person's health. Genetics, environmental factors, lifestyle, medications, and other medical conditions can play a role in developing obesity.



Body mass index (BMI) alone is not an accurate measure of adiposity.

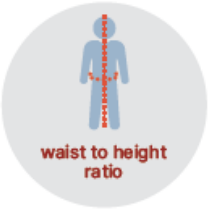
Use BMI+ to evaluate a person's adiposity and health risk.



waist circumference



waist to hip ratio*



waist to height ratio

*0.85 or higher for women and 0.90 or higher for men.

COMPLICATIONS OF OBESITY

 Type 2 diabetes

 Obstructive sleep apnea

 Cardiovascular disease

 MASLD – metabolic dysfunction-associated steatotic liver disease

 Osteoarthritis

APPROACH TO EFFECTIVE OBESITY CARE

PERSON-CENTERED CARE

- Use respectful language free from weight bias.
- Follow the 5 As:
 - **Ask** permission
 - **Assess** BMI+ and complications, including type 2 diabetes, dyslipidemia, hypertension, obstructive sleep apnea, and atherosclerotic cardiovascular disease
 - **Advise** on health impacts
 - **Agree** on goals
 - **Assist** with resources



TREATMENT OPTIONS

Treatment	25–26.9 kg/m ²	27–29.9 kg/m ²	30–34.9 kg/m ²	35–39.9 kg/m ²	≥40 kg/m ²
Nutrition, Physical Activity, and Behavioral Therapy	+	+	+	+	+
Pharmacotherapy		with complications	+	+	+
Metabolic and Bariatric Surgery			with complications	+	+

The + symbol represents the recommended use of the indicated treatment regardless of complications.

Learn more at obesityassociation.org/professional | 1-800-DIABETES (800-342-2383)

American Diabetes Association®

This infographic is based on recommendations from the ADA's Standards of Care in Diabetes—2025

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Appendix K

List of Acronyms in Table of Evidence

Acronym	Definition
A1C	Hemoglobin A1C
ANOVA	Analysis of Variance
AUB	Abnormal Uterine Bleeding
AUROC	Area Under the Receiver Operating Characteristic Curve
BMI	Body Mass Index
BP	Blood Pressure
CAP	Controlled Attenuation Parameter
CVD	Cardiovascular Disease
DM	Diabetes Mellitus
FO	Food Order
HbA1c	Hemoglobin A1C
HDL-C	High-Density Lipoprotein Cholesterol
HOMA-IR	Homeostatic Model Assessment of Insulin Resistance
HR	Hazard Ratio
HTN	Hypertension
IR	Insulin Resistance
IRB	Institutional Review Board
IQR	Interquartile Range
LDL-C	Low-Density Lipoprotein Cholesterol
MetS	Metabolic Syndrome
NAFLD	Nonalcoholic Fatty Liver Disease
PCOS	Polycystic Ovary Syndrome
PPV	Positive Predictive Value
RCT	Randomized Controlled Trial
T2DM	Type 2 Diabetes Mellitus
TC	Total Cholesterol
TG	Triglycerides
TG/HDL-C	Triglyceride-to-High-Density Lipoprotein Cholesterol Ratio
WC	Waist Circumference
WHR	Waist-to-Hip Ratio
WHtR	Waist-to-Height Ratio

TABLE OF EVIDENCE

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETA- TION, LIMITATIONS
Blum, M. R., Popat, R. A., Nagy, A., Cataldo, N. A., & McLaughlin, T. L. (2021). Using metabolic markers to identify insulin resistance in premenopausal women with and without polycystic ovary syndrome. <i>Journal of Endocrinological Investigation</i> , 44(10), 2123–2130. https://doi.org/10.1007/s40618-020-01430-2	To evaluate the accuracy of metabolic markers in predicting IR in premenopausal women with and without PCOS.	-Setting: Stanford University - 242 premenopausal women, without diabetes diagnosis - 171 without PCOS -71 with PCOS - San Francisco Bay Area, U.S. Women with AUB had: - increased abdominal circumference 60.6% - elevated SBP 81.8% -elevated DBP 72.7% -low HDL 56.1% -elevated triglycerides 51.5% -elevated glycemia 47%	- Design: Cross-sectional analysis - Procedures: Modified insulin suppression test after overnight fasting -no intervention - Measures: metabolic markers, TG, HDL-C, TC, LDL-C, BMI, TG/HDL-C, TC/HDL-C, fasting glucose, fasting insulin -endometrial histopathology	- PCOS group: TG/HDL-C ≥ 1.3 , HDL-C < 52 mg/dL, and TC/HDL-C ≥ 3.4 -had AUROC > 0.80 - Non-PCOS group: TG/HDL-C ≥ 1.9 best predictor (AUROC 0.73)- HDL-C had highest PPV in PCOS group - PCOS IR prevalence: 68% (n=48); non-PCOS IR: 58% (n=100) - $p < 0.05$ significance - Optimal TG/HDL-C cut-points: ≥ 1.3 (PCOS), ≥ 1.9 (non-PCOS)	-TG/HDL-C is a simple, cost-effective marker for IR in women. -Limitations: Non-Hispanic White cohort, small PCOS subgroup. Discussion: -Supports pilot use of low-cost biochemical markers -importance of clinicians to begin identifying high-risk metabolic state early to improve health and prevent disease

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETA- TION, LIMITATIONS
Charatcharoenwitthaya, P., Kuljiratitikal, K., Aksornchanya, O., Chaiyasoot, K., Bandidniyamanon, W., & Charatcharoenwitthaya, N. (2021). Moderate-intensity aerobic vs resistance exercise and dietary modification in patients with nonalcoholic fatty liver disease: A randomized clinical trial. <i>Clinical and Translational Gastroenterology</i> , 12(3), e00316. https://doi.org/10.14309/ctg.00000000000000316	To compare the effects of moderate-intensity aerobic exercise versus resistance exercise combined with dietary modification in patients with NAFLD. - To induce negative calorie balance in overweight/obese participants	-Siriraj Hospital, Bangkok, Thailand -Participants: Medical personnel recruited via flyers and posters, n = 38, n = 27 women, 8 = men -Inclusion: Sedentary individuals with minimal alcohol consumption (<20 g/day for women, <30 g/day for men) and diagnosed with liver steatosis via transient elastography (CAP >248 dB/m). -Exclusion: physical impairment, history of viral hepatitis, excessive alcohol consumption	-Design: RTC - Labs performed to assess glucose and insulin, to evaluate IR and β -cell function. -4-wks counseling by a dietitian to improve dietary habits and assess dropout risk. -Monthly counseling during the 12-week exercise period. -Participants maintained a 3-day food diary to track dietary adherence.	- 71% of participants exercising ≥ 3 x/wk no longer had hepatic steatosis, compared to 21% of those exercising <3 times weekly (P = 0.004). -Muscle improvement index, P = 0.004) -Aerobic exercise group: -1.21 (-2.35 to -0.08) Resistance exercise group: -0.61 (-1.34 to 0.13) P value for time: 0.046 P value for time-by-group interaction: 0.502	-participants were motivated to engage in exercise program -supervised sessions Limitations: Small sample of 35 participants decreases generalizability Discussion: -Moderate-intensity aerobic training and resistance training, alongside dietary modifications, are equally effective in reducing intrahepatic fat and improving IR in patients with NAFLD. -liver fat reduction even in absence of weight loss

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETA- TION, LIMITATIONS
Ma, Y.-L., Jin, C.-H., Zhao, C.-C., Ke, J.-F., Wang, J.-W., Wang, Y.-J., Lu, J.-X., Huang, G.-Z., & Li, L.-X. (2022). Waist-to-height ratio is a simple and practical alternative to waist circumference to diagnose metabolic syndrome in type 2 diabetes. <i>Frontiers in Nutrition</i> , 9, 986090. https://doi.org/10.3389/fnut.2022.986090	To evaluate whether WHtR could serve as an alternative to WC in diagnosing MetS among T2DM patients	- Hospital-based clinical population Shanghai, China -Females = 43.8% -Males = 56.2% - Age ranges = 18 to 91 - Ethnic group = Chinese -Exclusion, diseases affecting WC or WHtR such as malignant tumors	-cross-sectional/observational -Kappa test to evaluate consistence between WHtR and WC - adiposity thresholds established at 0.50 for both sexes -Biometrics weight, height, WC, hip circumference, BP, WHtR - MetS diagnosed if patient had at least two to four components, including abdominal obesity	-MetS prevalence using WHtR was 79.4% in women 68.6% in men -WHtR ≥ 0.52 independently associated with MetS -WHtR ≥ 0.52 greater risk for HTN 39.9% to 62.0%, increased WC from 20.9% to 94.3% -positive correlation between WHtR and IR for entire cohort raising HOMA2-IR by 39%	-study adjusted for medications like insulin and metformin - Limitations: -single site, not reflecting over all broader population of China -slight variations in WHtR cut-offs may still exist among racial and ethnic groups -may not be applicable where T2DM is absent - Discussion: -T2DM more likely to have 4 or 5 MeTs components with elevated WHtR

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETA- TION, LIMITATIONS
Montoya Castillo, M., Martínez Quiroz, W. d. J., Suarez-Ortegón, M. F., & Higuita-Gutiérrez, L. F. (2025). Waist-to-height ratio, waist circumference, and body mass index in relation to full cardiometabolic risk in an adult population from Medellín, Colombia. <i>Journal of Clinical Medicine</i> , 14(7), 2411. https://doi.org/10.3390/jcm14072411 .	The study aimed to compare the associations of three adiposity markers, WC, and BMI with cardiometabolic risk factors in individuals without a history of DM or CVD	- 29,236 adults (aged 19–121 years) - Medellín, Colombia in 2019 - predominantly female (73.2%), 26.8% men - middle-to-older aged, - 97.6% of participants over the age of 40 -71% over 60 -majority participants raised in urban areas 93.5% -69.9% physically inactive	- large-scale cross-sectional study - data extracted from electronic medical records excluding individuals with pre-existing diabetes, kidney disease, or cardiovascular conditions - logistic regression models to evaluate the association between adiposity markers and risk factors	- WHtR Superiority: Increased WHtR tripled the odds of having cardiac risk - WHtR showed proportional association with values of 0.6 with increased cardiac risk - BMI and cardiac risk plateau at 30 kg/m² - 91.5% participants had at least one cardiometabolic risk factor, 16.5% met full cardiometabolic risk	Interpretations: full cardiometabolic risk is simultaneous hyperglycemia, dyslipidemia, high BP Limitations: - Data had majority over 40, may limit applicability to younger population - targeted population group for this project - lifestyle factors self-reported Discussion: increased WHtR ratio markers increased odds of dyslipidemia, high blood pressure and hyperglycemia, giving validity to the anthropometric measure chosen for this project

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETA- TION, LIMITATIONS
Reeves, A., Elliott, M. R., Lewis, T. T., Karvonen-Gutierrez, C. A., Herman, W. H., & Harlow, S. D. (2022). Study selection bias and racial or ethnic disparities in estimated age at onset of cardiometabolic disease among midlife women in the us. <i>JAMA Network Open</i> , 5(11), e2240665. https://doi.org/10.1001/jamanetworkopen.2022.40665	Evaluate racial/ethnic disparities in age at onset of cardiometabolic outcomes HTN, IR in midlife women	N = 3,302 women in cohort; median baseline age 46.2 (range 42–52) Race/ethnicity: 28.3% Black, 7.6% Chinese, 8.7% Hispanic, 8.5% Japanese, 47.0% White Multi-site U.S. cohort (SWAN): Michigan, Boston, Chicago, Pittsburgh, Oakland, Newark, Los Angeles	-cross-sectional study -BP: Three seated measures; averaged 2nd & 3rd readings. Insulin: Fasting blood samples; solid-phase radioimmunoassay -rated health, educ level - Surveys for lifestyle, health history, WC, BMI, physical activity score, smoking status, alcohol use, self-rated health, ed level	- 686 deaths over median 10-year follow-up - WHR $\geq 0.90/0.85$ WHR $\rightarrow$ HR 1.75 (95% CI 1.17–2.62) - BMI ≥ 35 only predictive if WHR also elevated - WHR impact stronger in women; BMI stronger in men - Joint risk: BMI ≥ 35 & WHR $\geq 0.90/0.85 \rightarrow$ HR 2.71 (CI 1.72–4.28)	-association between higher WHtR and increased metabolic risk is possible Limitations: substantial right-censoring, drop out data for Hispanic women Discussion: -visceral fat (WC) used as surrogate measure, linked to adverse lipid profile -importance for this project also using WC -despite selection bias, valuable for disparities in age onset among Black and Hispanic women

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETA- TION, LIMITATIONS
Sima, A., Slagana, S. K., Drage, D., & Vesna, L. (2024). Evaluation of homa ir in perimenopause patients with abnormal uterine bleeding. <i>Research International Journal of Obstetrics and Gynecology</i> , 02(01), 001–004. https://doi.org/10.37179/rjog.000002	- Detect hyperplasia in obese perimenopausal patients with AUB - Assess insulin, glycemia, and HOMA-IR - Determine association with endometrial hyperplasia	- 100 perimenopausal women with AUB (ages 45–50) - Divided by BMI >30 or <30 - Control: 40 asymptomatic women - Setting: OB/GYN Clinic, Skopje, North Macedonia	- Prospective cohort design (1 year) - Complete diagnostic treatment, histopathology, and labs - Measures: Glycemia, insulin, HOMA-IR - Statistical analysis: ANOVA and Tukey HSD	- HOMA-IR highest in BMI >30 group (2.8) - 40.9% had endometrial hyperplasia - Hyperplasia risk 8x higher with elevated HOMA-IR - Glycemia >5.55 mmol/L tripled hyperplasia risk	- IR significantly linked to endometrial hyperplasia - Supports early screening for IR in perimenopausal AUB - Limitations: single-site, modest sample size decreases generalizability Discussion: -importance on early screening before target organ damage, metabolic metrics are not only for cardio protection due to increased cardiovascular risk but also endometrial, the importance of multidisciplinary approach with the targeted population of this project

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Shukla, A. P., Karan, A., Hootman, K. C., Graves, M., Steller, I., Abel, B., Giannita, A., Tils, J., Hayashi, L., O'Connor, M., Casper, A. J., D'Angelo, D., & Aronne, L. J. (2023). A randomized controlled pilot study of the food order behavioral intervention in prediabetes. <i>Nutrients</i> , 15(20), 4452. https://doi.org/10.3390/nu15204452	To assess the feasibility and impact of a behavioral intervention that involves consuming protein-rich foods and non-starchy vegetables before concentrated carbohydrates, which is expected to improve glucose tolerance, HbA1c levels, body weight, and overall nutrient intake.	- Recruited participants from February 2019 to October 2021 -Using an institutional research database Eligibility included English-speaking individuals aged 21 and older, weight- stable (defined as <5% weight change in the last 6 months), with a BMI of 25–40 kg/m ² and prediabetes (HbA1c 5.7–6.4%).	-Structured food order (FO) counseling groups nutritional education and counseling - FO group received extra carbohydrate- last food order counseling for 15 minutes at baseline and during weeks 4, 8, and 12 Insulin sensitivity assessed using: - HOMA-IR -Matsuda index Fisher's exact test	- Comparison of participants $\geq 15\%$ reduction in 2-hour glucose using Fisher's exact test. Weight decreased by -3.6 ± 5.7 lbs ($p = 0.017$; $-1.8\% \pm 2.8$, $p = 0.012$). -Trend toward improvement in HbA1c: -0.1 ± 0.2 ($p = 0.054$). -Achieved $\geq 15\%$ reduction in 2-hour glucose tolerance: -FO group: 2 out of 14 -Control group: 4 out of 21 -Fisher's exact test $p = 1.000$ (no significant difference)	Limitations: - Small sample size - Short duration. -Self-reported dietary recall -Concerns about the validity and reliability of the data -Demographic homogeneity of the cohort -Primarily white participants Discussion: -Study provides preliminary validation that food order interventions can modestly improve insulin sensitivity. This supports the feasibility of integrating a simplified dietary sequencing counseling component into the pilot.

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Tettamanzi, F., Bagnardi, V., Louca, P., Nogal, A., Monti, G., Mambrini, S. P., Lucchetti, E., Maestrini, S., Mazza, S., Rodriguez-Mateos, A., Scacchi, M., Valdes, A. M., Invitti, C., & Menni, C. (2021). A high protein diet is more effective in improving insulin resistance and glycemic variability compared to a mediterranean diet—a cross-over controlled inpatient dietary study. <i>Nutrients</i>, 13(12), 4380. https://doi.org/10.3390/nu13124380	To assess outcomes between two isocaloric dietary interventions (Mediterranean and high protein diets) in improving metabolic parameters in insulin-resistant obese women.	- inpatient, San Giuseppe Hospital, Italy - 20 insulin-resistant obese women -16 women completed the study -Age 20 to 57 years -BMI: 35 to 65 kg/m² -HOMA-IR score ≥ 3 -assessment of baseline habits, prandial hyperphagia, excessive carbohydrate, lipid, sodium consumption	-RCT -Intervention(s): calorie restriction 500Kcal in both mediterranean and high protein diet on all participants -daily glucose, weight loss, effect on microbiome -Measures: IR, HOMA-IR score, BMI, WHP, fat to lean mass ratio, BP, HR, lipid profile, gut microbiome	-Insulin levels: $-6.98 \mu\text{IU/mL}$ -HOMA-IR: -1.78 -improving glycemic variability (-3.13 mg/dL) -A panel of 10 microbial genera was identified as predictive of glycemic variability differences. -Fat to Lean Mass: The p-value is 0.05 -HDL-C: The p-value is 0.01 -HOMA-IR decreased more on HP than M diet	- WHR independently predicts mortality -HP superiority in managing insulin and glycemic variability Limitations: -20% drop out rate -21 day too short for long effects-lack of washout period between diets Discussion: - High protein diet was more effective than the Mediterranean diet in reducing IR, weight -Both diets performed well towards weight, BMI, and WHP ratio indicating the importance of including cardiometabolic indicators in studies such as in this project

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETA- TION, LIMITATIONS
Zhang, Y., Chen, G.-C., Sotres-Alvarez, D., Perreira, K. M., Daviglus, M. L., Pirzada, A., Gallo, L. C., Llabre, M. M., Cai, J., Xue, X., Isasi, C. R., Kaplan, R., Jehangir, A., Mir, R., Alfaifi, J., Alshahrani, A. M., Nandi, P., BinAfif, W. F., Sabah, Z. U., ... Qi, Q. (2024). General or central obesity and mortality among US Hispanic and Latino adults. <i>JAMA Network Open</i>, 7(1), e2351070. https://doi.org/10.1001/jamanetworkopen.2023.51070	To examine the associations of general and central obesity with mortality among US Hispanic and Latino adults.	- N = 15,773 Hispanic/Latino adults - Mean age: 40.9 years (SE 0.3) - 52.8% female, 47.2% male - Diverse ethnicities (e.g., Mexican, Cuban, Puerto Rican) - Community setting: Bronx, Chicago, Miami, San Diego - Country: United States	- Design: Population-based cohort study - Procedures: Multistage sampling, follow-up: 2008–2022 - BMI, body fat %, WC, WHR - Comparison Groups: WHR $\geq 0.90/0.85$ vs. $<$ threshold; BMI ≥ 35 vs. < 35 - Surveys for lifestyle, health history - Statistical Tests: Cox regression, hazard ratios, interaction models	- 686 deaths over median 10-year follow-up - WHR $\geq 0.90/0.85 \rightarrow$ HR 1.75 (95% CI 1.17–2.62) - BMI ≥ 35 only predictive if WHR also elevated - WHR impact stronger in women; BMI stronger in men - Joint risk: BMI ≥ 35 & WHR $\geq 0.90/0.85 \rightarrow$ HR 2.71 (CI 1.72–4.28)	-prioritizing WHR -gluteofemoral region fat accumulation - possible protective counteractions from metabolic harm from central obesity - Limitations: -lack of sufficient statistical power to mortality associations for moderate obesity - Discussion: Using other anthropometric measures for obesity supports growing literature hip/gluteal fat may have protective, anti-inflammatory and metabolic health associations

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