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# Acculturation, Dietary Behaviors, and Macronutrient Intake Among Mexican Americans with Prediabetes: The Starr County Diabetes Prevention Initiative

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## Abstract

**Purpose:** Examine the influences of sex and acculturation on dietary behaviors, macronutrient intake, and dietary quality in participants enrolled in a diabetes prevention initiative in Starr County, Texas.

**Methods:** Baseline data from the Starr County diabetes prevention study (*N*=300) were analyzed — acculturation (*country of origin, years in Starr County, language and food preferences*), depressive symptoms (*PHQ-9*), healthy eating self-efficacy (*WEL-SF*), diet quality (*HEI-2015*), fat avoidance (*FAS*), and macronutrients. Descriptive statistics and univariate ANCOVA were used to examine differences based on acculturation, controlling for sex.

**Results:** Participants were predominantly female (73%) and, on average, 51 years of age. Language and food preferences favored Spanish language and Hispanic foods, respectively. The

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The author(s) declare no potential conflicts of interest.

majority (71%) was born in Mexico but had resided in Starr County for 33 years, on average. Depressive symptoms were moderate and eating self-efficacy scores suggested low confidence in making healthy food choices, particularly for saturated fats. Spanish language preference was associated with worse dietary habits. The mean dietary quality score was lower than the national average (54 versus 59 nationally); females had slightly higher dietary quality than males, as well as a higher mean fat avoidance score, although differences were not clinically significant. Intakes of carbohydrate, saturated fats, and cholesterol were higher than recommended daily allowances.

**Conclusions:** The overall preference for speaking Spanish, as well as the influence of language on dietary intake, should inform future dietary interventions. Accommodating cultural norms and food preferences remain major challenges to improving dietary quality among the diverse Hispanic ethnic groups.

Obesity, a growing global epidemic, plays a major role in the development of insulin resistance, dyslipidemia, and hypertension, common precursors of cardiovascular events and premature deaths.[1–6] The National Diabetes Prevention Program (DPP) demonstrated that small weight reductions (≥7%) enhanced insulin sensitivity and glycemic control and delayed diabetes onset and related diabetes co-morbidities, particularly in populations at high risk for developing type 2 diabetes mellitus (T2DM).[7] Since the DPP, diabetes prevention has been a significant clinical and research priority, particularly among populations at high-risk for T2DM. Recently, researchers estimated that annually 5.3% of older adults with A1C-verified prediabetes progressed to T2DM.[8]

Hispanics constitute one of the fastest growing populations at highest risk for T2DM; they tend to be diagnosed at an earlier age and experience high rates of diabetes-related co-morbidities.[9] The U.S. Census Bureau estimated that in 2019, ~60 million Hispanics resided in the U.S., making them the largest minority group; 65% were of Mexican origin.[10] Obesity rates are particularly high in Mexican Americans who reside along the Texas-Mexico border, likely due in part to dietary factors and well-documented low rates of physical activity.[11–13] In previous Starr County diabetes self-management and support (DSMES) intervention clinical trials, these researchers documented a high rate of obesity (mean BMI=31), as well as a high dietary intake of saturated fat.[14,15] Research team members witnessed grocery store shoppers purchasing carts full of multiple gallon-sized containers of lard for their weekly meal preparation. Thus, for more than 30 years, a major health goal of previous Starr County diabetes-related intervention studies has been to reduce saturated fat intake, especially during food preparation, while maintaining cultural food preferences of study participants.

Table 1 shows current general recommendations for dietary-related factors, such as kilocalories (kcal) and fiber, as well as recommended daily allowances for macronutrients (protein, carbohydrate, and fats), taking sex differences into account. These are general guidelines and adjustments are frequently made, depending on individual characteristics, such as physical activity levels and age. Experts generally agree that the intake of saturated fat is more important than total fat in terms of avoiding negative health effects; that is, dietary saturated fat intake should be limited.[16] The good news is that in Starr County awareness of the obesity-diabetes link, as well as the other multiple negative health effects of obesity, including the documented links to serious COVID-19 outcomes, [17] seems to have increased over the years, based on the research team members' past observations in this community.

A healthy diet, physical activity, and hypoglycemic medications are the three mainstays for preventing or treating T2DM. However, in this underserved minority rural border population, a healthy diet is the primary focus. Extreme environmental, cultural, and social issues preclude the residents of Starr County, a typical U.S.-Mexico border community, from incorporating significant increases in physical activity. Environmental challenges associated with living along the U.S.-Mexico border include extremely hot weather during a major portion of the year, lack of paved streets and/or walking paths, and safety concerns. For women, cultural mores pose significant obstacles to incorporating physical activity/exercise into daily routines.[18,19] Further, high rates of poverty serve as a barrier to effective and/or adequate treatment with recommended hypoglycemic agents, including oral medications and/or insulin injections, as well as the follow-up testing to determine treatment effectiveness.

In 2017, this research team obtained funding from the National Institutes of Health (NIH) to test in Starr County a DSMES-type diabetes prevention program culturally tailored for Spanish-speaking Mexican Americans with verified *prediabetes*. The purpose of the analyses reported here was to examine dietary behaviors, macronutrient intake, and diet quality by sex, with a focus particularly on saturated fat intake, in participants enrolled in the current diabetes prevention initiative ongoing in Starr County ($N$=300). Further, the influences of four measures of acculturation — country of origin (U.S. versus Mexico), number of years living in Starr County, and language and food preferences (Spanish versus English and Hispanic versus American, respectively) — on these dietary factors were also examined. Information obtained from these analyses is critical to the development of dietary-focused interventions that incorporate cultural preferences, yet are effective in reversing the obesity and diabetes epidemic in the growing, high-risk Mexican American population.

## Research Design and Methods

For these analyses, baseline data of the Starr County diabetes prevention study collected from March 2018 through September 2019 were examined. Note that this time frame was prior to the COVID-19 pandemic. Starr County, the site of this study and previous studies conducted by this research team, has been described in detail in previous publications of these researchers.[14,15,20] Briefly, Starr County is 1 of 14 Texas counties located adjacent to the Rio Grande River that borders northern Mexico. A research field office located in Rio Grande City, the county seat, serves as the center of operations for all research projects. Starr County is one of the poorest counties in Texas as well as in the U.S. Some areas of the county from which study participants were recruited involve unincorporated settlements, called *colonias*, which experience even more severe poverty, pollution, and deprivation. The current estimated population of Starr County is 66,049; 96.3% is Mexican American.[21] The community is designated by the State of Texas as a Health Professional Shortage/Medically Underserved Area. The significant impact of T2DM in this community has been well-documented.[22]

Criteria employed for recruiting study participants from Starr County for the study were: 1) between 25 and 55 years of age; 2) no history of prior diabetes diagnosis (excluding gestational); and 3) verified prediabetes (impaired fasting glucose [≥100 and <126 mg/dL], impaired glucose tolerance [≥140 and <200 mg/dL on 2-hour post-load glucose], and/or A1C ≥5.7% and <6.5%). Exclusion criteria included: 1) a diabetes diagnosis at baseline; 2) a history of using any hypoglycemic medications (except during pregnancy); 3) currently pregnant or within 3 months postpartum; or 4) medical conditions for which changes in diet and/or physical activity would be contraindicated (e.g., heart failure or other conditions that require special diets and/or restricted physical activity). The study was approved by the Institutional Review Boards (IRB) of academic institutions directly involved: The University of Texas at Austin (IRB #2016120040) and the University of Texas Health Science Center at Houston (IRB #HSC-SPH-03-056). All recruited enrollees signed Spanish or English consent forms to participate.

Table 2 shows the categories of variables that were included in these analyses. For the assessment of *acculturation*, four measures were used: country of origin (Mexico versus U.S.), number of years living in Starr County, language preference, and food preferences. For language and food preferences, a higher score on the respective survey signified more frequent use of English and intake of American foods, respectively. For *psychological factors*, the Patient Health Questionnaire-9 (PHQ-9) was used to screen for depressive symptoms; a score of ≥10 indicates potential major depression.[23] To measure healthy eating self-efficacy, the Weight Efficacy Lifestyle Questionnaire-Short Form (WEL-SF, Spanish language version) was used; lower scores indicated higher levels of self-efficacy.[24] *Diet-related factors* included the Fat Avoidance Scale [FAS, Spanish version]), a 7-item scale that is used to determine the degree to which individuals avoid foods containing saturated fats, either in dietary intake and/or during food preparation.[25] Questions were designed to reflect traditional Mexican American cultural food preferences, e.g., “What type of fat oil do you use most often in cooking? (lard, meat fat, butter, shortening, margarine, vegetable oil).” FAS scores range from 0 to 1; lower scores indicate use of less desirable types of fat in the diet. The USDA’s Healthy Eating Index (HEI-2015) was used to measure general dietary quality in relationship to current national dietary recommendations.[26] Two other dietary variables — energy intake (in kcal) and fiber intake (in grams) — were also calculated. Specific *macronutrients* in the diet — protein, carbohydrate, total fat, saturated fat, and cholesterol — were estimated from a Food Frequency Questionnaire (FFQ), a semi-quantitative measure that was validated previously in Starr County.[27] With this instrument, researchers were able to collect information on amount and number of times certain foods, including cultural foods, were eaten during the previous month. Frequency data were converted to raw intakes and nutrient densities for analyses.

For *diabetes-related physiological outcomes*, three key indicators of overweight/obesity and diabetes risk were measured — body mass index (BMI), Visceral Adiposity Index (VAI),[28] and glycosylated hemoglobin (A1C). Body weights were measured with a balance beam scale with individuals in street clothing and without shoes; heights were obtained using a secured stadiometer. BMI was then calculated using the equation: body weight (in kg) / height (in meters$^2$). The VAI is based on waist circumference, BMI, and triglyceride and HDL cholesterol concentrations. The Monotest Cholesterol procedure and the GPO

Triglyceride procedure of Boehringer Mannheim were used for assessing cholesterol and triglycerides. A1C was analyzed onsite using a point-of-care device (Siemens DCA Vantage Analyzer, Malvern, PA).

Baseline data were checked for accuracy, then imported from an Excel computer database (Microsoft Corp., version 16.51) into SPSS Statistics (IBM Corp., Armonk, NY, version 26.0) for analyses. The statistical significance was set at $p$=0.01 to adjust for repeated significance testing.[29] Participant characteristics (Table 2), involving both categorical and continuous measures, were analyzed using descriptive statistics (e.g., frequencies, means). Sex differences in behavioral factors and physiological outcomes have been found consistently in previous and current Starr County studies.[20] Accordingly, univariate ANCOVA was used to analyze sex differences (Table 2) and also to examine the effects of the four acculturation variables — country of origin, number of years in Starr County, language preference, and food preferences — on psychological factors, diet-related factors, and macronutrient intake, while simultaneously controlling for sex differences; and additionally controlling for age for the variable, number of years in Starr County (Table 3). ANCOVA, a statistical test that combines ANOVA and regression, is typically used to remove the influence of one or more antecedents, potentially confounding variables.[30] As previously reported, power analyses for the intervention study ($N$=300) indicated a power of 86.6% for the priority outcome of weight loss, which is above the desired power of 80% for such analyses.[31] This sample size provided adequate power for the analyses reported here.

## Results

### Baseline Characteristics of Study Participants

Table 2 shows the baseline characteristics of the 300 participants enrolled in the Starr County diabetes prevention clinical trial. In general, the sample was predominantly female who, on average, was 51 years of age and had 10 years of education. Language and food preferences trended towards Spanish language and Hispanic foods, respectively. The majority of the sample (71%) was born in Mexico but had resided in Starr County for 33 years, on average. Depressive symptoms were moderate and eating self-efficacy scores suggested low confidence in making healthy food choices, especially in avoiding intake of saturated fats. Diet-related factors and macronutrient intake, the major foci of the analyses reported here, indicated a 2,000 kilocalorie daily intake, on average, and low conformity to national dietary recommendations (Healthy Eating Index [HEI-2015]). The mean HEI-2015 for the sample was 54, which is a lower food quality score than that of the general population (mean=59);[26] fiber intake measured in this sample was also low. For macronutrients, the daily protein intake was meeting or exceeding the recommendation of the American Dietetic Association (ADA), a recommendation that varies by age, sex, and body weight but, in general, ranges from 46 to 56 grams per day.[32] The daily carbohydrate intake of 229 grams was higher than that recommended by the ADA (130 grams) and the intake levels of saturated fat (25 grams) and cholesterol (403 grams) were higher than recommended thresholds as well; the general recommendation for saturated fat is 10% or less of daily calorie intake (e.g., 20 grams based on a daily intake of 2000 kilocalories). More than 70% of study participants reported a daily calorie intake of saturated fat higher than the recommended 10%. Mean BMI and VAI levels were high, as expected among individuals with prediabetes; and the mean A1C (5.7%) was consistent with a prediabetes diagnosis, an inclusion criterion for the study.

Table 2 also shows sex differences for each of the baseline variables included in these analyses. Although women outnumbered men in this study, the large sample size suggests the analyses should be sufficiently robust to violations of the assumption of relatively equal groups. Using an adjusted significance level of $p$=0.01, no significant sex differences were detected for demographic characteristics (age, years of education), acculturation variables (country of origin, number of years in Starr County, language/food preferences), psychological factors (depression, healthy eating self-efficacy), or physiological outcomes (BMI, VAI, A1C). For diet-related factors, males had a higher daily intake of kcal compared with females; general guidelines for adults include 2,500 kcal/day for males and 2,000 kcal/day for females, although adjustments are made for physical activity level, age, and body weight.[32] Thus, as expected, data analyses here found significant sex differences ($p$<0.001) for each of the five measured macronutrients (protein, carbohydrate, total fat, saturated fat, cholesterol), as well as for fiber intake. Both fat avoidance and healthy eating (HEI-2015) scores were significantly higher for females, compared with males ($p$=<0.001 and $p$=0.001, respectively). Note that fat avoidance and HEI-2015 scores, adjusted for sex differences, were significantly correlated ($r$=.22, $p$=<.001). Contrary to previously-reported research,[33] there were no statistically significant associations between depressive symptoms or healthy eating self-efficacy and any of the macronutrient intake levels.

Table 3 shows the results of the analyses examining the four acculturation factors. For the acculturation variable, *country of origin*, there were no statistically significant differences based on whether the individual was born in Mexico versus the U.S., controlling for potential sex differences and using the adjusted significance level of $p$=≤0.01. However, those born in Mexico had tendencies for a higher mean fiber intake ($p$=0.05) as well as a higher score on the HEI-2015 dietary quality measure ($p$=0.04). In fact, those born in Mexico reported a higher intake in all areas *except* saturated fat. For the acculturation variable, *years in Starr County,* there were no statistically significant differences based on the median split of years residing in that community, except for protein intake ($p$=.01). However, it is worth noting that individuals who had lived in the U.S. for 32 or more years reported a lower intake of total fat ($p$=0.04), saturated fat ($p$=0.06), and cholesterol ($p$=0.02). For the acculturation variable, *language preference,* there were statistically significant differences for most dietary measures, with those who preferred to speak Spanish reporting a higher intake of calories ($p$=0.003), fiber ($p$=<0.001), protein ($p$=0.002), carbohydrate ($p$=0.004), and total fat ($p$=0.01). Individuals speaking mostly Spanish reported higher intake levels of saturated fat ($p$=0.039) and cholesterol ($p$=0.044), compared to those who mostly spoke English. For the acculturation variable, *food preferences,* there were no statistically significant differences based on whether individuals tended to prefer mostly Hispanic versus American foods.

## Discussion

The purpose of the analyses reported here was to describe diet-related factors, particularly macronutrient intake with a focus on saturated fat, of a rural Mexican American population with verified prediabetes who reside on the Texas-Mexico border; and to examine differences based on sex, acculturation, and psychological factors. The importance of dietary quality in addressing the epidemic of obesity and T2DM was the primary factor that motivated these analyses. Exploration of baseline data from an ongoing diabetes prevention clinical trial may enable clinicians to focus dietary interventions on key targets specific to this growing population, such as sex differences in specific dietary factors such as carbohydrate, saturated fat, and cholesterol, while accommodating cultural food preferences.

On average, study participants were 51 years old, female, obese, and diagnosed with verified prediabetes.[20] The acculturation variable, *language preference*, was significantly associated with dietary intake. Overall dietary quality, as measured by the HEI-2015, was lower than the national average; females had a slightly higher mean dietary quality than males, as well as a higher mean fat avoidance score, although differences were not statistically significant. Intake of carbohydrate, saturated fat, and cholesterol were higher than recommended daily allowances.[32] Starr County findings are consistent with recently reported analyses of the National Health and Nutrition Examination Survey (NHANES) data. In the large NHANES sample, racial/ethnic and sex differences in the HEI-2015 scores were documented; Hispanic dietary quality scores were relatively low and males scored lower on dietary quality than females.[34,35]

The Starr County findings suggest two major issues that need to be addressed when planning future prediabetes intervention programs: 1) an overall preference for speaking Spanish coupled with the significant effect of language on dietary intake; and 2) the ongoing challenge of improving dietary quality while accommodating cultural norms and food preferences in this border community and other similar communities across the U.S.

The majority of people who immigrate to the U.S. border areas from Mexico tend to speak and understand primarily Spanish and speak little English, despite residing in the U.S. for many years.[36] Language concordance between health care providers and their messages and patients/clients has been found to significantly affect the adoption of health behavior recommendations.[37] Lack of ability to speak and understand English serves as a major barrier to motivating individuals to make needed changes in health behaviors.[38] Despite the large numbers of Mexican Americans who reside in the U.S., the availability of appropriate, high quality Spanish-language health education tools continue to be limited.[39] Further, given the diversity of the Hispanic ethnicity – Mexican Americans, Puerto Ricans, Cubans, etc. – providing guidance in the preferred language is a challenge. Significant language and cultural differences, such as food preferences, exist among Hispanic subgroups and continue years after immigrating into the U.S. Funding for development of educational tools to address the language preferences of these diverse groups is scarce, although funding is more available today than it was in the past. Compounding these challenges is the low health literacy rates that have been documented among Hispanic groups, particularly among immigrants.[40] A further characteristic, particularly among Mexican Americans who reside in communities along the Texas-Mexico border, is that they tend to speak a unique form of Spanish, often referred to as “Spanglish,” which is a blend of Spanish and English, or referred to as “conversational slang.” Additionally, the use of technology for educational purposes poses unique challenges, given the language diversity, low health literacy rates, and limited interest in learning new technologies.[41]

As with language preferences, food preferences trended towards traditional Hispanic foods, particularly high-fat, calorie-dense foods, among immigrants, regardless of length of time residing in the U.S.[36] Research continues to find significant barriers to healthy diet-related behaviors in many Hispanic communities, including economic poverty and expected roles of males versus females.[42] These researchers have experienced similar obstacles. Feedback from participants of diabetes studies conducted in Starr County have consistently identified improving the quality of their and their family’s food intake as priorities. Individuals wanted to learn how to prepare their favorite cultural foods in more healthy ways. However, simply telling them to limit saturated fats in their diets is woefully inadequate guidance. Study participants requested healthy, simple Hispanic recipes that are Mexican specific; they preferred food preparation demonstrations, either in person or on video. Again, these types of dietary educational tools that accommodate the diversity of Hispanic subgroups are limited.

For Starr County studies, researchers used several strategies, provided in Spanish, to address individuals’ dietary educational needs: 1) group visits to the local grocery store, led by Spanish-speaking dietitians, to learn how to read food labels, locate healthy substitutes for less healthy foods they currently use, taste healthy food options, and identify store aisles to avoid; 2) provision of healthy cultural snacks at weekly/biweekly intervention meetings; 3) group intervention sessions during which participants bring favorite recipes for the dietitian(s) and group members to suggest healthy modifications; and 4) Spanish-language videos of dietitians demonstrating the preparation of simple, healthy Mexican American recipes. These strategies have been well received by study participants but they are time consuming for staff and participants as well. So, the current ongoing diabetes prevention intervention trial is testing text messaging technology augmented with food demonstration videos and written recipes.

Several limitations of these analyses are noteworthy. Dichotomizing the acculturation variables may have diminished the precision of these measures and thus, variable relationships may have been undetected. Further, some measures, particularly the acculturation variables, had limited ranges, which may attenuate variable relationships. Self-reported dietary information is subject to potential bias; training of data collectors and the use of models and pictures to standardize portion sizes were used to minimize discrepancies in dietary intake estimates. Multiple analyses that were conducted raises the potential for a type 1 error rate (i.e., finding statistical significance by chance), so a conservative approach was employed by setting the level of statistical significance at 0.01. Regardless of these limitations, the importance of language preference — English versus Spanish — remained and was significantly related to many of the dietary factors and macronutrients that were measured.

## Conclusions

Dietary-related information presented here is important for the design of culturally-tailored weight loss programs that target Mexican Americans and that are aimed at diabetes prevention. Indeed, dietary changes represent one of the key targets to alter the course of transition from normal glycemia to prediabetes and diabetes. Although descriptive/correlational analyses such as these cannot determine causal connections between acculturation factors and key diabetes outcomes, these researchers add their voices to the calls for diabetes prevention strategies designed to accommodate the diversity among Hispanic subgroups. Researchers should explore strategies that go beyond merely telling individuals to change dietary food habits. A disturbing dietary recommendation that continues is the notion that Mexican Americans as well as other Hispanic subgroups should eliminate their cultural foods for more healthy American foods. As these researchers have stated in the past, this recommendation is not only culturally insensitive; it is factually wrong. Healthy Hispanic diets are attainable but individuals need to be taught how to modify cultural food preferences, both foods prepared at home as well as those that are eaten in restaurants, so that recipes are acceptable to family members as well. Otherwise, dietary strategies will continue to be ineffective.

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## References

1. Klaus JR, Hurwitz BE, Llabre MM, et al. Central obesity and insulin resistance in the cardiometabolic syndrome: pathways to preclinical cardiovascular structure and function. J Cardiometab Syndr. 2009;4(2):63–71. doi:10.1111/j.1559-4572.2008.00038.x [PubMed: 19614791]
2. Lechleitner M Obesity and the metabolic syndrome in the elderly – a mini-review. Gerontology. 2008;54(5):253–259. doi:10.1159/000161734 [PubMed: 18841025]
3. Wilson PW, Meigs JB. Cardiometabolic risk: a Framingham perspective. Int J Obes (Lond). 2008;32(Suppl 2):S17–S20. doi:10.1038/ijo.2008.30 [PubMed: 18469835]
4. Taylor AM. Cardiometabolic risk management in type 2 diabetes and obesity. Curr Diab Rep. 2008;8(5):345–352. doi:10.1007/s11892-008-0061-7 [PubMed: 18778582]
5. Lemieux I, Deprés JP. Metabolic Syndrome: past, present and future. Nutrients. 2020;12(11):3501. 10.3390/nu12113501 [PubMed: 33202550]
6. Guize L, Pannier B, Thomas F, Bean K, Jégo B, Benetos A. Recent advances in metabolic syndrome and cardiovascular disease. Arch Cardiovasc Dis. 2008;101(9):577–583. doi:10.1016/j.acvd.2008.06.011 [PubMed: 19041842]
7. Diabetes Prevention Program Research Group (DPP). Effect of progression from impaired glucose tolerance to diabetes on cardiovascular risk factors and its amelioration by lifestyle and metformin

intervention: the Diabetes Prevention Program randomized trial by the Diabetes Prevention Program Research Group. Diabetes Care. 2009;32(4):726–732. doi:10.2337/dc08-0494 [PubMed: 19171717]

8. Koyama AK, Bullard KM, Pavkov ME, Park J, Mardon R, Zhang P. Progression to diabetes among older adults with hemoglobin A1c-defined prediabetes in the US. JAMA Netw Open. 2022;5(4):e228158. doi:10.1001/jamanetworkopen.2022.8158 [PubMed: 35442457]
9. Chow EA, Foster H, Gonzalez V, McIver L. The disparate impact of diabetes on racial/ethnic minority populations. Clin Diabetes. 2012;30(3):130–133. doi:org/10.2337/diaclin.30.3.130
10. United States Census Bureau. The Hispanic Population in the United States: 2019. Accessed October 31, 2022. https://www.census.gov/data/tables/2019/demo/hispanic-origin/2019-cps.html
11. Rodríguez-Saldaña J Challenges and opportunities in border health. Prev Chronic Dis [serial online] 2005 Jan [accessed November 1, 2022]. Available from: URL: https://www.cdc.gov/pcd/issues/2005/jan/04_0099.htm
12. Ravussin E, Bogardus C. Energy balance and weight regulation: genetics versus environment. Br J Nutr. 2000;83(Suppl 1):S17–S20. doi:10.1017/s0007114500000908 [PubMed: 10889787]
13. United States Department of Health and Human Services, Center for Disease Control and Prevention. Physical Activity and Health: A Report of the Surgeon General 1999 Nov [accessed October 30, 2022]. Available from: URL: https://www.cdc.gov/nccdphp/sgr/sgr.htm
14. Brown SA, García AA, Kouzekanani K, Hanis CL. Culturally competent diabetes self-management education for Mexican Americans: the Starr County Border Health Initiative. Diabetes Care. 2002;25(2):259–268. doi:10.2337/diacare.25.2.259 [PubMed: 11815493]
15. Brown SA, Blozis SA, Kouzekanani K, García AA, Winchell M, Hanis CL. Dosage effects of diabetes self-management education for Mexican Americans: the Starr County Border Health Initiative. Diabetes Care. 2005;28(3):527–532. doi:10.2337/diacare.28.3.527 [PubMed: 15735182]
16. American Diabetes Association Professional Practice Committee. Classification and diagnosis of diabetes: standards of medical care in diabetes – 2022. Diabetes Care. 2022;45(Suppl 1):S17–S38. doi:10.2337/dc22-S002 [PubMed: 34964875]
17. Kumar A, Arora A, Sharma P, et al. Is diabetes mellitus associated with mortality and severity of COVID-19? A meta-analysis. Diabetes Metab Syndr. 2020;14(4):535–545. doi:10.1016/j.dsx.2020.04.044 [PubMed: 32408118]
18. Aycinena AC, Valdovinos C, Crew KD, et al. Barriers to recruitment and adherence in a randomized controlled diet and exercise weight loss intervention among minority breast cancer survivors. J Immigr Minor Health. 2017;19(1):120–129. doi:10.1007/s10903-015-0310-1 [PubMed: 26801931]
19. Chang C, Khurana S, Strodel R, Camp A, Magenheimer E, Hawley N. Perceived barriers to physical activity among low-income Latina women at risk for type 2 diabetes. Diabetes Educ. 2018;44(5):444–453. doi:10.1177/0145721718787782 [PubMed: 30014770]
20. Brown SA, Becker HA, García AA, et al. The effects of gender and country of origin on acculturation, psychological factors, lifestyle factors, and diabetes-related physiological outcomes among Mexican Americans: The Starr County diabetes prevention initiative. Chronic Illn. 2022 Mar 24. doi:10.1177/17423953221089315
21. United States Census Bureau. QuickFacts Starr County, Texas 2021 July [accessed October 30, 2022]. Available from: URL: https://www.census.gov/quickfacts/starrcountytexas
22. Hanis CL, Ferrell RE, Barton SA, et al. Diabetes among Mexican Americans in Starr County, Texas. Am J Epidemiol. 1983;118(5):659–672. doi:10.1093/oxfordjournals.aje.a113677 [PubMed: 6637993]
23. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606–613. doi:10.1046/j.1525-1497.2001.016009606.x [PubMed: 11556941]
24. Ames GE, Heckman MG, Diehl NN, Grothe KB, Clark MM. Further statistical and clinical validity for the Weight Efficacy Lifestyle Questionnaire—Short Form. Eat Behav. 2015;18: 115–119. doi:org/10.1016/j.eatbeh.2015.05.003 [PubMed: 26042918]
25. Knapp JA, Hazuda HP, Haffner SM, Young EA, Stern MP. A saturated fat/cholesterol avoidance scale: sex and ethnic differences in a biethnic population. J Am Diet Assoc. 1988;88(2):172–177. [PubMed: 3339203]

26. Reedy J, Lerman JL, Krebs-Smith SM, et al. Evaluation of the Healthy Eating Index-2015. J Acad Nutr Diet. 2018;118(9):1622–1633. doi:10.1016/j.jand.2018.05.019 [PubMed: 30146073]
27. McPherson RS, Kohl HW, García G, Nichaman MZ, Hanis CL. Food-frequency questionnaire validation among Mexican Americans: Starr County, Texas. Ann Epidemiol. 1995;5(5):378–385. doi:10.1016/1047-2797(95)00035-6 [PubMed: 8653210]
28. Amato MC, Giordano C, Galia M, et al. Visceral Adiposity Index: a reliable indicator of visceral fat function associated with cardiometabolic risk. Diabetes Care. 2010;33(4):920–922. doi:10.2337/dc09-1825 [PubMed: 20067971]
29. Vickerstaff V, Omar RZ, Ambler G. Methods to adjust for multiple comparisons in the analysis and sample size calculation of randomised controlled trials with multiple primary outcomes. BMC Med Res Methodol. 2019;19:129. doi:10.1186/s12874-019-0754-4 [PubMed: 31226934]
30. Mertler CA, Vannatta RA. Advanced and Multivariate Statistical Methods. 3rd ed. Pyrczak Publishing; 2005.
31. Cohen J Statistical Power Analysis for the Behavioral Sciences. Lawrence Erlbaum Associates; 1988.
32. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary guidelines for Americans, 2020-2025. 9th ed. 2020 December [accessed October 30, 2022]. Available from: URL: https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf
33. Vrany EA, Polanka BM, Hsueh L, Hill-Briggs F, Stewart JC. Race/ethnicity moderates associations between depressive symptoms and diet composition among U.S. adults. Health Psychol. 2021;40(8):513–522. doi:10.1037/hea0001078 [PubMed: 34618499]
34. Ma Y, Weng X, Gao X, et al. Healthy eating index scores differ by race/ethnicity but not hypertension awareness status among US adults with hypertension: findings from the 2011-2018 National Health and Nutrition Examination Survey. J Acad Nutr Diet. 2022;122(5):1000–1012. 10.1016/j.jand.2021.11.006 [PubMed: 34781003]
35. Overcash F, Reicks M. Diet quality and eating practices among Hispanic/Latino Men and Women: NHANES 2011-2016. Int J Environ Res Public Health. 2021;18(3):1302. 10.3390/ijerph18031302 [PubMed: 33535565]
36. Noe-Bustamante L Key facts about U.S. Hispanics and their diverse heritage 2019 September [accessed October 31, 2022]. Available from: URL: https://www.pewresearch.org/fact-tank/2019/09/16/key-facts-about-u-s-hispanics/
37. Clark T, Sleath B, Rubin RH. Influence of ethnicity and language concordance on physician-patient agreement about recommended changes in patient health behavior. Patient Educ Couns. 2004;53(1):87–93. doi:10.1016/S0738-3991(03)00109-5 [PubMed: 15062909]
38. Lopez-Quintero C, Berry EM, Neumark Y. Limited English proficiency is a barrier to receipt of advice about physical activity and diet among Hispanics with chronic diseases in the United States. J Acad Nutr Diet. 2009;109(10):1769–1774. doi:10.1016/j.jada.2009.07.003
39. Gorrepati PL, Smith GP. Contrasting readability and availability of Spanish language with English language patient education materials. Pediatr Dermatol. 2021;38(Suppl 2):142–143. doi:10.1111/pde.14485 [PubMed: 34850430]
40. Becerra BJ, Arias D, Becerra MB. Low health literacy among immigrant Hispanics. J Racial Ethn Health Disparities. 2017;4(3):480–483. doi:10.1007/s40615-016-0249-5 [PubMed: 27324821]
41. Brown SA, Perkison WB, García AA, et al. The Starr County Border Health Initiative: Focus groups on diabetes prevention in Mexican Americans. Diabetes Educ. 2018;44(3):293–306. doi:10.1177/0145721718770143 [PubMed: 29644932]
42. Dean WR, Sharkey JR, Johnson CM, St. John J. Cultural repertoires and food-related household technology within *colonia* households under conditions of material hardship. Int J Equity Health. 2012;11:25. doi:10.1186/1475-9276-11-25 [PubMed: 22587790]

**Table 1.**

General Dietary Recommendations for Adults: *Diet-related Factors and Macronutrients*

| Diet-related Factor | General Recommendation | | Additional Comments |
|---|---|---|---|
| | ***Males*** | ***Females*** | |
| Energy (kcal/day) | 2,000 - 2,400 | 1,600 - 2,000 | These are general guidelines for adults over the age of 18 years but recommendations need to be adjusted based on activity level, age, and body weight. |
| Fiber (grams/day) | 28 - 34 | 22 - 28 | USDA recommended daily goal should be at least 14 grams for every 1000 calories. Higher intake levels of total fiber have been recommended. |
| **Macronutrient** | | | |
| Protein (grams/day) | 56 | 46 | A more specific recommendation is 0.8 grams/kg of body weight; to estimate recommended intake, multiply weight by 0.36 or more specifically, use the online calculator, which takes age, sex, and activity level into account: https://www.nal.usda.gov/human-nutrition-and-food-safety/dri-calculator/results<br><br>Some experts recommend higher intake than recommended to improve satiety and reduce obesity. |
| Carbohydrate (grams/day) | 130 | | RDA based on average minimum amount of glucose used by the brain. Adults tend to consume more than the RDA: men=180-230 g/d; women=180-230 g/d. |
| Total fat (% kcal) | 20 - 35 | | Recommended levels lower with age. |
| Saturated fat (% kcal) | <10 | | Recommended levels consistent across all age groups. |
| Total cholesterol (mg/day) | limited | | Cholesterol levels are a major risk factor for cardiovascular disease so recommendations tend to involve limiting the daily intake as much as possible. |

Source: U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Dietary Guidelines for Americans, 2020-2025*. 9th Edition. December 2020. Available at DietaryGuidelines.gov.

**Table 2.**

Characteristics of Starr County Study Participants with Prediabetes: Total Sample (300 unless otherwise indicated) and by Sex (*Males=81, Females=219*)

| Participant Characteristics | TOTAL SAMPLE Mean ± SD or N (%) | *Males Frequency or Mean ± SD* | *Females Frequency or Mean ± SD* | Sex Differences *p* |
|---|---|---|---|---|
| **DEMOGRAPHIC CHARACTERISTICS** | | | | |
| Age (years) | 51.3 ± 7.9 | 51.5 ± 8.6 | 51.3 ± 7.6 | .83 |
| Years of education (*n* = 296) | 9.9 ± 3.7 | 10.7 ± 4.0 | 9.6 ± 3.5 | .02 |
| **ACCULTURATION FACTORS** | | | | |
| Language preference | 8.6 ± 4.9 | 9.7 ± 5.6 | 8.2 ± 4.6 | .02 |
| Food preferences | 2.6 ± 0.7 | 2.5 ± .84 | 2.7 ± .68 | .05 |
| Country of origin: U.S.<br>Mexico | 87 (29.0%)<br>213 (71.0%) | 29 (35.8%)<br>52 (64.2%) | 58 (26.5%)<br>161 (73.5%) | .08 |
| Years in Starr County | 32.9 ± 11.9 | 34.2 ± 12.7 | 32.5 ± 11.6 | .26 |
| **PSYCHOLOGICAL FACTORS** | | | | |
| Depression (PHQ-9) | 2.6 ± 3.6 | 2.2 ± 3.4 | 2.8 ± 3.7 | .21 |
| Eating self-efficacy (WEL-SF) | 3.0 ± 1.0 | 2.7 ± 1.0 | 3.0 ± 1.1 | .03 |
| **DIET-RELATED FACTORS** | | | | |
| Fat Avoidance (*n* = 299) | 0.09 ± 0.2 | 0.08 ± 0.02 | 0.09 ± 0.02 | <.001 |
| Healthy Eating Index-2015 (*n* = 299) | 54.0 ± 8.1 | 51.4 ± 7.5 | 54.9 ± 8.1 | .001 |
| Energy intake (kcal) (*n* = 299) | 1988 ± 1199 | 2632 ± 1628 | 1753 ± 893 | <.001 |
| Dietary fiber (g) (*n* = 299) | 17.7 ± 11.3 | 21.7 ± 15.4 | 16.3 ± 9.0 | <.001 |
| ***macronutrients*** | | | | |
| Protein (g) (*n* = 299) | 86.4 ± 57.0 | 115.1 ± 81.4 | 76.0 ± 40,3 | <.001 |
| Carbohydrate (g) (*n* = 299) | 229.2 ± 152.7 | 303.6 ± 213.7 | 202.1 ± 112.0 | <.001 |
| Total fat (g) (*n* = 299) | 84.2 ± 52.2 | 110.5 ± 69.7 | 74.6 ± 40.3 | <.001 |
| Saturated fat (g) (*n* = 299)<br>• Mean g<br>• N (%) whose intake ≥10% of kcal | <br>25.0 ± 15.8<br>222 (74.2%) | <br>33.6 ± 20.6<br>65 (81.3%) | <br>21.8 ± 12.3<br>157 (71.7%) | <br><.001<br>.06 |
| Cholesterol (mg) (*n* = 299) | 403.3 ± 325 | 548.9 ± 363 | 350.2 ± 293.1 | <.001 |
| **PHYSIOLOGICAL OUTCOMES** | | | | |
| Body mass index (kg/m$^2$) | 32.5 ± 6.3 | 32.6 ± 7.0 | 32.4 ± 6.0 | .80 |
| Visceral Adiposity Index (VAI) | 6.0 ± 4.6 | 6.3 ± 5.3 | 5.9 ± 4.4 | .52 |
| Glycosylated hemoglobin (A1C) | 5.70 ± 0.3 | 5.69 ± 0.3 | 5.71 ± 0.3 | .66 |

[*] **MEASURES**: Acculturation/language and food scales — language has possible scores ranging from 5 to 25 and food preferences range from 1-5, higher scores indicate greater use of the English language and American foods, respectively; depression (PHQ-9) — possible scores range from 0-27, higher scores indicate higher levels of self-reported depression; eating self-efficacy (WEL-SF) — possible scores range from 0-108, lower scores indicate higher levels of confidence in making healthy food choices; Fat Avoidance — mean scores range from 0 to 1, higher levels indicate behavior associated with avoiding high fat intake in the diet. The Healthy Eating Index-2015 (HEI-2015) represents intake of recommended foods/food groups; possible scores range from 0-100, higher scores indicate higher intake of recommended foods. VAI is a mathematical index that is based on waist circumference, BMI, triglycerides, and HDL cholesterol

**Table 3.**

Eating Behaviors and Macronutrients by 4 Acculturation Factors, Controlled for Sex[*]

| ACCULTURATION FACTOR: *Country of Origin* | | | | | |
|---|---|---|---|---|---|
| **MEASURE** | **Country** | **N** | **Mean ± SD** | **Significance** | |
| Eating self-efficacy | Mexico | 213 | 2.98 ± 1.0 | F = .38 | *p* = .54 |
| | U.S. | 87 | 2.87 ± 1.1 | | |
| Healthy Eating Index-2015 | Mexico | 213 | 54.7 ± 8.0 | F = 4.1 | *p* = .04 |
| | U.S. | 86 | 52.3 ± 8.1 | | |
| Energy intake (kcal) | Mexico | 213 | 1999 ± 1219 | F = .58 | *p* = .45 |
| | U.S. | 86 | 1960 ± 1156 | | |
| Dietary fiber(g) | Mexico | 213 | 18.4 ± 11.7 | F = 4.1 | *p* = .05 |
| | U.S. | 86 | 16.1 ± 10.2 | | |
| Protein(g) | Mexico | 213 | 87.9 ± 61.5 | F = 1.4 | *p* = .24 |
| | U.S. | 86 | 83.0 ± 43.9 | | |
| Carbohydrate(g) | Mexico | 213 | 230.0 ± 140.5 | F = .34 | *p* = .56 |
| | U.S. | 86 | 227.4 ± 180.3 | | |
| Total fat(g) | Mexico | 213 | 84.6 ± 54.4 | F = .45 | *p* = .50 |
| | U.S. | 86 | 83.2 ± 47.0 | | |
| Saturated fat(g) | Mexico | 213 | 24.8 ± 16.5 | F = .05 | *p* = .82 |
| | U.S. | 86 | 25.3 ± 14.2 | | |
| Cholesterol(mg) | Mexico | 213 | 410 ± 339 | F = .96 | *p* = .33 |
| | U.S. | 86 | 387 ± 288 | | |
| **ACCULTURATION FACTOR: *Years in Starr County*[**]** | | | | | |
| **MEASURE** | **Years** | **N** | **Mean ± SD** | **Significance** | |
| Eating self-efficacy | <32 yrs. | 146 | 2.97 ± 1.0 | F = .00 | *p* = .99 |
| | ≥32 yrs | 154 | 2.93 ± 1.1 | | |
| Healthy Eating Index-2015 | <32 yrs. | 146 | 54.3 ± 8.0 | F = .046 | *p* = .83 |
| | ≥32 yrs | 153 | 53.7 ± 8.1 | | |
| Energy intake (kcal) | <32 yrs. | 146 | 2040 ± 1229 | F = 3.0 | *p* = .08 |
| | ≥32 yrs | 153 | 1938 ± 1171 | | |
| Dietary fiber(g) | <32 yrs. | 146 | 18.2 ± 11.1 | F = 2.1 | *p* = .15 |
| | ≥32 yrs | 153 | 17.3 ± 11.5 | | |
| Protein(g) | <32 yrs. | 146 | 91.7 ± 63.5 | F = 6.1 | *p* = .01 |
| | ≥32 yrs | 153 | 81.5 ± 49.6 | | |
| Carbohydrate(g) | <32 yrs. | 146 | 229.1 ± 143.3 | F = .78 | *p* = .38 |
| | ≥32 yrs | 153 | 229.4 ± 161.6 | | |
| Total fat(g) | <32 yrs. | 146 | 87.7 ± 53.6 | F = 4.4 | *p* = .04 |
| | ≥32 yrs | 153 | 80.8 ± 50.9 | | |
| Saturated fat(g) | <32 yrs. | 146 | 25.8 ± 16.5 | F = 3.5 | *p* = .06 |

| ACCULTURATION FACTOR: *Country of Origin* | | | | | |
|---|---|---|---|---|---|
| **MEASURE** | **Country** | **N** | **Mean ± SD** | **Significance** | |
| | ≥32 yrs | 153 | 24.2 ± 15.2 | | |
| | <32 yrs. | 146 | 432 ± 359 | | |
| Cholesterol(mg) | ≥32 yrs | 153 | 376 ± 287 | F = 5.3 | *p* = .02 |
| **ACCULTURATION FACTOR:** ***Language Preference****** | | | | | |
| **MEASURE** | **Language** | **N** | **Mean ± SD** | **Significance** | |
| | Mostly Spanish | 135 | 2.97 ± 0.99 | | |
| Eating self-efficacy | Mostly English | 165 | 2.93 ± 1.09 | F = .008 | *p* = .93 |
| | Mostly Spanish | 135 | 54.0 ± 8.4 | | |
| Healthy Eating Index-2015 | Mostly English | 164 | 54.0 ± 7.8 | F = .123 | *p* = .73 |
| | Mostly Spanish | 135 | 2164 ± 1277 | | |
| Energy intake (kcal) | Mostly English | 164 | 1843 ± 1114 | F = 9.18 | *p* = .003 |
| | Mostly Spanish | 135 | 20.39 ± 11.86 | | |
| Dietary fiber(g) | Mostly English | 164 | 15.57 ± 10.36 | F = 17.93 | *p* = <.001 |
| | Mostly Spanish | 135 | 95.13 ± 65.99 | | |
| Protein(g) | Mostly English | 164 | 79.29 ± 47.31 | F = 9.45 | *p* = .002 |
| | Mostly Spanish | 135 | 251.1 ± 147.3 | | |
| Carbohydrate(g) | Mostly English | 164 | 211.2 ± 155.2 | F = 8.35 | *p* = .004 |
| | Mostly Spanish | 135 | 90.62 ± 55.64 | | |
| Total fat(g) | Mostly English | 164 | 78.89 ± 48.76 | F = 6.63 | *p* = .01 |
| | Mostly Spanish | 135 | 26.40 ± 16.88 | | |
| Saturated fat(g) | Mostly English | 164 | 23.80 ± 14.86 | F = 4.29 | *p* = .039 |
| | Mostly Spanish | 135 | 434 ± 357 | | |
| Cholesterol(mg) | Mostly English | 164 | 378 ± 294 | F = 4.08 | *p* = .044 |
| **ACCULTURATION FACTOR:** ***Food Preferences******* | | | | | |
| **MEASURE** | **Food** | **N** | **Mean ± SD** | **Significance** | |
| | Mostly Hispanic | 85 | 2.94 ± 1.2 | | |
| Eating self-efficacy | Mostly American | 215 | 2.95 ± 0.99 | F = .00 | *p* = .983 |
| | Mostly Hispanic | 85 | 54.9 ± 8.4 | | |
| Healthy Eating Index-2015 | Mostly American | 214 | 53.6 ± 7.9 | F = 2.08 | *p* = .151 |
| | Mostly Hispanic | 85 | 2007 ± 1375 | | |
| Energy intake (kcal) | Mostly American | 214 | 1980 ± 1125 | F = .02 | *p* = .890 |
| | Mostly Hispanic | 85 | 17.54 ± 12.12 | | |
| Dietary fiber(g) | Mostly American | 214 | 17.83 ± 10.99 | F = .17 | *p* = .678 |
| | Mostly Hispanic | 85 | 89.19 ± 72.85 | | |
| Protein(g) | Mostly American | 214 | 85.35 ± 49.42 | F = .06 | *p* = .803 |
| | Mostly Hispanic | 85 | 231.5 ± 161.9 | | |
| Carbohydrate(g) | Mostly American | 214 | 228.4 ± 149.2 | F = .015 | *p* = .902 |
| Total fat(g) | Mostly Hispanic | 85 | 84.23 ± 57.81 | F = .085 | *p* = .771 |

| ACCULTURATION FACTOR: ***Country of Origin*** | | | | | |
|---|---|---|---|---|---|
| **MEASURE** | **Country** | **N** | **Mean ± SD** | **Significance** | |
| | Mostly American | 214 | 84.17 ± 49.97 | | |
| | Mostly Hispanic | 85 | 25.06 ± 17.59 | | |
| Saturated fat(g) | Mostly American | 214 | 24.94 ± 15.12 | F = .072 | *p* = .789 |
| | Mostly Hispanic | 85 | 431 ± 391 | | |
| Cholesterol(mg) | Mostly American | 214 | 392 ± 295 | F = .509 | *p* = .476 |

[*] All means adjusted for sex differences; *Years in Starr County* adjusted for sex and age

[**] Sample divided according to the median split of the *Years in Starr County* variable = 32 years

[***] Sample divided according to the median split of the *Language Preferences* variable = 6.0

[****] Sample divided according to the median split of the *Food Preferences* variable = 3.0