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Healthcare provider-delivered healthy eating recommendations among U.S. Hispanic/Latino adults

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ABSTRACT

U.S. Hispanic/Latino adults are at heightened risk for developing diet-related chronic diseases. Healthcare provider recommendations have shown to be effective for promoting health behavior change, but little is known about healthcare provider healthy eating recommendations among Hispanics/Latinos. To investigate the prevalence of and adherence to healthcare provider-delivered healthy eating recommendations among a U.S. sample of Hispanic/Latino adults, participants ($N = 798$; $M = 39.6 \pm 15.1$ years; 52% Mexican/Mexican American) were recruited via Qualtrics Panels to complete an online survey in January 2018. Most (61%) participants reported having ever received a healthcare provider-delivered dietary recommendation. Higher body mass index (AME = 0.015 [0.009, 0.021]) and having a chronic health condition (AME = 0.484 [0.398, 0.571]) were positively associated with receiving a dietary recommendation while age (AME = −0.004 [−0.007, −0.001]) and English proficiency (AME = −0.086 [−0.154, −0.018]) were negatively associated. Participants reported adhering regularly (49.7%) and sometimes (44.4%) to recommendations. There were no significant associations with patient characteristics and adherence to a healthcare provider-delivered dietary recommendation. Findings inform next steps toward increasing implementation of brief dietary counseling from healthcare providers to support prevention and management of chronic diseases among this under-studied population.

1. Introduction

Healthy eating, including daily fruit and vegetable intake, is linked to reduced chronic disease risk (Centers for Disease Control and Prevention, 2021). Hispanics/Latinos exhibit high diet-related chronic disease risk (Centers for Disease Control and Prevention & National Center for Health Statistics, 2019a). Specifically, only about 18% and 15% of Hispanic adults achieve fruit and vegetable consumption recommendations (Siega-Riz et al., 2019), respectively. Additionally, 58% consume at least two sugar-sweetened beverages daily (Park et al., 2019) and more than 98% consume beyond recommended sodium limits (Siega-Riz et al., 2019).

With diffuse benefits from healthy eating, Healthy People 2030 prioritizes increasing provider visits incorporating nutritional counseling (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d). According to the Input-Output Framework, five components influence persuasiveness of health communication interventions: source, message, channel, receiver, and destination (McGuire, 2013). Healthcare providers (HCPs) are often perceived as credible, trustworthy sources for health information, increasing the likelihood others seek and heed even their simple, brief health behavior change messages. In a randomized controlled trial, patients who received physicians' advice to reduce dietary fat intake, compared to patients who did not, were more likely to reduce dietary fat consumption (Kreuter et al., 2000). Among adults with hypertension, 82% who received physicians' advice to change eating habits reported taking action to do so, compared to 51% who did not receive such advice (Viera et al., 2008).

Despite high chronic disease prevalence (Centers for Disease Control and Prevention & National Center for Chronic Disease Prevention and Health Promotion, 2021) and support for HCPs to recommend healthy eating, only half of adults report having ever received such a recommendation (Nguyen et al., 2011; Viera et al., 2007; Xiang et al., 2015; Yang et al., 2011). Patient characteristics associated with greater likelihood for recommendation receipt include being older (Xiang et al., 2015), male (Viera et al., 2008), a body mass index (BMI) $\geq$30 kg/m^2 (Viera et al., 2008; Xiang et al., 2015), a chronic health condition (Nguyen et al., 2011; Viera et al., 2008; Xiang et al., 2015), and health

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insurance (Xiang et al., 2015). Low English proficiency is associated with lower healthcare access (Al Shamsi et al., 2020) and quality (Timmins, 2002), and higher likelihood of patient-provider miscommunication (Timmins, 2002).

Since most (~80%) U.S. Hispanics/Latinos visit a HCP annually (Centers for Disease Control and Prevention & National Center for Health Statistics, 2019b), HCP-delivered healthy eating recommendations can be a promising, brief, evidence-informed strategy for reducing disproportionate chronic disease risk. However, with limited representation in extant study samples, how common HCPs (i.e., source) make healthy eating recommendations (i.e., message) to Hispanics/Latinos (i.e., recipients) (McGuire, 2013) is unknown. Further unknowns are Hispanic/Latino characteristics associated with receipt or non-receipt of recommendations. Research is warranted for insight into whether and among whom implementation and dissemination efforts are most needed to improve intervention uptake among HCPs serving Hispanics/Latinos.

Adherence to healthy eating recommendations is integral in the pathway between recommendation receipt and prevention and management of chronic diseases. The only adherence study of HCP healthy eating recommendations among Hispanics/Latinos were among those receiving hemodialysis. Patients reported 59–88% adherence rates to recommended intake of potassium- and phosphorous-containing foods (López et al., 2007). The Health Belief Model (Rosenstock, 1974) would suggest these rates may be higher than the general Hispanic/Latino population, given the likely high perceived susceptibility and severity of poor outcomes with non-adherence among patients on hemodialysis. Adherence studies on HCP lifestyle recommendations among non-Hispanics/Latinos report a range of adherence (Praet and van Loon, 2009; Yang et al., 2011). The Health Belief Model (Rosenstock, 1974) indicates barriers to adherence matter by negatively impacting adherence to recommendations despite an individual's intentions. The Social Determinants of Health Framework (Yearby, 2020) outlines the inequitable distribution of these barriers across populations, which contributes to the documented differences in adherence across samples. Like other populations of color, U.S. Hispanics/Latinos are more likely to face additional barriers to healthy eating compared with non-Hispanic Whites due to historic and present-day structural racial and ethnic discrimination (Hagiwara et al., 2020; Kazmierski et al., 2021; Yeh et al., 2008). For example, food insecurity (Hernandez et al., 2017), acculturative stress (Kazmierski et al., 2021), and language barriers (Andreae et al., 2017) are more prevalent among Hispanics/Latinos compared with non-Hispanic Whites, making adherence to healthy eating recommendations more challenging. For Hispanic/Latino immigrants, lack of familiar fruits and vegetables and lack of tools to prepare traditional meals in the U.S. can further impede healthy eating (Yeh et al., 2008).

Patient characteristics associated with adherence include older age, seen with dietary adherence among Taiwanese adults with type II diabetes (Yeh et al., 2018). A U-shaped association was observed among Canadian adults, with younger and older adults reporting higher adherence to a doctor's lifestyle recommendations than middle-aged adults (Levesque et al., 2012). Higher education and income were correlated with better adherence (DiMatteo, 2004) although racial and ethnic findings were not explored. Compared with self-reported poor health and presence of depression, good or excellent health and absence of depression were also associated with better adherence to doctors' recommendations (Grenard et al., 2011; Levesque et al., 2012). In a meta-analysis of thirty-one studies examining associations between patient characteristics and HCP recommendation adherence (Grenard et al., 2011), one study was predominantly of Latinos but assessed only medication adherence in patients with type II diabetes (Mann et al., 2009). Overall, Hispanic/Latino patient characteristics associated with adherence to HCP healthy eating recommendations are largely unknown. Research is needed to inform culturally tailored interventions to support adherence and healthier outcomes among Hispanics/Latinos at highest chronic disease risk.

Using a U.S. national sample of Hispanic/Latino adults, this study addresses the following research questions and hypotheses:

1) What is the prevalence of receiving a HCP healthy eating recommendation?

It was hypothesized that prevalence of receiving a HCP healthy eating recommendation would be lower than previous literature with predominantly non-Hispanics/Latinos (Viera et al., 2007; Xiang et al., 2015).

2) What patient characteristics are associated with receipt?

It was hypothesized that those who were older, identified as a man, had a higher BMI, had a chronic health condition, had health insurance, and spoke/understood English better would be more likely to have received a healthy eating recommendation from a HCP than those who were younger, identified as a woman, had a lower BMI, did not have a chronic health condition, were uninsured, and spoke/understood English less well (Nguyen et al., 2011; Timmins, 2002; Viera et al., 2008; Xiang et al., 2015).

3) What is the adherence rate to a HCP healthy eating recommendation?

It was hypothesized that adherence to HCP healthy eating recommendations would be lower than previous findings on predominately non-Hispanic/Latino samples, as Hispanics/Latinos face additional barriers to healthy eating (Hagiwara et al., 2020; Kazmierski et al., 2021; Yearby, 2020; Yeh et al., 2008).

4) What patient characteristics are associated with better adherence?

It was hypothesized that those who were older, more educated, had a higher annual household income, reported excellent health, had lower depressive symptoms, and spoke/understood English better would report better adherence to a HCP healthy eating recommendation compared to those who were younger, less educated, had a lower annual household income, reported poor health, had greater depressive symptoms, and spoke/understood English less well (Andreae et al., 2017; DiMatteo, 2004; Grenard et al., 2011; Levesque et al., 2012; Yeh et al., 2018).

2. Methods

2.1. Procedure

Detailed methods regarding this cross-sectional study and the national representativeness of this sample have been described elsewhere (Budd et al., 2021). The dataset can be found in the Harvard Database (Budd, 2020). Briefly, participants were recruited in January 2018 via Qualtrics Panels, an online platform that partners with market research panels to recruit a nationwide U.S. sample of potentially eligible participants. The initial email invitation omitted specific study details to reduce self-selection bias. Eligibility criteria were defined as ≥18 years old, identify as Hispanic or Latino, live within the U.S., and English or Spanish reading proficiency. Based on self-report responses, eligible participants received an online survey with an informed consent document. Consenting participants were directed to an online survey in English or Spanish, depending on their language preference. The survey included 197 questions, assessing health-related constructs. University of Oregon's Institutional Review Board approved study protocol.

2.2. Measures

The Demographic and Health Data Questionnaire (Smith et al., 2017;

Tucker et al., 2014) assessed age, gender, height, weight, chronic health conditions, health insurance, education, annual household income, and self-reported health. Two bilingual research assistants translated the questionnaire from English into Spanish. BMI was calculated using height and weight (Centers for Disease Control and Prevention & Division of Nutrition, Physical Activity, and Obesity, 2014). Extreme BMI data (i.e., <12 or >65 kg/m^2) from seven participants were excluded from analyses (Weir and Jan, 2020).

The English language subscale from the Abbreviated Multidimensional Acculturation Scale assessed English proficiency (Zea et al., 2003). It consists of five items on speaking and four items on understanding English in different scenarios (e.g., at school or work). For each scenario, participants rate themselves on a Likert-type scale from one (i.e., *not very well*) to four (i.e., *extremely well*). Items are added and averaged for overall English proficiency. Internal consistency among Hispanics/Latinos (αs = 0.96–0.97) has been strong (Zea et al., 2003).

The Patient Health Questionnaire-9 has adequate reliability and validity (Kroenke et al., 2001). Internal consistency is modest to strong among Latino patients on English (α = 0.84) and Spanish (α = 0.85) versions (Merz et al., 2011). Participants rate the frequency of depressive symptoms (e.g., feeling down) experienced over the previous two weeks on a scale of zero (i.e., *not at all*) to three (i.e., *nearly every day*). The nine items are summed to represent depressive symptom severity. Five categories are used for interpreting results (e.g., 20–27 [severe depression]). Internal consistency here is strong (α = 0.92).

Receipt of a HCP healthy eating recommendation was assessed by *"Has a health care provider recommended that you change your eating habits (*e.g.*, eat more fruit and vegetables) to manage and/or prevent a chronic health condition (such as diabetes or high blood pressure)?"* with *yes*, *no*, and *I do not recall* options. This and the adherence question, were created by authors of the Demographic and Health Data Questionnaire (Smith et al., 2017; Tucker et al., 2014).

Adherence to a HCP healthy eating recommendation was assessed by *"Are you following the recommendation of your provider (*e.g.*, eating more fruits and vegetables)?"* (Smith et al., 2017; Tucker et al., 2014) with *regularly*, *sometimes*, *rarely*, or *not at all* options. Previous literature on patient adherence to HCP recommendations have been similar, such as a number scale of one (i.e., *never)* to five (i.e., *always*; Levesque et al., 2012).

2.3. Statistical analyses

Descriptive statistics were performed to describe study sample, examine response distributions (George and Mallery, 2010) and sample prevalence of receipt and adherence to HCP healthy eating recommendations. Pearson's bivariate correlations were conducted to test for multicollinearity. Analyses were conducted using IBM SPSS Statistics for Windows, Version 27. Average marginal effects were calculated using the SAS Margins macro.

A binomial logistic regression was conducted to determine patient characteristics associated with receiving a HCP healthy eating recommendation. Independent variables included age, gender, BMI, chronic health condition, health insurance, and English proficiency. Gender was dichotomized (woman/man), due to too few endorsements for "other" (n = 10). For chronic health conditions, *overweight/obesity* endorsement were removed. BMI was instead added as an independent variable as literature has found it associated with receiving a healthy eating recommendation (Viera et al., 2008; Xiang et al., 2015). Current chronic health condition was dichotomized (absence/presence) as health service utilizations (e.g., prescriptions) differ among those with and without chronic health conditions (Buttorff et al., 2017). The dependent variable, receipt of a HCP healthy eating recommendation, was dichotomized (yes/no). '*I do not recall*' responses (n = 38) were removed from analyses due to too small endorsements to stand alone and was not collapsed with the '*no*' group as they significantly differed by BMI, $F(2, 771) = 24.47$, $p < .001$, and health insurance, χ^2 $(2, N = 311) = 10.51$, p =.005.

A multinomial logistic regression was conducted to determine patient characteristics associated with better adherence among those who received a HCP healthy eating recommendation. Independent variables included age, education, annual household income, self-reported health, depressive symptoms, and English proficiency. To facilitate more equal covariate group distributions, education and annual household income were each collapsed into three categories: ≤ high school or GED, trade/technical school or 2-year college, and ≥ 4-year college/university and < $10,000–$29,999, $30,000–$69,999, and $70,000–$100,000+. The dependent variable, adherence to HCP healthy eating recommendations, was recoded into three response categories, collapsing '*not at all*' (n = 4) and '*rarely*' (n = 25) into '*not at all/rarely*'.

3. Results

3.1. Participants

Participants (N = 798) were 18 to 81 years old (M = 39.6±15.1 years). Most completed the survey in English (80%); 52% identified as Mexican or Mexican American; and 65.4% reported English as their first language. Approximately 90% indicated they speak and understand English *pretty well* or *extremely well*. Participant demographic information appears in Table 1. Missing data were considered minimal (Schafer, 1999).

4. Research question 1 and 2 results

Sixty-one percent of participants reported having received a HCP healthy eating recommendation (research question 1). Regarding research question 2, the binomial logistic regression explained 32.4% of the variance in receipt of a HCP healthy eating recommendation. Four of the six patient characteristics were significantly associated with receipt of a HCP healthy eating recommendation (Table 2). Specifically, for every unit increase in age there was an associated 0.4% [−0.007, −0.001] decrease in the probability of receipt. For each one unit increase in BMI, there was a 1.5% [0.009, 0.021] increase in the probability of receipt. Those with a chronic health condition had an increased 48.4% [0.398, 0.571] probability of receiving a HCP healthy eating recommendation than those without a chronic health condition. For each one unit increase in English proficiency, there was a 8.6% [−0.154, −0.018] decrease in the probability of receipt. Gender (p =.425) and health insurance (public, p =.107; private, p =.077) were not significantly associated with receipt.

5. Research question 3 and 4 results

Participants who reported receiving a HCP healthy eating recommendation reported *regularly* (49.7%) or *sometimes* (44.4%) adhering to the recommendation, while fewer indicated *rarely* (5.1%) or *not at all* (0.8%) adhering (research question 3). Regarding research question 4, the multinomial logistic regression explained 14.1% of the variance in adherence to HCP healthy eating recommendations. There were no statistically significant associations between the hypothesized variables and adherence (Table 3).

6. Discussion

Healthy eating recommendations from a HCP can promote healthier dietary changes among patients, possibly preventing or reducing chronic disease progression. Using a U.S. national sample, this study is the first to quantify the proportion of Hispanics/Latinos who have ever received a HCP healthy eating recommendation and identify patient characteristics associated with likelihood of receipt of this brief, evidence-informed health intervention (Kreuter et al., 2000; Viera et al., 2008). Adherence findings, and associated patient characteristics,

Table 1
Descriptive Statistics of Key Study Variables and Demographic Characteristics of a Sample of U.S. Hispanic/Latino Adults (N = 798) from 2018.

Variable	N	Missing	Mean (SD)[a]	Skewness (SE)[b]	Kurtosis (SE)	Min., Max.
Age	797	1	39.64 (15.05)	0.307 (0.087)	−0.955 (0.173)	18, 81
Body Mass Index	774	24	28.30 (7.27)	1.064 (0.088)	1.715 (0.176)	13.70, 64.19
Depressive Symptoms	797	1	17.04 (6.98)	0.810 (0.087)	−0.198 (0.173)	9, 36
English Proficiency	793	5	3.63 (0.59)	−1.87 (0.87)	3.63 (0.173)	1, 4

Variable	**N (Valid %[c])**
Gender	
Woman	467 (58.5)
Man	320 (40.2)
Other	10 (1.3)
Ethnic Origin	
Mexican or Mexican American	415 (52.0)
Puerto Rican	136 (17.1)
Cuban	68 (8.5)
Spanish	44 (5.5)
Dominican	27 (3.4)
Another Hispanic or Latino origin (e.g., Columbian, Venezuelan, Peruvian)	108 (13.5)
English is first language	
Yes	522 (65.4)
No	276 (34.6)
Current U.S. region of residence	
South	316 (39.6)
West	182 (22.8)
Northeast	155 (19.4)
Midwest	145 (18.2)
Highest level of education completed	
≤ High school or GED	239 (30.4)
Trade/technical school or 2-year college	222 (28.2)
≥ 4-year college/university	325 (41.4)
Employment status	
Work full-time	395 (49.7)
Work part-time	114 (14.3)
Unemployed but looking for a job	97 (12.2)
Do not work (e.g., stay-at home parent, retired, on disability, etc.)	189 (23.8)
Annual household income	
< $10,000 – $29,999	231 (29.0)
$30,000 – $69,999	300 (37.6)
$70,000 – $100,000+	266 (33.3)
Health insurance coverage	
Private insurance (e.g., HMO, PPO)	392 (49.1)
Public insurance (e.g., Medicare, Medicaid)	304 (38.1)
Uninsured	102 (12.8)
Self-reported health	
Excellent	103 (12.9)
Good	393 (49.2)
Fair	261 (32.7)
Poor	41 (5.2)
Annual doctor visits	
0-1 time	222 (27.8)
2-3 times	351 (44.0)
4 + times	225 (28.2)
Presence of a chronic health condition	
At least one current chronic health condition	362 (45.4)
No current chronic health condition	436 (54.6)
Current chronic health conditions reported[d]	
Hypertension	181 (22.7)

(*continued on next page*)

Table 1 (*continued*)

Variable	N	Missing	Mean (SD)[a]	Skewness (SE)[b]	Kurtosis (SE)	Min., Max.	
High cholesterol							175 (21.9)
Type 2 diabetes							122 (15.3)
Heart disease							27 (3.4)
Cancer							15 (1.9)
Other (e.g., arthritis, fibromyalgia, depression)							54 (6.8)
HCP ever recommend a change in eating habits (e.g., eat more fruits and vegetables) to prevent/manage chronic health condition[e]							
Yes							487 (61.0)
No							273 (34.2)
Following HCP recommendation (e.g., eat more fruits and vegetables)							
Regularly							242 (49.7)
Sometimes							216 (44.4)
Not at all/Rarely							29 (5.9)

Notes. [a] SD = standard deviation; [b] SE = standard error; [c] Valid % = Percent of participants with missing data excluded; [d] Participants could report having more than one chronic health condition, therefore, the percentages here represent the proportion of the sample that indicated having each chronic health condition listed; [e] = 'I do not recall' responses were removed (n = 38); HCP = healthcare provider. Missing data for non-key study variables ranged from 0 to 1.5%.

Table 2
Associations between Patient Characteristics and Receipt of a Healthy Eating Recommendation by a Healthcare Provider Among U.S. Hispanic/Latino Adults (N = 722) from 2018.

Variables	OR (95% CI)	*p* value	AME (95% CI)
Age	0.98*** (0.97-0.99)	0.005	−0.004 (−0.007, −0.001)
Gender			
Woman	ref		
Man	0.86 (0.60–1.24)	0.425	-0.023 (−0.101, 0.056)
Body mass index	1.08*** (1.05–1.11)	<0.001	0.015 (0.009, 0.021)
Chronic health condition(s)			
None	ref		
≥1	9.05*** (5.97–13.72)	<0.001	0.484 (0.398, 0.571)
Health insurance coverage			
Uninsured	ref		
Public insurance only (e.g., Medicaid, Medicare)	1.60 (0.90–2.81)	0.107	0.128 (−0.002, 0.259)
Private insurance (e.g., HMO, PPO)	1.65 (0.95–2.86)	0.077	0.153 (0.025, 0.281)
English Proficiency	0.60*** (0.44–0.83)	0.002	−0.086 (−0.154, −0.018)

Notes for binomial logistic regression. OR = odds ratio; CI = confidence interval; AME = average marginal effects; ref = reference group; Nagelkerke's R-squared = 0.324; *** p <.01 (two-tailed).

advance the literature, as previous studies focused predominately on non-Hispanic/Latino samples (Egede, 2003; Hill-Briggs et al., 2005). A population with heightened risk for poor dietary behaviors and chronic disease (Centers for Disease Control and Prevention & National Center for Health Statistics, 2019a), understanding who are more or less likely to receive these recommendations can inform efforts toward reducing health inequities and meeting the Healthy People 2030 objective of increasing nutritional counseling for provider visits.

The sample prevalence of receiving a HCP healthy eating recommendation was 61%, comparable to 62% of a previous study of predominantly non-Hispanic Whites with hypertension (Viera et al., 2007). This was contrary to our hypothesis based on a study of Mexican-American adults with BMIs ≥30 kg/m^2, where 48% had received a HCP healthy eating recommendation (Nguyen et al., 2011). That study was specific to receiving advice for fewer high-fat/high-cholesterol foods (Nguyen et al., 2011), whereas the present study included recommendations for any healthy dietary change. While receipt among Hispanics/Latinos was higher than expected, substantial improvement remains for use of this brief intervention among HCPs serving these patients.

Consistent with hypotheses and past research with predominantly non-Hispanic Whites (Nguyen et al., 2011; Viera et al., 2008; Xiang et al., 2015), those with a chronic health condition and with higher BMIs had increased probabilities of recommendation receipt. Of patient characteristics examined, having a chronic health condition was most strongly associated with receipt, with 83.43% of participants with a chronic health condition having reported receiving such a recommendation. Given chronic diseases are leading causes of death among U.S. Hispanics/Latinos (Centers for Disease Control and Prevention & National Center for Health Statistics, 2019a), these results are promising. However, and importantly, healthy eating is integral in chronic disease prevention (Centers for Disease Control and Prevention, 2021); as such, recommendations should also be delivered to Hispanics/Latinos without a chronic health condition, but may be at risk due to dietary behaviors. HCPs of Hispanics/Latinos should be aware that 50.40% of patients without chronic health conditions have never received a healthy eating recommendation. Brief medical office screenings for dietary behaviors (e.g., fruit and vegetable intake) would assist, with more accuracy than BMI (Centers for Disease Control and Prevention & National Center for Chronic Disease Prevention and Health Promotion, 2021; Peters et al., 2019) in identifying patients at risk for chronic disease who would benefit from receiving a healthy eating recommendation. In fact, HCPs recommending someone with a higher BMI improve their dietary behaviors because of their BMI without first screening for a need for dietary changes is an example of weight-based discrimination. Weight-based discrimination is highly common in medical settings (Puhl and Brownell, 2006) with experiences associated with chronic health conditions and poor mental health outcomes, controlling for BMI (Puhl and Suh, 2015; Wu and Berry, 2018).

In this sample, older adults had a 2% decreased likelihood of receiving a healthy eating recommendation, contrary to literature of predominantly non-Hispanic White (Xiang et al., 2015). Generally, compared with younger adults, healthy eating recommendations among older adults may be more important as they are at increased risk for developing chronic disease (Centers for Disease Control and Prevention & National Center for Chronic Disease Prevention and Health Promotion, 2020), and data indicate their fruit and vegetable intake is lower than recommended guidelines (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). HCPs who care for Medicare patients should consider screening for eating patterns and make healthy eating recommendations as needed. While screening for

Table 3
Associations between Patient Characteristics and Better Adherence to Healthy Eating Recommendation by a Healthcare Provider Among U.S. Hispanic/Latino Adults (n = 476) from 2018.

	Sometimes			Regularly		
Variables	OR (95% CI)	*p* value	AME (95% CI)	OR (95% CI)	*p* value	AME (95% CI)
Age	1.02 (0.99–1.05)	0.312	0.002 (−0.001, 0.005)	1.02 (0.99–1.05)	0.186	0.001 (−0.001, 0.004)
Education						
≤ High school or GED	ref			ref		
Trade/technical school or 2-year college	2.82 (0.91–8.72)	0.072	0.110 (−0.001, 0.222)	3.02 (0.96–9.49)	0.059	0.123 (0.006, 0.239)
≥ 4-year college/university	1.32 (0.49–3.55)	0.584	0.027 (−0.107, 0.161)	1.86 (0.69–5.02)	0.222	0.086 (−0.036, 0.207)
Annual Household Income						
< $10,000-$29,999	ref			ref		
$30,000-$69,999	1.44 (0.56–3.70)	0.447	0.050 (−0.070, 0.171)	0.76 (0.29–1.99)	0.581	−0.037 (−0.142, 0.068)
$70,000-$100,000+	1.90 (0.57–6.31)	0.293	0.083 (−0.055, 0.222)	1.75 (0.53–5.74)	0.356	0.039 (−0.048, 0.126)
Self-report health						
Poor	ref			ref		
Fair	1.50 (0.34–6.62)	0.592	0.040 (−0.133, 0.214)	2.39 (0.49–11.72)	0.282	0.127 (−0.192, 0.446)
Good	1.89 (0.38–9.36)	0.435	0.054 (−0.130, 0.238)	3.93 (0.72–21.36)	0.113	0.176 (−0.146, 0.498)
Excellent	0.24 (0.03–2.11)	0.199	-0.351 (−0.798, 0.096)	3.82 (0.50–29.25)	0.197	0.172 (−0.161, 0.505)
Depressive symptoms	0.98 (0.92–1.04)	0.486	−0.002 (−0.009, 0.004)	0.97 (0.92–1.03)	0.363	−0.002 (−0.008, 0.003)
English Proficiency	1.11 (0.58–2.12)	0.745	0.007 (−0.062, 0.076)	1.09 (0.57–2.07)	0.805	0.004 (−0.055, 0.064)

Notes for multinomial logistic regression. ref = reference group; OR = odds ratio; CI = confidence interval; Nagelkerke's R-squared = 0.141. ORs represented here are the odds of reporting 'sometimes' or 'regularly' compared to 'not at all/rarely' adhering to a healthcare provider healthy eating recommendation.

the need for intervention is ideally done prior to intervention delivery, these findings suggest there may be opportunity for increased delivery of HCP healthy eating recommendations among older Hispanics/Latinos to prevent and manage chronic diseases. Also contrary to the hypothesis and previous literature for language barriers in healthcare (Al Shamsi et al., 2020; Timmins, 2002), English proficiency was associated with a decreased probability of receipt. It is unknown why this is, but the sample was largely skewed toward high English proficiency. Inconsistent with extant literature and study hypotheses, receipt was not associated with gender or health insurance (Kasper et al., 2000; Nguyen et al., 2011; Viera et al., 2008; Xiang et al., 2015). Findings could be interpreted as promising as they do not point to an inequity among Hispanics/Latinos in receipt of this intervention by gender or health insurance, despite presence of inequities in healthcare access and quality by gender (Daher et al., 2021) and health insurance status (Hsia et al., 2000).

Adherence to HCP healthy eating recommendations in this sample was greater than hypothesized. Almost all (94.1%) participants who had received such a recommendation adhered *regularly* or *sometimes*, promising, regarding the benefits for U.S. Hispanics/Latinos. Based on this finding, the Input-Output Framework may suggest Hispanics/Latinos identify HCPs as credible and trustworthy sources for health messages, which increases their likelihood of adhering to the recommendation. There is promise for other sources of these health messages, including pharmacists and community health workers (Sharp et al., 2018). Community health workers, or Promotores de Salud, are trained members of the community they serve and have been shown to be especially effective at decreasing barriers to care and promoting health among Hispanic/Latino communities (WestRasmus et al., 2012). Participants (44.4%) who indicated sometimes adhering, may be best served with longer discussions designed to explore and problem-solve barriers to healthy eating, which may be more appropriate for community health workers. To further support Hispanics/Latinos more regularly adhere to healthy eating recommendations, mobile phone-based reminders may be helpful, with adherence improvements found among Bangladeshi patients with type II diabetes (Yasmin et al., 2020). Additionally, other digital interventions have shown to improve dietary adherence, specifically the Dietary Approaches to Stop Hypertension (DASH) diet, among medically vulnerable patients (Steinberg et al., 2019). Future research should examine culturally responsive strategies to further support adherence to recommendations among Hispanics/Latinos. Also, longitudinal studies are needed to determine short- and long-term adherence.

Curiously, patient characteristics associated with adherence to HCP healthy eating recommendations among *non*-Hispanic/Latino samples (DiMatteo, 2004; Grenard et al., 2011; Levesque et al., 2012; Yeh et al., 2018) were not significant in this study. A curvilinear association between age and adherence to HCP recommendations among Canadian adults (Levesque et al., 2012) inspired a post hoc exploratory analysis, but no such association was identified. While English proficiency was not associated with adherence, a previous study found when language barriers were addressed, patient adherence to scheduled healthcare visits increased (Andreae et al., 2017). Findings and interpretations here should be considered an initial assessment of how common receipt of HCP healthy eating recommendations are among U.S. Hispanics/Latinos and how well recommendations are adhered to. Patient characteristics (Reininger et al., 2017) or contextual factors (Hagiwara et al., 2020; Kazmierski et al., 2021; Weiler and Crist, 2009; Yeh et al., 2008) not included here may be more relevant for adherence among Hispanics/Latinos, particularly contextual factors, as U.S. Hispanics/Latinos experience many ecological barriers to healthy eating (Hagiwara et al., 2020; Yeh et al., 2008). Future research should examine these factors to better identify Hispanics/Latinos with heightened risk for poorer adherence to HCP healthy eating recommendations and inform culturally appropriate interventions to support adherence.

6.1. Strengths and limitations

Findings advance literature related to HCP healthy eating recommendations and adherence among U.S. Hispanics/Latinos, an underserved, growing patient population (Pew Research Center, 2017) experiencing heightened risk for chronic diseases (Centers for Disease Control and Prevention & National Center for Health Statistics, 2019a). Findings can assist efforts to increase the provision of recommendations, per Healthy People 2030 objectives (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, n.d.). This sample was nationally representative of nativity, ethnic origins, employment, and health insurance of U.S. Hispanics/Latinos (Noe-

Bustamante and Flores, 2019; U.S. Department of Health and Human Services & Office of Minority Health, 2017). Current chronic health conditions were also representative of national averages among Hispanics/Latinos (U.S. Department of Health and Human Services & Office of Minority Health, 2021a; U.S. Department of Health and Human Services & Office of Minority Health, 2021b). Participants completed the survey in English or Spanish, increasing accessibility.

Limitations include the cross-sectional design, as causal inferences cannot be made. The retrospective, self-report measures are vulnerable to biases. Additionally, while the survey was available in English and Spanish, other languages spoken by Hispanics/Latinos (e.g., Mam) were not available, omitting these individuals' experiences. Since there was a high level of English proficiency, findings may not generalize to Hispanics/Latinos with low English proficiency, who experience heightened barriers to healthcare access (Al Shamsi et al., 2020) and quality care (Timmins, 2002). Additionally, few participants identified as transgender and/or non-binary, making it impossible to investigate meaningful differences to minoritized genders and sexual orientations. Further steps are needed to fill this gap as sexual and gender diverse individuals report poorer quality healthcare relative to non-sexual and gender diverse individuals (Giblon and Bauer, 2017; Markovic et al., 2021). The survey did not assess specificity or frequency of the HCP healthy eating messages respondents received, limiting investigation of other relevant Input-Output Framework components. Survey items that assessed receipt and adherence to a HCP healthy eating recommendation lacked psychometric data. Lastly, this study was conducted entirely online, therefore results are unlikely generalizable to those without internet access or less likely to interface with technology (15% U.S. Hispanics/Latinos do not have internet access via smartphone; Pew Research Center, 2021).

7. Conclusion

In this sample of U.S. Hispanic/Latino adults, 61% reported having received a HCP-delivered healthy eating recommendation. Patient characteristics, including age, BMI, chronic health condition, and English proficiency may matter regarding who is more or less likely to receive a recommendation. Nearly all who received a recommendation reported adhering sometimes or regularly, with no significant variability across patient characteristics. Findings advance literature and can inform HCPs on chronic disease prevention and management and national efforts to increase delivery of healthy eating recommendations to more Hispanics/Latinos who would benefit from the brief intervention, thereby potentially contributing to the reduction of health inequities.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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