

## THE LATINO HEALTH PROJECT: PILOT TESTING A CULTURALLY ADAPTED BEHAVIORAL WEIGHT LOSS INTERVENTION IN OBESE AND OVERWEIGHT LATINO ADULTS

**Objective:** To pilot test a culturally adapted behavioral weight loss intervention in obese and overweight Latino adults.

**Design:** Pilot study.

**Setting:** Latino community organization in Durham, North Carolina.

**Participants:** Overweight and obese, self-identified Latinos  $\geq 18$  years old.

**Intervention:** Intervention consisted of 20 weekly group sessions (90–120 minutes each) incorporating motivational interviewing techniques. The intervention goal was weight loss by adopting the Dietary Approach to Stop Hypertension (DASH) dietary pattern, increasing physical activity, and reducing caloric intake. The cultural adaptation included foods and physical activities commonly used in the Latino culture, using a Spanish-speaking interventionist, and conducting the intervention at a local Latino community organization.

**Main outcome measures:** Weight, body mass index (BMI), blood pressure, dietary pattern, and physical activity were measured at baseline and at 20 weeks.

**Results:** A total of 56 participants are included in the final analysis. The average weight loss was 5.1 lbs (95% CI  $-8.7$  to  $-1.5$ ;  $P=.006$ ); and there was a reduction in BMI of 1.3 kg/m<sup>2</sup> (95% CI  $-2.2$  to  $-0.5$ ;  $P=.002$ ) at 20 weeks. Systolic blood pressure decreased by 2.6 mm Hg (95% CI  $-4.7$  to  $-0.6$ ;  $P=.013$ ).

**Conclusion:** A culturally adapted behavioral intervention for the treatment of overweight and obesity is potentially effective in a diverse group of Latino adults. (*Ethn Dis.* 2012;22(1):51–57)

**Key Words:** Obesity, Overweight, Latinos, Cultural, Intervention, Weight Loss

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### INTRODUCTION

Obesity is well recognized as a major risk factor for hypertension (HTN), hyperlipidemia, and type 2 diabetes mellitus (DM2).<sup>1</sup> In 2007–2008, the prevalence of obesity was 32.2% among adult men and 35.5% among adult women.<sup>2</sup> It is estimated that the medical costs associated with obesity are as high as \$147 billion per year.<sup>3</sup> In the US population, obesity disproportionately affects individuals with a Latino background. It is estimated that Latinos have a 21% higher prevalence of obesity as compared to non-Hispanic Whites.<sup>4,5</sup> The Latino population represents 15% of the US population<sup>6</sup> and is the fastest growing minority group in this country, therefore efforts to minimize obesity in this group and development of effective interventions for weight loss are desperately needed. Moreover, the prevention and management of obesity in Latinos represents a significant challenge, as most previously developed interventions for weight reduction have not been tested in this minority group.<sup>7,8</sup> Also, it is well known that weight loss in overweight or obese individuals prevents

and improves blood pressure and diabetes control, conditions affecting Latinos at a disproportional rate.<sup>9–11</sup>

Studies in which weight loss and increased physical activity are the primary outcomes in Latinos are scarce and the results are heterogeneous. One of the biggest limitations of prior studies is a lack of acknowledgment for diversity among Latinos (eg, country of origin) as well as acculturation and ethnic sensitivity.<sup>12</sup> This heterogeneity among the Latino population in the United States is an important factor to consider when designing and implementing a culturally appropriate weight loss intervention because of the potential impact of this cultural diversity on the intervention effect. Thus, the Latino Health Project (LHP) pilot study was designed to provide preliminary data on the effect of a culturally adapted behavioral weight loss intervention in a diverse sample of overweight/obese Latino adults.

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## METHODS

### Setting, Design, and Target Population

The LHP pilot study was conducted at EL Centro Hispano (ECH) located in Durham, North Carolina. It is the largest grassroots Latino organization in the North Carolina Triangle area (Durham, Chapel Hill, and Raleigh). We used a pre- and post-test approach to pilot test the impact of the intervention on participant weight, body mass index (BMI), blood pressure (BP), and lifestyle changes. The LHP pilot study participants were required to be overweight/obese ( $BMI \geq 25 \text{ kg/m}^2$ ), self-identified as Spanish-speaking Latino adult men and women (aged  $\geq 18$  years) living in the Triangle area of North Carolina. Participants were excluded if they were pregnant, had any contraindications to weight loss, or were considered not competent to give consent. All aspects of this study were approved by the Duke Institutional Review Board and all participants provided written (in Spanish) informed consent. Interactions with study participants were conducted in Spanish and all study materials were translated into Spanish and adapted to the Latino culture. Intervention sessions were conducted by a Spanish-speaking Latino interventionist, native from Colombia, familiar with the cultural differences among Latino populations from different countries of origin.

### Recruitment

We used two primary recruitment methods. First, we placed printed media (eg, flyers) at organizations and businesses serving the local Latino population. Second, we established direct contact with potential participants through events conducted at El Centro Hispano (ECH), the largest grassroots Latino organization in the Triangle area. The organization provides programs addressing health, education, leadership development, and community organiza-

tion. Latina members of our research team (Corsino and Rocha-Goldberg) assisted at health-related events. In addition, ECH distributed information to their clients directly.

### Measurements

After providing written informed consent, participants completed baseline measurements and completed questionnaires to gather demographic, dietary, and physical activity information. Dietary information was collected using the Spanish version of the Block Food Frequency Questionnaire (FFQ).<sup>13,14</sup> Physical activity was collected with a Spanish questionnaire developed by ECH that queried participants about types and frequency of typical daily and leisure activities (eg, do you practice any sports). The questionnaires were completed once again at the end of the intervention (week 20). In addition, each week, participants were asked to record their daily physical activity (minutes/day) and intake of fruits, vegetables, grains, dairy products, and fat in a weekly (7 days) diet and physical activity diary. Weight and BP were measured at baseline and at 20 weeks. Body weight was measured in light indoor clothes without shoes, to the nearest .1 lb, using a high-quality, calibrated digital scale. Height was measured using a wall-mounted stadiometer, and recorded to the nearest .1 cm. Body mass index was calculated from these measurements as the Quetelet Index, ( $\text{weight}[\text{kg}]/\text{height}[\text{m}^2]$ ). Blood pressure was obtained from the right arm with an appropriate sized cuff and an oscillometric blood pressure machine after the participant was seated quietly for 5 minutes. We obtained a total of three blood pressure measurements with 30 seconds rest in between; the average of the second and third readings was calculated and that value used for data analysis. Measurements were performed by trained and certified study personnel.

### Intervention

All participants received the intervention, which consisted of 20 weekly group sessions, each lasting 90–120 minutes. Two separate groups of participants were assembled and met on different days and times to accommodate differences in participants' availability. Both groups received the same intervention. The intervention focused on weight loss in the context of the Dietary Approaches to Stop Hypertension (DASH) dietary pattern,<sup>15</sup> increased moderate physical activity, and reduced calorie intake. The lifestyle behavioral intervention was developed based on approaches previously used in the PREMIER,<sup>7</sup> Weight Loss Maintenance (WLM),<sup>8</sup> and Hypertension Improvement Project trials (HIP).<sup>16</sup> The cultural adaptation was accomplished by incorporating traditional foods and food names used in different countries of Latin American (North, Central, South America, and the Caribbean) and by incorporating physical activities commonly used in the Latino culture such as dancing and soccer. In addition, during the intervention, we acknowledged the cultural differences among Latinos of different countries such as the differences in the Spanish language eg, use of different names for foods. Also, the intervention was conducted mainly by Latino investigators and study staff in a location familiar and trusted by the local Latino community. Further, we made accommodations for child care in order to facilitate the participation of individuals with young children.

The weekly group sessions were participatory and interactive, rather than didactic, and incorporated components of motivational interviewing, a client-oriented therapeutic style to enhance the individual readiness to change.<sup>17, 18</sup> The interventionist was a dietitian with experience in motivational enhancement and group facilitation techniques. All sessions were conducted at ECH. Guided physical activity or food demonstrations were included in

many sessions. Each week, participants set reasonable short-term goals and developed specific short-term behavioral action plans to reinforce, support, and monitor their progress. The interventionist encouraged participants to: 1) develop weekly action plans and goals to achieve moderate caloric reduction and an increase in moderate-intensity (3-6 metabolic equivalent tasks (METs) physical activity); 2) maintain daily food and activity records; 3) reduce portion sizes; 4) reduce foods high in calories, fat, and sodium; and 5) increase consumption of fruits, vegetables, and low-fat dairy products. At each weekly session, weight was measured and attendance recorded.

**Analysis**

The main outcome for the study was weight change from baseline to 20 weeks. Secondary outcomes were changes in BMI, BP, dietary intake, and physical activity. We calculated summary statistics for participant demographics, weight, BMI, BP, dietary intake, and physical activity at baseline. We examined changes in weight, BMI, BP, and dietary intake from baseline to 20 weeks using paired *t* tests. Unfortunately, calculation of changes in physical activity was limited due to missing data and therefore was not informative. For all analyses, a *P*<.05 was used to indicate statistical significance. All statistical analyses were performed using E-Guide (SAS Institute, Cary, NC).

**RESULTS**

A total of 85 individuals were identified from our recruitment efforts and expressed interest in our study. Of those, 26 consented, but were unable to continue with the study intervention and/or data collection due to diverse reasons including inability to participate due to work schedule (15%) and subsequent pregnancy (19%). An additional 3 individuals were excluded

**Table 1. Baseline characteristics of participants, overall and by sex**

Variable	Total N=56	Women n=47	Men n=9
Age, years, mean ± SD	38 ± 9.2	37.2 ± 9.3	42.6 ± 8.0
Missing data	3	2	1
Years in US, mean ± SD	11.7 ± 4.7	11.0 ± 4.4	14.6 ± 4.8
Missing data	10	10	0
Overweight, (BMI ≥25 and <30 kg/m <sup>2</sup> ) n (%)	24 (43)	22 (47)	2 (22)
Obese, (BMI ≥30 kg/m <sup>2</sup> ) n (%)	30 (53)	23 (49)	7 (78)
Missing data	2 (4)	2 (4)	0 (0)
Country of Origin, n (%)			
Colombia	3 (5)	3 (6)	0 (0)
Cuba	1(2)	0 (0)	1 (11)
El Salvador	2 (4)	2 (4)	0 (0)
Guatemala	1 (2)	1 (2)	0 (0)
Mexico	40 (71)	35 (74)	5 (55)
Peru	1 (2)	1 (2)	0 (0)
Venezuela	1 (2)	0 (0)	1 (11)
Missing data	7 (12)	5 (11)	2 (22)
Marital status, n (%)			
Married	28 (50)	24 (51)	4 (44)
Single	9 (16)	7 (15)	2 (22)
Divorced	3 (5)	2 (4)	1 (11)
Widow	0 (0)	0 (0)	0 (0)
Partnership	12(21)	10 (21)	2 (22)
Missing data	4 (7)	4 (9)	0 (0)
Education, n (%)			
0–6 grade	13 (23)	11 (23)	2 (22)
7–9 grade	9 (16)	9 (19)	0 (0)
10–12 grade	14 (25)	12 (25.5)	2 (22)
Vocational	4 (7)	3 (6)	1 (11)
Some college	8 (14)	6 (13)	2 (22)
College	5 (9)	3 (6)	2 (22)
Missing data	3 (5)	3 (6)	0 (0)
Number insured, n (%)			
No insurance	46 (82)	38 (81)	8 (89)
Private insurance	6 (11)	5 (11)	1 (11)
Missing data	4 (7)	4 (8)	0 (0)
Finances, n (%)			
Have money to pay bills	22 (39)	18 (38)	4 (44)
You have money to pay the bills, but only because you have to cut back on things	16 (28)	13 (28)	3 (33)
You are having difficulty paying the bills, no matter what you do.	4 (7)	3 (6)	1 (11)
Don't know/ refused	6 (11)	6 (13)	0 (0)
Missing data	8 (14)	7 (15)	1 (11)

due to missing outcome data (weight, BMI, and BP) at follow up. Further, two participants were excluded from the weight and BMI analysis due to missing weight at follow up, but were included in the analysis of other variables. Of the remaining 56 individuals included in this report, as

noted in Table 1, 47 (84%) were female, the average age was 38 ± 9.2 years, and the average time living in the United States was 11.7 ± 4.7 years. Thirty (53%) were obese (BMI≥30 kg/m<sup>2</sup>) and 24 (43%) were overweight (BMI≥25 and <30 kg/m<sup>2</sup>). Forty (71%) were from Mexico;

**Table 2. Baseline characteristics in Mexican and non-Mexican participants, N=49 (missing data regarding country of origin in 7 participants)**

Variable	Mexican n= 40	Non-Mexican n=9
Age, years, mean ± SD	37.5 ± 8.8	41.5 ± 10.3
Missing data	2	0 (0)
Years in US, mean ± SD	12.0 ± 4.8	10.2 ± 2.8
Missing data	6	2
Overweight, (BMI ≥25 and <30 kg/m <sup>2</sup> ) n (%)	16 (40)	4 (44)
Obese, (BMI ≥30 kg/m <sup>2</sup> ) n (%)	23 (57)	5 (56)
Missing data	1 (3) <sup>a</sup>	0 (0)
Marital status, n (%)		
Married	23 (57)	2 (22)
Single	3 (7)	5 (56)
Divorced	2 (5)	0 (0)
Widow	0 (0)	0 (0)
Partnership	8 (20)	2 (22)
Missing data	4 (10)	0 (0)
Education, n (%)		
0–6 grade	9 (23)	2 (22)
7–9 grade	8 (20)	1 (11)
10–12 grade	11 (28)	1 (11)
Vocational	3 (8)	1 (11)
Some college	5 (13)	2 (22)
College	1 (3)	2 (22)
Missing data	2 (5)	0 (0)
Number insured, n (%)		
No insurance	33 (82)	7 (78)
Private insurance	3 (8)	2 (22)
Missing data	4 (10)	0 (0)
Finances, n (%)		
Have money to pay bills	15 (37)	5 (56)
You have money to pay the bills, but only because you have to cut back on things	14 (35)	1 (11)
You are having difficulty paying the bills, no matter what you do.	2 (5)	0 (0)
Don't know/refused	4 (10)	1 (11)
Missing data	5 (13)	2 (22)

<sup>a</sup> One of the Mexican participants was among the two participants excluded from the weight analysis due to missing follow up weight.

the remainder were from a variety of countries in Latin America including Colombia (5%), Cuba (2%), El Salvador (4%), Guatemala (2%), Peru (2%),

and Venezuela (2%). Twenty-eight (59%) were married. Thirty-six (64%) had an educational level of high school or less. Forty-six (82%) had no health

insurance. Further, twenty (35%) reported some financial limitations. Baseline characteristics of those excluded from analysis were similar (eg, 73% were female, average age was 31.8 ± 7.8 years, average weight (n=24) was 169.8 ± 37.2 lbs, and BMI was 31.8 ± 5.5 kg/m<sup>2</sup>).

In order to assess the potential generalizability of the intervention to the diverse Latino population in the US, we explored difference between Mexicans (representing the majority of Latinos in this country) versus Non Mexicans. As shown in Table 2, baseline characteristics were similar in participants of Mexican origin (n=40) and those from other countries in Latin America (n=9). Mexicans were on average 37.5 ± 8.8 years vs 41.5 ± 10.3 in the non-Mexican participants. Average time living in the United States was 12 ± 4.8 years for Mexicans vs 10.2 ± 2.8 in non-Mexicans. 23 (57%) Mexicans and 5 (56%) non-Mexicans were obese respectively. Of those participants with attendance information, 27% attended at least 15/20 group sessions, 36% attended 10/20, and 66% attended 5/20.

At baseline, participants weighted an average of 170.8 ± 35.1 lbs and lost an average of 5.1 lbs (95% CI -8.7 to -1.5; P=.006) over 20 weeks. Blood pressure (SBP/DBP) averaging 114.4 ± 10.8/69.8 ± 9.1 mm Hg, fell an average of 2.6 (95%CI -4.7 to -0.6; P=.013)/ 0.5 (95%CI -2.5 to 1.6; P=.596) mm Hg. (Table 3)

Despite recommendations to consume the DASH dietary pattern, which emphasizes intake of vegetables, fruit, low-fat dairy products, and decreased

**Table 3. Weight, BMI, and blood pressure outcomes**

Outcome	Baseline mean ± SD	20-week follow-up mean ± SD	Change mean (95% CI)	P
Weight, lbs, N=54	170.8 ± 35.1	165.7 ± 33.1	-5.1 (-8.7 to -1.5)	.006
BMI, kg/m <sup>2</sup> , N=54	31.4 ± 4.7	30.1 ± 4.6	-1.3 (-2.2 to -.5)	.002
Systolic blood pressure, mm Hg, N=56	114.4 ± 10.8	111.1 ± 10.9	-2.6 (-4.7 to -.6)	.013
Diastolic blood pressure, mm Hg, N=56	69.8 ± 9.1	69.2 ± 8.8	-.5 (-2.5 to 1.5)	.596

SD, standard deviation; CI, confidence interval.

**Table 4.** Change in dietary outcomes, N= 40

Variable	Baseline mean $\pm$ SD	20-week follow-up mean $\pm$ SD	Difference mean (95% CI)	P
Vegetables (serving/day)	3.4 $\pm$ 2.0	3.5 $\pm$ 2.6	.00 (-.7 to .7)	.98
Fruits (serving/day)	2.0 $\pm$ 1.1	1.7 $\pm$ .8	-.34 (-.6 to .00)	.05
Grains (serving/day)	5.5 $\pm$ 3.9	4.1 $\pm$ 2.2	-1.4 (-2.9 to -.02)	.05
Meats (serving/day)	2.3 $\pm$ 1.8	1.6 $\pm$ 1.0	-.6 (-1.3 to -.06)	.03
Dairy (serving/day)	1.5 $\pm$ .9	1.4 $\pm$ 1	-.1 (-.5 to .1)	.27
Fats (serving/day)	2.2 $\pm$ 1.4	1.9 $\pm$ .9	-.3 (-.7 to -.07)	.10

SD, standard deviation; CI, confidence interval.

intake of meats and fats, there was no significant change in consumption of vegetables, low-fat dairy, and fats, and intake of fruits and grains went down. On the other hand, consistent with DASH, the consumption of meats decreased. (Table 4)

## DISCUSSION

In this pilot study, testing a culturally adapted behavioral change intervention in Latino adults, significant weight, BMI, and SBP reductions were achieved. Participants also had a reduction in consumption of meats consistent with the DASH dietary pattern recommendations. Our results demonstrate a statistically and clinically significant improvement in weight, BMI, and SBP. However, the improvement in weight, BMI and SBP seen in our participants is less than changes seen in other studies testing a similar intervention in other segments of the population.<sup>7,19</sup> We can speculate that one of the reasons our participants did not have a similar reduction in weight, BMI and SBP is the small number of participants in our study.

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*Our results demonstrate a statistically and clinically significant improvement in weight, BMI, and SBP.*

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This study is particularly novel because we adapted the intervention, taking into consideration the heterogeneity that exists within the Latino population. In general, the vast majority of studies targeting behavioral interventions for weight control in Latinos focus on the Mexican American population.<sup>20-22</sup> Although Mexican Americans constitute the majority of Latino Americans in this country, the rate of growth of the Mexican American population has remained unchanged since 2000. However, populations of Latino Americans from other countries of origin grew faster during the last decade.<sup>23</sup> In this pilot study, we included participants from diverse countries in Latin America. Considering cultural differences among different countries in Latin America in the design of the intervention makes the results more generalizable to the diverse Latino population in this country. We consider this a valuable contribution to the currently available literature.

In our study, we incorporated traditional foods, adapted recipes and encouraged physical activities commonly used in Latino culture. We also conducted the intervention in a familiar community setting, and utilized a Latino Spanish-speaking interventionist who was able to acknowledge the cultural differences among Latinos from different countries. In order to acknowledge the cultural difference among Latinos from different countries, we incorporated foods and recipes traditional of each country as well as acknowledged the language and diet

differences among these countries. Further, the cultural adaptation also incorporated lessons learned from our previous experience with the Latino population, which included recruiting participants in collaboration with trusted institutions.<sup>24</sup> Thus, the cultural adaptation of the intervention incorporated multiple aspects of the Latino culture and was not only focused on the language difference. Our approach was consistent with the recommendations that interventions aiming to change behaviors associated with obesity in minorities require cultural adaptation that incorporates providers from the same ethnic group, performs the interventions in the community setting, uses the group preferred language, and incorporates traditional foods and activities.<sup>25</sup>

Our pilot study attempts to fill a gap in evidence concerning weight loss intervention for the Latino population. For example, a review of weight-loss intervention studies specifically targeting the Latino population,<sup>12</sup> described that few of the studies testing weight loss intervention in Latinos reported information concerning several key characteristics (eg, how participants were identified as Latinos, level of education, socioeconomic status, country of origin, and length of residence in the United States).

Data regarding the number of years participants were living in the United States is particularly important because this characteristic is related to the concept of acculturation. Acculturation is usually used to describe the process by

which customs and beliefs change when people from different cultural traditions come in contact with each other.<sup>26</sup> Acculturation also refers to the behavior changes among immigrants that occur as a result of continuous exposure to a different culture.<sup>12</sup> Among the most important changes experienced by immigrants to the United States are changes in diet and level of physical activity. These changes increase with time of exposure and in fact, there is a strong relationship with the incidence of obesity among Latinos and the amount of years living in the United States.<sup>27</sup> In a study published by Kaplan et al in 2004, the investigators reported that compared to those living in the United States <4 years, Hispanics living in the United States for 5 to 9, 10 to 14, and  $\geq 15$  years were 2.2, 3.5, and 4.3 times, respectively, more likely to be obese. Further, the length of residence in the U.S. is likely to be associated with increase acculturation.<sup>28</sup> In our study, we used the variable years living in the U.S. as a measurement of acculturation. The average years living in the United States in our sample was 11.7 years. Considering that length of residence in the United States is associated with increased acculturation and that the likelihood of being obese increases with time living in the United States, we speculate that implementing a culturally adapted intervention similar to the one tested in this pilot study earlier in the acculturation process might have a larger impact on obesity treatment and prevention in this population.

Adherence, as measured by percentage of participants that attended each group session, was 36% for those who attended at least 10 out 20 sessions. Attendance at group sessions has been a predictor of weight loss in several weight loss trials.<sup>29</sup> In our study, despite the lower number of participants who attended all sessions, we were able to show clinically and statistically significant weight loss, further suggesting that our culturally adapted intervention is potentially effective.

This pilot study had a number of limitations. First, our study lacked a control group. However, weight changes in our pilot study were clinically and statistically significant suggesting that our observations represent true intervention effects which we expect will be validated in a randomized controlled trial. Second, we included in this analysis only those who completed the intervention; those who dropped out likely had less weight loss. However, our pilot study did not have resources to promote adherence and high follow-up rates comparable to large clinical trials in which outcome data were available for over 90% of participants at 6 months.<sup>7,8,16</sup> Given adequate trial resources and a randomized design, we could better estimate actual effect size. Nonetheless, our pilot study suggests that such a larger trial is feasible and likely to have positive results. Third, the use of self-reported dietary intake and physical activity might be affected by recall bias or educational barriers to accurate reporting. Our diet results were somewhat unexpected. In fact, the validity of FFQ tends to be lower among minorities and individuals with lower educational level<sup>30,31</sup> and 64% of our study participants had an educational level of high school or less. Future trials would benefit from using interviewer-administered questionnaires for Hispanics.<sup>31</sup> Further, our PA results were inconclusive (data not shown). We can speculate that in addition to the recall bias and educational barriers that might be affecting accurate reporting, the use of a not validated instrument to measure physical activity was also a limiting factor. Future studies should consider the utilization of a Spanish version of a validated instrument to assess physical activity in this population.

Our pilot study also had strengths, including measurement of key baseline characteristics such as country of origin, length or residence in the United States, and socioeconomic status. Our intervention was deliberately designed to accom-

modate various Latino cultures and levels of acculturation, so that it could ultimately be easily disseminated to the diverse Latino populations in this country.

In summary, the results of this pilot study provide valuable information and lessons that will further facilitate the implementation of studies testing a culturally-tailored behavioral lifestyle weight-loss intervention targeting the Latino population. Future research targeting and testing weight loss interventions in the Latino population should take into consideration the diversity among Latinos, the importance of conducting the intervention in locations trusted by the community, the importance of incorporating investigators and study personnel from the same ethnic group, the need to adapt the intervention to Latino diet and exercise/sport preferences, and the need to consider level of acculturation. Our results suggest that such an approach will lead to clinically significant weight loss in Latinos, but implementation and dissemination will require more definitive evidence from randomized controlled trials.

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#### REFERENCES

1. Crawford AG, Cote C, Couto J, et al. Prevalence of obesity, type ii diabetes mellitus, hyperlipidemia, and hypertension in the United States: findings from the GE Centricity Electronic Medical Record database. *Popul Health Manag.* 2010;13(3):151-161.
2. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and Trend in Obesity Among US Adults, 1999-2008. *JAMA.* 2010;303(3):235-241.
3. Finkelstein EA, Trogon JG, Cohen JW, Dietz W. Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Aff (Millwood).* 2009;28(5):w822-831.
4. Obesity by Race/Ethnicity 2006-2008. Center for Disease Control and Prevention. <http://>

- www.cdc.gov/obesity/data/trends.html#Race. Accessed June 29, 2011.
5. Obesity and Hispanic Americans. The Office of Minority Health. <http://www.minority-health.hhs.gov/templates/content.aspx?ID=6459>. Accessed June 29, 2011.
  6. Hispanic Population of the United States. U.S. Census Bureau. [http://www.census.gov/population/www/socdemo/hispanic/hispanic\\_pop\\_presentation.html](http://www.census.gov/population/www/socdemo/hispanic/hispanic_pop_presentation.html). Accessed June 29, 2011.
  7. Appel LJ, Champagne CM, Harsha DW, et al. Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. *JAMA*. 2003;289(16):2083–2093.
  8. Svetkey LP, Stevens VJ, Brantley PJ, et al. Comparison of strategies for sustaining weight loss: the weight loss maintenance randomized controlled trial. *JAMA*. 2008;299(10):1139–1148.
  9. Caballero AE. Type 2 diabetes in the Hispanic or Latino population: challenges and opportunities. *Curr Opin Endocrinol Diabetes Obes*. 2007;14(2):151–157.
  10. Ostchega Y, Dillon CF, Hughes JP, Carroll M, Yoon S. Trends in hypertension prevalence, awareness, treatment, and control in older U.S. adults: data from the National Health and Nutrition Examination Survey 1988 to 2004. *J Am Geriatr Soc*. 2007;55(7):1056–1065.
  11. Torres M, Azen S, Varma R. Prevalence of obesity and associated co-morbid conditions in a population-based sample of primarily urban Mexican Americans. *Ethn Dis*. 2006;16(2):362–369.
  12. Lindberg NM, Stevens VJ. Review: weight-loss interventions with Hispanic populations. *Ethn Dis*. 2007;17(2):397–402.
  13. Block G, DiSogra C. WIC Dietary Assessment Validation Study, Final Report. Food and Nutrition Service, U.S. Department of Agriculture. <http://www.nutritionquest.com/company/our-research-questionnaires/>. Accessed June 29, 2011.
  14. Block G, Wakimoto P, Jensen C, Mandel S, Green RR. Validation of a food frequency questionnaire for Hispanics. *Prev Chronic Dis*. 2006;3(3):A77.
  15. Appel L, Moore TJ, Obarzanek E, et al. for the DASH Collaborative Research Group. A clinical trial of the effects of dietary patterns on blood pressure. *N Engl J Med*. 1997;336:1117–1124.
  16. Svetkey LP, Pollak K, Yancy WSJr, et al. Hypertension improvement project: randomized trial of quality improvement for physicians and lifestyle modification for patients. *Hypertension*. 2009;54(6):1226–1233.
  17. Emmons KM, Rollnick S. Motivational interviewing in health care settings. Opportunities and limitations. *Am J Prev Med*. 2001;20(1):68–74.
  18. Miller WR, Rollnick S. *Motivational Interviewing: Preparing People for Change*. 2nd ed Guilford Press; 2002.
  19. Hollis JF, Gullion CM, Stevens VJ, et al. Weight loss during the intensive intervention phase of the weight-loss maintenance trial. *Am J Prev Med*. 2008;35(2):118–126.
  20. Poston WS, Reeves RS, Haddock CK, et al. Weight loss in obese Mexican Americans treated for 1-year with orlistat and lifestyle modification. *Int J Obes Relat Metab Disord*. 2003;27(12):1486–1493.
  21. Cousins JH, Rubovits DS, Dunn JK, et al. Family versus individually oriented intervention for weight loss in Mexican American women. *Public Health Rep*. 1992;107(5):549–555.
  22. Faucher MA, Mobley J. A community intervention on portion control aimed at weight loss in low-income Mexican American women. *J Midwifery Womens Health*. 2010;55(1):60–64.
  23. U.S. Hispanic Country of Origin Counts for Nation, Top 30 Metropolitan Areas. Pew Hispanic Center. <http://pewhispanic.org/reports/report.php?ReportID=142>. Accessed July 7, 2011.
  24. Rocha-Goldberg Mdel P, Corsino L, Batch B, et al. Hypertension Improvement Project (HIP) Latino: results of a pilot study of lifestyle intervention for lowering blood pressure in Latino adults. *Ethn Health*. 2010;15(3):269–282.
  25. Kumanyika S. Ethnic minorities and weight control research priorities: where are we now and where do we need to be? *Prev Med*. 2008;47(6):583–586.
  26. Hunt LM, Schneider S, Comer B. Should “acculturation” be a variable in health research? A critical review of research on US Hispanics. *Soc Sci Med*. 2004;59(5):973–986.
  27. Park Y, Neckerman KM, Quinn J, Weiss C, Rundle A. Place of birth, duration of residence, neighborhood immigrant composition and body mass index in New York City. *Int J Behav Nutr Phys Act*. 2008;5:19.
  28. Kaplan MS, Huguot N, Newsom JT, McFarland BH. The association between length of residence and obesity among Hispanic immigrants. *Am J Prev Med*. 2004;27(4):323–326.
  29. Sacks FM, Bray GA, Carey VJ, et al. Comparison of weight-loss diets with different compositions of fat, protein, and carbohydrates. *N Engl J Med*. 2009;360:859–873.
  30. Kristal AR, Feng Z, Coates RJ, Oberman A, George V. Associations of race/ethnicity, education, and dietary intervention with the validity and reliability of a food frequency questionnaire: the Women’s Health Trial Feasibility Study in Minority Populations. *Am J Epidemiol*. 1997;146(10):856–869.
  31. Block G, Wakimoto P, Jensen C, Mandel S, Green RR. Validation of a food frequency questionnaire for Hispanics. *Prev Chronic Dis*. 2006;3(3):A77.

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