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Provider Counseling, Health Education, and Community Health Workers: The Arizona WISEWOMAN Project

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ABSTRACT

Background: **The Arizona Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) project used provider counseling, health education, and community health workers (CHWs) to target chronic disease risk factors in uninsured, primarily Hispanic women over age 50.**

Methods: **Participants were recruited from two Tucson clinics participating in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). Women were randomly assigned into one of three intervention groups: (1) provider counseling, (2) provider counseling and health education, or (3) provider counseling, health education, and CHW support. At baseline and 12 months (1998–2000), participants were measured for height, weight, waist and hip circumference, and blood pressure. Blood tests were conducted to check blood glucose, cholesterol, and triglyceride levels. At each time point, participants also completed 24-hour dietary recalls and questionnaires focusing on their physical activity levels.**

Results: **A total of 217 women participated in baseline and 12-month follow-up. Three fourths were Hispanic. All three intervention groups showed an increase in self-reported weekly minutes of moderate-to-vigorous physical activity, with no significant differences between the groups. Significantly more women who received the comprehensive intervention of provider counseling, health education, and CHW support progressed to eating five fruits and vegetables per day, compared with participants who received only provider counseling or provider counseling plus health education.**

Conclusions: **All three interventions increased moderate-to-vigorous physical activity but not fruit and vegetable consumption. The intervention group with provider counseling, health education, and CHW support significantly increased the number of women meeting national recommendations for fruit and vegetable consumption.**

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INTRODUCTION

THE LEADING CAUSES OF DEATH in Hispanic women are heart disease/stroke, cancer, and diabetes mellitus.[1] The relationship between lifestyle risk factors and these chronic diseases is clearly established.[2–7] Compared with non-Hispanic whites, U.S. Hispanics are at increased risk for physical inactivity.[1,7] Similar to the U.S. population as a whole, the majority of Hispanics do not eat the recommended number of servings of fruits and vegetables.[8] Because the Hispanic population is the fastest growing ethnic minority group in the United States, it is becoming increasingly important to develop effective chronic disease interventions that focus on Hispanics and, in particular, on uninsured Hispanic women. Uninsured women tend to have reduced access to medical care, postpone preventive services, and exhibit worse cardiovascular disease (CVD) risk factor profiles than do insured women.[9,10]

One promising method of promoting behavior change is the use of community health workers (CHWs), lay health advisors, or *promotores*.[11–17] Many health service programs targeting Hispanic populations have used CHWs to involve key members of the community in programs, increase access to medical services, and assist medical providers in gaining the trust and respect of their clients. CHWs can create bridges between researchers or medical practitioners and community members, helping both sides to overcome cultural barriers that hinder access to health information and healthcare.[12,13] Studies examining the effectiveness of the CHW model for individuals or families with particular illnesses have found that CHWs can significantly increase access to care and preventive screening.[12–15] Although more recent studies have used CHWs to target behavior change, limited documentation exists that addresses their effectiveness in promoting lifestyle changes, such as increased physical activity (PA) or dietary changes.

In 1995, Arizona initiated a prevention intervention for CVD that targeted uninsured Hispanic women over age 50 who were participating in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). The Arizona project, which featured CHWs, was one of the three original studies funded by the Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) program. During Phase One (1995–1998), a 1-year program was implemented and revised for Phase Two (1998–2000).[18] The primary purpose of this paper is to document the effectiveness of the Phase Two Arizona WISEWOMAN project in increasing women's PA and fruit and vegetable consumption over 1 year.

MATERIALS AND METHODS

Study design

The study used an experimental design in which individuals were randomized to one of three interventions (Table 1). The lowest intensity intervention (i.e., active control) consisted of provider counseling (PC) based on the patient-provider communication model.[19] In the second intervention group, participants received health education (HE) classes (designed using social cognitive theory)[20] and a monthly newsletter in addition to provider counseling (PC+HE). In the third, and most intensive, level of intervention, participants received provider counseling, health education, and social support provided by CHWs (PC+HE+CHW). Our hypothesis was that participants in the second and third intervention groups would show greater increases in PA level and fruit and vegetable consumption than participants who received PC only, with PC+HE+CHW participants showing the greatest increases.

The target population for the program was uninsured Hispanic women aged ≥ 50 years who were participating in the NBCCEDP. To ensure the enrollment of a high percentage of Hispanic women, we identified two NBCCEDP clinics in Tucson with Hispanic recruitment rates >50%. All interested clients at the clinics were invited to participate regardless of race or ethnicity. Recruitment occurred between August 1998 and February 2000.

Women who met the inclusion criteria and were deemed medically eligible were referred to the WISEWOMAN project by nurse practitioners at the two clinics. After WISEWOMAN staff provided eligible participants with a detailed explanation of the project, the women interested in participating in the 12-month program signed a consent form, completed a series of baseline questionnaires, and were randomized to one of the three intervention groups. In addition, participants were asked to return at 6 and 12 months for a provider visit and follow-up data collection. Protocols for the study were approved by the Uni-

Table 1. Intervention Components Provided at Each of the Three Intervention Levels

Intervention component	Intervention level[a]		
	PC	PC+HE	PC+HE+CHW
Provider counseling	√	√	√
Prescription: Increase fruit/vegetable consumption	√	√	√
Prescription: Increase physical activity	√	√	√
Referral to education classes		√	√
Education class: Come eat the rainbow (nutrition)		√	√
Education class: Let's get moving (physical activity)		√	√
Monthly newsletter		√	√
Community health worker support			√

[a]PC, provider counseling; HE, health education; CHW, community health worker.

versity of Arizona and the Arizona Department of Health Services Institutional Review Boards.

Intervention

At each clinic visit, nurse practitioners gave participants health education brochures, briefly discussed the benefits of and barriers to increasing PA and consumption of fruits and vegetables, and gave a behavior change prescription tailored to the individual. Nurse practitioners were trained to tailor their prescriptions by recommending a frequency of PA and a target for fruit and vegetable consumption that would be safe and achievable for each woman. Providers promoted all forms of moderate-to-vigorous physical activity, including suggesting three 10-minute increments per day as a means of accumulating 150+ minutes per week.[7] Women were also encouraged to increase their fruit and vegetable consumption incrementally, with an overall goal of 5+ servings per day.[8]

In addition to receiving PC, participants in the PC+HE and PC+HE+CHW intervention groups were referred to two HE classes (one on nutrition, one on PA) and received a monthly health newsletter for 12 months. Reminder calls were made over a 6-month period to all women who were eligible but had not attended the classes.

Participants in the PC+HE+CHW group also communicated on a regular basis, ranging from semiweekly to monthly, with CHWs, who provided information and support and organized bimonthly walks. The project CHWs included 6 bilingual Hispanic women, 5 of whom were > age 50. An additional CHW left the project after 1 month. Four had been previously trained as CHWs to provide outreach, translation services, and transportation to NBCCEDP clients.

Each CHW was assigned up to 20 participants from the PC+HE+CHW intervention group who lived in or near her own ZIP code area. The CHWs contacted participants by telephone every 2 weeks. If participants could not be contacted personally, messages were left on answering machines or with family members. Scheduled phone conversations included (1) an explanation of one new benefit of eating more fruits and vegetables or increasing PA, (2) a reminder about how to modify behavior, (3) questions to assess participants' knowledge, followed by short and easy behavior change tips, and (4) an invitation to the next scheduled bimonthly walk. Although length of phone conversations depended on each participant's time constraints, CHWs were encouraged to cover all four components of the educational message and to provide participants with support for behavior change.

At the CHW-led bimonthly walks, the CHWs encouraged participants to find walking partners, build friendships, and support each other in their health improvement goals. By being assigned participants with similar ZIP codes, the CHWs attempted to link participants from nearby neighborhoods. Walks were organized in different parts of town to encourage different participants to attend.

Measurements

Clinic technicians received 8 hours of training to conduct standardized height, weight, and blood pressure measurements. Height was measured to the nearest 0.25 inch using a clinic stadiometer, weight was measured to the nearest 0.25 lb using clinic scales and with participants in light clothing, and two blood pressure measurements were taken 5 minutes apart using the same arm. The nurse practitioners conducted waist and

hip measurements to the nearest 0.1 cm. All measures were obtained in duplicate, with a third measure taken if the two initial measurements disagreed by more than a specified amount (> 0.5 in for height, > 1 lb for weight, > 5 mm Hg for systolic or diastolic blood pressure [SBP or DBP], > 4.0 cm for waist and hip measurements).

Depending on the clinic, a participant either immediately saw a doctor and had her blood drawn (i.e., she had fasted) or was rescheduled for a blood draw and an appointment to see the provider. Blood samples were analyzed for total serum cholesterol, blood glucose, and triglyceride levels at a single certified laboratory.

Project staff attempted to obtain 24-hour diet recalls at three time points (i.e., baseline and 6-month and 12-month follow-ups) for all study participants. Bilingual WISEWOMAN project staff conducted the initial recall of food eaten for the previous 24 hours (midnight to midnight) in a face-to-face interview. Staff at the Arizona Cancer Center conducted the remaining two recalls by telephone, without prior participant notification. Overall, participants were asked to recall their food intake for 1 weekend day and 2 weekdays at each of the three data collection time points. Cancer Center staff coded and entered the diet recall data into the Nutrient Data System for Research (NDS-R) software version 4.05_33 (Nutrition Coordinating Center [NCC], University of Minnesota, Minneapolis, MN). Nutrient values were generated using the NDS-R, and fruit and vegetable servings were calculated using the NDS-NCC Food Servings Count System. The Food Servings Count System uses the National Cancer Institute (NCI) 5 A Day program definitions of fruits and vegetables.[21] Foods high in fat (e.g., French fries, avocados) were not counted as servings of fruits and vegetables because they did not meet the NCI 5 A Day program criteria.

The CHWs administered to each participant the Arizona Activity Frequency Questionnaire (AAFQ)[22] and a health and lifestyle questionnaire (HLQ) based on Behavioral Risk Factor Surveillance Survey questions. Women also answered health history questions from the Arizona BCCEDP. All interviews were conducted in either Spanish or English as determined by the participant's preferred language.

Analysis

To compare changes between groups, linear regression was used for change scores (12 months minus baseline) that were derived for continuous outcomes. In addition to analyzing PA and fruit and vegetable consumption as continuous variables, they were also treated as categorical variables using chi-square.

For all statistical comparisons, it is important to distinguish between groups and effects. For example, the PC group received only the PC intervention. Thus, the effect of PC alone was tested by comparing baseline outcomes with 12-month outcomes for the PC intervention. In the absence of a control group that received no intervention, however, the PC effect was difficult to distinguish from other environmental effects, such as secular trends. For the PC+HE group, which received both interventions, the HE effect was assessed by contrasting the changes in the PC+HE group with the changes in the PC group. Finally, the CHW group experienced PC, HE, and CHW interventions. The CHW effect was assessed by comparing the coefficient of the PC+HE intervention with that of the PC+HE+CHW intervention. This approach assumed a linear, additive model. Interaction effects were examined, but none were found to be statistically significant. However, because interaction effects are more difficult to detect than main effects, this finding could be a function of sample size. Thus, the assumption of linear additivity may not be correct. It was, therefore, useful to also assess a combined HE and CHW effect, derived by comparing the PC+HE+CHW group with the PC group.

In the regression models, both unadjusted results and results adjusted for age, body mass index (BMI), and ethnicity were obtained. In addition, conditional change models controlling for baseline measures of the outcome and the control variables were developed to determine the effect of the initial measure on the outcome. We used intercooled Stata version 7 (Stata Corporation, College Station, TX) to conduct all statistical analyses.

RESULTS

A total of 543 women were approached for possible participation in the study. Of these, 65 (12%) were not medically eligible, 68 (12%) chose not to participate, 45 (8%) withdrew from the study before the initial visit, and 4 (1%) were dropped because of missing information on diet and PA. A baseline response rate of 75% ($n = 361$) was calculated after eliminating the medically ineligible participants from the total 543 women. Subse-

quently, 35 women were ineligible for the 12-month visit because they had died (1), moved (15), become insured (12), or were only eligible for a 6-month return visit (7). This left a total of 326 participants. In all, 217 women (67% of eligible participants) returned at 12 months. The only difference between the women who returned (217) and those who did not (144) was that a significantly larger percentage of the women who did not return lived with their children. There were no other differences in the demographic, behavioral, or physiological measures. The results presented here are based on the sample of women who returned at 12 months regardless of their degree of participation in the assigned intervention group.

Table 2 shows baseline sociodemographic characteristics of participants who returned at 12 months by intervention level. Seventy-four percent of participants self-classified as Hispanic, and 63% specified Spanish as their preferred language. Most participants had not completed high school (64%) and were not employed (65%). Few were current smokers (12%). No significant demographic differences by intervention group existed at baseline.

At baseline, PC+HE+CHW participants had significantly higher SBP compared with PC and PC+HE participants, and waist measurements were significantly larger in PC+HE+CHW participants compared with PC participants (Table 3). Although there were no significant differences among participants in the mean number of servings of fruits and vegetables at baseline (Table 3), significantly fewer participants in the PC+HE+CHW group reported eating more than five servings of fruits and vegetables daily when compared with the other two groups (Table 4). No other differences were statistically significant at baseline.

Over the 12-month period, SBP decreased significantly in the PC+HE+CHW group, and DBP increased significantly in the PC group (Table 3). Total cholesterol significantly decreased in both the PC+HE and PC+HE+CHW groups. The PC+HE participants' waist size increased significantly over the 12-month period. All three groups demonstrated significant increases in minutes of moderate-to-vigorous PA (Table 3), and the PC+HE+CHW group significantly increased the percentage of women meeting national recommendations for daily fruit and vegetable consumption (Table 4). The percentage of hypertensive individuals (SBP >140 mm Hg or DBP >90 mm Hg) decreased significantly in both the PC and PC+HE+CHW groups (Table 4). Because we were unable to monitor medication usage, however, we do not know whether this pos-

Table 2. Sociodemographic Characteristics of Participants Who Returned at 12 Months, by Intervention Level[a]

Characteristic	*Total participants* (n = 217)	*PC*[b] (n = 77)	*PC+HE* (n = 73)	*PC+HE+CHW* (n = 67)
Age, mean years (SD)	57.2 (4.8)	56.7 (4.9)	58 (4.7)	57 (4.8)
Household variables, mean (SD)				
Income ($/year)	9,737 (4919)	9,446 (4759)	9,807 (5664)	10,003 (4283)
Size	2.5 (1.6)	2.6 (1.7)	2.5 (1.7)	2.3 (1.4)
Ethnicity/race (%)				
White, non-Hispanic	25	25	23	27
Hispanic	74	75	73	73
African American	1	0	4	0
Preferred language (%)				
English	32	29	33	34
Spanish	63	68	61	60
Bilingual	5	4	6	6
Completed high school (%)	36	34	32	43
Employed (%)	35	31	33	40
Living with (%)				
Spouse or companion	48	48	44	52
Children	40	43	40	37
Smoker	12	10	11	16

[a]No significant difference between intervention levels at baseline.
[b]PC, provider counseling; HE, health education; CHW, community health worker.

Table 3. Comparison of Mean Values for Selected Biological and Behavioral Measures between Intervention Groups at Baseline and within Intervention Groups over 12 Months (Unadjusted)

	PC[a]			PC+HE			PC+HE+CHW		
Characteristic	n[b]	*Baseline mean (SD)*	*Change[c] (95% CI)*	n[b]	*Baseline mean (SD)*	*Change[c] (95% CI)*	n[b]	*Baseline mean (SD)*	*Change[c] (95% CI)*
Height (m)	74	1.6 (0.1)	0.0 (0.0, 0.0)	71	1.6 (0.1)	0.0 (0.0, 0.0)	66	1.6 (0.1)	0.0 (0.0, 0.0)
Weight (kg)	73	70.8 (14.1)	−0.3 (−1.5, 1.0)	71	73.3 (15.1)	0.9 (−0.8, 2.7)	67	76.3 (14.1)	0.1 (−0.9, 1.0)
Body mass index (kg/m^2)	73	28.6 (5.3)	−0.1 (−0.6, 0.5)	71	29.3 (5.2)	0.7 (−0.1, 1.4)	66	30.7 (5.5)	0.1 (−0.3, 0.6)
Waist (cm)*	67	87.6 (12.8)	0.9 (−0.4, 2.2)	65	89.7 (12.8)	2.8 (1.3, 4.4)***	65	92.6 (13.2)	0.9 (−0.5, 2.3)
Systolic blood pressure (mm Hg)[d]**	73	121.8 (15.2)	0.4 (−2.7, 3.6)	70	122.8 (16.4)	0.4 (−3.2, 3.9)	67	130.0 (18.5)	−5.1 (−8.9, −1.2)**
Diastolic blood pressure (mm Hg)	73	72.9 (8.5)	3.4 (1.5, 5.2)***	70	75.2 (10.7)	0.43 (−1.6, 2.5)	67	74.2 (9.6)	1.3 (−0.8, 3.3)
Total cholesterol (mg/dl)	63	216.1 (48.2)	−6.1 (−13.7, 1.4)	54	217.4 (49.3)	−10.9 (−19.9, −1.8)*	59	216.8 (50.3)	−8.3 (−16.0, −0.7)*
Glucose (mg/dl)	63	103.8 (44.0)	−2.3 (−12.0, 7.4)	53	114.7 (55.8)	−4.5 (−11.3, 2.3)	59	103.1 (31.8)	0.1 (−4.7, 4.9)
Moderate-to-vigorous physical activity (min/week)	76	35.0 (49.6)	15.1 (0.5, 29.8)**	72	53.4 (78.7)	22.6 (2.2, 43.0)*	66	32.2 (42.9)	22.8 (6.0, 39.6)**
Fruit/vegetable intake (servings/day)	77	4.2 (2.7)	−0.59 (−1.2, 0.1)	73	4.2 (3.6)	−0.23 (−1.0, 0.5)	67	3.5 (2.6)	0.26 (−0.5, 1.0)

[a]PC, provider counseling; HE, health education; CHW, community health worker.
[b]Sample sizes vary because of missing data.
[c]Change = 12 month measurement − baseline measurement. A positive value indicates an increase over time; a negative value indicates a decrease over time.
[d]Significantly different between intervention groups at baseline (PC+HE+CHW outcome significantly greater than PC and PC+HE).
*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

itive outcome was due to improved treatment through medication or behavior change. When comparing the effects of the intervention (Table 5), none of the characteristics were significant after controlling for BMI, age, ethnicity, and baseline measurement.

DISCUSSION

Regardless of the type of intervention received, all participants in Phase Two of the Arizona WISEWOMAN project significantly increased the number of minutes of moderate-to-vigorous PA over 1 year. These results suggest that PC with a prescription to increase PA may be adequate to change self-reported PA behavior in an extremely sedentary and primarily Hispanic female population. Further research with a true control group is necessary to test this theory further. The group that received HE in addition to PC reported the most minutes of PA and had the largest percentage of group members who had achieved the PA recommendations at baseline, but the percentage achieving PA recommendations did not change at all over the 12-month period. The PC+HE group also had notably higher blood glucose levels at baseline than the other two groups, which may have prompted providers to be more conservative in their counseling.

Our study did not detect meaningful differences between intervention groups with respect to PA level. However, both our HE classes and the CHWs encouraged fairly subtle behavior changes, such as increasing the intensity of activity when doing chores (i.e., dancing while vacuuming) and accumulating 10-minute bouts of activity to achieve a total of 30 minutes per day. The AAFQ does not have an intensity rating system and may not have been sensitive enough to

TABLE 4. SELECTED CATEGORICAL OUTCOMES COMPARED AT BASELINE BETWEEN GROUPS AND WITHIN GROUPS OVER 12 MONTHS

			PC[a]				*PC+HE*				*PC+HE+CHW*			
	Total			*Baseline*	*12 month*	*% difference*[b]		*Baseline*	*12 month*	*% difference*[b]		*Baseline*	*12 month*	*% difference*[b]
Characteristic	n	%	n	%	%		n	%	%		n	%	%	
Body mass index ≥25	210	79.8	73	73.0	73.0	0.0	71	79.2	83.4	4.2	66	88.1	83.5	−4.6
High blood pressure[c]	210	20.1	73	14.7	3.6	−11.0*	70	18.1	6.7	−11.4	67	28.4	7.2	−21.2***
High cholesterol[d]	176	28.4	63	32.4	27.6	−4.8	54	26.3	18.9	−7.4	59	16.0	5.8	−10.2
High fasting glucose[e]	175	18.0	63	13.2	19.6	6.4	53	26.7	30.5	3.8	59	14.8	11.4	−3.4
Physical activity ≥150 min/week	214	4.6	76	3.9	6.5	2.6	72	8.2	8.2	0.0	66	1.5	9.1	7.6
Fruit/vegetable intake ≥5/day[f]	217	24.0	77	31.2	26.0	−5.2	73	28.8	20.5	−8.3***	67	17.9	25.4	7.4*

[a]PC, provider counseling; HE, health education; CHW, community health worker.

[b]Percentage of sample at 12 months − percentage of sample at baseline. A positive value indicates an increase over time, and a negative value indicates a decrease over time.

[c]Systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg.

[d]≥240 mg/dl.

[e]≥110 mg/dl.

[f]Significantly different between intervention groups at baseline (PC+HE+CHW participants significantly lower than PC and PC+HE).

*$p \leq 0.05$; ***$p \leq 0.001$.

Table 5. Parameter Estimates for Linear Regression of Intervention Effects on Outcomes of Interest

Characteristic	Health education effect (PC+HE vs. PC)			Health education and CHW group (PC+HE+CHW vs. PC)			CHW effect (PC+HE+CHW vs. PC+HE)		
	β	SE	p	β	SE	p	β	SE	p
Body mass index (kg/m^2)									
	[a]0.709	0.430	0.101	0.203	0.438	0.644	−0.506	0.441	0.252
	[b]0.765	0.436	0.081	0.278	0.445	0.533	−0.486	0.456	0.277
	[c]0.765	0.436	0.081	0.278	0.445	0.533	−0.486	0.456	0.277
Waist (cm)									
	[a]1.921	0.999	0.056	0.031	0.9991	0.975	−1.891	1.010	0.063
	[b]2.018	1.015	0.048	0.023	1.0198	0.982	−1.996	1.025	0.053
	[c]1.981	0.941	0.036	0.159	0.9455	0.866	−1.822	0.951	0.057
Systolic blood pressure (mm Hg)									
	[a]−0.095	2.499	0.969	−5.495	2.486	0.028	−5.400	2.512	0.033
	[b]1.794	2.380	0.452	−4.254	2.417	0.080	−6.047	2.424	0.013
	[c]1.294	1.791	0.471	−0.382	1.845	0.836	−1.676	1.857	0.368
Diastolic blood pressure (mm Hg)									
	[a]−2.921	1.376	0.035	−2.099	1.397	0.135	0.821	1.411	0.561
	[b]−2.175	1.360	0.111	−1.494	1.381	0.281	0.681	1.385	0.623
	[c]−1.122	1.108	0.312	−1.141	1.121	0.310	−0.019	1.126	0.987
Total cholesterol (mg/dl)									
	[a]−4.709	5.720	0.411	−2.179	5.588	0.697	2.530	5.808	0.664
	[b]−4.849	5.836	0.407	−2.595	5.715	0.650	2.254	5.955	0.706
	[c]−3.996	4.984	0.424	−0.009	4.890	0.999	3.987	5.089	0.434
Glucose (mg/dl)									
	[a]−2.173	5.364	0.686	2.436	5.214	0.641	4.609	5.446	0.399
	[b]−2.418	5.392	0.654	0.533	5.254	0.919	2.951	5.504	0.593
	[c]3.193	4.490	0.478	0.916	4.333	0.833	−2.277	4.576	0.620
Triglycerides (mg/dl)									
	[a]−18.276	19.765	0.358	2.906	19.765	0.883	21.182	19.289	0.275
	[b]−16.667	19.649	0.399	7.805	20.661	0.706	24.472	20.286	0.231
	[c]−5.266	14.532	0.718	6.045	15.220	0.692	11.313	15.018	0.453
Moderate-to-vigorous activity (min/week)									
	[a]7.278	12.171	0.550	7.462	12.452	0.550	0.184	12.611	0.988
	[b]5.304	12.123	0.662	4.490	12.409	0.718	−0.814	12.435	0.949
	[c]12.361	11.714	0.293	3.765	11.880	0.752	−8.596	12.033	0.476
Fruit/vegetable intake (servings/day)									
	[a]0.360	0.492	0.465	0.853	0.503	0.091	0.493	0.513	0.214
	[b]0.213	0.501	0.671	0.639	0.513	0.214	0.427	0.514	0.407
	[c]0.242	0.354	0.494	0.296	0.363	0.417	0.053	0.364	0.885

[a]Linear regression, unadjusted.
[b]Linear regression adjusted for BMI, ethnicity, and age.
[c]Linear regression adjusted for BMI, ethnicity, age, and variable at baseline.

adequately quantify brief periods of activity. Both of the higher intensity intervention groups (PC+HE and PC+HE+CHW) lowered their total cholesterol from baseline to follow-up, but there were no significant differences among all three groups after adjusting for age, BMI, ethnicity, and baseline measurement.

Although fewer than a third of the participants were eating five or more fruit and vegetable servings per day at baseline, consumption was higher than the national average in all three intervention groups, with women in the PC+HE+CHW group eating the least compared with the other two groups. This higher-than-average fruit and vegetable consumption in older Hispanic women compared with the U.S. population as a whole

has been documented in other studies.[23,24] The PC+HE+CHW group significantly increased the percentage of women meeting national recommendations for daily fruit and vegetable consumption over 1 year. Although no significant intervention effect was seen, the mean number of servings increased by 0.26 in the PC+HE+CHW group.

WISEWOMAN interventions in Massachusetts and North Carolina have also reported increased PA and positive dietary changes.[25,26] In North Carolina, women who received three individually tailored, culturally appropriate lifestyle counseling sessions reported a significantly lower dietary risk score at follow-up than did women who received screening only. In Massachusetts, women who received PC, HE, and referrals to community resources reported significant improvements in PA compared with women who received only PC and HE.

The physiological results in our study were not strikingly different from those of previous WISEWOMAN studies. In North Carolina, all participants significantly lowered their total cholesterol, SBP, and DBP. Our cholesterol findings were similar, in that two groups (PC+HE and PC+HE+CHW) showed improvements in total cholesterol at follow-up. Although the decrease in cholesterol was greater in our study (~8 mg/dl) than that found in North Carolina (~6 mg/dl), this finding can likely be explained by our retention of women on cholesterol medication in our analysis (whereas North Carolina excluded them) because of our inability to track medication use. Our interventions had little impact on DBP, which increased slightly in all three groups. In an analysis that combined the results of the Massachusetts and North Carolina WISEWOMAN projects,[10] DBP decreased by about 1.5 mm Hg.

Our study had several limitations. First, our follow-up rate of 67% was lower than hoped for, although it was not low for an intervention with a large proportion of minority participants. Our follow-up rate was comparable to the rate of minority follow-up in the North Carolina WISEWOMAN project.[25] In addition, Tucson is located 90 minutes from the Mexican border, and many of our participants lived part-time in Mexico, which lessened their availability for follow-up. As is true for many low-income populations, transportation to the clinics for follow-up frequently was problematic. A large proportion of women who failed to return (compared with those who did return) lived with their children and may have been dependent on them for transportation. Second, our sample size was relatively modest. Our original sample size was estimated at 200 women per intervention group. Due to many factors, we were unable to achieve that goal. Thus, we may have lacked the statistical power needed to detect significant changes. Third, in addition to the problem of self-report bias, our assessment of PA may not have been sensitive enough to measure subtle changes in activity level and lacked objective measures of PA.

The Arizona WISEWOMAN project is the first WISEWOMAN project to explicitly test the impact of CHWs. Our results indicate that PC may have offered an intervention of sufficient strength to increase minutes of self-reported moderate-to-vigorous activity, although the absence of a true control group makes this finding difficult to interpret. We also found that CHW support combined with PC+HE resulted in a greater percentage of women meeting recommendations for fruit and vegetable intake. The Arizona WISEWOMAN model of PC in combination with HE and CHW support is a promising model for increasing both moderate-to-vigorous PA and fruit and vegetable consumption in uninsured Hispanic women that requires further testing.

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