Health Psychology
2007, Vol. 26, No. 4, 392–400


0278-6133/07/$12.00 DOI: 10.1037/0278-6133.26.4.392

# Resources for Health: A Primary-Care-Based Diet and Physical Activity Intervention Targeting Urban Latinos With Multiple Chronic Conditions

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***Objective:*** The Resources for Health trial evaluates a social-ecologically based lifestyle (physical activity and diet) intervention targeting low-income, largely Spanish-speaking patients with multiple chronic conditions. ***Design:*** A randomized controlled trial was conducted with 200 patients recruited from an urban community health center and assigned to intervention and usual care conditions. Intervention involved 2 face-to-face, self-management support and community linkage sessions with a health educator, 3 follow-up phone calls, and 3 tailored newsletters. ***Main Outcome Measures:*** Primary outcomes measured at 6-months were changes in dietary behavior and physical activity. Changes in multilevel support for healthy living were evaluated as a secondary outcome. ***Results:*** After adjustment for age, sex, language, and number of chronic conditions, significant intervention effects were observed for dietary behavior and multilevel support for healthy lifestyles but not for physical activity. ***Conclusion:*** The Resources for Health intervention provides an effective and practical model for improving health behavior among low-income, Spanish-speaking patients with multiple chronic conditions.

*Keywords:* RCT, self-management, health disparities, comorbidity, RE-AIM

There is widespread agreement that patient involvement in disease management (referred to as *self-management* or *collaborative management*) is required for control of chronic disease and for prevention of disease complications (Von Korff, Glasgow, & Sharpe, 2002; Wagner & Groves, 2002). For the majority of chronic conditions, this involves addressing multiple behavioral risk factors (i.e., physical activity, diet, smoking and alcohol), as well as monitoring and managing the signs of symptoms of disease, taking medications appropriately, maintaining regular contact with health care providers, and managing emotional and social sequelae (Clark, Becker, Lorig, Rakowski, & Anderson, 1991; Lorig et al., 1999; Wagner, 2001).

The past two decades have witnessed a wealth of research demonstrating the efficacy of chronic disease self-management interventions (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Goldstein, Whitlock, & DePue, 2004; Norris et al., 2002; Von Korff, Gruman, Schaefer, & Curry, 1997). These interventions have most often focused on key lifestyle behaviors, and on medication adherence, and have targeted patients with a range of chronic conditions, with an emphasis on asthma, arthritis, and diabetes (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002).

Despite the growing evidence base, some key gaps remain. The better part of this literature has focused on White, middle class samples, thus telling us little about how best to deliver chronic disease self-management interventions to low-income, ethnic minority and underserved patients, who bear the largest burden of disease and often have more than one chronic condition and multiple self-management behaviors that need to be addressed (Agency for Healthcare Research and Quality, 2003; Eakin, Bull,

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This work was funded by Robert Wood Johnson Foundation Grant 041862 for its national program on Improving Chronic Illness Care (www.improvingchroniccare.org). We are grateful to the staff and patients of the Clinica Campesina Family Health Services for their support of and participation in this study. We also acknowledge the work of Kate Troy in assisting with data management and Russ Glasgow for his insightful comments on a draft of this article.

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Glasgow, & Mason, 2002; Institute of Medicine Committee on Quality of Health Care in America, 2001). Members of these special populations often do not or cannot access traditional health care settings where self-management supports are more likely to be offered (Brown, Long, Gould, Weitz, & Milliken, 2000; Levkoff & Sanchez, 2003; Sorensen et al., 2003).

Self-management interventions have largely been guided by intervention models that emphasize the individual, often ignoring the social−environmental context in which patients live (Glasgow & Eakin, 2000; Orleans, 2000; Sorensen et al., 2003). In addition, the evaluation of self-management interventions has tended to occur in the context of efficacy trials with an emphasis on issues of internal validity. The conduct of practical behavioral trials that address the generalizability of findings, the reach and representativeness of study participants, the feasibility of implementation in the real-world context of primary care, and the institutionalization of interventions at the systems level, lags far behind (Glasgow, Bull, Gillette, Klesges, & Dzewaltowski, 2002; Glasgow, Davidson, Dobkin, Ockene, & Spring, 2006; Glasgow, Klesges, Dzewaltowski, Bull, & Estabrooks, 2004).

The Resources for Health study evaluates a physical activity and diet intervention targeting low-income, largely Spanish-speaking patients with multiple chronic conditions. It adds to the literature on self-management interventions by: (a) targeting an underserved, minority subgroup; (b) extending the largely individually focused interventions in this area to include an emphasis on participants' social environment consistent with the social−ecological model; (c) addressing multiple risk behaviors in patients with multiple comorbid conditions; and (d) using the RE-AIM framework (reach, efficacy, adoption, implementation, maintenance) (Glasgow, Vogt, & Boles, 1999) to guide an approach to evaluation of outcomes that balances both internal and external validity in the context of a practical behavioral trial.

## Method

### *Study Design*

This was a randomized controlled trial of a lifestyle intervention evaluating short-term (6 weeks) and medium-term (6 months) outcomes on the primary behavioral targets of physical activity, dietary behavior, and the secondary outcome of multilevel support for healthy lifestyles. Participants were randomly assigned to intervention or usual care conditions, with stratification on gender and primary language.

Institutional Review Board (IRB) approval was initially received from the AMC Cancer Research Center IRB in January 2001 and renewed by the Colorado Multiple IRB (COMIRB # 02-789) in December 2002.

### *Setting and Participants*

The study was conducted at Clinica Campesina Family Health Services, a community health center that provides primary health care services to low-income and medically underserved individuals in the Denver Metro area. The study took place at the urban North Denver clinic, the one with the largest percentage of Spanish-speaking clientele. Although the acculturation of the sample was not formally assessed, the sample is primarily Spanish speaking, and the population served by Clinica Campesina have generally spent fewer than 5 years living in the United States. While there are other measures of acculturation that are more precise (Cuellar, Arnold, & Maldonado, 1995), researchers have commonly used both English language and number of years of U.S. residency as a proxy for acculturation (Bethel & Schenker, 2005; Grunbaum, Kann, & Kinchen, 2004; Minnis & Padian, 2001).

Study participants were adults with greater than one or more chronic conditions for which a lifestyle intervention focused on physical activity and diet would be appropriate (i.e., hypertension, chronic pain, hypercholesterolemia, depression, type 2 diabetes, osteoarthritis, obesity, chronic lung disease, heart disease, osteoporosis, hepatitis, history of cancer, previous stroke, multiple sclerosis). Inclusion criteria were diagnosis of one or more chronic conditions as above, age 30 years and over, having a telephone, and not planning to move from the area during the study's time frame.

### *Recruitment*

Study recruitment began in February 2002 and concluded in August 2003. Names and contact information for all patients meeting age and chronic condition eligibility criteria were obtained from the clinic medical records database ($n = 605$). Letters were sent from clinic providers to patients describing the study and recommending their participation. Included with the letter was a stamped, self-addressed postcard for patients to return to the clinic if they wanted to decline being contacted about the study. Patients for whom postcards had not been returned were followed up with a phone call.

Recruitment calls were made by a bilingual research assistant, with study consent and baseline data collected over the phone. Randomization occurred following collection of baseline data and was determined on the basis of a computer-generated randomization scheme and the opening of sequentially numbered envelopes.

### *Intervention*

The conceptual framework underpinning the intervention was based on a behavioral−ecological approach to chronic disease self-management that emphasizes assessment, feedback, goal setting, and problem solving (Glasgow & Eakin, 2000), as well as on social−ecological theory with a focus on identification of multilevel/community supports for health behavior change (Green, Richard, & Potvin, 1996; Stokols, 1992).

The intervention was culturally adapted and translated into Spanish for an urban, low-income, largely Latino patient population (Riley, Glasgow, & Eakin, 2001). The adaptation included the translation and validation of measures and intervention materials.

The intervention was conducted by an experienced, bilingual, health educator, and involved two face-to-face visits (60−90 min) 3 months apart, three follow-up phone calls, and three newsletters tailored to the behavioral goals of each participant. The face-to-face visits took place either at the clinic or in the participant's home, based on participant preference. Because of the very low literacy levels of study participants, and the fact that some were not able to read and write in either Spanish or English, the use of visual aids was emphasized throughout the intervention.

The intervention protocol followed the 5 As approach advocated in multiple behavioral risk factor interventions (Ask, Assess, Advise, Agree, Arrange; Glasgow et al., 2002; Glasgow, Toobert, & Hampson, 1996; Goldstein et al., 2004). Participants received education on national physical activity (U.S. Department of Health and Human Services, 1996) and dietary recommendations (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2005) along with feedback from their baseline assessment. Participants then chose a self-management goal related to physical activity or healthy eating, and—key to the emphasis on external resources—identified one or two types of social−environmental resources they could use to help them reach their goal (e.g., family and friends, health care team, neighborhood resources). At the conclusion of the session, participants received a one-page goal sheet summarizing their personal action plan.

At 2 and 6 weeks after the initial visit, the health educator made a brief follow-up phone call to reinforce progress toward goal attainment and to problem-solve barriers. During the second face-to-face visit, participants were encouraged to consider setting a goal for the second target behavior. A third follow-up phone call, the last point of contact, occurred 2 weeks after this visit to address the goals and barriers again, and to discuss strategies for maintenance of behavior change, with an emphasis on use of multilevel support resources. To reinforce behavior change goals, three tailored newsletters were mailed to participants over the course of the 6-month intervention. The low-literacy−focused newsletters reminded participants of their physical activity or diet goals, addressed participant-reported barriers and suggested examples of multilevel support resources that could be used. Patients in the usual care condition were mailed a local area community resources guide and three newsletters on basic financial management (i.e., careers and employment, budgeting skills, and establishing credit).

### *Measures*

The RE-AIM (Dzewaltowski, Glasgow, Klesges, & Estabrooks, 2004; Goldstein et al., 1999) framework was used to guide evaluation of study outcomes.

*Reach.* Reach was calculated as the percentage and representativeness of eligible patients who took part in the study. Patient characteristics were assessed using a short set of self-reported demographic items, including gender, age, education, income, race, primary language, marital status, smoking status, and number and type of chronic conditions.

*Efficacy.* Efficacy was evaluated by improvement from baseline on two primary outcome measures (physical activity and dietary behavior) and one secondary outcome measure (multilevel support for healthy lifestyles) at 6 weeks and 6 months. Data were collected by a bilingual research assistant over the telephone.

Physical activity was measured using the Behavioral Risk Factor Surveillance Survey Physical Activity items (Centers for Disease Control and Prevention, 2000). This set of 15 items assesses total minutes of vigorous and moderate activity and walking in the past week and has been shown to correlate highly with other measures of physical activity (Brownson et al., 2004; Brownson, Jones, Pratt, Blanton, & Heath, 2000). Two physical activity outcome variables were calculated: (a) total minutes of walking per week (as walking is the preferred activity of most middle-aged and older adults; Simpson et al., 2003), and (b) consistent with U.S. physical activity guidelines, a dichotomous variable indicating whether participants met the guidelines (i.e., 30 min/day of moderate physical activity on at least 5 days/week or 20 min/day of vigorous activity on at least 3 days/week), although statistical power was not based on this dichotomous variable. A Spanish language version of the Behavioral Risk Factor Surveillance Survey Physical Activity items was obtained from the Centers for Disease Control and Prevention and was evaluated for face validity and clarity during formative work for this trial.

Dietary behavior was measured using the Kristal Fat and Fiber Behavior Questionnaire (FFB). The FFB is a 20-item scale measuring behaviors related to low-fat and high-fiber eating patterns. Previous research has found this scale to be reliable and sensitive to change and to correlate well with other "gold standard" measures such as food records and food frequency questionnaires (Glasgow, Perry, Toobert, & Hollis, 1996; Kristal, Shattuck, & Henry, 1990; Shannon, Kristal, Curry, & Beresford, 1997). A Spanish-language version of the FFB was adapted for use in the current study (Kristal, Shattuck, & Patterson, 1999). A total FFB score was calculated, with scores ranging from 1.00 to 4.00, lower scores indicating better fat and fiber-related dietary behavior.

Multilevel support for healthy lifestyles was measured using the Chronic Illness Resource Survey (CIRS). The CIRS is a 22-item scale that assesses support for healthy lifestyle behaviors and chronic illness self-management from multiple sources including family and friends, health care providers, neighborhood and community, media and health policies (Glasgow, Strycker, Toobert, & Eakin, 2000; Glasgow, Toobert, Barrera, & Strycker, 2005). CIRS subscale and total scores were calculated and ranged from 1.00 to 5.00, with higher scores indicating more support. The English version of the CIRS had been previously validated (Glasgow et al., 2000), and a Spanish version was validated during formative work for this trial (Eakin et al., in press).

*Adoption, implementation, and maintenance.* Adoption was measured by the number of clinics and providers approached who agreed to participate in the trial. Implementation was measured by tracking the delivery of the intervention protocol, including the number of intervention sessions delivered, and the percentage of patients setting goals on physical activity and dietary behavior change. As this was a 6-month trial, longer-term maintenance of outcomes was not assessed.

### *Statistical Analyses*

General descriptive and bivariate statistical analyses were carried out using SPSS for Windows (Version 12.0.1, 2003, SPSS, Chicago, IL) statistical software package. Continuous variables were tested for normal distribution. Analyses were carried out on an intention-to-treat basis. Significance was set at $p < .05$ (two-tailed). Based on the sample size of 200, this study had 81% power ($p < .05$) to detect an effect size of 0.20 on the two primary behavioral targets (physical activity and dietary behavior) at 6 months.

We used independent sample $t$ tests and Pearson's chi-square tests were used to assess differences between participants and nonparticipants, the treatment group and usual care group, and dropouts and completers. To examine changes between the treatment and usual care group over time, and to maximize the amount of data that were used in the analysis, repeated measures analysis

of variance regression models, using a generalized estimating equations approach, were carried out using the SUDAAN statistical package (Version 8.0.2, Cary, NC). Regression models were adjusted for sex, age, language, and number of chronic conditions. Subgroup analyses were also conducted to assess outcome measures for the intervention group, based on dose of intervention and behavioral goals set, compared with the usual care group. The alpha level was not adjusted for these secondary analyses.

## Results

### *Reach*

Figure 1 shows the flow of participants through the study. Names of 605 potentially eligible patients were identified from clinic medical records. Of these, 345 were reached by phone for determination of eligibility and recruitment, 258 were study eligible, and 200 agreed to participate (33% of the initial pool, 58% of

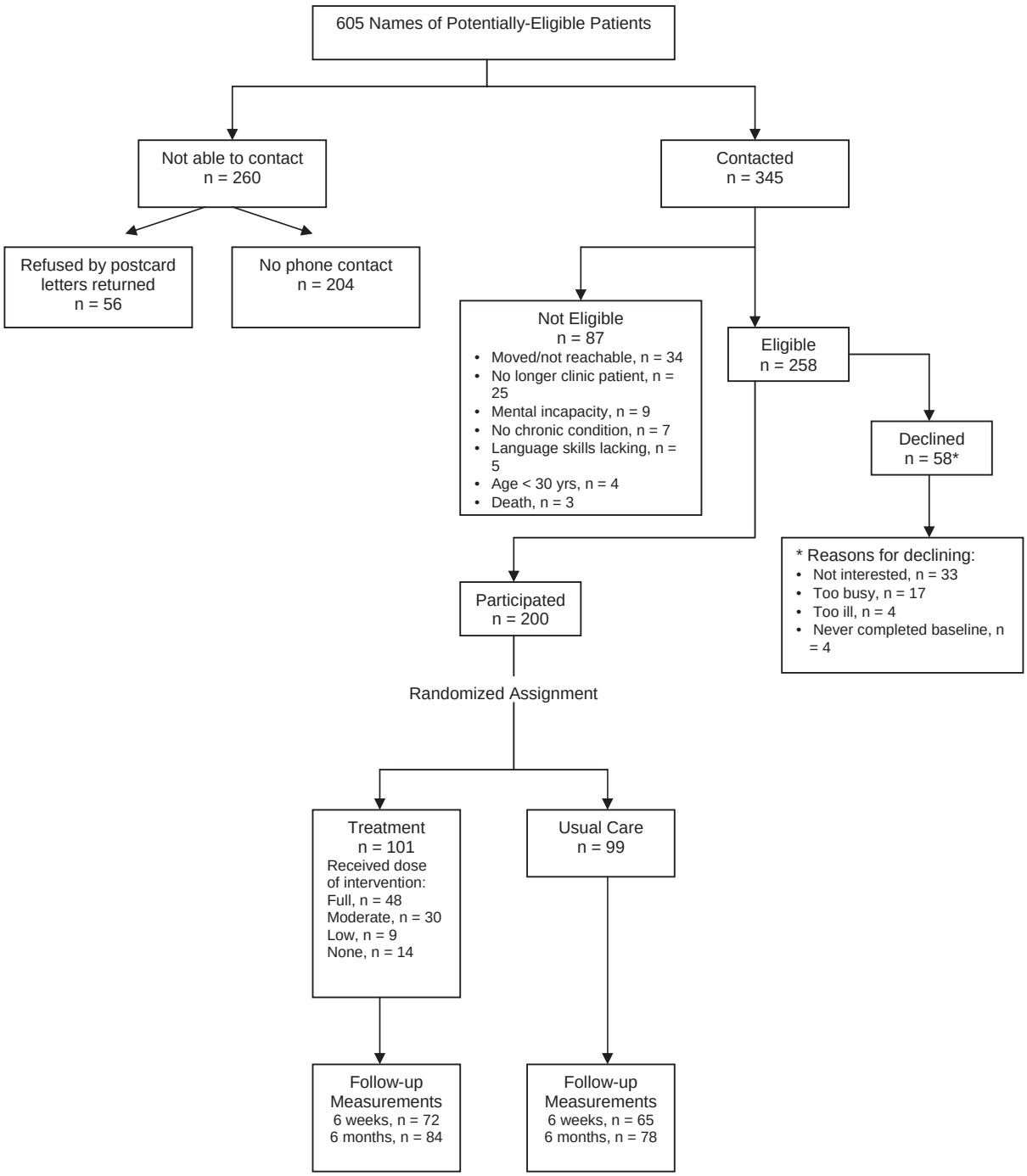


*Figure 1.* Flow of participants through the study.

those reached by phone, and 78% of those reached and eligible). Compared with nonparticipants, participants were more likely to be female (data not shown). Complete data were available for 69% of participants at 6 weeks and 81% at 6 months, and retention rates did not differ significantly between intervention and usual care groups. Women and Spanish speakers were more likely to complete study assessments compared with men and English speakers (data not shown).

Baseline characteristics of participants randomized to the treatment group and those in usual care are shown in Table 1. Groups differed significantly with respect to primary language and ethnicity, and although not statistically significant, there appeared to be differences with respect to number of chronic conditions ($p = .08$). The stratified, random assignment scheme did not result in equal proportions of Spanish speakers in each study condition as block randomization was not used and recruitment was stopped earlier than anticipated because of limited resources.

### *Efficacy*

Changes in dietary behavior, physical activity, and multilevel support for healthy lifestyles between the groups over the three time points are shown in Table 2. Scores were adjusted for sex, age, language, and number of chronic conditions. A statistically significant difference between the groups over time was evident for dietary behavior, Wald $F(2) = 4.64$, $p = .011$. The treatment group showed a significantly greater improvement in dietary behavior compared to the usual care group at both 6 weeks (intervention effect $= -0.16 \pm 0.08$, $p = .031$) and 6 months (intervention effect $= -0.18 \pm 0.06$, $p = .003$). There were no significant differences between groups over time for physical activity when assessed as change in minutes walked per week, Wald $F(2) = 2.04$, $p = .132$, or as the percentage of those meeting national physical activity guidelines, Wald $F(2) = 1.37$, $p = .505$.

A statistically significant difference between the treatment and usual care groups over time was observed for multilevel support for healthy lifestyles (CIRS total score), Wald $F(2) = 8.23$, $p < .001$. The treatment group reported significantly greater support at both 6 weeks (intervention effect $= 0.32 \pm 0.08$, $p < .001$) and 6 months (intervention effect $= 0.23 \pm 0.08$, $p = .003$). Analysis of changes for the individual CIRS subscales revealed significant differences over time between the treatment and usual care groups for the personal, Wald $F(2) = 9.67$, $p < .001$, and family and

Table 1
*Baseline Demographic and Health-Related Characteristics of Sample*

| Characteristic | Treatment ($n = 101$) | Usual care ($n = 99$) |
|---|---|---|
| Age (years; $M \pm SD$) | 50 ± 13 | 49 ± 13 |
| Sex | | |
| Female | 80 (79.2) | 77 (77.8) |
| Male | 21 (20.8) | 22 (22.2) |
| Language* | | |
| Spanish | 77 (76.2) | 56 (56.6) |
| English | 24 (23.8) | 43 (43.4) |
| Ethnicity** | | |
| Hispanic/Latino | 81 (80.2) | 69 (71.1) |
| Anglo | 8 (7.9) | 22 (22.7) |
| Other | 12 (11.9) | 6 (6.2) |
| Smoker | 20 (20.2) | 24 (24.2) |
| Married | 67 (66.3) | 53 (54.1) |
| Live alone | 6 (5.9) | 11 (11.2) |
| Yearly household income | | |
| Less than $10,000 | 32 (34.4) | 36 (37.5) |
| $10,000–$30,000 | 51 (54.8) | 44 (45.8) |
| Greater than $30,000 | 10 (10.8) | 16 (16.7) |
| Education | | |
| Elementary/some high school | 67 (66.3) | 69 (70.4) |
| High school graduate | 17 (16.8) | 13 (13.3) |
| Some college/college graduate | 17 (16.8) | 16 (16.3) |
| No. of chronic conditions | | |
| One | 8 (7.9) | 17 (17.2) |
| Two | 25 (24.8) | 28 (28.3) |
| Three or greater | 68 (67.3) | 54 (54.5) |
| Physical activity level | | |
| Total minutes walking per week (median and range) | 60 (0–840) | 70 (0–840) |
| % meeting guidelines | 19 (18.8) | 17 (17.2) |
| Dietary behavior score[a] | 2.46 ± 0.47 | 2.50 ± 0.42 |
| Multilevel support for healthy lifestyles[b] | 2.67 ± 0.52 | 2.60 ± 0.49 |

*Note.* Data are *n* (%) or mean ± standard deviation.
[a] Fat and Fiber Behavior Questionnaire: Lower scores indicate better dietary behavior (range = 1.00–4.00). [b] Chronic Illness Resources Survey (total score): Higher scores indicate greater support for healthy lifestyles (range = 1.00–5.00).
* $p = .004$. ** $p = .009$.

Table 2
*Adjusted Mean Outcome Measures (± Standard Errors) for Intervention and Usual Care Groups at Baseline, 6 Weeks, and 6 Months Postintervention*

| Variable | Baseline | 6 weeks | 6 months |
|---|---|---|---|
| Dietary behavior[a] | | | |
| Intervention | 2.47 ± 0.05 | 2.25 ± 0.06* | 2.24 ± 0.05* |
| Usual care | 2.48 ± 0.04 | 2.42 ± 0.05 | 2.43 ± 0.05 |
| Multilevel support for healthy lifestyles[b] | | | |
| Intervention | 2.67 ± 0.05 | 2.98 ± 0.06* | 2.98 ± 0.06* |
| Usual care | 2.61 ± 0.05 | 2.59 ± 0.06 | 2.69 ± 0.05 |
| Change minutes of walking/week | | | |
| Intervention | | 11 ± 20 | 16 ± 20 |
| Usual care | | 47 ± 23 | −11 ± 23 |

*Note.* Data were adjusted for age, sex, language, and number of chronic conditions.
[a] Lower scores indicate better dietary behavior (range = 1.00–4.00). [b] Higher scores indicate better support (range = 1.00–5.00).
* $p < .05$.

friends, Wald $F(2) = 5.11$, $p = .007$, subscales (data not shown). When the dietary behavior data were reanalyzed including adjustment for changes in total CIRS score, the intervention effect previously seen had disappeared, Wald $F(2) = 1.72$, $p = .182$, indicating that the CIRS mediated the observed change in dietary behavior.

### *Adoption*

All three of the community health center clinics of the Clinica Campesina Family Health Services were approached for participation, and all agreed to participate, although because of limited research resources, patients were recruited only from the largest of the three clinics. In that clinic, all of the 12 providers agreed to participate.

### *Implementation*

Forty-eight (47.5%) of the 101 intervention condition participants received both intervention visits, 39 (38.6%) received only one, and 14 (13.9%) were unable to be contacted for intervention visits or phone calls. Forty-six (45.5%) received the intended three follow-up phone calls, 29 (28.7%) received two calls, 9 (8.9%) received one call, and a further 3 (3.0%) were never reached for follow-up calls. During the intervention, 41 (40.6%) participants set goals for physical activity only, 13 (12.9%) set diet goals only, 33 (32.7%) set both physical activity and diet goals, and 14 (13.9%) did not set any goals (because they were never reached for intervention). Subgroup analyses to determine the effect of the number of intervention contacts and the selection of behavioral goals did not alter the results observed (data not shown).

## Discussion

The Resources for Health trial, with its focus on improving physical activity and dietary behavior in low-income and predominantly Spanish-speaking patients with multiple comorbid chronic conditions, addresses a significant gap in the literature (Goldstein et al., 2004). Taking the broader public health perspective of the RE-AIM framework (Glasgow et al., 2004) allows the study results to be interpreted not only in terms of their immediate impact, but also in terms of their potential for generalization.

*Reach.* Given the challenges of recruiting and retaining a highly migratory, low-income, low literacy population, the ability to (a) enroll 78% of those contacted and eligible and (b) retain 81% at 6 months supports the feasibility of this approach. The overrepresentation of women and Spanish speakers suggests that recruitment efforts reached those most in need but also that it will take more effort to engage Latino men in health behavior interventions.

*Efficacy.* Significant improvements occurred in one of two primary outcome measures, namely dietary behavior, and in the secondary outcome of multilevel support for healthy lifestyles. The lack of change in physical activity was disappointing, but more than likely reflects the difficulty in measuring physical activity via a brief self-report instrument (Sallis & Saelens, 2000) and the potentially limited sensitivity of the Behavioral Risk Factor Surveillance Survey Physical Activity population surveillance measure to detect change in the context of an intervention trial.

*Adoption.* The trial was clearly and strongly supported by the community health care clinic in which it was conducted, as indicated by the 100% provider participation.

*Implementation.* This trial was challenging to implement, with numerous missed and rescheduled appointments; however, overall 77% received at least three of the five intended intervention contacts, again supporting the feasibility of the approach.

*Maintenance.* The medium-term (6-month) outcomes preclude evaluation of longer term maintenance of behavior change. However, with regard to maintenance at the clinic/systems level, the clinic intends to retain the study interventionist on staff as a chronic disease health educator.

A strength of the study was the use of the social−ecological model to guide the intervention and broaden the focus to take into account the multiple levels of influence on health behavior change (Green, 2001; Stokols, 1996). This was not only implicit as an underlying theory, but operationalized via the use of the CIRS to provide feedback to participants and to assist with goal setting around use of multilevel resources. The CIRS was also used as an outcome measure, and one on which significant between-groups change was observed. In addition, the CIRS also mediated the

effect of the intervention on dietary outcomes—an effect demonstrated in a previous trial (Glasgow et al., 2005)—highlighting the importance of taking into account multiple levels of support in the delivery of health behavior change interventions.

Study limitations include the use of uncorroborated, self-reported, albeit validated, outcome measures; the use of a single interventionist; recruitment of Latino patients (primarily of Mexican descent) from a single clinic, which may limit the generalizability of findings; and the lack of longer term follow-up. The sample size was also too small to allow for analyses of patients nested within providers. However, providers were not involved in the delivery of the intervention, and our previous work has shown the intraclass correlations for the measures used in this study to be extremely small (Glasgow et al., 1997).

Although there is a growing literature on health behavior interventions targeting Latinos, studies of interventions directly comparable to the chronic disease self-management approach of Resources for Health are few. Existing studies have often targeted Latinas as the keepers of family health (Amaro & de la Torre, 2002) and have used a variety of intervention modalities, including lay health advisors (or promotoras) to deliver intervention (Kim, Koniak-Griffin, Flaskerud, & Guarnero, 2004; Navarro, Rock, McNicholas, Senn, & Moreno, 2000; Swider, 2002) using print and mass media (Nestle & Cowell, 1990; Wechsler & Wernick, 1992), as well as multiple modality approaches (Elder et al., 1998). The most comparable study involved multiple health centers and targeted multiethnic adults (a small percentage of whom were Latino) around diet and physical activity (Emmons et al., 2005). Like Resources for Health, it involved a session with a health educator, follow-up phone calls, and tailored mailings; unlike Resources for Health, it also involved clinicians providing a tailored health behavior change prescription. Similar to the present findings, Emmons and colleagues (2005) found significant changes in dietary behaviors, but not in physical activity, perhaps suggesting that physical activity may be a more difficult behavior to change in lower income, multiethnic subgroups.

A recent study based in the primary health care setting evaluated a physical activity and dietary intervention that targeted primarily Latinas 50 years of age and over recruited from community health clinics and that delivered across three conditions: provider counseling; provider counseling and health education; and provider counseling, health education, and community health worker support (Staten et al., 2004). At the 12-month follow-up, although there were no significant between-groups differences, all three groups showed an increase in physical activity, whereas women receiving the comprehensive intervention were more likely to make dietary changes. In an intervention to improve fat and fiber targeting Latinas recruited via random digit dialing, Elder et al. (2005) evaluated three conditions: lay health advisors plus tailored materials, tailored materials only, or off-the-shelf print materials. At 12-weeks postintervention, although there were no significant differences between conditions, the lay health advisor condition achieved significant improvements across a number of dietary outcomes. In general these studies provide modest support for the efficacy of health behavior interventions among Latinos but indicate that more needs to be done to elucidate the most effective intervention modalities and to facilitate change across both diet and physical activity behaviors.

The Resources for Health intervention was adapted for the largely Latino sample from previous chronic disease self-management interventions conducted by Glasgow and colleagues that targeted primarily Caucasian samples (Riley, Glasgow, & Eakin, 2001; Glasgow & Eakin, 2000). The Resources for Health sample showed both poorer levels of health behaviors at baseline and similar to or greater intervention effects for both fat- and fiber-related dietary behavior (Glasgow et al., 1997; Glasgow & Toobert, 2000; Kristal, Curry, Shattuck, Feng, & Li, 2000) and multilevel support for healthy lifestyles (Glasgow et al., 2005). This suggests that there is merit in adapting and evaluating existing evidence-based primary-care-based health behavior interventions with Latino and other high-risk subgroups (Goldstein et al., 2004; O'Malley, Gonzalez, Sheppard, Huerta, & Mandelblatt, 2003).

Results of the Resources for Health trial suggest that a practical and behaviorally focused, social–ecological model driven intervention to enhance chronic disease self-management can be successfully delivered in a community health care context to low-income, Spanish-speaking patients. Future research needs to address generalization to other disadvantaged groups, longer term maintenance of outcomes, and evaluate cost-effectiveness and changes across multiple behavioral risk factors.

## References


Agency for Healthcare Research and Quality. (2003). *National healthcare disparities report.* Rockville, MD: U.S. Department of Health and Human Services.

Amaro, H., & de la Torre, A. (2002). Public health needs and scientific opportunities in research on Latinas. *American Journal of Public Health, 92,* 525–529.

Barlow, J., Wright, C., Sheasby, J., Turner, A., & Hainsworth, J. (2002). Self-management approaches for people with chronic conditions: A review. *Patient Education and Counseling, 48,* 177–187.

Bethel, J., & Schenker, M. (2005). Acculturation and smoking patterns among Hispanics: A review. *American Journal of Preventive Medicine, 29,* 143–148.

Brown, B. A., Long, H. L., Gould, H., Weitz, T. A., & Milliken, N. (2000). A conceptual model for the recruitment of diverse women into research studies. *Journal of Women's Health, 9,* 625–632.

Brownson, R. C., Chang, J. J., Eyler, A. A., Ainsworth, B. E., Kirtland, K. A., Saelens, B. E., et al. (2004). Measuring the environment for friendliness toward physical activity: A comparison of the reliability of 3 questionnaires. *American Journal of Public Health, 94,* 473–483.

Brownson, R. C., Jones, D. A., Pratt, M., Blanton, C., & Heath, G. W. (2000). Measuring physical activity with the Behavioral Risk Factor Surveillance System. *Medicine and Science in Sports and Exercise, 32,* 1913–1918.

Centers for Disease Control and Prevention. (2000). *Behavioral Risk Factor Surveillance System Survey Questionnaire.* Atlanta, GA: Author.

Clark, N. M., Becker, M. H., Lorig, K., Rakowski, W., & Anderson, L. (1991). Self-management of chronic disease in older adults. *Journal of Aging and Health, 3,* 3–27.

Cuellar, I., Arnold, B., & Maldonado, R. (1995). The Acculturation Rating Scale for Mexican Americans-II: A revision of the original ARSMA scale. *Hispanic Journal of Behavioral Sciences, 17,* 275–304.

Dzewaltowski, D. A., Glasgow, R. E., Klesges, L. M., & Estabrooks, P. (2004). RE-AIM: Evidence-based standards and a web resource to improve translation of research into practice. *Annals of Behavioral Medicine, 28,* 75–80.

Eakin, E. G., Bull, S. S., Glasgow, R. E., & Mason, M. (2002). Reaching those most in need: A review of diabetes self-management interventions

in disadvantaged populations. *Diabetes/Metabolism Research and Reviews, 18,* 26–35.

Eakin, E. G., Reeves, M. M., Bull, S. S., Riley, K. M., Floyd, S., & Glasgow, R. E. (in press). Validation of the Spanish-language version of the Chronic Illness Resources Survey. *International Journal of Behavioral Medicine.*

Elder, J. P., Ayala, G. X., Campbell, N. R., Slymen, D., Lopez-Madurga, E. T., Engelberg, M., & Baquero, B. (2005). Interpersonal and print nutrition communication for a Spanish-dominant Latino population: Secretos de la buena vida. *Health Psychology, 24,* 49–57.

Elder, J. P., Campbell, N. C., Candelaria, J. I., Talavara, G. A., Meyer, J. A., & Moreno, C. (1998). Project Salsa: Development and institutionalization of a nutrition health promotion project in a Latino community. *American Journal of Health Promotion, 12,* 391–401.

Emmons, K., Stoddard, A., Fletcher, R., Gutheil, C., Gonzalez Suarez, E., Lobb, R., et al. (2005). Cancer prevention among working class, multiethnic adults: Results of the Healthy Directions-Health Centers Study. *American Journal of Public Health, 95,* 1200–1205.

Glasgow, R. E., Bull, S. S., Gillette, C., Klesges, L. M., & Dzewaltowski, D. A. (2002). Behavior change intervention research in healthcare settings: A review of recent reports with emphasis on external validity. *American Journal of Preventive Medicine, 23,* 62–69.

Glasgow, R. E., Davidson, K. W., Dobkin, P. L., Ockene, J., & Spring, B. (2006). Practical behavioral trials to advance evidence-based behavioral medicine. *Annals of Behavioral Medicine, 31,* 5–13.

Glasgow, R. E., & Eakin, E. G. (2000). Medical office-based interventions. In F. J. Snoek & T. C. Skinner (Eds.), *Psychology in diabetes care* (pp. 141–168). Chichester, England: Wiley.

Glasgow, R. E., Klesges, L., Dzewaltowski, D., Bull, S., & Estabrooks, P. (2004). The future of health behavior change research: What is needed to improve translation of research into health promotion practice? *Annals of Behavioral Medicine, 27,* 3–12.

Glasgow, R. E., La Chance, P., Toobert, D. J., Brown, J., Hampson, S. E., & Riddle, M. C. (1997). Long term effects and costs of brief behavioural dietary intervention for patients with diabetes delivered from the medical office. *Patient Education and Counseling, 32,* 175–184.

Glasgow, R. E., Perry, J. D., Toobert, D. J., & Hollis, J. F. (1996). Brief assessments of dietary behavior in field settings. *Addictive Behaviors, 21,* 239–247.

Glasgow, R. E., Strycker, M. A., Toobert, D. J., & Eakin, E. G. (2000). A social-ecological approach to assessing support for disease self-management: The chronic illness resource survey. *Journal of Behavioral Medicine, 23,* 943–950.

Glasgow, R. E., & Toobert, D. J. (2000). Brief, computer-assisted diabetes dietary self-management counseling. *Medical Care, 38,* 1062–1073.

Glasgow, R. E., Toobert, D. J., Barrera, M., & Strycker, L. A. (2005). The Chronic Illness Resources Survey: Cross-validation and sensitivity to intervention. *Health Education Research, 20,* 402–409.

Glasgow, R. E., Toobert, D. J., & Hampson, S. E. (1996). Effects of a brief office-based intervention to facilitate diabetes dietary self-management. *Diabetes Care, 19,* 835–842.

Glasgow, R. E., Vogt, T. M., & Boles, S. M. (1999). Evaluating the public health impact of health promotion interventions: The RE-AIM framework. *American Journal of Public Health, 89,* 1322–1327.

Goldstein, M. G., Pinto, B. M., Marcus, B. H., Lynn, H., Jette, A. M., McDermott, S., et al. (1999). Physician-based physical activity counseling for middle-aged and older adults: A randomized trial. *Annals of Behavioral Medicine, 21,* 40–47.

Goldstein, M. G., Whitlock, E. P., & DePue, J. (2004). Multiple behavioral risk factor interventions in primary care: Summary of research evidence. *American Journal of Preventive Medicine, 27*(Suppl. 2), 61–79.

Green, L. W. (2001). From research to "best practices" in other settings and populations. *American Journal of Health Behavior, 25,* 165–178.

Green, L. W., Richard, L., & Potvin, L. (1996). Ecological foundations of health promotion. *American Journal of Health Promotion, 10,* 270–281.

Grunbaum, J., Kann, L., & Kinchen, S. (2004). Youth risk behavior surveillance—United States, 2003. *Morbidity and Mortality Weekly Report Surveillance Summaries, 53,* 1–96.

Institute of Medicine Committee on Quality of Health Care in America. (2001). Improving the 21st-century health care system. In *Crossing the quality chasm: A new health system for the 21st century* (pp. 23–38). Washington, DC: National Academy Press.

Kim, S., Koniak-Griffin, D., Flaskerud, J. H., & Guarnero, P. A. (2004). The impact of lay health advisors on cardiovascular health promotion: Using a community-based participatory approach. *Journal of Cardiovascular Nursing, 19,* 192–199.

Kristal, A. R., Curry, S. J., Shattuck, A. L., Feng, Z., & Li, S. (2000). A randomized trial of a tailored self-help dietary intervention: The Puget Sound Eating Patterns Study. *Preventive Medicine, 31,* 380–389.

Kristal, A. R., Shattuck, A. L., & Henry, H. J. (1990). Patterns of dietary behavior associated with selecting diets low in fat: Reliability and validity of a behavioral approach to dietary assessment. *Journal of the American Dietetic Association, 90,* 214–220.

Kristal, A. R., Shattuck, A. L., & Patterson, R. E. (1999). Differences in fat-related dietary patterns between Black, Hispanic and White women: Results from the Women's Health Trial Feasibility Study in Minority Populations. *Public Health Nutrition, 2,* 253–262.

Levkoff, S., & Sanchez, H. (2003). Lessons learned about minority recruitment and retention from the Centers on Minority Aging and Health Promotion. *Gerontologist, 43,* 18–26.

Lorig, K. R., Sobel, D. S., Stewart, A. L., Brown, B. W., Bandura, A., Ritter, P., et al. (1999). Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: A randomized trial. *Medical Care, 37,* 5–14.

Minnis, A., & Padian, N. (2001). Reproductive health differences among Latin American- and US-born young women. *Journal of Urban Health, 78,* 627–637.

Navarro, A., Rock, C., McNicholas, L., Senn, K., & Moreno, C. (2000). Community-based education in nutrition and cancer: The Por La Vida Cuidandome curriculum. *Journal of Cancer Education, 15,* 168–172.

Nestle, M., & Cowell, C. (1990). Health promotion of low-income minority groups: The challenge for nutrition education. *Health Education Research, 5,* 527–533.

Norris, S. L., Nichols, P., Caspersen, C. J., Glasgow, R. E., Engelgau, M., Jack, Jr., L., et al. (2002). Increasing diabetes self-management education in community settings: A systematic review. *American Journal of Preventive Medicine, 22*(Suppl. 4), 39–66.

O'Malley, A. S., Gonzalez, R. M., Sheppard, V. B., Huerta, E., & Mandelblatt, J. (2003). Primary care cancer control interventions including Latinos: A review. *American Journal of Preventive Medicine, 25,* 264–271.

Orleans, C. T. (2000). Promoting the maintenance of health behavior change: Recommendations for the next generation of research and practice. *Health Psychology, 19*(Suppl. 1), 76–83.

Riley, K. M., Glasgow, R. E., & Eakin, E. G. (2001). Resources for health: A social-ecological intervention for supporting self-management of chronic conditions. *Journal of Health Psychology, 6,* 693–705.

Sallis, J. F., & Saelens, B. E. (2000, June). Assessment of physical activity by self-report: Status, limitations, and future directions. *Research Quarterly for Exercise and Sport, 71*(Suppl. 2), S1–14.

Shannon, J., Kristal, A. R., Curry, S. J., & Beresford, S. A. (1997). Application of a behavioral approach to measuring dietary change: The fat- and fiber-related diet behavior questionnaire. *Cancer Epidemiology, Biomarkers & Prevention, 6*(5), 355–361.

Simpson, M. E., Serdula, M., Galuska, D. A., Gillespie, C., Donehoo, R. S., Macera, C., et al. (2003). Walking trends among US adults: The Behav-

ioral Risk Factor Surveillance System, 1987–2000. *American Journal of Preventive Medicine, 25,* 95–100.

Sorensen, G., Emmons, K. M., Hunt, M. K., Barbeau, E., Goldman, R., Peterson, K., et al. (2003). Model for incorporating social context in health behavior interventions: Applications for cancer prevention for working-class, multiethnic populations. *Preventive Medicine, 37,* 188–197.

Staten, L., Gregory-Mercado, K., Ranger-Moore, J., Will, J., Giuliano, A., Ford, E., et al. (2004). Provider counseling, health education, and community health workers: The Arizona WISEWOMAN Project. *Journal of Women's Health, 13,* 547–556.

Stokols, D. (1992). Establishing and maintaining healthy environments: Toward a social ecology of health promotion. *American Psychologist, 47,* 6–22.

Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion, 10,* 282–298.

Swider, S. M. (2002). Outcome effectiveness of community health workers: An integrative literature review. *Public Health Nursing, 19,* 11–20.

U.S. Department of Health and Human Services. (1996). *Physical activity and Health: A report of the Surgeon General.* Atlanta, GA: Author.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. (2005). *Dietary guidelines for Americans.* Washington, DC: U.S. Government Printing Office.

Von Korff, M., Glasgow, R. E., & Sharpe, M. (2002). Organising care for chronic illness. *British Medical Journal, 325,* 92–94.

Von Korff, M., Gruman, J., Schaefer, J., & Curry, S. (1997). Collaborative management of chronic illness. *Annals of Internal Medicine, 127,* 1097–1102.

Wagner, E. H. (2001). Meeting the needs of chronically ill people. *British Medical Journal, 323,* 945–946.

Wagner, E. H., & Groves, T. (2002). Care for chronic diseases. *British Medical Journal, 325,* 913–914.

Wechsler, H., & Wernick, S. M. (1992). A social marketing campaign to promote low-fat mild consumption in an inner-city Latino community. *Public Health Reports, 107,* 202–207.