



HHS Public Access

Author manuscript

Soc Sci Med. Author manuscript; available in PMC 2016 October 01.

Published in final edited form as:

Soc Sci Med. 2015 October ; 143: 98–106. doi:10.1016/j.socscimed.2015.08.029.

***Tu Salud, ¡Si Cuenta!*: Exposure to a community-wide campaign and its associations with physical activity and fruit and vegetable consumption among individuals of Mexican descent**

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Abstract

Mexican Americans along the US-Mexico border have been found to be disproportionately affected by chronic diseases particularly related to lack of physical activity and healthful food choices. A community-wide campaign (CWC) is an evidence-based strategy to address these behaviors but with few examples of implementation in Mexican descent populations facing profound health disparities. We examined exposure to a CWC, titled *Tu Salud ¡Si Cuenta!*, and its association with meeting the recommended minutes of moderate and vigorous physical activity weekly and consuming more portions of fruits and vegetables daily. A cross-sectional sample of 1438 Mexican descent participants was drawn from a city-wide, randomly-selected cohort interviewed between the years 2008 and 2012. Multivariable comparisons of participants exposed and not exposed to the CWC and meeting physical activity guidelines or their fruit and vegetable consumptions using mixed effects models were conducted. The community-wide campaign components included different forms of mass media and individually-focused components such as

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community health worker (CHW) home visits. After adjusting for gender, age, marital status, educational attainment, language preference, health insurance, and diabetes diagnosis, the strongest association was found between meeting physical activity guidelines and exposure to both CHW discussions and radio messages (adjusted $OR=3.83$; 95% $CI= [1.28, 6.21]$; $p=0.0099$). Participants who reported exposure to both radio and TV messages consumed more portions of fruits and vegetables than those who reported no exposure (adjusted $RR=1.30$; 95% $CI= [1.02, 1.66]$; $p= 0.0338$). This study provides insights into the implementation and behavioral outcomes associated with exposure to a community-wide campaign, a potential model for addressing lifestyle modifications in populations affected by health disparities.

Keywords

US-Mexico border; community-wide campaign; evidenced based intervention; health disparities; fruit and vegetable consumption; physical activity

INTRODUCTION

Ethnic minorities and persons with low income experience disproportionate rates of obesity and chronic diseases associated with obesity, including type 2 diabetes, hypertension, coronary heart disease, and stroke (Fisher-Hoch, et al., 2010; Mokdad et al., 2003; Ogden et al. 2006; Ogden, Yanovski, Carroll, & Flegal, 2007). However, addressing lifestyle changes to prevent obesity and related diseases among ethnic minority populations remains a challenge (Corsino, et al., 2012; Faucher & Mobley, 2010; Lindberg, et al., 2012; Ockene et al., 2011; Poston et al., 2003; Rosal et al., 2011; Vincent, 2009). The Centers for Disease Control and Prevention, National Cancer Institute, and other national agencies have registries and searchable databases of evidence-based interventions (EBIs) to support their wide-spread dissemination and implementation and reach ethnic minority populations with the best approaches to addressing chronic diseases and other leading causes of mortality and morbidity (NREPP, 2015).

The Guide to Community Preventive Services (*Guide*) recommends the multi-component community-wide campaign to increase physical activity based on a systematic review (Task Force on Community Preventive Services, 2005). The *Guide* recommends community-wide campaigns as large-scale initiatives delivering messages using mass media; providing individually focused efforts such as physical activity counseling, health risk screenings and education; and implementing environmental and policy change strategies. Of the 10 studies on which this recommendation was based five studies were conducted in the United States and only two studies reached Hispanic populations (Kahn, Ramsey, Heath, & Howze, 2002). All 10 studies engaged the community to create “highly-visible, broad-based, multiple intervention approaches” (Kahn et al., 2002, pg 77) and showed improvement on outcomes such as the percentage of people being physically active (median net increase of 4.2%), their energy expenditure (median net increase of 16.3%), and their knowledge about exercise and intentions to be physically active. The Guide also indicated that community-wide campaigns often target additional health outcomes such as healthy food choices (Task Force on Community Preventive Services, 2005).

The EBI replicated and adapted in this current study was included in the systematic review of the Community Guide on physical activity and is the well documented Stanford Five City Project (Young, Haskall, Taylor, & Fortmann, 1996). This intervention targeted multiple behavioral outcomes including increased physical activity through print materials, weekly newspaper articles, and group education sessions. Staff organized walking group programs, and local lay leaders were trained to lead walking groups. In years 3 and 4 of the Stanford Five City project, TV segments were released, and an in depth exercise booklet was distributed. In year 5 worksite wellness initiatives were implemented. Results indicated a positive treatment effect for men and women on physical activity outcomes. Our community-wide campaign was also informed by replications of this intervention in our region among Hispanic populations where peer role model stories were featured in the media elements (Ramirez & McAlister, 1988; Fernández-Esquer, Espinoza, Torres, Ramirez, & McAlister, 2003).

The Guide noted that there is a lack of information about what components of community wide campaigns are most effective and for what populations. This paper reports the associations of exposure to unique components of a community-wide campaign titled *Tu Salud ¡Sí Cuenta!* (TSSC), known in English as *Your Health Matters!* and meeting physical activity and fruit and vegetable consumption guidelines. Using culturally relevant strategies and a community-engaged research approach, TSSC was adapted from the Stanford Five city EBI to improve physical activity and healthy food choices among adults (18 years) of Mexican descent living along the Texas-Mexico border (Reininger et al., 2010). The TSSC components were designed for individuals, along with their family members, since past research has indicated that family is central to those of Mexican descent (Ong, Phinney, & Dennis, 2006; Reininger et al., 2005; Sabogal, Marin, Otero-Sabogal, Marin, & Perez-Stable, 1987). We hypothesized that adults who report exposure to multiple components of TSSC would be more likely to report meeting the weekly recommended minutes of moderate and vigorous physical activity and consume more portions of fruits and vegetables daily.

METHODS

Description of the Community Advisory Board and EBI Adaptation

The backbone of TSSC is a coalition formed in 2005, named the Community Advisory Board (CAB), representing region-wide organizations of community health workers (CHWs), medical providers, universities, community-based organizations, and religious organizations that have met regularly to plan, guide, and advocate for issues identified as significant for the most vulnerable and underserved members of this region. Organizational members were originally invited to the CAB through snowball recommendations and evolved based on gap analyses or expressed interests by entities. An average of 35 CAB members met quarterly with additional subcommittee actions undertaken as directed by the larger group and its CAB leadership team. One priority of the CAB was to develop an intervention to address the health disparities found in diabetes, cardiovascular disease, and cancer in our community. After reviewing findings of local research from the Texas-Mexico border, CAB members and researchers jointly selected the EBI with its community-wide

campaign approach to address their selected behavioral outcomes. The CAB and researchers determined adaptations were needed in three areas: the timing of when intervention components were deployed, further cultural adaptation, and the addition of social media options. In regards to timing, the original EBI launched English and Spanish print media initially and then added TV programming overtime; however, because of limited financial resources, the TSSC outreach and media components began only in Spanish. The CAB's input to address the region's majority Spanish-only or Spanish-preferred speakers set this priority population. TSSC expanded its media efforts to include both English and Spanish after a few years. The original EBI recruited lay leaders who were current exercisers to deliver walking groups, and education sessions were provided by health professionals. The TSSC campaign recruited and trained CHWs to deliver intervention educational sessions either door-to-door or in small groups and to deliver Latin dance-based exercise groups. CHWs and this style of exercise are culturally acceptable in the region. Like the original study, the CHWs delivering the intervention were selected because they personally were making the lifestyle changes being promoted. In the original EBI, social media options were not used but TV with role models providing testimonials and newsletters were. The TSSC campaign also used these traditional mediums with role model testimonials and added social media in the later years as venues for promoting the lifestyle change messages. Like the original EBI, the CAB and researchers committed to a multi-year intervention period knowing the complexity of changing population behaviors and the extent of need in the region. The TSSC used a participatory approach including CAB members giving input into the framing of specific topics and slogans, role models and experts to be featured in the campaign, and measurement of outcomes. Additionally, CHW groups piloted media and newsletter materials in the community for feedback and modifications before broad dissemination. CAB members promoted and participated in hosting TSSC components, reviewed evaluation findings during quarterly meetings and in subcommittees, and provided support and advocacy for environmental changes and policy improvements. Like the original EBI, TSSC has expanded its components yearly and in the later years focused on reaching organizations, the environment, and policy. Since 2003 (Figure 1) the community-wide campaign and the CAB have expanded to ensure a broad-based and highly visible community-wide campaign. Detailed information about the CAB's active partnership and roles in TSSC is described elsewhere (please see <https://sph.uth.edu/campuses/brownsville/community-wide-campaign-implementation-guide-.htm> for implementation guide).

Two primary theories were used to develop the campaign: Social Cognitive Theory, with its constructs of observational learning, self-efficacy, self-regulation, and reinforcement, (Bandura, 1986) and the Transtheoretical Model with media messages focused on the earlier stages and CHW outreach using the processes of change depending on the individual's stage of change (Prochaska, DiClemente, & Norcross, 1992). More recently behavioral change techniques, or the specific active ingredients that lead to behavior change (Michie et al., 2011), have been identified to help refine and replicate TSSC (See Table 1). Our conceptualization of these techniques map onto the two primary theories with some examples provided below. The campaign also used the Ecological Model (McLeroy, Bibeau, Steckler, & Glanz, 1988) as its framework for layering interventions across several of the levels of influence (individual, interpersonal, organizational, community, policy).

Media Messages of TSSC

Mass media messages relied heavily on behavioral change techniques drawn from Social Cognitive Theory including community peer models modeling the desired behavior and describing to viewing or listening audiences the *natural consequences* of their old unhealthy behaviors, *comparing their new behaviors* to salient others (Mexican descent community, peers), and experts and peers models *comparing the outcomes* possible when physical activity and fruit and vegetable guidelines are met and not met. These media messages created *covert learning* for the audience as the peer models discussed reinforcements of their behaviors through personal testimonials. The media tested in this study include: 30 second radio segments on three Spanish-language stations aired during morning drive times; 4-5 minute weekly TV health segments shown during a Spanish-language morning show; a Spanish-language newsletter with low-literacy designed messages; a Spanish-language TSSC website.

Individually Focused Components of TSSC

The individually focused efforts of TSSC relied heavily on CHWs delivering behavioral change techniques through motivational interviewing strategies. The Social Cognitive Theory constructs of self-regulation and reinforcement were operationalized as the CHWs worked with participants to set *goals and plans* for increasing physical activity and consuming fruits and vegetables, and identifying sources of *social support* for these behavior changes. TSSC also provided risk factor screenings for adults to identify unhealthy BMIs and blood pressure readings, and staff described the *natural consequences* of not attending to unhealthy readings as warning signs and offered practical *social support* by referring individuals to free exercise classes in addition to providing vouchers for farm fresh produce at the local farmers market. The exposure to home-based CHW discussions is specifically tested in this study.

Organizational, Environmental and Policy Components of TSSC

Beginning in 2008, the TSSC implementation began reaching worksites, modifying the environment, and promoting policies that would support increased physical activity and healthier food choices, although the planning and garnering support for these activities began early in the life of TSSC. Organizational change strategies included weight loss challenges reaching worksites, and environmental changes included implementation of weekly farmers markets. Synergy between mass media, individually focused components, and organizational and environmental changes also occurred. For example, CHW discussions and newsletters mention TV and radio segment times; TV and radio segments promote risk factor screening, community events, and farmers market. This current study does not include a measure of the exposure to TSSC organizational, environmental, or policy changes as these campaign components were generally implemented beyond the sampling timeframe for the current study.

Sample

For the study reported here, a cross sectional sample (n=1438) was drawn from participants in the ongoing Cameron County Hispanic Cohort. This well characterized cohort started in

the year 2003 to characterize the burden of chronic disease in the region and at the time of analysis comprised of over 2,600 adults of Mexican descent living in Cameron County, nestled against the Texas-Mexico border (Fisher-Hoch et al., 2012). Cohort participants were taken from randomly selected households, identified by census tracts and blocks, and stratified by socio-economic status, using a two-stage cluster systematic sampling method. Trained CHWs visited selected households and all members aged 18 years were invited to participate. Once participants completed consent procedures and were enrolled into the study, clinical exams, questionnaires and anthropometric measures were taken. During an interview, bilingual trained staff read the questionnaire to participants in their preferred language (English or Spanish) and recorded responses. Questionnaires included items on participants' exposure to the TSSC components (described below).

The Cameron County Hispanic Cohort provides a large, city-wide weighted sample of adults who were the priority population for TSSC. The cross-sectional sample for this study includes cohort members who were interviewed at any one point between the years of 2008 – 2012, during which the media and individually focused components of the TSSC were fully implemented. If cohort participants were interviewed more than one time, their earliest interview responses were included in the sample. The study received approval from the respective university ethics committee.

Measurement of TSSC Exposure

The approach to measuring exposure to the TSSC components was adapted from previous research on media campaigns where participants were asked to recall exposure to media messages without the benefit of aids and then to identify the ads they liked most and to provide a summary of the main theme of that ad (Sly, Hopkins, Trapido, & Ray, 2001; Sly, Trapido, & Ray, 2002). Our approach was similar but examined all the components of the campaign, not just the media messages. We first asked an unaided question to assess exposure to the TSSC campaign generally, "Have you regularly read, seen, or heard any health messages from the "Tu Salud ¡Si Cuenta!" Campaign?" Whether or not the person indicated exposure to this first question, a second set of questions asked the respondents about the level of exposure to each component of the campaign "ever" and "in the last six months". If the respondent indicated some level of exposure then the respondent was asked to describe their favorite features of that campaign component in order to confirm their exposure. Other items asked about trust and use of the component to change behaviors although data are not used in this current analysis. During the second set of questions the respondent was shown a one page handout with the following images: our CHWs, a generic TSSC newsletter, and the logos of radio and TV partners. No specific details about the campaign component were provided. Some participants responded to the first question indicating that they did not recognize the campaign, but when they were asked the second set of questions about specific components of the campaign, they recalled their exposure and provided detail about their favorite example of that component. Based on the responses to the second set of specific questions, 17 (1.18%) participants who responded they did not recognize the campaign but recalled exposure and were able to provide details were reclassified to have had TSSC exposure. Some participants initially said they recognized the TSSC campaign (N=45, 3.13%) but were unable to confirm recognition with the second set

of specific exposure questions. These participants were reclassified to have had no TSSC exposure. After these reclassifications, the number of participants who had TSSC exposure was n=514. For this study, we assume that the number of campaign components that the respondent could confirm is the dose effect of exposure and we examine the interaction effects of the components.

Measurement of Physical Activity

Questions assessing physical activity asked participants about the intensity, frequency and duration of minutes exercised per week using the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003) and Godin Leisure-Time Exercise Questionnaire instruments (Godin & Shephard, 1997). The IPAQ has been used to assess physical activity worldwide including in Spanish populations (Bauman et al., 2011; Craig et al., 2003; Hallal et al., 2010). We conducted a test-retest reliability study with the IPAQ in our Mexican descent sample that showed evidence of acceptable reliability (Dang, 2009) as did another study among Mexican Americans (Medina, Barquera, & Janssen, 2013). The Godin Leisure-Time Exercise Questionnaire also has evidence of acceptable reliability and validity among (Rauh, Hovell, Hofstetter, Sallis, & Gleghorn, 1992). These data were used to determine if the United States physical activity guidelines were met (USDHHS, 2008) by calculating the metabolic equivalent (MET) adjusted minutes of moderate and vigorous exercise reported during the previous week. Total activity less than 600 MET adjusted minutes was considered as not meeting physical activity guidelines (Bauman et al., 2009). Based on the recommended scoring protocols, 38 (2.6%) participants with extreme values (< 7680 MET adjusted minutes) of physical activity were excluded from the analyses. Of these individuals, those excluded were more often male (57.9% vs. 31.6%), relatively younger (mean age 43.4 vs. 47.3), and had higher educational attainment (73.7% vs. 64.4%) than the group reporting less extreme MET adjusted minutes. No significant differences in exposure to TSSC campaign were found between the two groups.

Measurement of Fruit and Vegetable Consumption

Participants were asked about fruit and vegetable consumption using the validated Two-item Dietary Questionnaire for adults, (Cappuccio et al., 2003) “How many portions of fruit, of any sort, do you eat on a typical day?” and “How many portions of vegetables, excluding potatoes, do you eat on a typical day?” Pictures of common, locally consumed fruits and vegetables were provided to participants with appropriate portion sizes shown. The recommendations for healthful food consumption include 5 or more portions (generally considered a 1/2 cup of fresh, frozen, or canned produce or a medium sized piece of produce) of fruits and vegetables daily (Krauss et al., 2000). Portions of over 10 were excluded from the analysis based on recommendations of the standardized reporting tool (Cappuccio et al., 2003).

Sociodemographic Variables

The following characteristics were used to describe the demographics of the sample: gender, age, marital status (single/never married, married, divorced/separated, or widowed), educational attainment (less than 8 years, 8 years or more), preferred language (English or

Spanish), diabetes (meeting American Diabetes Association (2010) definition or not), and health insurance (insured or not insured).

Statistical Analysis

We conducted univariate and multivariate comparisons of participants exposed and not exposed to the TSSC campaign message components and meeting physical activity guidelines, using mixed effect models accounting for correlations within census tracts and blocks, and discrepancies in survey versions across the four years (January 2008-April 2012) of data collection. We performed logistic regression analysis to evaluate the effect of exposure on meeting physical activity guidelines. A Poisson regression model was used to compare participants exposed and not exposed in regard to fruit and vegetable consumption (treated as a non-negative count of events in one day) rather than performing linear regression analysis where the data are assumed to be normally distributed. Over dispersion and zero-inflation in the count model were tested and found not to be significant. Exposure to individual components and combination of components of the TSSC campaign were assessed in relation to physical activity and fruit and vegetable outcomes. Multivariable models were constructed adjusting for demographic variables including gender, age, marital status, educational attainment, preferred language, and diabetes. Potential confounding and interactive effects across exposures were addressed in developing a final multivariable model. We also conducted some propensity models to generate propensity score-adjusted estimates (results not reported) and found similar results to the multivariable regression modeling. All analyses were performed using SAS 9.3. Statistical significance was set at $p < 0.05$.

RESULTS

Table 2 describes the demographic characteristics of the sample and the degree to which they met guidelines for physical activity and fruit and vegetable consumption. The majority of the sample were female, married, had at least 8 years of education, identified Spanish as their preferred language, did not have diabetes, and did not have health insurance. Significant differences in physical activity and fruit and vegetable consumption were found by gender, age, marital status, educational attainment, preferred language, and diabetes, and were controlled for in the multivariate analysis to examine exposure effect.

We found that 58.4% of the participants reported no physical activity in the 7 days prior to their interview, and 21.8% reported not having consumed any fruit and vegetables on the day prior to the interview. The majority of participants (71.3%) did not meet either the physical activity guidelines or the guidelines for daily fruit and vegetable consumption.

Table 3 describes exposure to components of TSSC in relation to physical activity guidelines. Approximately 37% of all participants reported exposure to TSSC. Those who were exposed to TSSC were more likely to have met physical activity guidelines than those who were not exposed (adjusted OR=1.7; 95% CI= [1.3, 2.2]; $p=0.0001$). We also assessed the effect of exposure to a single component of TSSC among individuals who reported a single exposure and separately the effect of any combination of exposures among those individuals who reported those specific combination of exposures. For example, we

examined the likelihood of meeting physical activity guidelines among participants who reported only one exposure (e.g., radio). Also, we examined the likelihood of meeting physical activity guidelines among participants who reported exposure to combined components of TSSC (e.g. Radio and TV) With this approach we found, meeting physical activity guidelines was most strongly associated with exposure to both the CHW discussions and radio messages (adjusted OR=3.8; 95% CI= [1.3, 6.2]; p=0.0099). The CHW discussions, in combination with newsletter, radio, and TV messages, were associated with increased odds of meeting physical activity guidelines (adjusted OR=2.8; 95% CI= [1.2, 6.2]; p=0.0156). Thus participants who reported exposure to more than one TSSC campaign component were more likely to meet the physical activity guidelines.

Table 4 describes the association between exposure to TSSC and fruit and vegetable consumption among the full sample.

We found that exposure to only two components of the campaign was associated with increased consumption of fruits and vegetables. We found separate significant effects of radio itself (adjusted RR=1.19) and a combination of radio and TV (adjusted RR=1.3). Participants who were exposed to radio and TV messages consumed 30% more portions of fruits and vegetables than those who were not exposed to TSSC (adjusted RR=1.3; 95% CI= [1.02, 1.7]; p=0.0338).

DISCUSSION

This study provides insight into the implementation of a community-wide campaign designed to reach a population suffering from health disparities in one of the poorest regions of the United States along the Texas-Mexico border. Unlike some community-wide campaigns that are turned on intensively for a short time frame (3 - 6 months), the TSSC campaign has been expanding over the last decade with original components retained and additional ones added. Community input and involvement in the campaign has come through a large and active CAB. The TSSC campaign was designed to have CHW outreach and primarily Spanish language media implemented in the early years to reach the most marginalized of the community. The focus of this study was the components implemented in the earlier years of implementation of the TSSC campaign from 2003 - 2011.

This study found associations between meeting physical activity guidelines and increased portions of fruit and vegetable consumption and exposure to specific components of a community-wide campaign intervention, even after adjusting for gender, age, marital status, educational attainment, language preference, health insurance, and diabetes diagnosis. Causality of these associations cannot be established because of the cross-sectional study design, but we did find multiple significant associations. This study found these associations in a city-wide population randomly sampled from their homes. This type of sampling provides sound population estimates for the reach of campaign, indicating that 37% of the population reported exposure to the TSSC during the timeframe studied.

Our findings also contribute to the literature on community-wide campaigns in regards to what components of TSSC were associated with behavioral outcomes. Specifically, we

found robust associations with multiple components of TSSC and meeting physical activity guidelines. In general, the odds of meeting physical activity guidelines were higher when respondents reported exposure to multiple components of the campaign compared to when they reported exposure to a single component. The odds were highest of all when the multiple exposures included discussions with a CHW. Therefore, for physical activity, we found strong support for our hypothesis that exposure to multiple components of TSSC is generally associated with increased odds of meeting the guidelines for weekly moderate and vigorous physical activity. However, we did not find this pattern when examining fruit and vegetable consumption, where the dose response hypothesis was not supported. Here, only exposure to mass media components was associated with increased fruit and vegetable consumption.

This result may indicate the complexity of changing habits associated with purchasing and preparing healthy food choices among a population currently eating very few fruits and vegetables. It also may suggest that individuals who are most interested in consuming fruits and vegetables attend to media messages about these topics. Finally, it may suggest there was an imbalance in the content presented by TSSC with more emphasis on physical activity rather than fruit and vegetable consumption. At best, there was a mean portion difference found among individuals who reported exposure to the radio and to the radio and TV messages of TSSC of approximately two-thirds of a portion (or approximately 2.6 ounces of produce). That is, while significant, the reported portion increase was relatively small, although similar to that found in studies of other clinically based interventions (Beresford, Thompson, Feng, Christianson, McLerran, & Patrick, 2001; Pomerleau, Lock, Knai, & McKee, 2005). One component of TSSC that was not significantly associated with meeting physical activity guidelines or more portions of fruits and vegetables was the TSSC website. The website was not created until 2010 and at this point exposure was low in this sample with less than 50 users because the digital divide was well established (Zickuhr & Smith, 2012; Barzilai-Nahon, 2006) and Internet usage had not yet saturated this population. Future research will examine exposure to the TSSC website and social media because recent studies in the area are showing the digital divide is decreasing (Reininger, et al., 2013) Also, future research will investigate behavioral change techniques best suited to maximize nutritional behavioral outcomes associated with exposure to community-wide campaigns.

Limitations

Limitations to this study are related to causality. Using a cross-sectional sample we are unable to draw conclusions about the causal link between exposure to TSSC and changes in behavior. The study was also limited to primarily individuals of Mexican descent who preferred Spanish language media. Social desirability bias is also a potential limitation as participants all lived in a community where increased attention was being given in the media and in community events for adopting healthy behaviors. Additionally, the two item fruit and vegetable measure used still requires additional validity studies among Mexican Americans. Finally, direct measures of physical activity and fruit and vegetable consumption, rather than self-reported measures, were not employed. These approaches are more costly and logistically complicated when used in population studies. Future research

should expand on the associations found and examine causality by including mediators, behavioral outcomes and biological or clinical outcomes.

Despite its limitations, our study provides unique insights into behavioral outcomes associated with exposure to a community-wide campaign, after adjusting for sociodemographic variables, to improve lifestyle choices in a population affected by health disparities. The use of community-wide campaigns may serve as a model for addressing health disparities, even among low resource communities when supported by community partners. This study provides further evidence of the utility of community-wide campaign interventions for these vulnerable populations.

ACKNOWLEDGEMENTS

This work was supported by the UT Health Clinical and Translational Science Award (UL1 TR000371), NIH/ National Center on Minority Health and Health Disparities (MD000170 P20), and the Texas Department of State Health Services funding for University of Texas Community Outreach (UTCO). The authors of this manuscript would like to acknowledge and thank Dr. Alfred McAlister for his leadership and guidance on establishing the intervention framework and its adaptation from the original intervention program. We would also like to recognize the dedicated staff who have worked continuously to implement and evaluate the intervention. Finally we would like to thank the Community Advisory Board and the people of Brownsville for their willingness to participate in collaborative scientific endeavors.

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Highlights

- > Community wide campaigns are novel for modifying lifestyle behaviors.
- > Exposure to campaign associated with meeting physical activity guidelines.
- > Mexican American health disparities may benefit from campaign implementation.

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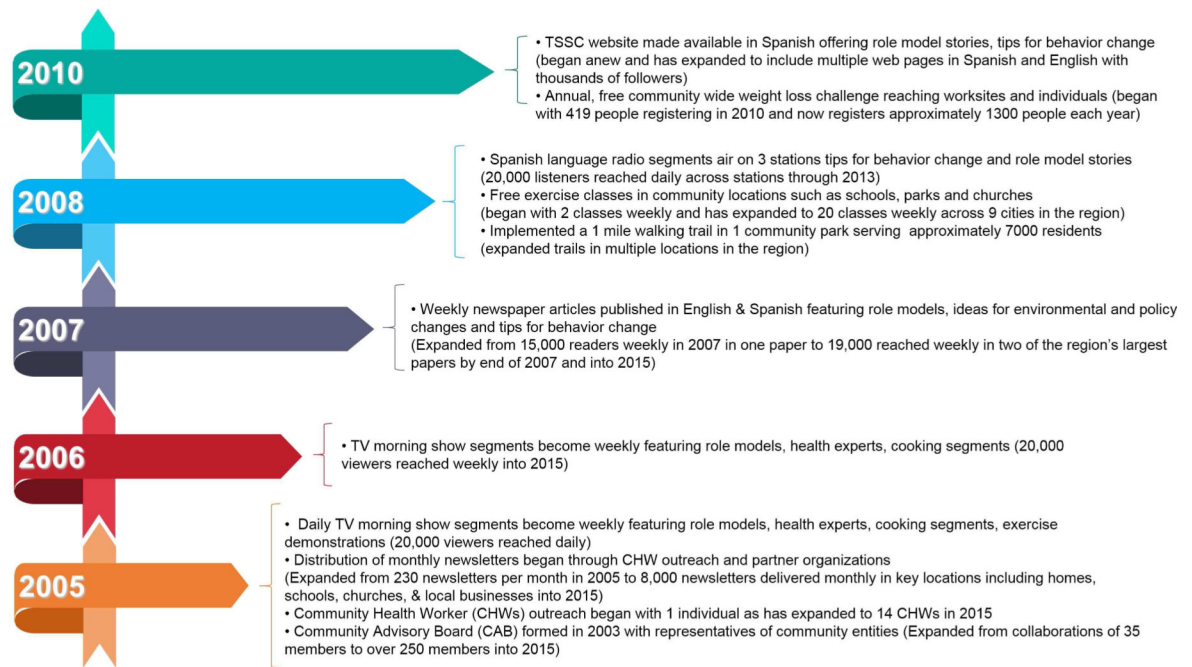


Figure 1.
Implementation timeline of selected components of the Tu Salud, ¡Sí Cuenta! (TSSC) Community-wide Campaign (CWC) during its first five years with brief description of future progress

Table 1

Summary of the behavior change techniques and theory constructs found in selected components of the *Tu Salud, ¡Sí Cuenta!* campaign.

Behavior Change Techniques/ Theoretical Link, Where Defined by Campaign	Media			Individually Focused Efforts		
	TV	Radio	News-letters	Risk Factor Screening	CHW Visits	Free Exercise Classes
Goals and Planning						
Goal setting (behavior) / SCT Self-regulation	✓		✓		✓	
Problem solving / TTM behavioral processes					✓	
Review behavioral goals / SCT Self-regulation					✓	
Feedback and Monitoring						
Feedback on behavior / SCT Self-efficacy and Self-regulation					✓	✓
Feedback on outcomes of behavior				✓		✓
Social Support						
Social Support (unspecified) / SCT Reinforcement and TTM Helping Relationships				✓	✓	✓
Social Support (emotional) / SCT Reinforcement and TTM Helping Relationships					✓	✓
Shaping Knowledge						
Instruction on how to perform a behavior / SCT Self-efficacy and Self-regulation	✓		✓		✓	✓
Natural Consequences						
Information about health consequences / TTM Consciousness raising	✓	✓	✓	✓	✓	✓
Saliency of consequences / TTM Consciousness raising and dramatic relief	✓		✓	✓	✓	
Information about social and environmental consequences TTM dramatic relief and environmental re-evaluation	✓	✓	✓		✓	
Anticipated regret / SCT observational learning	✓		✓			
Comparison of Behavior						
Demonstration of the behavior / SCT Self-efficacy and Self-regulation	✓		✓			
Social comparison / SCT observational learning	✓		✓			
Information about others' approval / SCT observational learning	✓		✓			
Associations						
Prompts / Cues / TTM Counter Conditioning, stimulus control and Reinforcement Management			✓	✓	✓	
Repetition and Substitution						

Behavior Change Techniques/ Theoretical Link, Where Defined by Campaign	Media			Individually Focused Efforts		
	TV	Radio	News-letters	Risk Factor Screening	CHW Visits	Free Exercise Classes
Behavioral practice / rehearsal / SCT Self-efficacy and Self-regulation						✓
Comparison of Outcomes						
Credible source	✓	✓	✓		✓	
Pros and cons / TTM Pros and Cons	✓	✓	✓			
Comparative imagining of the future / TTM Self re-evaluation	✓		✓		✓	
Reward and Threat						
Material incentive / SCT Reinforcement and TTM Reinforcement Management				✓	✓	✓
Social reward / SCT Reinforcement and TTM Reinforcement Management						✓
Antecedents						
Restructuring of the physical environment						✓
Restructuring of the social environment						✓
Identity						
Identification of self as role model	✓	✓	✓		✓	
Self-belief						
Verbal persuasion about capability /				✓	✓	✓
Focus on past success					✓	✓
Covert Learning						
Imaginary reward / SCT Observational learning	✓	✓	✓		✓	
Vicarious consequences / SCT Observational learning	✓	✓	✓		✓	

Note. Based on Behavioral Change Techniques by: Michie, S., Ashford, S., Sniehotta, F. F., Dombrowski, S. U., Bishop, A., & French, D. P. (2011). A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: the CALO-RE taxonomy. *Psychology & Health*, 26(11), 1479-1498.

Abbr. CHW=Community Health Worker. SCT=Social Cognitive Theory (Bandura, 1986). TTM=Transtheoretical Model (Prochaska, 1992).

Table 2

Summary of the demographic characteristics of participants from the Cameron County Hispanic cohort (2008 - 2012).

	CCHC, <i>n</i> (%) (<i>n</i> =1,438)	^a Met PA Guidelines, <i>n</i> (%)		^b <i>p</i> value	^c Portions of FV Mean (SD)	^d <i>p</i> value
		No (<i>n</i> =993) (69.73%)	Yes (<i>n</i> =431) (30.27%)			
Gender				0.0012		<0.0001
Male	464 (32.27)	293 (29.51)	166 (38.52)		2.31 (2.28)	
Female	974 (67.73)	700 (70.49)	265 (61.48)		2.85 (2.54)	
Age				<0.0001		0.0741
35 years	372 (25.87)	211 (21.25)	157 (36.43)		2.39 (2.29)	
36-48 years	369 (25.66)	266 (26.79)	102 (23.67)		2.72 (2.58)	
49-59 years	371 (25.80)	267 (26.89)	99 (22.97)		2.87 (2.44)	
60 years	326 (22.67)	249 (25.08)	73 (16.94)		2.75 (2.64)	
Marital status				0.0010		0.0933
Single/Never Married	224 (15.59)	132 (13.29)	91 (21.16)		2.39 (2.24)	
Married	920 (64.02)	645 (64.95)	267 (62.09)		2.67 (2.46)	
Divorced/Separated	184 (12.80)	130 (13.09)	49 (11.40)		3.01 (2.89)	
Widowed	109 (7.59)	86 (8.66)	23 (5.35)		2.78 (2.23)	
Educational Attainment				<0.0001		0.3720
8 years	509 (35.40)	392 (39.48)	112 (25.99)		2.58 (2.45)	
> 8 years	929 (64.60)	601 (60.52)	319 (74.01)		2.74 (2.49)	
Language^e				<0.0001		0.8736
Spanish	1098 (77.43)	799 (81.36)	287 (68.01)		2.70 (2.48)	
English	320 (22.175)	183 (18.64)	135 (31.99)		2.64 (2.49)	
Insurance				0.8361		0.7257
Insurance	458 (31.85)	320 (32.23)	136 (31.55)		2.72 (2.62)	
None	980 (68.15)	673 (67.77)	295 (68.45)		2.66 (2.41)	
Diabetes				0.0023		0.6809
Diabetes	368 (26.08)	280 (28.60)	86 (20.53)		2.64 (2.34)	
No Diabetes	1043 (73.92)	699 (71.40)	333 (79.47)		2.68 (2.51)	

Abbr. CCHC=Cameron County Hispanic Cohort. PA=Physical Activity. FV=Fruit and Vegetable.

Note.

^aParticipants met physical activity guidelines if engaged in at least 150 minutes of moderate and vigorous exercise in the past 7 days.

^bMixed logistic regression models.

^cNumber of portions (80 g each) of fruits and vegetables consumed daily.

^dMixed Poisson regression model.

^ePreferred language choice of participant.

Table 3

Adjusted odds ratios for physical activity guidelines by exposure to *Tu Salud, ¡Si Cuenta!* campaign components for full sample of English and Spanish speakers.

Exposure	TSSC, <i>n</i> (%) ^a (<i>n</i> =1,400)	^b Met PA Guidelines, <i>n</i> (%)		^c AOR (95% CI)	<i>p</i> value
		No (<i>n</i> =993) (71.65%)	Yes (<i>n</i> =393) (28.35%)		
Had ever read, seen, or heard any health messages from the TSSC campaign	514 (37.33)	346 (35.41)	166 (42.56)	1.70 (1.30,2.22)	0.0001
CHW Discussion	200 (14.71)	133 (13.78)	66 (17.14)	1.72 (1.22,2.44)	0.0023
Radio	75 (5.51)	43 (4.45)	31 (8.07)	2.32 (1.39,3.87)	0.0014
TV	233 (17.41)	159 (16.75)	74 (19.47)	1.51 (1.08,2.11)	0.0152
Newsletter	366 (26.93)	242 (25.08)	122 (31.77)	1.80 (1.35,2.40)	<0.0001
Web	16 (1.20)	10 (1.06)	6 (1.59)	2.04 (0.71,5.92)	0.1877
Radio and TV	37 (2.70)	26 (2.67)	11 (2.84)	1.47 (0.69,3.14)	0.3124
CHW Discussion and Radio	30 (2.18)	16 (1.64)	13 (3.34)	3.83 (1.28,6.21)	0.0099
CHW Discussion and TV	81 (5.90)	50 (5.13)	31 (7.99)	2.31 (1.41,3.79)	0.0010
CHW Discussion and Newsletter	185 (13.46)	123 (12.63)	61 (15.64)	1.73 (1.21,2.48)	0.0029
Newsletter and TV	147 (10.72)	97 (9.97)	50 (12.89)	1.75 (1.19,2.59)	0.0050
Newsletter and Radio	50 (3.64)	28 (2.87)	21 (5.43)	2.61 (1.41,4.83)	0.0024
Newsletter, TV, and Radio	24 (1.75)	18 (1.84)	6 (1.55)	1.32 (0.50,3.48)	0.5809
CHW Discussion, Newsletter, and TV	77 (5.59)	48 (4.91)	29 (7.44)	2.23 (1.34,3.70)	0.0021
CHW Discussion, Newsletter, and Radio	28 (2.03)	15 (1.54)	12 (3.08)	2.75 (1.21,6.24)	0.0156
CHW Discussion, Radio, and TV	17 (1.24)	11 (1.13)	6 (1.54)	2.23 (0.77,6.41)	0.1378
CHW Discussion, Radio, TV, and Newsletter	15 (1.09)	10 (1.02)	5 (1.28)	2.04 (0.65,6.41)	0.2194

Abbr. AOR= Adjusted Odds Ratio. CHW=Community Health Worker. CI=Confidence Interval. PA=Physical Activity. TV=Television. TSSC=Tu Salud, ¡Si Cuenta!.

Note.

^aSubjects (*n*=29) with >7680 total metabolic equivalent adjusted minutes were excluded.

^bPhysical activity guidelines were met if participants engaged in at least 150 minutes of moderate and vigorous exercise in the past week; *n*=1,386 total participants of which *n*=14 were excluded due to missing physical activity data.

^cAOR were calculated using mixed logistic regression models adjusted for marital status, age, years in school, language, gender, and diabetes.

Table 4

Adjusted relative rate for fruit and vegetable consumption by *Tu Salud, ¡Si Cuenta!* component, by English and Spanish speakers ($n=1481$)^a.

Exposure	Portion of FV, ^b Estimated Mean (SE)		^b ARR (95% CI)	p value
	Not exposed	Exposed		
Have ever read, seen, or heard any health messages from the TSSC campaign	2.26 (0.07)	2.38 (0.10)	1.05 (0.96,1.15)	0.2522
CHW Discussion	3.00 (0.07)	2.33 (0.14)	1.01 (0.89,1.15)	0.8479
Radio	2.27 (0.07)	2.70 (0.24)	1.19 (1.00,1.41)	0.0543
TV	2.26 (0.07)	2.42 (0.13)	1.07 (0.96,1.20)	0.2353
Newsletter	2.29 (0.07)	2.36 (0.11)	1.03 (0.94,1.14)	0.5091
Web	2.29 (0.07)	1.54 (0.36)	0.67 (0.42,1.07)	0.0925
Radio and TV	2.28 (0.07)	2.97 (0.36)	1.30 (1.02,1.66)	0.0338
CHW Discussion and Radio	2.29 (0.07)	2.64 (0.37)	1.15 (0.87,1.52)	0.3137
CHW Discussion and TV	2.30 (0.07)	2.33 (0.20)	1.01 (0.85,1.20)	0.9019
CHW Discussion and Newsletter	2.31 (0.07)	2.30 (0.15)	0.99 (0.88,1.13)	0.9308
Newsletter and TV	2.28 (0.07)	2.48 (0.16)	1.09 (0.95,1.24)	0.2067
Newsletter and Radio	2.30 (0.07)	2.47 (0.28)	1.08 (0.86,1.34)	0.5126
Newsletter, TV, and Radio	2.29 (0.06)	2.95 (0.45)	1.29 (0.95,1.74)	0.0983
CHW Discussion, Newsletter, and TV	2.31 (0.07)	2.22 (0.20)	0.96 (0.80,1.15)	0.6679
CHW Discussion, Newsletter, and Radio	2.30 (0.07)	2.59 (0.38)	1.13 (0.85,1.51)	0.4129
CHW Discussion, Radio, and TV	2.29 (0.06)	2.90 (0.51)	1.26 (0.89,1.79)	0.1898
CHW Discussion, Radio, TV, and Newsletter	2.30 (0.06)	2.83 (0.54)	1.23 (0.85,1.79)	0.2702

Abbr. ARR=Adjusted Relative Rate. CHW=Community health worker. CI=Confidence Interval. FV=Fruit and Vegetable. TSSC=Tu *Salud, ¡Si Cuenta!*.

Note.

^aSubjects ($n=12$) with >10 total portions of FV consumption were excluded.

^bARR were calculated using mixed Poisson regression models adjusted for age, years in school, and gender.