The Environmental Health/Home Safety Education Project: A Successful and Practical U.S.–Mexico Border Initiative

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The Environmental Health/Home Safety Education Project (Proyecto de Salud Ambiental y Seguridad en el Hogar) has been developed in response to a wide array of severe and often preventable environmental health issues occurring in and around homes on the U.S.–Mexico border. Utilizing well-trained community members, called promotoras*, homes are visited and assessed for potential environmental hazards, including home fire and food safety issues. Data analyzed from project years 2002 to 2005 shows a significant impact in knowledge levels and initial behavior change among targeted participants as it relates to fire and food safety issues. Since the initiation of the project in 1999, hundreds of participants have improved their quality of life by making their homes safer. The project has proven to be sustainable, replicable, flexible, and attractive to funders.*

Keywords: *home fire and food safety; U.S.–Mexico border health;* promotoras

Colonias, rural communities located along the U.S.–Mexico border, began to develop in the 1950s. They exist on unincorporated lands, and frequently the communities lack a combination of basic necessities such as running and drinkable water, sewer and drainage systems, electricity, safe and sanitary housing, and paved roads (U.S. Department of Housing and Urban Development [HUD], 2008b). Moreover, a sizeable amount of homes lack proper sanitation, causing debilitating effects on the environmental health of this border region (University of Texas Pan American, Community Outreach Partnership Center [COPC], n.d.). Individuals living in colonias have a yearly average income of $5,000, with many employed as farm workers. The majority of colonia residents are U.S. citizens (85%) and Hispanic (97%; HUD, 2008b).

Along the U.S.–Mexico border, there are more than 1,500 colonias, which are home to more than 500,000 people. For New Mexico, it is estimated that more than 40,000 individuals reside in more than 140 different colonias within the state (HUD, 2008a). The New Mexico colonias are largely concentrated between the El Paso, Texas, and Juarez, Mexico, metropolitan area and Las Cruces, New Mexico, along the 44-mile stretch of the Rio Grande valley (HUD, 2008a), the site of the intervention addressed in this article.

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BACKGROUND

Families living in colonias face a range of health issues. Two common issues are home fires and food safety, which will be elaborated on below.

Home Fire Safety Issues

Rural communities and their residents experience fire deaths at a rate twice that of individuals in urban settings. Issues inherent to much of rural America include a low population density and spatial distance between communities. Rural residents tend to live below the poverty level at a greater rate than do urban residents (14.2% to 12.1%, respectively). It is difficult for residents to obtain newer, safer products and safety devices, for example, smoke detectors. For rural residents, poverty is a stronger factor, in regards to fire risk, than is the rural nature of their living situations (U.S. Fire Administration [USFA], 2007).

Within the United States, the Western region has the second highest rate of rural fire deaths, with 28.2 deaths per 1 million, just below the South–Southeastern region at 29.0 per 1 million. The Northeast and the North–Central region of the nation trail these two regions, with 27.0 and 22.8 per 1 million, respectively, for rural fire deaths. Specifically for the West, this area has some unique subgroups to include Native American, migrant, and Mexican border communities, including colonias. These subgroups have distinct variations in their living situations, fire codes and enforcement issues, and community structure, for example, reservations, as compared to other rural areas in America (USFA, 2007).

Primary sources that cause fires in rural communities include heating equipment (36%), cooking (13%), and electrical distribution equipment (12%), for example, switches, receptacles, and outlets. Seventy-three percent of rural homes do not have functioning smoke detectors as compared to 65% of urban settings (USFA, 2007).

Housing in rural areas is frequently substandard. The use of manufactured housing is common, with 7% of houses in the West relying on manufactured housing, as compared to 12% in the South, 5% in the North–Central, and 3% in the Northeast portions of the nation (USFA, 2007). For this project, the *promotoras* estimate at least 75% of their participants live in manufactured housing.

For children as it relates to fires, U.S. children sustain scalds from hot bath water or liquid spills, and thermal injuries from house or trash fires. Mexican children sustain scald burns from large pots of hot liquids placed on the ground, flame injuries from gas tank explosions, fireworks or house fires, and electrical injuries from high-tension wires (Rosenberg et al., 2006).

Across the nation, a wide array of smoke detector giveaway programs has been conducted. Although providing the detector is good, the effectiveness of the actual installation and use of the detectors is not clear. In a five-state group (Arkansas, Maine, Maryland, Massachusetts, and North Carolina) involving both urban and rural areas, two methods were used to distribute smoke detectors: providing vouchers or direct installation. After a year, it was found that 89.8% of the houses in the direct instillation groups had working fire detectors compared with 65% in the voucher group (Harvey et al., 2004). Citing an intervention with American Indian families, Ludington (2000) reported on a program in which Indian Health Service engineering staff assessed homes and then proceeded to provide and install smoke detectors, among other safety equipment. With this effort, the prevalence of smoke detectors in homes rose from 58% to 96%.

Food Safety Issues

In the United States alone, there are more than 76 million cases of food-borne illness and more than 325,000 hospitalizations and 5,000 deaths annually (Mead et al., 1999). Key topics to be taught during a food safety education program should include personal hygiene, adequate cooking, avoiding cross contamination, keeping foods at safe temperatures, and avoiding foods that come from unsafe sources (Medeiros, Hillers, Kendall, & Mason, 2001).

A 9-year study of the U.S.–Mexico border region (1990-1999) found that there was excessive morbidity due to certain infectious diseases, such as food-borne botulism and shigellosis (Doyle & Bryan, 2000). Storing

foods at inappropriately warm temperatures is found to be more common in poorer homes and with people who do not live alone. A person's attitudes toward food safety are linked with socioeconomic and demographic status, culture, experience, and personal preferences (Wilcock, Pun, Khanona, & Aung, 2004).

A study of low-income residents in Tennessee assessed refrigerator conditions, cleanliness, and temperatures used to keep foods. As part of the study, information and a refrigerator thermometer were left with the residents at the conclusion of the first visit. After 3 months, about one third of the residents were reinterviewed, and it was found that most (77%) had kept the thermometer in their refrigerator and checked it regularly (Godwin, Thompson, Pearson, & Kinslow, 2006).

Project Development

The Southern Area Health Education Center (SoAHEC) Environmental Health/Home Safety Education Project started with astute observations, made by concerned public health professionals from the local border community and university, about a wide array of severe, yet often preventable, environmental health issues. A pilot project was initiated in 1999 through two Southwestern University centers: the SoAHEC and the Border Health Education Training Center. The purpose of the pilot project was to conduct in-home assessments using *promotoras* to identify potential environmental health and home safety hazards. At any given time, there were two or three *promotoras* working on the project, depending on funding levels. A variety of hazards were encountered, including unsafe storage of chemicals like pesticides, food preparation and safety issues, and potentially dangerous wiring. Once the hazards were identified, educational outreach was provided to participants about the specific safety hazards identified in their homes and how they could remedy some of the situations. At the visit, the *promotoras* provided participants with an incentive package that included a smoke detector, a fire extinguisher, a refrigerator thermometer, electrical safety caps, a first-aid kit, and cabinet safety latches.

METHOD

Priority Population and Recruitment

A total of 380 participants were targeted in the years 2002 to 2005 by the Environmental Health/Home Safety Project. The priority population was Hispanic and Latino women residing in the New Mexico portion of the U.S.–Mexico border region. Specific demographics were not collected to avoid resistance to this intervention by prospective participants. Almost all participants were economically disadvantaged and at least 90% lived in rural areas or colonias where educational, economical, and health care resources remain scarce.

The households or participants were recruited through community presentations conducted by the *promotoras*. In addition, new participants were referred by project participants from previous years through their social networks.

The Environmental Health/Home Safety Education Project is a health education intervention and was not designed as a research study. The data reported here were collected for project evaluation purposes only. The confidentiality of the evaluation data collected was maintained at all stages. The observed results of this intervention prompted the process of seeking review and approval from the New Mexico State University Institutional Review Board for project implementation and evaluation.

The project addresses injury prevention and environmental health, two priority areas identified in *Healthy Border 2010* (United States-Mexico Border Health Commission [USMBHC], 2003). *Healthy Border 2010* is a bilateral agenda for disease prevention and health promotion in the border region. Similar to *Healthy People 2010* (United States Department of Health and Human Services [USDHHS], 2000) for the United States, this document is U.S.–Mexico border region specific, providing baseline data for the year 2000 and identified 2010 targets.

Theoretical Basis of the Project

The Environmental Health/Home Safety Education Project was based on the Health Belief Model (Becker, 1974). This model suggests that increasing an individual's perception of the health risks may contribute to desirable behavior change. For this project, the model predicts that awareness and knowledge about the risks associated with environmental hazards in the home and health conditions related to these risks will lead to behaviors that improve the safety of the home environment. Specifically, it was postulated that education about actions necessary to decrease such threats to their health and safety would increase participants' ability to perceive the benefits of positive behavior. In addition, project planners reasoned that providing the skills and equipment to reduce the environmental hazards would be instrumental in initiating and maintaining positive behavior change. The self-efficacy of the participants, in relation to the desired behavior change, would be positively influenced by enabling them to understand the potential benefits of reducing some environmental health hazards and by empowering

them to implement behavior changes through the training provided by the *promotoras*. The combination of specific outreach (identifying home hazards in participants' own homes), education, and empowerment (providing tools and technology for change) was believed to be essential to program success.

The project planners of the Environmental Health/Home Safety Project acknowledge the influence of situational and environmental factors that could affect participants' behavior, independent of their knowledge level. For example, most of the participants targeted by this intervention have a low annual household income, which would inhibit their ability to buy smoke detectors, fire extinguishers, and other safety devices. The incentives that were provided were designed to aid participants in initiating behavior change. Providing education to encourage the use of the prevention strategies without equipping the participants with the means to acquire these items would have undermined the purpose of the intervention and would be unethical.

Promotoras *Assist in Addressing Environmental Health Issues*

Promotoras are community members who work primarily in community settings and represent the community's linguistic, cultural, educational, and economic characteristics (Witmer, 1995). The incorporation of *promotoras* in the Project was a logical step to ensure that participants would be comfortable with people entering their homes and be receptive to discussing matters that are considered private (Forster-Cox, Mangadu, Jacquez, & Corona, 2007). Through extensive literature reviews, the authors discovered that this is one of the pioneer, and few ongoing, promotora home-based, home-visit–oriented projects to focus exclusively on environmental health matters along the U.S.–Mexico border (Ramos, May, & Ramos, 2001; Tillett, 2005; U.S. Environmental Protection Agency [USEPA], 2000).

The Home Visits

Promotoras visited participants' homes two times. The first visit normally lasted 2 to 3 hours. During this time, the promotora would meet the participant and answer her questions. Participants' health and safety knowledge were measured using a brief survey with nine multiple-choice questions (pretest). *Promotoras* also visually assessed the home environment using a home safety checklist. Information from the checklist was used as a measure of participants' actual behaviors.

Also during the first visit, the *promotoras* distributed fire extinguishers, smoke alarms, and other incentives. *Promotoras* then instructed participants on how to install the smoke detectors and observed the participants carrying out the action. At the end of the first visit, a large magnet was placed on the refrigerator indicating which environmental health and home safety issues were to be addressed by the participant before the promotora's follow-up visit, as well as local emergency numbers.

After the first visit, *promotoras* completed a form, "Education Provided," identifying the specific education provided as it related to the checklist completed from the home assessment. For example, if the home checklist indicated that there was an issue with asthma and allergies in the home, the promotora would provide information on second-hand smoke, pets, and dust in the carpet. A mark was made on the Education Provided form indicating that such information was shared with the participant.

The second visit, which occurred at least 2 weeks after the first visit, lasted 1 to 1.5 hours. Participants were administered the same knowledge survey (posttest). A repeat of the home assessment was conducted and information recorded in a separate column of the original checklist. *Promotoras* determined how many of the recommended changes had been made by the participant since the first visit. In those cases where the recommended changes had not been made by the second visit, additional education and information was shared by the promotora with the participant about the particular hazard(s). The smoke detector, whether it was installed during the first visit or already present prior to the first home assessment, was examined to ensure that it was still functioning. An evaluation form and self-addressed stamped envelope were left with the participant. The form allowed the participant to evaluate the project, information received, assistance, and support provided. Once the completed evaluation was received by the project office, the participant received a certificate of completion in the mail.

The step-by-step home visit plan for the first and second visits, the forms to be completed (English and Spanish), and the incentives provided are included in the Environmental Health/Home Safety Tool Kit. The Tool Kit is available from the SoAHEC Web site at http://www.soahec-nm.org/documents/env%20health/Home_Safety_toolkit.pdf.

Data from the pre- and posttests and both home assessments from the years 2002-2003, 2003-2004, and 2004-2005 (n = 380) were analyzed separately (by year) and for the entire project period. Changes in knowledge were measured by comparing responses on the pre- and posttests and were analyzed using McNemar's test. Behavior changes were measured by comparing observations recorded in the first and second home checklist. Data were entered into a Microsoft Excel

TABLE 1
Participant Fire Safety and Food Safety Knowledge and Awareness Before and After the Intervention, 2002 to 2005 (*N* = 380)

		Correct Responses for Fire Safety			*Correct Responses for Food Safety*		
Year	*Test*	n	*%*	p[a]	n	*%*	p[a]
2002-2003	Pre (*n* = 204)	157	77	*ns*	130	64	<.0001
	Post (*n* = 204)	146	72		191	94	
2003-2004	Pre (*n* = 112)	73	65	<.0001	83	74	.0001
	Post (*n* = 112)	106	95		106	95	
2004-2005	Pre (*n* = 64)	41	64	<.0001	44	69	.0002
	Post (*n* = 64)	62	97		61	95	
2002-2005	Pre (*n* = 380)	271	71	*ns*	257	68	<.0001
	Post (*n* = 380)	314	83		358	94	

a. McNemar's statistic.

spreadsheet and were statistically analyzed using SPSS and Stata. A *p*-value threshold of .05 was used to determine significance.

RESULTS

The purpose of the health education intervention provided by the *promotoras* was to increase the participants' knowledge and behaviors related to environmental safety. Two survey questions were used to evaluate changes in knowledge related to fire safety and food safety: (1) What should you do to alert yourself of a fire? (a) Get rid of any fire extinguisher; (b) install a working smoke detector; (c) plan a fire escape plan; or (d) call the fire department. (2) To prevent a food-borne illness it is important to: (a) buy a new refrigerator; (b) fill the refrigerator with too much food; (c) leave the salsas uncovered on the table; or (d) never thaw meats at room temperature. For the first question, the correct response is (b), install a working smoke detector. For the second question, the correct answer is (d), never thaw meats at room temperature.

Knowledge and Behavior Changes Following the Health Education Intervention

Pre- and postintervention fire safety knowledge was measured on a yearly and cumulative basis for all project years (see Table 1). The percentage of participants who answered the fire safety question correctly increased significantly in two of the three project years. Although there was no change during the 1st year of the project, in the 2nd and 3rd years the percentage of participants responding correctly increased by more than 30 percentage points after the educational intervention. The cumulative change, incorporating data from all 3 project years, was 12 percentage points and was not statistically significant. Changes in knowledge regarding food safety were statistically significant for each project year, with the percentage of correct responses to the food safety question increasing by 26 percentage points from 2002 to 2005.

Analysis of data from the first and second home assessments for project years 2002 to 2005 showed an overall improvement in behavior change regarding fire and food safety. For each year of the project, the percentage of homes with functioning smoke detectors increased significantly after the intervention (Table 2). At the time of the second home assessment, 97% of all participants had smoke detectors that were installed and functional. Behavior pertaining to food safety also improved significantly each year. From 2002 to 2005, the percentage of participants who reported thawing meats at room temperature decreased from 64% to 4%.

DISCUSSION

The Environmental Health/Home Safety Education Project achieved its intended project outcomes in terms of increasing the knowledge about fire and food safety among project participants and initiating behavior change. The statistically significant increase in measures of knowledge and behavior regarding fire and food safety indicate the effectiveness of project process and implementation. It is disappointing to note that fire safety knowledge did not increase during the 1st year of the project, but the significant increases during the

TABLE 2
Participant Fire Safety and Food Safety Behaviors Before and After the Intervention, 2002 to 2005 (*N* = 380)

		Homes With Installed and Functioning Smoke Detectors			*Homes Where Meats Are Thawed at Room Temperature*		
Year	*Home Assessment*	n	%	p[a]	n	%	p[a]
2002-2003	1st (*n* = 204)	58	28	<.0001	122	60	<.0001
	2nd (*n* = 204)	201	98		11	5	
2003-2004	1st (*n* = 112)	29	26	<.0001	71	63	<.0001
	2nd (*n* = 112)	104	93		3	3	
2004-2005	1st (*n* = 64)	5	8	<.0001	50	78	<.0001
	2nd (*n* = 64)	64	100		1	2	
2002-2005	1st (*n* = 380)	92	24	<.0001	243	64	<.0001
	2nd (*n* = 380)	369	97		15	4	

a. McNemar's statistic.

final 2 project years suggests that this part of our intervention became more effective over time. The question about fire safety knowledge was not well designed in the 1st year, causing confusion among some participants as to which was the correct response; the response choices were clarified in Year 2.

The project was initially conceived as an intervention rather than a research project. For that reason, no control group was used, and the relationship between the program and measured outcomes may not be causal. However, it makes intuitive sense that an intervention that both educates and provides the tools and technology for behavior change would lead to the results observed. The results of this study are thus a first step toward demonstrating the utility of home-based safety interventions. Evidence for the utility of this intervention would be enhanced by future research involving a control group.

The positive relationship between the intervention and the behavioral changes, as well as comments made by participants, provides support for the Health Belief Model. Several participants indicated that they did not have prior knowledge about the use or installation of smoke detectors and felt empowered to learn that they could install and maintain the devices themselves. The educational intervention provided by the *promotoras* allowed participants to learn how to prevent or reduce the risk of an adverse outcome (in this example, home fires), obtain skills to install a smoke detector, and speak of their comfort level in maintaining the smoke detector.

Various limitations to the intervention should be noted. The reported knowledge and behavior changes were based on responses to only four questions and measure only two elements of home safety. As indicated above, there was no control group involved in the study, and improvements in knowledge and behavior cannot unequivocally be attributed to the intervention. Finally, because participants were similar to one another with respect to geography, ethnicity, and socioeconomic status, these results may not be generalizable to other communities.

CONCLUSION

The need for environmental health and home safety information, specifically as it relates to fire and food safety for participants residing along the U.S.–Mexico border, is significant. The Environmental Health/Home Safety Education Project uses well-trained individuals, who represent the community's linguistic, cultural, educational, and economic characteristics. As the *promotoras* enter homes, assess potential environmental hazards, and provide support and assistance in the resolution of many of the identified hazards, a large number of participants made their homes safer. Using the Environmental Health/Home Safety Tool Kit, which was developed as a result of the project, other border, tribal, and rural communities can create similar projects to assist participants in addressing their own array of environmental health/home safety issues in culturally appropriate and sensitive manners.

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