MedlinePlus and the challenge of low health literacy: findings from the *Colonias* project*

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Objective: To explore the potential of a community-based health information outreach project to overcome problems associated with health literacy in low-income Hispanic communities along the Texas-Mexico border.

Methods: Using a train-the-trainer approach, community outreach workers known as *promotoras* were trained by a health information outreach team to search English and Spanish versions of MedlinePlus. These 15 *promotoras* submitted written examples on a weekly basis of the topics they helped residents explore on MedlinePlus and the ways in which the residents used the information. These weekly reports, along with verbal interviews with *promotoras* and others in the communities, allowed development of a database of 161 incidents (''stories'') demonstrating how community residents

used MedlinePlus. These stories were thematically analyzed to explore how the program benefited participants.

Results: The database of stories included examples of community residents becoming better informed about their illnesses, resolving to visit doctors, making decisions about recommended treatments, reducing their anxiety about health conditions, committing to healthy or preventive behavior, and assisting family members.

Conclusion: With the help of paraprofessionals like *promotoras*, community-based health information outreach projects may improve the ability of community residents to understand their health conditions and to participate actively in their health care.

INTRODUCTION

The National Library of Medicine bibliography on health literacy defines this concept as an individual's capacity ''to obtain, process, and understand basic health information and services needed to make appropriate health decisions'' [1]. The relationship of health literacy to a variety of health outcomes has been well documented, with thorough literature reviews presented in publications by organizations such as the Council on Scientific Affairs for the American Medical Association [2], the Agency for Healthcare Research and Quality [3], and the Institute of Medicine [4]. Such reports present extensive evidence that poor health literacy affects a number of health outcomes, including use of services, risk of hospitalization, health screening, knowledge of one's disease, and ability to manage chronic illnesses like hypertension and diabetes.

The identification of health literacy as a priority by organizations like the Institute of Medicine [5], the National Library of Medicine (NLM) [6], and the US Health and Human Service Department's Healthy People 2010 [7] underscores the growing recognition of the importance of increasing patients' health literacy to improve the quality of health care and fight health disparities.

Many proposed methods for dealing with low health literacy are targeted toward health-care provid-

Highlights

- *Promotoras*, community social service assistants trained to help residents of medically underserved Hispanic neighborhoods access health and social services, were trained to find quality online health information for community residents.
- *Promotoras* reported using online resources (primarily MedlinePlus en español) weekly to help residents with health concerns.
- *Promotoras* reported that residents used MedlinePlus to understand health conditions, relieve anxiety, and make decisions about or manage their health (such as deciding when to seek treatment or how to take medications).

Implications

- Community-based health information outreach using *promotoras* has considerable potential to raise health literacy levels in vulnerable populations.
- *Promotoras* and other types of paraprofessionals can be effective partners for health science librarians conducting outreach to medically underserved communities.
- Health science librarians can contribute toward the development of community health workers' core competencies by training them in the use of online consumer health databases.

ers and institutions. Some solutions emphasize the need to develop patient materials written at varied reading levels and in different languages for health providers to distribute [8]. Others emphasize developing practitioners' skills in assessing patients' health literacy levels and developing effective communication strategies for patients at different levels of understanding [9, 10].

The expectation that health-care professionals alone can resolve the issues stemming from poor health literacy is unrealistic. As Parker points out, problems of low health literacy are compounded by a health-care system in which "health practitioners and health care system providers expect patients to assume more responsibility for self-care at a time when the health system is increasingly fragmented, complex, specialized and technologically sophisticated" [9]. She also notes barriers that may prove particularly difficult for practitioners to overcome, such as busy practice settings and the shame individuals feel about their lack of understanding.

Efforts also should be made toward raising levels of health literacy among patients. Coaching may be an important factor in developing health literacy levels. One study examined a community-based approach in which Head Start parents were trained to assess the level of severity of their children's illnesses and decide whether emergency room visits were necessary [11]. In this project, parents who received coaching in how to assess common childhood illnesses said they were more likely to consult health materials before contacting a physician and were less likely to call 911, go to an emergency room, or see a doctor for mild problems than were parents who received written material without coaching. The findings suggest that the most successful information outreach programs aimed at building awareness of health resources will also teach individuals to apply health information.

If coaching is an important strategy for improving health literacy, health information outreach strategies may need to extend beyond clinics and doctors' offices into community-based organizations (CBOs) with health education as part of their missions. In fact, the NLM's Strategic Plan for Addressing Health Disparities 2004–2008 [6] identifies CBOs as important partners in helping individuals overcome problems of health literacy by teaching them to use technology, navigate consumer health web sites, and apply health information to their own health care.

PROJECT OVERVIEW

The *Colonias* Project was an 18-month outreach project with the goal of increasing usage of MedlinePlus and MedlinePlus en español in low-income, medically underserved Hispanic communities (*colonias*) along the Texas-Mexico border, where residents primarily speak Spanish. Language was one reason that *colonias* populations were targeted. In a study of functional health literacy, 61% of Spanish-speaking patients, compared to one-third of English-speaking patients, had inade-

quate or marginal health literacy [12]. Another survey showed that many Hispanic patients received less routine health testing and monitoring than blacks, whites, and Asians—but Hispanics with higher levels of health literacy used more health services [13].

Language barriers were not the only reason that *colonias* populations seemed in need of health information outreach. *Colonia* literally translates to "neighborhood," but in South Texas, the term refers to specific residential developments created in the late 1960s and early 1970s, when Texas landowners sold land inexpensively to mostly Mexican immigrants, with no plans to provide services like electricity or water and sewer. There are more than 1,800 such communities along the Texas-Mexico border, and many still struggle to get basic services and resources that most other US residents take for granted. Some of the lowest levels of income, educational attainment, and access to health care are found in these border communities [14].

The Project used a train-the-trainer approach, in which paraprofessional outreach workers who were residents of the community were trained to use both the English and Spanish versions of MedlinePlus. They, in turn, coached other residents to use the resource. The program was based on empowerment models of health promotion [15], with a focus on increasing the capacity of community-based organizations to assist community residents in accessing and using online consumer health resources.

The University of Texas Health Science Center at San Antonio (UTHSCSA) Library partnered with the Texas A&M University Center for Housing and Urban Development (TAMU-CHUD), which has supported considerable community development in *colonias* all along the Texas-Mexico border. TAMU-CHUD trains and manages a group of community outreach workers, called *promotoras,* who are also residents of the *colonias* they serve [16]. (The feminine version of *promotores* is used throughout this paper because, although there were males working as *promotores* with TAMU-CHUD, only the *promotoras* had sustained contact with the outreach librarians and provided evaluation data to the project.) These community workers are extremely effective liaisons between the residents and various community agencies because they are readily accepted and trusted. The *promotoras* were based in *colonia* community centers but went into the communities to promote services and assist residents in accessing community services such as food stamps, GED classes, and healthcare services. Because of the role of *promotoras* in the communities, residents often asked them to find health information.

Using a pilot program from a previous UTHSCSA Library and TAMU-CHUD health information outreach project [14] as the blueprint, the project team conducted health information outreach in three regions along the Texas-Mexico border. Table 1 describes the activities of the *Colonias* Project conducted in the three TAMU-CHUD *Colonias* Project regions: the Lower, Mid, and West Rio Grande Valley regions. Strategies in the three areas varied in intensity, based on the

Table 1
Project overview

	The *Colonias* Project
Goal	• Increasing usage of MedlinePlus and MedlinePlus en español in low income communities along the Texas-Mexico border called *colonias*
Project Partners	• University of Texas Health Science Center at San Antonio Libraries (Briscoe and Regional Academic Health Center branches), Texas A&M University Center for Housing and Urban Development (TAMU-CHUD) *Colonias* Project, National Library of Medicine
Geographic locations of outreach activities	• Activities were conducted in Texas along the Texas-Mexico border. TAMU-CHUD had regional offices in the Weslaco (Lower Rio Grande Valley), Laredo (Mid-Rio Grande Valley) and West Rio Grande Valley (El Paso). In the project, investigators referred to these areas as South Texas, Laredo area, and El Paso area respectively.
Outreach team	• Four librarians: Two from the RAHC campus and two from the San Antonio campus (Two were fluent in Spanish and English) • Evaluation specialist from the San Antonio campus
Services provided in Lower Rio Grande Valley area	• Initial demonstrations to *promotoras*, TAMU-CHUD *promotora* coordinators, and community center directors • Presentations to large and small groups at community center functions • Attendance at health fairs • Community center volunteer training • Training provided to *promotoras* from three participating community centers. Most participated in group training sessions at the Regional Academic Health Center Library, which included *promotoras* from other organizations • Eighteen-month follow-up with seven *promotoras* from participating community centers, which included site visits for one-to-one training and demonstrations upon request of the *promotoras* or community center staff
Services provided to Mid Rio Grande Valley Region (Laredo Area)	• Demonstration of MedlinePlus and MedlinePlus *en español* to *promotoras* and their coordinators, community center directors and volunteers, and community residents • Training session at an English as Second Language class at the TAMU-CHUD administrative office • Visits to three community centers served by TAMU-CHUD in the Laredo area. MedlinePlus was demonstrated to *promotoras* and community members (Demonstrations were given at community centers if they had Internet access or were planning to get it during the contract period) • Half-day training to eight *promotoras* at the UTHSCSA Laredo Extension Campus's technology lab • Half-day follow-up training session several weeks after the first training session to allow *promotoras* to access health information for residents and get further assistance from health science librarians
Services provided to West Rio Grande Valley Region (El Paso area)	Demonstrations of MedlinePlus and MedlinePlus en español to: • Staff from the TAMU-CHUD West Rio Grande Valley Region • Community center staff, *promotoras*, and residents at three *colonia* community centers • Staff members of the Texas Commission on Alcohol and Drug Abuse Prevention Resources Center • Librarians from the Rio Grande campus of the El Paso Community College, which has a *promotora* certification program and had just built a new health sciences building with a community clinic
Number of documented contacts	• Lower Rio Grande Valley: 321 • Mid-Rio Grande Valley:71 • West Rio Grande Valley:16

proximity of each region to the Regional Academic Health Center (RAHC), where the outreach team was based, and the level of Internet services available to the communities in each region. The RAHC is located in the Lower Rio Grande Valley, so community centers in that region received the highest amount of contact with the outreach team. In this area, the intervention plan was flexible, allowing outreach librarians to respond to requests from *promotoras* for training and outreach.

Promotoras received several hours of initial training, then a librarian on the team would, at their request, join in community events such as health fairs or public health presentations. The outreach librarians also worked periodically with community center volunteers and others in the community who had strong community organizing skills and a commitment to helping their neighbors. Outreach librarians used the phrase *chispita* (''sparkler'') to describe these people.

METHODS

The UTHSCSA and TAMU-CHUD team employed several evaluation methods to continuously improve the *Colonias* Project and assess its outcomes. One of these methods focused on collecting exploratory information about how community residents used information from MedlinePlus specifically to understand health information and how they applied the information in decision-making, disease prevention, and management of their health. Therefore, the current work reports findings from the outcomes evaluation data answering two specific questions:

■ Did the health information outreach project improve community residents' access to health information and their ability to understand their health conditions?
■ If so, how did residents use tools like MedlinePlus to enhance their ability to manage their health and illnesses?

To answer these questions, a database was compiled of ''stories'' collected throughout the project (Appendix 1). These stories were brief descriptions of incidents reported to the outreach team about residents accessing MedlinePlus and their use of the information. The stories were collected through three methods. First, the team's evaluation specialist observed training sessions at the beginning of the project and recorded any incidents in which community residents or *promotoras* discussed MedlinePlus information and how they planned to use the information. Second, the *promotoras* at the participating community centers in the Lower Rio Grande Valley agreed to submit up to

two written accounts per week for several months of situations in which they helped residents get online health information or retrieved information for residents. Because *promotoras* had ongoing relationships with community residents, the *promotoras* often could report the outcomes of these incidents. In order to simplify data collection for the busy *promotoras,* no guidelines were given specifying type of stories to report: *promotoras* were just asked to choose two stories and report them. They also identified gender and age group (youth, teen, adult, elder) of the person in the story.

Finally, the evaluation specialist for the project made site visits to the three community centers in the Lower Rio Grande Valley midway through the project to interview *promotoras,* recording additional stories that arose from those interviews. One final site visit at the end of the project was made to the only center that still had an active *promotoras* program and Internet connection; the other centers had neither at the end of the project due to funding issues.

While many of the *promotoras* spoke Spanish as their primary language, TAMU-CHUD program coordinators asked that reporting sheets be written in English to develop *promotoras'* language skills; their other reporting forms were also in English. The majority of accounts were written in English. Those written in Spanish were translated by one of the RAHC outreach librarians who was fluent in the language.

The *promotoras* were the source for 92% of the stories, while residents, community center staff, and volunteers provided the other 8% of the stories. Of the accounts collected from *promotoras,* 84% were written accounts and 16% were told in face-to-face encounters. The majority of stories came from the Lower Rio Grande Valley communities (94%) while 6% were provided by *promotoras* from the Laredo *colonias* at their second training session. Most of the reports were submitted by *promotoras* who had been trained by the outreach team during this project. However, approximately 16% of the reports were submitted by *promotoras* hired in the final months of the project who had not received training from the team librarians. They were taught to use the resources by a community volunteer who had received training from the outreach team.

To analyze the data, stories were thematically coded using procedures described in a number of qualitative methods resources [17–19]. The data were analyzed by two members of the outreach team: the librarian who directed the outreach project and the evaluation specialist who collected and compiled the data. The decision to use two coders was based on Patton's recommendation that multiple reviewers work independently and then discuss findings (both agreements and disagreements) to produce a more balanced, less biased analysis [17].

Each coder read through all the stories and independently developed categories of outcomes, defined as ways in which individuals were affected by using MedlinePlus. The pair coded approximately twelve cases, refined the coding scheme, coded twenty-four cases, and refined the scheme again. Finally, each independently coded all stories with eight agreed-upon outcomes categories. When appropriate, stories were categorized under more than one code. Any coding discrepancies were discussed until agreement was reached as to the consensus codes for each story.

Stories were then arranged by code, read by both coders, and discussed in order to develop full descriptions of the categories of MedlinePlus usage. In the process of developing the descriptions, the coders collapsed two categories so that the thematic structure was defined by the six themes described in Table 2. Trustworthiness of the category structure was validated using expert review [17]: the outreach librarians who worked most with the *promotoras* read through the descriptions in Table 2 and verified that the six categories captured the nature of their assistance with *promotoras* and residents at the community centers.

A validity check of the analysis was conducted through the final community center site visit, which was scheduled ten months after most of the stories had been collected and coded. Due to staff turnover, none of the five *promotoras* at this meeting had received direct training on MedlinePlus from the outreach team. They had, however, been trained by a volunteer computer instructor and reported using MedlinePlus approximately three times per week in helping residents. Along with the nineteen written stories they had submitted to the database, they provided six more stories in a group interview conducted at the final site visit. These twenty-five stories were considered a second wave of data collection. The two coders compared the new stories against the themes derived from the *promotoras'* stories to see if they could be categorized using the existing thematic structure. Each story fit into the categories developed for the first set of stories; most qualitative researchers consider redundancy a signal to stop collecting data. The coders concurred that the first wave of findings had been corroborated by the last twenty-five cases, indicating thoroughness and accuracy of the thematic structure.

RESULTS

Sample

Outcomes were identified in 157 stories (98%). Four stories, all reported in writing by *promotoras,* had no discernable outcomes and therefore were not coded. The majority of stories in the database involved female residents (76%), probably because the health-care responsibilities of *colonia* families generally fall to women. A small percentage (19.5%) involved males (no gender was identified for 4.5% of stories). Most stories involved residents identified as adults (67%), with 17% identified as seniors, 4% as teens, and 4% as youth.

Themes

The usage level by *promotoras* and residents provided evidence that there was considerable interest in MedlinePlus in the outreach communities for this proj-

Table 2
Categories of MedlinePlus usage among *Colonia* residents

The following six themes of MedlinePlus usage emerged from the thematic analysis of the stories database.

1. **Became more informed about a disease, condition, diagnosis, treatment, or healthy behavior**
   - Investigate underlying health problems for symptoms they are experiencing
   - Gain basic parenting information (e.g., performing CPR on children)
   - Develop visual images of anatomy affected by health conditions
   - Learn more about prescription drugs (e.g., side effects; instructions for when and how to take the drug)
   - Learn early signs of diseases (often due to family history)
   - Understand many aspects of complicated illnesses like cancer (such as treatment choices, treatment side effects, support groups, prognosis)
   - Reduce anxiety about a diagnosis or pending medical procedure
2. **Use MedlinePlus to gain more control over interactions with health care providers**
   - Learn about treatments for certain conditions so they can ask their physician about it
   - Research the seriousness of their illness and consequences of not treating an illness
   - Look up symptoms and conditions to prepare questions for upcoming doctor's appointments
   - Learn what symptoms of their health conditions are serious enough to require consultation with a physician or immediate treatment
   - Learn ways to manage their health conditions (e.g., hypertension, diabetes) to avoid extra doctor visits
   - Verify that the physician has not made an error (specifically in drug prescriptions)
   - Check for inconsistencies between a doctor's diagnosis and information from MedlinePlus to decide if a second opinion is needed
3. **Make decisions about treatment options**
   - Check for the availability and efficacy of over-the-counter medications
   - Investigate safety and side effects when considering whether to take a medication
   - Research to decide whether to get a recommended surgery
4. **Make (or intend to make) lifestyle changes**
   - Change behavior to prevent or manage health conditions (e.g., change diet to prevent hives or improve cholesterol)
   - Learn safety behaviors (such as safe food preparation)
   - Adopt behaviors to avoid problems common to their health conditions (such as telling dentists about heart conditions)
5. **Help a family member or friend**
   - Research ways to take care of children (general health like dental care; treatments for acute conditions like head lice; management of chronic conditions like diabetes)
   - Find information to better understand what a friend or family member is experiencing with a health condition
   - Educate family members about the individual's illness so they can avoid getting the same condition
6. **Use MedlinePlus to support a job responsibility**
   - Assist community residents in locating health information for their health concerns (*promotoras*)
   - Investigate MedlinePlus to promote among clients or patients

ect. Most *promotoras* reported using MedlinePlus two or three times a week to assist residents with health-care concerns.

Table 2 summarizes the six themes that emerged from the analysis of the collected stories. General comments on frequency and examples for each theme are provided in the narrative below.

Residents used MedlinePlus to become more informed about a disease, condition, diagnosis, treatment, or healthy behavior. The majority of stories usually involved residents using MedlinePlus to gain an understanding of a health issue affecting them or family members. In some stories, particularly those collected from training sessions, they appeared to be browsing different illnesses as a way to explore MedlinePlus. In other instances, participants attended a presentation at the community center, then used MedlinePlus immediately afterwards to gather more information about the topic.

Some people used MedlinePlus to investigate symptoms as a way to diagnose the underlying health condition. For instance, one woman used it to figure out if her headaches were caused by migraines or eye problems.

Sometimes parents were trying to gain basic knowledge about caring for children or grandchildren, such as information about childhood obesity. Some parents looked for information about acute childhood illnesses like chicken pox or about good health behavior like guidelines for dental care.

Prescription drug information was a popular topic.

Residents often sought information about how to take their medications (e.g., with or without food) and potential side effects. In one instance, a community resident learned for the first time that medications had side effects.

Some residents wanted to learn the early signs of health problems like cancer. Often these residents had a family member with that condition and were concerned about being predisposed to the illness through heredity. Other residents had catastrophic conditions and wanted to understand more about their illnesses. For instance, one woman with cancer used MedlinePlus to read about how the illness affected her, treatments available to her, and how to take care of herself. One elderly male thought there was no treatment for prostate cancer until a *promotora* found information for him on MedlinePlus.

At site visits and particularly at trainings, *promotoras* and residents often mentioned that the graphics in MedlinePlus were very important in helping people understand their health conditions. In one case, a woman's ability to see anatomically what might be occurring in her body seemed to help her commit to having a lump in her breast examined.

A number of people found that becoming informed about an illness or upcoming procedure helped them cope with anxiety. Sometimes all they needed to reduce anxiety was information in their primary language. One resident had had no information about diabetes in Spanish until a *promotora* helped her with MedlinePlus; her anxiety was greatly decreased once she learned her disease was manageable. Some people

looked up information on pending health procedures, such as the case of a woman scheduled for a pulmonary artery test. Residents found resources for coping, such as the case of a woman with kidney failure who was facing dialysis and learned about support available to her.

Sometimes residents realized their illnesses were not as serious as they had thought or that their illnesses were treatable. For instance, one woman was afraid to ask her physician questions about a diagnosis of high cholesterol. Her research on MedlinePlus indicated that cholesterol problems varied in terms of severity. She said she finally ''had the courage'' to ask questions about the condition and learned her cholesterol levels were borderline.

Use of MedlinePlus helped individuals develop more control of their interactions with their healthcare providers. The database included examples of ways in which individuals used MedlinePlus to make decisions about seeing physicians. For instance, research on MedlinePlus led some residents to follow up with their physicians because the information they found underscored the seriousness of an illness or symptom. Sometimes residents discovered their conditions were less serious than they had thought; however, in most accounts, they said their research made them realize that their disease was more serious or persuaded them to take their condition more seriously and consult a doctor sooner than they would have without the information. For instance, a resident with excessive potassium in his urine was convinced from MedlinePlus materials that he needed to see a doctor. This visit led to a hospital admission by his doctor for this potentially serious condition.

A number of residents researched their health conditions in preparation for seeing their doctor. In fact, in one of the community centers with a senior citizen lunch program, a *promotora* often went through MedlinePlus with older residents and helped them write down questions for upcoming appointments. At another center, a *promotora* helped a woman with diabetes research over-the-counter (OTC) eye drops and learn they were problematic for people with her condition. She talked with her doctor, who confirmed that she should avoid OTC drops and gave her a prescription.

People also learned how to avoid complications related to their health conditions. In one case, a resident learned the symptoms of dangerously high blood pressure (headache and nausea) and that he needed to get immediate attention when these symptoms occur. Some diabetes patients realized they needed to buy properly fitting shoes and get regular dental checkups to avoid health problems.

Finally, some residents used MedlinePlus to verify what their doctors told them. In one case, a woman did not trust information she got from a doctor, so she read about her condition on MedlinePlus, found discrepancies, and decided to get a second opinion. In another case, one woman always checked her prescrip-

tions to make sure they treated the condition for which they were prescribed, because she had heard of incidents of busy doctors making mistakes such as not checking for patients' drug allergies.

Residents sometimes used MedlinePlus information to make decisions about a treatment option. In some instances, people used MedlinePlus to find nonprescription treatments for illnesses. Some lacked health insurance and wanted to avoid unnecessary doctor's visits. Others looked for methods to temporarily control painful conditions, specifically carpal tunnel syndrome or varicose veins, while *promotoras* sought resources to get them much-needed surgery.

In other cases, residents made decisions about taking treatments. Some looked up drug safety and side effects specifically to decide whether or not to take a prescription or an OTC drug. In other accounts, people used MedlinePlus information to make decisions about getting or foregoing surgery.

Residents made lifestyle changes or intended to make changes as a result of researching on MedlinePlus. The stories in this category showed that residents used MedlinePlus to learn how to live healthier, safer lives. While the outreach team cannot verify that any behavior changes actually occurred with the residents, the stories showed that some residents understood their role in managing their health and used MedlinePlus to help them learn to live healthier lives.

The majority of stories focused on eating behavior. Often the motivation was weight control, but other examples included managing health conditions like diabetes and hypertension, controlling conditions like rashes and gas, and supplementing nutrition. For instance, a man found and followed dietary guidelines for patients like him who were undergoing dialysis.

The second most frequent behavior change involved safety. In some cases, parents learned safety behavior related to families, such as locking away poisons or preventing food contamination. Finally, in some cases, people learned important management behaviors for chronic conditions, like telling dentists about heart conditions and carrying a bacterial endocarditis card.

Residents researched illnesses to help or understand the conditions of family members or friends. Most stories in this category involved parents and grandparents retrieving information to care for children. However, there were a few incidents in which people looked for information to understand a family member's experience with an illness, like a son trying to understand his mother's osteoporosis or a mother trying to comprehend her son's depression. In at least two cases, a resident got information about treatment for a relative who was convinced a health condition was untreatable. In one of those cases, a family intervention convinced the relative to seek what might have been life-saving treatment.

Residents used MedlinePlus to support their professional or community leadership responsibilities. Obviously, *promotoras* relied heavily on MedlinePlus for meeting their responsibilities to the community, such as printing out information for residents, using it to give presentations at the community centers, or just introducing a new resident to some of the resources at the community center. However, other professionals and community leaders also learned to use MedlinePlus to help their communities. In one instance, the coordinator of a local adult center sought MedlinePlus training so he could use the resource with the elders at his facility. In another instance, a woman introduced other members of her church to MedlinePlus. Finally, there was a story of a *chispita,* a wheelchair-bound man who had frequent visitors from the community; this man reported that he often used his own computer to research health information for visitors.

DISCUSSION

The *Colonias* Project demonstrated the potential for community-based health information outreach strategies in countering problems associated with low health literacy. The stories reported in this study demonstrated great variability in the impact of the project, with outcomes as simple as people finding treatments for hair loss to as dramatic as individuals seeking treatment for life-threatening conditions.

This evaluation research was exploratory and has limitations. For instance, the examples of MedlinePlus usage were not collected through random sampling methods, so the findings cannot be generalized to the *colonia* resident population or to the larger Hispanic population. Also, many of these outcomes are self-reported, representing what residents said they did or intended to do as a result of getting health information from MedlinePlus. Therefore, it cannot be verified that residents followed through with their intentions. Also, most stories were second-hand accounts from *promotoras* and others in the community, so the stories may have some bias or may be affected by the recorder's level of reporting skill. This project also did not assess the extent to which residents understood the information provided and how much help they required from the *promotoras* in comprehending the written information provided.

Nonetheless, the outcomes evaluation showed that when health librarians trained *promotoras* to use MedlinePlus, the *promotoras* were effective in increasing the use of the resource within the communities. In contrast to fragmented health-care practices described by Parker [9], the *promotoras* provided a source of assistance that was consistently available to residents. Residents' relationships with *promotoras* may have provided a continuity that they would not have found in the busy clinics. Group and individual interviews with *promotoras* and others indicated that *promotoras* appeared to be building the capacity of individual residents to research their own health concerns. In addi-

tion to promoting the resource within the neighborhoods, *promotoras* also assisted residents with use of computer technology and reported that many community members could learn to use MedlinePlus on their own after two or three search sessions.

The final interviews for this project underscored the importance of *promotoras* in this outreach effort. By the end of the project, two of the three South Texas community centers in the project had lost funding for their *promotoras.* Three key informants (the coordinator of the *promotoras* at those two sites, a former *promotora* who still lived in the *colonia,* and a *chispita* in one of the *colonias*) all verified that community center activity involving MedlinePlus stopped when the *promotoras'* work ended. However, at the community center that maintained its program, the *promotoras* said they continued to help residents locate information in MedlinePlus.

Many of the *promotoras* who worked with the team had moved on to other jobs by the end of the eighteen months. Since the completion of this project, Texas A&M has restructured their *colonias* program and many of the TAMU-CHUD staff members left their positions. Therefore, the *Colonias* Project outreach team has been unable to maintain contact with the *promotoras* to know if they are persisting in their use of MedlinePlus. The team knows of one *promotora* who, after she left her position, did come to the community center to find health information on MedlinePlus regarding a family member's illness.

The findings from this project suggest that *promotoras* and other types of health and social service assistants like lay health advisers and community health workers (CHWs) can be important partners to health science librarians involved in consumer health information outreach to medically underserved and vulnerable populations. CHWs are one of the fastest growing professions in the US [20], and they seem particularly helpful in improving health-care access for vulnerable and medically underserved groups. A literature review presents a number of studies showing that CHWs have a positive influence over patients' knowledge, health behaviors, and access to care, particularly screening and follow-up care [21]. Two randomized-controlled studies showed that multiple contacts from CHWs improved patients' use of health services [22] and led to better health management of asthma [23]. Findings from this project suggest another potential outcome of CHW programs: increased health literacy among residents in their communities.

Many of the studies cited above had very prescribed roles for *promotoras,* such as outreach to women for screening and annual checkups, which might limit their potential in helping to raise the level of health literacy in their communities. However, a recognition of the complexity of the CHW role is emerging, as demonstrated by findings from a national survey examining the work roles and responsibilities of CHWs [24]. Through this survey, researchers identified seven core competencies and roles required for those holding this paraprofessional position.

To prepare CHWs for their complex roles and to better integrate them into the health care system, some states are developing training and certification programs [25]. At least three of the core competencies from the national survey could be enhanced if CHWs gained proficiency in searching online databases. Relevant competencies include providing culturally appropriate health education, building individual and community capacity, and informal counseling and support. Health science librarians could partner with coordinators of training and certification program to teach CHWs valuable search skills for online consumer health information.

The descriptive categories presented in Table 2 have broad applications for health science librarians who want to conduct consumer health information outreach with any consumer population. These six categories could be conceptualized as outcomes for almost any consumer health outreach project. The information could also provide ideas for development of quantitative methods. For instance, the examples provided in each category could guide development of survey items.

CONCLUSION

The findings in this project suggest that health outreach librarians wishing to work with vulnerable populations should consider partnering with intermediaries like *promotoras.* While health care professionals can learn to compensate and accommodate low literacy levels, outreach projects such as the *Colonias* Project can help to build health literacy skills so that patients can take more responsibility for their care. Ultimately, incorporation of both approaches may be the best strategy for improving the health care of vulnerable populations.

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REFERENCES

1. Ratzan SC, Parker RM. Introduction—current bibliographies in medicine 2000–1: health literacy January 1990 through October 1999. [Web document]. Bethesda (MD): National Library of Medicine; 2000 Feb. [cited 30 Apr 2006]. <http://www.nlm.nih.gov/pubs/cbm/hliteracy.html>.

2. Council on Scientific Affairs for the American Medical Association. Health literacy: report for the AMA council on scientific affairs. JAMA 1999 Feb;281(6):552–57.

3. Berkman ND, DeWalt DA, Pignone MP, Sheridan SL, Lohr KN, Lux L, Sutton SF, Swinson T, Bonito AJ. Literacy and health outcomes: summary. [Evidence Report/Technology Assessment, No. 87, Web document]. Rockville, MD: Agency for Healthcare Research and Quality, Jan. 2004. [cited 15 Feb 2006]. <http://www.ahrq.gov/clinic/epcsums/litsum.pdf>.

4. Nielsen-Bohlman L, Panzer AM, Kindig DA. Health literacy: a prescription to end confusion. Washington, DC: The National Academies Press, 2004.

5. Institute of Medicine. Executive Summary. Priority areas for national action: transforming health care quality. [Web document]. Washington, DC: National Academies Press, 2003. [cited 15 Feb 2006]. <http://www.nap.edu/execsumm/0309085438.html#sum>.

6. National Library of Medicine. Strategic plan for addressing health disparities 2004–2008. [Web document]. Bethesda, MD: National Library of Medicine, 2004. [cited 15 Feb 2006]. <http://www.nlm.nih.gov/pubs/plan/nlm_health_disp_2004_2008.html>.

7. US Department of Health and Human Services. Healthy People 2010: understanding and improving health and objectives for improving health. [Web document]. 2nd ed., v.1. Washington, DC: US Government Printing Office, November 2000. [rev. 30 Jan 2001; cited 15 Feb 2006]. <http://www.healthypeople.gov/Document/tableofcontents.htm#volume1>.

8. Schloman B. Health literacy: a key ingredient for managing personal health. [online journal]. OJIN. 2004 Feb. [cited 15 Feb 2006]. <http://nursingworld.org/ojin/infocol/info_13.htm>.

9. Parker R. Health literacy: a challenge for American patients and their health care providers. Health Promot Int 2000 Dec;15(4):277–83.

10. Parker R. What patients do—and don't—understand: widespread ignorance has triggered a silent epidemic. [online journal]. Postgrad Med Online 2001 May;109(5). [cited 15 Feb 2006]. <http://www.postgradmed.com/issues/2001/05_01/editorial_may.htm>.

11. Herman AD, Mayer G. Reducing the use of emergency medical resources among Head Start Families: a pilot study. J Comm Health 2004 Jun;29(3):197–208.

12. Williams MV, Baker D, Parker RM, Nurss JR. Relationship of functional health literacy to patients' knowledge of their chronic disease. Arch Intern Med 1998 Jan;158(2):166–72.

13. Arbelaez JJ, Cooper LA. Patient-physician relationships and racial disparities in the quality of health care. Am J Public Health 2003 Oct;93(10):1713–9.

14. Bowden VM, Wood FB, Warner DG, Olney CA, Olivier ER, Siegel ER. Health information Hispanic outreach in the Texas Lower Rio Grande Valley. J Med Libr Assoc 2006 Apr; 94(2):179–88.

15. Laverack G, Labonte R. A planning framework for community empowerment goals within health promotion. Health Policy and Planning 2000 Sep;15(3):255–62.

16. May ML, Bowman GJ, Ramos KS, Rincones L, Rebollar MG, Rosa ML, Saldana J, Sanchez AP, Serna T, Viega N, Villegas GS, Zamorano MG, Ramos IN. Embracing the lo-

cal: enriching scientific research, education, and outreach on the Texas-Mexico border through a participatory action research partnership. Environ Health Perspect 2003 Oct; 111(13):1571–6.

17. Patton MQ. Qualitative research and evaluation methods. 3rd ed. Thousand Oaks, CA: Sage, 2002.

18. Glesne C. Becoming qualitative researchers. 2nd ed. New York: Longman, 1999.

19. Rossman GB, Rallis SF. Learning in the field. 2nd ed. Thousand Oaks, CA: Sage, 2003.

20. Bureau of Labor Statistics. Social and human service assistants. Occupational Outlook Handbook. 2006–07 edition. [Web document]. Washington, DC: United States Department of Labor, 2004. [cited 5 May 2006]. <http://www.bls.gov/oco/ocos059.htm>.

21. Swider SM. Outcome effectiveness of community health workers: an integrative literature review. Public Health Nurs 2002 Jan-Feb;19(1):11–20.

22. Hunter JB, de Zapien JG, Papenfuss M, Fernandez ML, Meister J, Giuliano AR. The impact of a promotora on increasing routine chronic disease prevention among women age 40 and older at the US-Mexico Border. Health Educ Behav 2004 Aug;31(4):18S–28S.

23. Krieger JW, Takaro TK, Song L, Weaver M. The Seattle-King County Healthy Homes Project: a randomized, controlled trial of a community health worker intervention to decrease exposure to indoor asthma triggers. Am J Public Health 2005 Apr;95(4):652–9.

24. Rosenthal EL. A summary of the National Community Health Advisor Study. [Web version]. Baltimore, MD: Annie E. Casey Foundation, 1998. [cited 15 Feb 2006]. <http://www.rho.arizona.edu/nchas_files/nchas_summary.htm>.

25. Ro MJ, Treadwell HM, Northridge M. Community health workers and community voices: promoting good health. [Web document]. Atlanta, GA: Morehouse School of Medicine, 2003. [cited 15 Feb 2006]. <http://www.communityvoices.org/Uploads/CHW_FINAL_00108_00042.pdf>.

Appendix 1

Example of a story added to the database

(Note: To protect resident confidentiality, the example below was created using several stories.)

What type of information did the person get from MedlinePlus?

Cholesterol and what it means

How did the information help the person? What did the person do as a result of getting the MedlinePlus information?

Found out she is borderline and she is not so anxious. Will be more active. Eat fiber, fruits, vegetables and avoid foods that make it worse.

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