PREPARING COMMUNITY HEALTH WORKERS TO ADDRESS HEARING LOSS

By

Daisey Thalia-Sánchez Jacob

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As members of the Audiology Doctoral Project Committee, we certify that we have read the Audiology Doctoral Project prepared by Daisey Sánchez Jacob, titled *Preparing Community Health Workers to Address Hearing Loss* and recommend that it be accepted as fulfilling the Audiology Doctoral Project requirement for the Degree of Doctor of Audiology.

_____ Date:
December 18, 2015
Nicole Marrone, Ph.D.

_____ Date:
December 18, 2015
Stephanie Adamovich, Ph.D.

_____ Date:
December 18, 2015
Sonia Colina, Ph.D.

_____ Date:
December 18, 2015
Maia Ingram, M.P.H.

Final approval and acceptance of this document is contingent upon the candidate's submission of the final copies of the document to the Graduate College.

I hereby certify that I have read this audiology doctoral project document prepared under my direction and recommend that it be accepted as fulfilling the audiology doctoral project requirement.

_____ Date: April 28, 2016
Audiology Doctoral Project Chair: Nicole Marrone, Ph.D.

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SIGNED:

Daisey Thalia-Sánchez Jacob

Daisey-Thalia Sánchez Jacob

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Abstract

Objective: To expand the access to culturally relevant hearing health services in a rural U.S. border community with already limited healthcare resources, community health workers (Promotoras de Salud) were trained to provide peer-facilitated hearing education classes.

Design: A specialized three-phase training process for community health workers was developed, implemented, and evaluated. The training process included: 1) Focus groups with community health workers and residents from the community to raise awareness of hearing loss among community health workers and the community; 2) A 3-hour workshop training to introduce basic topics to prepare community health workers to identify signs of hearing loss among community members and utilize effective communication strategies; and 3) A 24-hour multi-session, interactive training over 6 weeks for community health workers who would become facilitators of educational and peer-support groups for individuals with hearing loss and family members.

Study Sample: Twelve Spanish-speaking local community health workers employed by a federally qualified health center participated in a focus group, 12 received the general training, and four individuals with prior experience as health educators received further in-person training as facilitators of peer-education groups on hearing loss and communication.

Results: Community health workers increased their knowledge base and confidence in effective communication strategies and developed skills in facilitating hearing education and peer support groups. Through case study practice, community health workers demonstrated competencies and applied their learning to specific situations related to effective communication with hearing loss, family support, assistive technology, use of hearing protection, and making referrals for hearing health care. Needs were identified for ongoing training in the area of assistive technology and addressing situations of more severe hearing loss.

Conclusions: It is feasible to train community health workers to begin to address hearing loss and facilitate peer health education and support groups for individuals with hearing loss and their family members. In efforts to increase access to audiologic services in rural or hard-to-reach areas, application of the community health worker model with a partnership of audiologists deserves further consideration as a viable approach.

KEYWORDS: Community health workers; hearing loss; access; disparities; Spanish; aural rehabilitation groups

Introduction

Across the United States, many people are living with hearing loss who have not accessed audiologic services. About 30 million adults have hearing loss in both ears (Lin et al. 2011), however, less than 20% access hearing aids (Chien & Lin, 2012; Nash et al. 2013). Among Mexican Americans, the proportion of affected individuals who access treatment is even lower, at an estimated 4-10% (Lee et al. 1991; Nieman et al. 2015). This number is surprisingly low given that nearly 1 in 7 Hispanic/Latino adults in the U.S. has hearing loss (Cruickshanks et al. 2015).

Untreated hearing loss is but one of the multiple disparities Mexican Americans living along the United States-Mexico border confront in accessing health care. This 2,000-mile region has seen a remarkable increase in its population since the year 2000 (Border Research Partnership, 2013), and faces physician shortages, high levels of poverty, unemployment, and disease. The lack of access to general health care, limited health literacy, and dearth of other community resources creates an environment in which access to care for hearing loss may be overlooked, despite its being an undeniably difficult aspect of aging (United States-México Border Health Commission, 2010).

To address the health disparities facing US-Mexico border communities, as well as other underserved populations, members of these same communities can be trained to promote health and provide disease prevention and basic intervention services in a culturally relevant manner (Swider et al. 2009). These individuals, known as “Community Health Workers” (CHWs) or “*Promotoras de salud*” in Spanish, serve as intermediaries between health professionals and patients, not only connecting people to services but also advocating for their individual health needs as the so-called frontline workers (Nemcek, 2003). The main requirement for a CHW is to be a member of the community they serve and to exhibit leadership characteristics within the context of the community. Community health workers most likely receive on-the-job training both

in the core competencies of CHWs (Rosenthal et al. 2011) and on specific health conditions such as diabetes, cardiovascular disease, and breast cancer (Ingram, 2013). Though the CHW model has been used to address a myriad of health issues, (Cornejo et al. 2011; Norris et al. 2006; Koniak-Griffin et al. 2015; Philis-Tsimikas et al. 2011), we found no evidence that it has yet been applied to the issue of outreach among adults with hearing loss in the United States. In the global hearing health context, there have been examples of community health worker roles in hearing screening and community-based rehabilitation (Araújo et al, 2013; World Health Organization, 2006, 2012). Other examples of community health worker roles related to hearing loss have involved increasing access to primary health care for persons with hearing loss who are Deaf or Deaf-blind (Jones, Renger, & Fireston, 2005).

Management of hearing loss includes four primary overlapping approaches: sensory management through provision of hearing assistive devices (hearing aids, cochlear implants, etc.), instruction, perceptual and communication training, and psychosocial counseling targeting issues of participation and quality of life (Boothroyd, 2007). This overall approach has been termed aural or audiologic rehabilitation (AR). One way to implement the counseling and education component is through a supportive group environment. Audiologic rehabilitation groups have been shown to benefit individuals with hearing loss by providing a venue for self-expression, improving their communication through the use of strategies, reducing social and emotional withdrawal, and increasing self-awareness of hearing aids and other assistive technology (Chisolm et al. 2004; Hawkins, 2005). These groups have also contributed to an increase in the quality of life for family members and friends of those who have hearing loss by providing them with tools to improve communication, increasing realistic expectations, and attaining a better understanding of their partner's hearing loss (Preminger, 2003).

The use of aural rehabilitation groups as a means to provide education, counseling and peer support for individuals with hearing loss presents an opportunity to extend application of the CHW model to address disparities in hearing healthcare to underserved communities in

culturally relevant ways. The current study is part of ongoing NIH-funded research to develop and test the effectiveness of a community health worker model to reduce disparities in access to hearing health care among rural, Hispanic/Latino older adults in the United States. The study is based on an academic-community partnership between audiology, public health, translation studies, and community health workers of a federally-qualified health center in an Arizona community. In the current article, we illustrate how the community health workers identified a lack of hearing loss education as a disparity in their community and expressed a desire for further instruction on this topic. This resulted in the training of community health workers in audiology and hearing loss topics by the academic partners composed of audiology clinicians, researchers, and bilingual audiology graduate students. The three-phased training process included: 1) focus groups with community members to identify unmet needs related to hearing health care; 2) a workshop to prepare community health workers to identify signs of hearing loss among community members and use effective communication strategies; and 3) additional training for community health workers who would become facilitators of a hearing health outreach program culturally and linguistically tailored to the primarily Spanish speaking, rural Mexican American community. We propose that the application of the community health worker model, in conjunction with the expertise of audiology researchers and clinicians, deserves further exploration.

Methods

Setting

Nogales, AZ is a U.S.-Mexico border city with a population of 20,948 (U.S. Census, 2011). Approximately 13.8% of the population is over the age of 65 years. Using means and confidence intervals drawn from a population-based study representative of national demographics (Lin et al. 2011), conservative estimates of the prevalence of hearing loss

suggest that it is likely that at least 1,500 people over the age of 65 are living with chronic bilateral hearing loss in Nogales, AZ. The Federally Qualified Health Center (FQHC) is the major primary health care provider for the area serving 21,000 patients. The responsibilities of the CHWs include facilitation of health interventions, patient advocacy and education, health promotion through health fairs and campaigns, and patient follow-up/maintenance through home visits. Despite having several programs for the aging population the department had not addressed hearing loss among their clients.

Participants

Participants were female community health workers with over 15 years of work experience in the Nogales federally qualified health center. The main requirement for a community health worker is to be a member of the community they serve and to exhibit leadership characteristics within the context of the community. Community health workers then receive on-the-job training, both in the core competencies of community health workers (Rosenthal et al. 2011) and on specific health conditions such as diabetes, cardiovascular disease, and breast cancer (see Table 2 for further information about community health workers). Community health workers' responsibilities include facilitation of health interventions, patient advocacy and education, health promotion through health fairs and campaigns, and patient follow-up through home visits.

Because cross-training is a strong component of the community health worker model, all of the community health workers of the federally qualified health center were invited to attend a focus group (Training phase 1: n = 12) and a general 3-hour workshop (Training phase 2: n = 12). Four individuals continued with the in-depth training after the general workshop (3 community health workers and their health promotion manager). The community health workers involved in the third phase of the training were selected on the basis of their extensive work experience and specific skills as assessed by their manager including interest in hearing loss, willingness to learn, compassion and empathy, leadership and advocacy.

Training and Learning Framework

The goal of the training was for the community health workers to become prepared to recognize the effects of hearing loss on individuals and their families, respond with appropriate referrals and communication strategies, and for experienced health educators to become facilitators of peer support groups for hearing loss, and teach self-management techniques and effective communication strategies for this chronic health condition. The Freire Empowerment Educational Model (Wallerstein & Bernstein, 1988) was the basis of the training and learning framework. Table 1 outlines the training phases and critical learning activities for the community health workers within the framework of Freire's model. In the Freire Empowerment Model, learning is supported through reflection and action, and equal emphasis is placed on the knowledge of the student and the teacher. The community health workers' knowledge and connection to their community was recognized as an integral component of the training process. Use of this framework focused the training process on empowering community health workers to recognize problems and potential solutions regarding hearing loss in their community.

The three steps in the Freire Empowerment Educational Model are listening, pose problems, and act-reflect-act. Listening requires engaging community members as co-learners in identifying their own needs. This was accomplished through a series of focus groups completed with community health workers and Nogales residents. The second step, pose problems, requires a discussion and critical-thinking about solutions for complex problems. This step was accomplished during meetings between the academic partners and the community health workers to discuss the issues raised in the focus groups and general workshop. The third step, Act-Reflect-Act, requires individuals to take action within the community and apply their learning. This critical step involved the academic partners training the community health workers on a set of hearing-related topics that included both knowledge and skill competencies so that the staff could take action to support individuals with hearing loss in their community.

Training Procedures

Community Health Worker Focus Groups. As part of the *Listening* step in the Freire Empowerment Empowerment Educational model, the academic partners facilitated a focus group with twelve community health workers from the FQHC. This was done to assess community health worker awareness of issues related to hearing loss among their clients, to identify community health worker training needs, and to clarify aspects of the community health worker model that would integrate well with an aural rehabilitation approach for an outreach program addressing access to care and the quality of life effects of hearing loss. Four additional focus groups were facilitated by the community health workers with individuals that the community health workers recruited from the community who self-identified as having hearing loss, or family members of those with hearing loss. The community health workers were trained on how to lead focus groups for people with hearing loss. All five of the focus groups lasted approximately 2 hours, were conducted in Spanish, digitally audio recorded, and then transcribed, coded, and analyzed for thematic content by the academic partners. (Detailed results of these community focus groups will be presented elsewhere.)

Meetings with Academic Partners. As part of the *Pose Problems* step in the Freire Empowerment Educational model, the community health workers met with the academic partners to discuss the topics that arose in the focus groups. The community health workers identified a need to offer hearing loss education in their community and specifically expressed the desire for further specific training that would enable them to facilitate hearing loss education and support groups to empower community members and increase access to care.

General 3-hour Workshop. As part of the *Act-Reflect-Act* step in the Freire Empowerment Educational model, a general three-hour workshop was held for all of the community health workers at the federally qualified health center. The format was an interactive discussion-based training that utilized Power Point as a presentation tool for didactic class materials and discussion prompts, as well as a number of interactive activities including a

hearing loss simulation and video otoscopy. The workshop included information about the anatomy and physiology of the auditory system, various lifestyle, communication, and emotional effects that may be caused by hearing loss and a general introduction to communication strategies and assistive devices. A component of the audiological information presented in this general workshop was obtained and adapted from an established AR program by the academic partner in Tucson, AZ. Throughout the workshop an emphasis was placed on the importance of making appropriate referrals for clients to audiology, otolaryngology, and speech, language pathology when there are hearing, ear, or speech-language concerns.

In-depth Community Health Worker Training. As part of the Act-Reflect-Act step in the Freire Empowerment Educational model, three experienced community health workers and the health promotion manager participated in twenty-four additional hours of audiologic training that included eight sessions over eight weeks. The sessions were led in Spanish by two bilingual, bicultural audiology graduate students (D.S. and A.S.) and supervised by audiology faculty (S.A., F.P.H., and N.M.). An outline of the evidence-based training curriculum is provided in Appendix A. The topics were selected based on a literature review and best-practice guidelines, the focus group data that revealed the community's hearing loss educational needs, the open-ended responses from the general workshop evaluations indicating training needs, and the expertise of the academic partners. Existing curricula for audiology assistants and audiology technicians were reviewed, however the research team found that these materials were not specific for the promotoras' unique role as non-clinical, community liaisons. The information regarding appropriate referrals to health professionals was again reinforced. Consideration was made to include topics related to the effects of hearing loss not only at the individual level, but also the family and community levels in response to the needs expressed during the focus group process.

Evaluation Measures

Focus Groups. The research team used N-Vivo software (Fereday & Muir-Cochrane, 2006) to conduct thematic content analysis of the focus group data. Several themes emerged from these analyses that explored the perspective of community health workers concerning: 1) their awareness of hearing loss as a health issue; 2) their experiences in dealing with hearing loss and its effects on clients; 3) the potential for community health workers to address hearing loss.

General 3-hour Workshop. A case study discussion and post-training measures were utilized to evaluate the general 3-hour workshop. At the end of the general 3-hour workshop, the community health workers were presented with a case study example of an adult client with hearing loss facing isolation issues due to his hearing loss and communication difficulties with family members speaking to him from different rooms. This served to form a group discussion and provided the community health workers the opportunity to recall and apply the information on communication strategies and audiology referrals they had learned during the workshop. The academic partners assessed the validity and accuracy of the community health worker's responses. The community health workers were also asked to complete a 3-month post-measure in which they rated the usefulness of the information on topics such as hearing loss, audiometry and communication strategies, and the ease or clarity of the information. The 3-month post-measure also asked the community health workers in what ways they were more aware of hearing loss following the workshop, to describe the most interesting or new information they learned in the workshop, and how the workshop impacted them or their work.

In-depth Community Health Worker Training. Various case study discussions and pre- and post-training measures were utilized. Prior to the beginning of each training session, the community health workers completed one pre-measure containing 5 to 7 open-ended questions assessing levels of knowledge on aspects of the audiology training that were to be presented that session. An example for the *How We Hear* session included, "What are three causes of

hearing loss?" One question in each pre-measure was dedicated to asking the community health workers, "What is the most important thing that you would like to know about this topic?" to make the subsequent training as relevant and specific as possible to their interests and their community's educational needs. Additionally, multiple case study examples were used throughout the training sessions to assess the community health workers' competency in recommending audiology or medical referrals for hearing-related concerns, and suggesting effective communication strategies to clients.

The post-training assessment included seven comprehensive knowledge-based questions that allowed the academic partners to assess the community health workers' competency in hearing loss-related concepts. The questions asked the community health workers to list common causes of hearing loss, describe basic factors that affect the outcomes of hearing aid use, name communication strategies that improve communication, describe basic information that can be understood from an audiogram, and list examples of hearing assistive technology systems. The post-test was administered to ensure that the community health workers' knowledge of basic concepts was deemed accurate by the academic partners. The post-training assessment also included six questions that assessed their skills, knowledge and confidence (before and after the training sessions) in facilitating a hearing education and support group for individuals with hearing loss. The community health workers were asked to rate their level of confidence in facilitating a group for adults and families living with hearing loss and in helping individuals to: protect their hearing, improve their use of hearing aids, improve their communication, understand their hearing test results, and use hearing assistive devices. Examples of the post-training questions are listed in Appendix B.

Results

Training Phase 1: Community Health Worker Focus Group

The analysis of the community health worker focus group data revealed that while some community health workers reported concerns about hearing loss among their own family members, many of the community health workers had not thought about hearing loss among other members of the community or its impact on health prior to the focus group. They also reported that they had never received information or training on the topic. Of note is the fact that hearing loss had not been emphasized to them as a health issue: "We all know about diabetes and how to manage it, but hearing…we don't know much. We just aren't that conscious of it here in Nogales." Upon reflection, however, the community health workers gave several examples of hearing loss impeding their interactions with clients. The predominant example was their awareness that clients with hearing loss were not benefitting as much as would be expected from other group health education classes.

> *"There are those individuals who cannot hear and pretend like they understand the topic but once you ask them more about it you realize they are completely wrong."*
>
> *"In our diabetes class, there is a man who comes with a family member and has a hearing aid. During the class, he seems lost. I can tell he is trying to pay attention but he cannot follow… so he always seems quiet and uninterested and doesn't interact much."*

The focus group results also indicated that because of the lack of resources in their rural community, the community health workers felt that there was little they could offer their clients beyond making suggestions that they have more patience with individuals who have hearing loss. Additionally, the community health workers were determined in their requests for education on hearing loss, the effects of hearing loss on communication, health, family life, effective communication strategies, available hearing assistive technology, and community resources for clinical care and self-management.

Training Phase 2: Evaluation of General 3-hour Workshop

Through the case study discussion, the academic partners determined that the community health workers were competent in introductory information regarding recommending referrals to audiology and the use of communication strategies for individuals with hearing loss. 10 of 12 (83%) community health workers who attended the general 3-hour workshop returned a 3-month post-training evaluation. The post-training evaluation contained eight questions, of which three were self-rating content questions, three were open-ended perception questions, and two directly related to the format of the training. Of the post-training evaluations that were received, 100 % of the community health workers gave a rating of "Strongly Agree" or "Agree" with the following statement, "The information about _____ (hearing loss, audiograms, communication strategies) helped me to understand my/my partner's/my patients' hearing loss better." Figure 1 depicts these results. Refer to Figure 1.

Lastly, on the 3-month post-training evaluation the community health workers responded to a question on their perceptions of training needs for hearing-related topics and a desire to help community members with hearing loss.

- *"I would like more classes and to learn more so that I can help my community. It's a topic that is not discussed, at least for promotoras."*
- *"The information was great… hopefully we can share this information with our community."*

Responses to the three open-ended questions on the 3-month post-training evaluation further described the issues and challenges facing the community from the community health worker's perspective. Some of the issues described included the limited resources in their community and the lack of importance attributed to hearing loss by society. In addition, from the case study discussion held at the end of the 3-hour workshop, the community health workers expressed that the information about hearing loss was new, relevant and applicable to their community. Refer to Table 3.

Training Phase 3: Evaluation of In-Depth Training Sessions

The in-depth training was effective in increasing the community health worker's knowledge of hearing loss and audiology-related concepts, and increasing the community health worker's confidence to lead a support group for hearing loss. All of the community health workers were able to correctly answer all of the knowledge-based questions with 100% accuracy. Group mean scores revealed that the community health workers increased their confidence in facilitating a health education group for adults with hearing loss and their families in all of the categories (Refer to Table 4).

Through the case study discussions, the academic partners determined that the community health workers were competent in recommending referrals and applying their learning of hearing loss topics. For example, when asked "What are three factors that improve the success of hearing aid users?" responses included "motivation to use the devices, realistic expectations, the right hearing aid for the particular person (molded to ear, programmed correctly), family support, getting used to their hearing aids."

Discussion

Training community health workers about hearing loss, and thereby applying the community health worker model, is a new approach that has the potential to increase access to hearing healthcare in rural or under-served areas. As future facilitators of hearing health education and support outreach programs, it is vital the community health workers be taught factual and valid information through a systematic approach. The expertise provided by the academic partners from audiology guided the development of the training and ensured the information presented to the community health workers was accurate and valid. This partnership then allows accurate information to be disseminated by the community health workers in culturally relevant ways. Through the case studies and post-outcome assessments, the community health workers' knowledge regarding basic information on hearing loss was verified.

As revealed by the community health worker focus group, hearing health may be unrecognized or devalued as a health priority in communities facing major health disparities for several reasons. First, hearing loss is not life threatening, and second, there is a general view that little can be done to improve quality of life beyond the prohibitive cost of hearing aids. Thus, a community-academic partnership such as the one presented here can assist health agencies in assessing the need for intervention services and providing a cost-effective and accessible hearing health intervention that can be beneficial to clients with or without assistive devices. Further, the use of the community health worker model provides a means to access a difficult-to-reach population and connect those in the community needing audiologic and other clinical referrals with the hearing health care system.

The ability for community health workers to effectively communicate without language barriers and on a personal level with community members, as well as the already established role of the community health workers at the federally qualified health center site, places them in a unique role as hearing health education and support group facilitators in efforts to expand access to audiologic services. The community academic partnership utilized in this study facilitated co-learning and shared development of learning objectives that would allow the community health workers to begin to address hearing loss in their communities and facilitate access to hearing health care. The foundation of the community health worker model is that as members and leaders of their communities, community health workers are the experts in identifying and responding to health issues facing community members in culturally appropriate ways (HSRA, 2007). The community health workers' expertise as leaders in their own community made them exemplary individuals to inform the academic partners and provide feedback and suggestions about the adaptation of the hearing health education program discussed in this paper. Through the trainings provided and guided by the academic partners, the community health workers are prepared to deliver information on hearing loss in culturally relevant ways to their community members. We also found that experienced community health

workers are able to gain sufficient familiarity with audiology-related concepts at a lay-person's level, such as explaining the basic results of a hearing screening to a community member, helping individuals to protect their hearing by applying knowledge of various forms of hearing protection, and understanding basic information on the time-intensity tradeoff related to noise exposure.

This study established the need for new knowledge related to hearing loss among community health workers in a rural, U.S.-Mexico Border community. Further development of the training curriculum to evaluate and test its applicability in other communities, as well as defining the level of ongoing supervision and support needed to sustain a hearing loss outreach program, is in progress. Only a small number of community health workers went on to participate in the initial offering of the in-depth training due to available resources. However, the concentrated focus on these community health workers also allowed us to engage them in the curriculum development process and to closely assess their ability to integrate the information and effectively train others through subsequent observation. As such, we recommend additional investigation of this training with a larger and more diverse group of community health workers. The training program on hearing loss for community health workers developed here was implemented within a single federally qualified health center. This health center is located in a border community with a primarily Spanish-speaking patient population. Therefore, some needs of this health center and community health worker staff may be specific to this community setting, while others may be present within other health centers or for community health workers serving other minority or underserved populations. We also recommend additional training and evaluation measures at timed intervals to assess the community health worker's long-term retention of hearing loss related knowledge and communication skills. Additionally, we recommend evaluating the individuals who will participate in the hearing outreach programs facilitated by the community health workers.

Qualitative evaluation of our three-phase process of training CHWs also revealed that once CHWs become aware of hearing loss as a health issue, they have a strong interest in assisting their clients and advocating for increased access to health care. This indicates that when community members identify disparities, they can propose solutions and work to mitigate those disparities. In this project, the CHWs of the border community became aware of hearing loss disparities. The CHWs proposed training and education as viable solutions to mitigate the negative effects for their fellow community members who have hearing loss. Finally the CHWs underwent training in hearing loss and audiology concepts with the purpose of establishing educational and support groups for individuals with hearing loss and their frequent communication partners. This indicates that when community members become aware of issues affecting their community, the solutions can arise from within the community itself.

Applications of this project in other underserved areas must take several factors into account. These include the community health workers' work experience, specifically experience in facilitating group discussions, any linguistic and cultural differences in the local area, and the interpretation or translation of the information. The community health workers who were trained and participated in this project had extensive experience facilitating support groups, and advocating for patients through medical and home visits. If this project is implemented in other areas with community health workers who have less experience facilitating support groups, then it is imperative to provide further training on how to foster group discussions and ways to ensure that the participants share personal accounts during the group sessions. Additionally, the language and dialects spoken in a specific community should be factored in to the application of a similar project. The translation of the information on hearing loss must consider the purpose that the materials are expected to accomplish, including audience characteristics such as their linguistic and socioeconomic traits, and health literacy. Throughout the trainings, the community health workers provided feedback on the Spanish word choices used when materials were translated or created directly in Spanish. They edited the word choices that they deemed

confusing or unclear for the Spanish population they serve in Nogales, AZ. Further information about the language mediation and translation process our research team undertook can be found in Colina, Marrone, Ingram, and Sánchez (In Press).

In conclusion, preparing community health workers to address hearing loss by partnering the community health worker's expertise in culturally-competent health education with the audiologist's clinical expertise has potential as an approach to reduce disparities in accessing hearing healthcare in disadvantaged areas. As members of their own communities who share similar life experiences and culture, community health workers play a vital role through social support and community trust. Because of this, they have a unique skill set in culturally relevant communication, problem solving, and support of behavior change that some clinicians may not possess to reach individuals in disadvantaged areas. The community health workers who participated in this training curriculum are currently facilitating hearing health education and support groups for individuals with hearing loss and their families. The training curriculum for community health workers is currently being revised for future dissemination. Future projects include formalizing this training for other community health workers and potential application in other rural health areas or in other underserved communities.

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Appendices

Table 1. The training phases and corresponding critical learning activities for community health workers within the framework of the Freire Empowerment Model (Wallerstein & Bernstein, 1988) and learning objectives classified along the cognitive process dimension of the revised Bloom's taxonomy (Krathwohl, 2010).

Training Phase	Critical Learning Activities	Bloom's Taxonomy of Critical Learning	Step within Freire Empowerment Model
1	Focus groups of community health workers (n = 12); Interviews and focus groups with Nogales residents	Remember/ Experiential Learning	Listening
2	General Workshop (12 community health workers)	Understand	Pose Problems
3	In-depth Training (3 community health workers, 1 project manager)	Evaluate Analyze Apply	Act, Reflect, Act
Ongoing support and supervision	Pilot Hearing Health Education and Support Groups	Create	Act, Reflect, Act

Table 2. Further Information Regarding Community Health Workers.

Community Health Workers (CHWs)	
Definition	"A community health worker is a frontline public health worker who is a trusted member of and/or has an unusually close understanding of the community served. This trusting relationship enables the worker to serve as a liaison/link/intermediary between health/social services and the community to facilitate access to services and improve the quality and cultural competence of service delivery." –American Public Health Association (APHA), 2010.
Characteristics	Non-judgmental, altruistic, trustworthy, creativity to adapt interventions, follow healthy lifestyle habits, effective communication skills, ability to work with others. (Cornejo et al. 2011; Steps Forward, NIH)
Rationale	"The community health worker model is predicated on…social networks, social support, participatory education, and community empowerment. The community health worker model involves systematic training and support of trusted and respected community members who engage in community outreach, participatory health education, and provision of social support to others within their personal and community social networks. The theoretical rationale is that community health workers contribute to community empowerment and social change as they engage community members in participatory education processes of consciousness raising, dialogue, and reflection (Freire, 1970/1974). In turn, the increased individual and community-level capacity building and empowerment contribute to improved access and utilization of health knowledge, resources, and services and to decreased health disparities." (Koskan et al., 2013; pg 391)

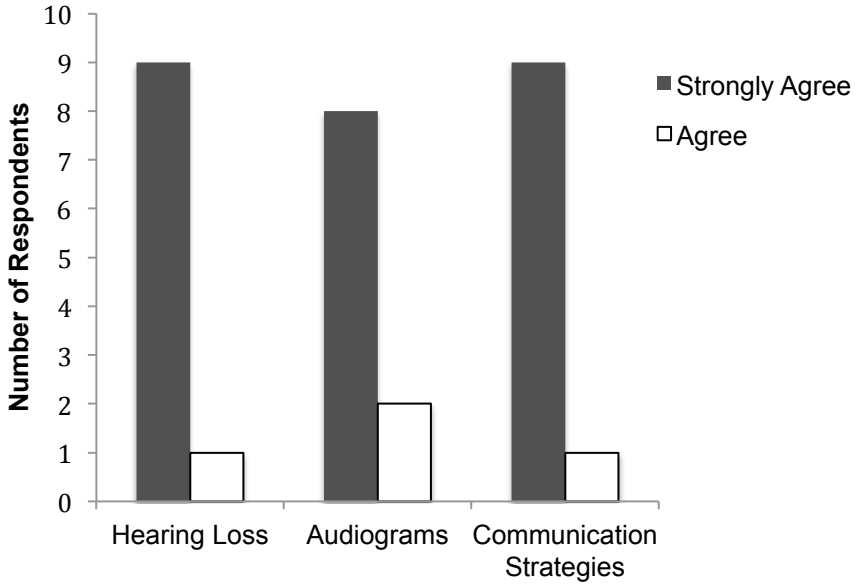
Table 3. Responses of Community Health Workers from the evaluation of the 3-hour workshop on hearing loss and effective communication strategies.

Question	Example Responses
What was the most surprising/interesting thing that you learned?	• "That we must be patient with people who don't understand us because sometimes it's because they can't hear us." • "It (hearing loss) is a common problem and we don't give it any importance. We need to educate ourselves about it, and educate our community." • "How hearing loss can affect the entire family."
After the presentation, have you noticed that you are more aware of hearing loss?	• "Of course, now I'll be more cautious of my surroundings because I know how sensitive it (the ear) is to damage." • "Yes, especially (more aware) with the elderly and young children."
How has the information impacted you?	• "Learning more about all of the effects it (hearing loss) has." • "Many times we think that people don't want to respond or they selectively listen, but now I can recommend family members, friends and patients to get their hearing tested." • "It impacted me learning how many people have hearing loss, and how few resources exist."

Table 4. Community Health Worker self-efficacy confidence ratings for applying learning to implement a hearing wellness program in their community, where 1 = not at all confident to 5 = very confident. (n = 4)

Question	Pre-Training average (SD)	Post-Training average (SD)
How confident are you that you can help people with hearing loss to protect their hearing?	1.75 (0.94)	4.5 (0.57)
How confident are you in your ability to advise participants on how to improve the use of hearing aids?	1.25 (0.5)	4(0)
How confident are you that you can help people with hearing loss and their family members to communicate?	1.5 (0.57)	4.5 (0.57)
How confident are you in your ability to explain to a client what their audiogram means (overall)?	1.25 (0.5)	4 (0.81)
How confident are you in your ability to use hearing devices (not hearing aids) to help people with hearing loss?	1 (0)	3.75 (0.44)
How confident are you in your ability to facilitate a group program for people with hearing loss?	1.75 (0.95)	4.5 (0.57)

Figure 1. Ratings of agreement with statements about the benefit of training content by Community Health Workers (n = 12) using a response scale of strongly agree, agree, neutral, disagree, strongly disagree.



"The information about ____ helped me to understand my/my partner's/my patient's hearing loss better"

Appendix A.

Outline of topics for each 3-hour interactive session, the material covered and the pre/post evaluation measures) for Community Health Worker facilitator training sessions.

Training Session	Topics	Pre/post Knowledge Assessed
1	How we Hear • What is sound (simple and complex acoustic signals) • Basic anatomy of the outer/middle/inner ear, auditory brainstem, and cortical pathways, binaural hearing, localization • Introduction to hearing loss types (categories of severity, progressive versus sudden versus temporary threshold shifts) Interactive component: Videos depicting various frequencies, decibels, examples of acoustic reverberation, absorption, and decreasing sound level with distance. Videos depicting basic auditory physiology including sound passing through the outer ear through the auditory cortex.	• Common causes of and risk factors for hearing loss likely to be encountered in the community • The role of acoustics and anatomy in the basic understanding of hearing loss
2	Hearing Loss • Hearing loss epidemiology • Auditory disorders (presbycusis, otitis media, ototoxicity, Meniere's, tinnitus) • Discussion of cultural practices and home remedies for hearing and ear-related concerns were discussed, as these arose during the focus groups Interactive component: Videos and images depicting various hearing loss types and degrees of severity. Case study examples depicting individuals facing various auditory disorders and their symptoms. Group discussion concerning home remedies common to their community.	• Knowledge of the scale of the impact of hearing loss in the United States • Recognize common causes of hearing loss and auditory disorders • Debunking common myths that do not improve someone's hearing or ear concerns • Case studies
3	Hearing Aids • Hearing aid functions • Types/styles	• Basic hearing aid function • Various hearing aid

	• Cost • Process of obtaining hearing aids Interactive component: community health workers were fit with low-gain open-fit hearing aids during this session. Group discussion about their experience "hearing" with a hearing aid. Video depicting hearing aid technology changes over time. Video depicting a cochlear implant simulation.	styles for various lifestyle and patient needs • Introductory information about obtaining hearing aids • Case studies
4	Hearing Aids • Cleaning and maintenance • Factors that affect successful use • Realistic expectations Interactive component: Demonstration of several hearing aid types. Discussion of hearing aid trial periods, warranties and contracts.	• Factors that contribute to the success of hearing aid use • Realistic expectations for individuals who have hearing loss and want to purchase hearing aids • Case studies
5	Communication, Strategies, and Emotions • Communication • Factors that impede successful communication for individuals with hearing loss and their communication partners (family members, friends) • The negative emotions that may arise due to hearing loss • The differences in the emotions of the person with hearing loss and the communication partner • Strategies that may improve communication for those with hearing loss and their communication partners Interactive component: Discussion regarding factors that impede successful communication. Hearing loss simulation activity. Role-play of communication breakdowns and group discussion of communication strategies. Speech-reading activity to demonstrate the importance of contextual information when communicating.	• Building blocks of communication • Deterrents to successful communication for individuals with hearing loss • The negative effects on the communication partner • Use of communication strategies for individuals with hearing loss and their communication partner • Case studies
6	Hearing Tests and the Health Care Team • Air and bone conduction audiometric testing • Interpreting the audiogram, other audiologic tests (otoacoustic emissions, tympanometry, auditory brainstem response)	• Basic understanding of an audiogram • Testing differences for adults and children • Knowledge of community resources • Case studies

	• Differences in test procedures for adults versus pediatric patients • Information about the existing hearing health care resources in their community Interactive component: Group discussion about case study examples depicting individuals with hearing loss concerns, and introductory hearing aid questions. community health workers underwent hearing screenings and tympanometry testing.	
7	Hearing Conservation, Hearing Assistive Technology Systems, and Advocacy • Noise exposure • The time-intensity trade-off • Types of hearing protection • Hearing assistive technology (demonstrations of TV EARS and looped systems) • Advocacy information for individuals with hearing loss, with emphasis on The Americans with Disabilities Act Interactive component: Videos depicting the intensities of various environmental sounds and videos depicting corresponding hair cell damage. Demonstration of proper earplug placement. Demonstrations with assistive technology including infrared, hard-wired, FM, induction loops, captioned telephones, and alerting systems such as vibrotactile alarms. Video depicting how induction loops work.	• How to protect one's hearing • Hearing Assistive Technology Systems that may be beneficial for individuals with hearing loss • Advocacy rights and hearing loss accommodations • Case studies
8	Techniques for facilitating a group program for persons with hearing loss • How to arrange the physical environment for communication access • How to structure the group and communication ground rules • How to elicit discussion among group members related to communication and coping • How to manage communication breakdowns and interactions between	• Group examples • Practical skills in using microphones, sound field amplification system, and Group FM system

	members of the group Interactive component: Role-play and simulated group discussions. Hands-on practice setting up the assistive technology systems.	

Appendix B.

Examples of the pre-test questions that were repeated in the post-training assessment:

- What are two causes of hearing loss?
- Name two risk factors for developing hearing loss.
- What are two realistic expectations for hearing aids?
- Name 2 strategies that improve communication.
- Name 2 assistive listening devices (other than hearing aids).
- What would you like to learn about hearing aids?

Examples of the post-training assessment questions:

- What are two things you must take into account when leading a group for people with hearing loss?
- How confident are you that you can help people with hearing loss protect their hearing?
- How confident are you that you can improve an individual's use of hearing aids?

References

Araújo, ES, de Freitas Alvarenga K, Umau, D, Pagnossin, DV, Wen, CL. (2013) Community health worker training for infant hearing health: effectiveness of distance learning. *Int J Audiol* 52(9): 636-641.

Boothroyd, A. (2007) Adult aural rehabilitation: what is it and does it work? *Trends Amplif* 11(2): 63-71.

Border Research Partnership. (2013) *The State of the Border Report*: *A Comprehensive Analysis of the U.S.-Mexico Border*. Edited by E. Lee and C. Wilson, Mexico Institute, Woodrow Wilson International Center for Scholars, Washington, D.C.

Chien, W, Lin, FR. (2012) Prevalence of hearing aid use among older adults in the United States. *Arch Int Med* 172(3): 292-293.

Chisolm, T, Abrams, H, McArdle, R. (2004) Short and long-term outcomes of adult audiologic rehabilitation. *Ear Hear* 25(5): 464-477.

Colina, S, Marrone, N, Ingram, M., Sánchez, D. (In Press). Translation Quality Assessment in Health Research: A functionalist alternative to back translation. *Eval Health Prof*.

Collins-Dogrul, J. (2006). Managing US-Mexico "border health": An organizational field approach. *Soc Sci Med,* 63: 3199-3211.

Cornejo, E., Denman, C.A., Sabo, S., De Zapién, J., Rosales, C. (2011). *Scoping Review of Community Health Worker/Promotora-Based Chronic Disease Primary Prevention Programs on the U.S.-Mexico Border.* El Colegio de Sonora- Centro de Estudios en Salud y Sociedad. University of Arizona Mel and Enid Zuckerman College of Public Health.

Cruickshanks, K.J., Dhar, S., Dinces, E., Fifer, R.C., Gonzalez, F. 2nd, Heiss, G., Hoffman, H.J., Lee, D.J., Newhoff, M., Tocci, L., Torre, P. 3rd, Tweed, T.S. (2015). Hearing impairment

prevalence and associated risk factors in the Hispanic Community Health Study/Study of Latinos. *JAMA Otolaryn Head Neck Surg, 141 (7): 641-648.*

Fereday, J., Muir-Cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *Intl J Qual Methods* 5(1): 80-92.

Ferguson WJ, Lemay CA, Hargraves JL, Gorodetsky T, Calista J. (2012). Developing community health worker diabetes training. *Health Educ Res* 27(4): 755-765

Hawkins, D. B. (2005). Effectiveness of counseling-based adult group aural rehabilitation programs: A systematic review of the evidence. *J Amer Acad Audiol* 16: 485-493.

Hickson, L. Worrall, L., Scarinci, N. (2007). A randomized controlled trial evaluating the active communication education program for older people with hearing impairment. *Ear Hear* 28(2): 212-230.

Hunter J, de Zapien J, Papenfuss M, Fernandez M, Meister J, Giuliano A. (2004). The impact of a *promotora* on increasing routine chronic disease prevention among women aged 40 and older at the U.S.-Mexico border. *Health Educ Behav 31*(4 Suppl): 18S-28S.

Ingram M, Piper R, Kunz S, Navarro C, Sander A, Gastelum S. (2012). Salud Sí: a case study for the use of participatory evaluation in creating effective and sustainable community-based health promotion. *Fam Comm Health* 35(2):130-138.

Ingram M, Torres E, Redondo F, Bradford G, Wang C, O'Toole M. (2007). The impact or *promotoras* on social support and glycemic control. *Diabetes Educator* 33(Supp 6): 172S-1786

Ingram M, Reinschmidt KM, Schachter KA, Davidson CL, Sabo SJ, De Zapien JG, Carvajal SC. (2012). Establishing a professional profile of community health workers: results from a national study of roles, activities and training. *J Community Health* 37(2): 529-537.

Jones, E.G., Renger, R., Firestone, R. (2005). Deaf community analysis for health education priorities. *Public Health Nursing* 22(1), 27-35.

Koniak-Griffin, D., Brecht, M.L., Takayanagi, S., Villegas, J., Melendrez, M., Balcazar, H. (2015). A community health worker-led lifestyle behavior intervention for Latina (Hispanic) women: feasibility and outcomes of a randomized controlled trial. *Intl J Nursing Studies* 52(1): 75-87.

Koskan, A.M., Friedman, D.B., Brandt, H.M., Walsemann, K.M., Messiass, D. K. H. (2013). Preparing Promotoras to Deliver Health Programs for Hispanic Communities: Training Processes and Curricula. *Health Promotion Practice* 14(3): 390-399.

Kricos, P.B. (2000). The influence of nonaudiological variables on audiological rehabilitation outcomes. *Ear Hear* 21(4 Suppl): 7S-14S.

Lee, D.J., Carlson, D.L., Lee, H.M., Ray, L.A., Markides, K.S. (1991). Hearing loss and hearing aid use in Hispanic adults: Results from the Hispanic Health and Nutrition Examination Survey*. Am J Public Health* 81(11):1471-1474.

Lin F.R., Niparko, J.K., Ferrucci L. (2011). Hearing Loss Prevalence in the United States. *Arch Int Med* 171: 1851-1852.

Nash SD, Cruickshanks KJ, Huang GH, Klein BE, Klein R, Nieto FJ, Tweed TS. (2013). Unmet hearing health care needs: the Beaver Dam offspring study. *Amer J Public Health* 103(6): 1134-1139.

Nemcek MA, Sabatier R. (2003). State of evaluation: community health workers. *Public Health Nursing* 20:260-70.

Nieman, C.L., Marrone, N., Szanton, S.L., Thorpe, R.J. Jr., Lin, F.R. (2016). Racial/Ethnic and Socioeconomic Disparities in Hearing Health Care Among Older Americans. *J Aging Health,* 28(1): 68-94.

Norris S, Chowdhury F, Van Let K, Horsley T, Brownstein J, Zhang X, et al. (2006). Effectiveness of Community Health Workers in the Care of Persons with Diabetes. *Diabetic Medicine.* 23:544-56.

O'Brien, M.J., Squires, A.P., Bixby, R.A., Larson, S.C. (2009). Role development of community health workers: an examination of selection and training processes in the intervention literature. *American Journal of Preventative Medicine*, 37(6, S1): S262-S269.

Philis-Tsimikas, A., Fortmann, A., Lleva-Ocana, L., Walker, C., Gallo, L.C. (2011). Peer Led Diabetes Education Programs in High-Risk Mexican Americans Improve Glycemic Control Compared With Standard Approaches. *Diabetes Care*. 34 (9): 1926-1931.

Preminger, J. E. (2003). Should significant others be encouraged to join adult group audiologic rehabilitation classes?. *Journal of the American Academy of Audiology,* 14(10),545-55.

Sabo S, Wennerstrom A, Phillips D, Haywoord C, Redondo F, Bell ML, Ingram M. (2015). Community Health Worker Professional Advocacy: Voices of Action from the 2014 National Community Health Worker Advocacy Survey. *J Ambul Care Manage*. 38(3): 225-235.

Swider, S., M., Martin, M., Lynas, C., Rothschild, S. (2009). Project MATCH. Training for a Promotora Intervention. *The Diabetes Educator*. 1-11.

Terpstra, J., Coleman, K., J., Simon, G., Nebeker, C. (2011). The Role of Community Health Workers (CHWs) in Health Promotion Research: Ethical Challenges and Practical Solutions. *Health Promotion Practices,* 12 (1): 86-93.

U.S. Department of Health and Human Services Health Resources and Services Administration Bureau of Health Professions (HSRA). (2007). *Community Health Worker National Workforce Study. An Annotated Bibliography.*

United States-México Border Health Commission. 2010. *Border Lives. Health Status In The United States-Mexico Border Region.* US-Mexico Border Health Commission. 1-362.

United States-México Border Health Commission. 2010. *Health Disparities and the U.S.-México Border: Challenges and Opportunities. A White Paper.* US-Mexico Border Health Commission. 1-15.

Wallerstein, N., Bernstein, E. (1988). Empowerment education: Freire's ideas adapted to health education. *Health Education Quarterly*, 15(4): 379-394.

World Health Organization. (2006). *Primary Ear and Hearing Care Training Resource.* Geneva, Switzerland: World Health Organization Press.

World Health Organization (2012). *Community-Based Rehabilitation: Promoting Ear and Hearing Care through CBR.* Geneva, Switzerland: World Health Organization Press.