Translating Public Health Practices: Community-Based Approaches for Addressing Hearing Health Care Disparities

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ABSTRACT

Epidemiologic studies reveal disparities in hearing health care with lower prevalence of hearing aid use among older adults from racial/ethnic minority groups and lower socioeconomic positions. Recent national reports recommend exploring innovative delivery models to increase the accessibility and affordability of hearing health care, particularly for underserved and vulnerable populations. With an expected rise in the prevalence of age-related hearing loss over the next four decades due to a rapidly aging population, the condition is a growing public health imperative. This review describes key public health practices for developing and delivering community-based care that characterizes an emerging area of research in novel approaches of hearing loss management programs to reach underserved populations. With evolving technologies that enable care to extend beyond the clinic, adapting a long-utilized community health worker approach presents a strategy for the field of hearing health care to be actively involved in designing and leading initiatives for achieving hearing health equity. Principles from community-based participatory research offer a paradigm for the field to integrate into its research endeavors for addressing disparities. An interdisciplinary approach for engaging these challenges offers hearing

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health care researchers and providers an opportunity to advance the field and delivery of care.

KEYWORDS: hearing health care disparities, age-related hearing loss, community health worker, community-based participatory research

HEARING HEALTH CARE IS A PUBLIC HEALTH IMPERATIVE

Age-related hearing loss is often regarded as a common and inevitable part of the aging process that impacts communication function and quality of life. Nearly two-thirds of adults 70 years and older in the United States have hearing loss.[1] Beyond communication difficulties, age-related hearing loss is independently associated with social isolation,[2,3] depression,[4–6] as well as accelerated cognitive decline[7] and incident dementia.[8] Given its prevalence, age-related hearing loss may be the largest potentially modifiable risk factor for dementia.[9] With increasing recognition of the role of hearing loss in healthy aging, management of age-related hearing loss takes on greater importance and wields significant implications for ensuring equitable access to hearing health care services by all demographics of the population. Through the study and adaptation of proven public health practices, hearing health care researchers and providers have novel strategies for leading initiatives to achieve hearing health equity.

NEED FOR INNOVATIVE APPROACHES TO HEARING HEALTH CARE: ACCESSIBILITY AND DISPARITIES

The concept of health care accessibility is complex. From a public health perspective, it can be described as "the timely use of personal health services to achieve the best possible health outcomes."[10] Beyond the mere availability and convenient physical proximity of services, the extent of a population "gaining access" depends on multiple dimensions including financial, organizational, and social or cultural barriers that can either facilitate or limit utilization of care.[11] The accessibility of health care therefore is also dependent on the affordability and acceptability of services, where considerations for the contexts of diverse populations' cultural relevance, unique settings, individual or communal needs, and perspectives are inherent in the definition.[11] In hearing health care, another significant factor to consider is the impact of perceived stigma that associates hearing loss and hearing aids with ageism and disability.[12]

National statistics are limited in documenting older adults' access to hearing health care and self-reported hearing aid use typically serves as a proxy measure. While the overall prevalence of hearing aid use among older adults with hearing loss remains low with estimates ranging from 14.2 to 33.1%,[1,13–15] nationally representative studies reveal disparities in hearing aid utilization by race/ethnicity and socioeconomic positions. Among older adults with hearing loss, minority populations and those within lower income profiles reported lower rates of hearing aid use.[15–17] For example, one study observed that when compared with white counterparts, black older adults were 58% and Mexican American older adults were 78% less likely to report regular hearing aid use after controlling for age and degree of hearing loss.[16] These findings underscore the need for addressing ethnocultural and socioeconomic domains in the development of novel approaches for equitable access to hearing loss management opportunities.

PUBLIC HEALTH APPROACHES IN AUDIOLOGY: RESPONDING TO NATIONAL ATTENTION FOR HEARING HEALTH EQUITY

Recent reports from the President's Council of Advisors on Science and Technology (PCAST) and the National Academies of Sciences, Engineering, and Medicine (NASEM) specifically highlighted the need for increasing the accessibility and affordability of hearing health care.[18,19] Among the proposed recommendations described in the 2016 NASEM report, the committee on accessible and affordable

hearing health care for adults called attention to the need for improving access for underserved and vulnerable populations from economically disadvantaged and racial/ethnic minority groups.[19] Multiple complex factors often rooted in both systemic and social inequalities contribute to poorer health outcomes for these demographics.[20,21] In particular, the NASEM report recommends the promotion of community health workers (CHWs) as a potential mechanism for increasing the accessibility of hearing health care through workforce expansion.[19] The recommendation to use CHWs for addressing health disparities is consistent with the Department of Health and Human Services' proposals and the Healthy People 2020 initiative.[21,22]

The purpose of this review is to describe a strategy for advancing access to hearing care through the integration of public health practices traditionally used to address health care disparities. These specifically include the development of a CHW delivery model of care through a community-based participatory research (CBPR) approach. Both synergistically emphasize the perspectives and experiences of the end users,[23–25] which include older adults with hearing loss and their communication partners. The evidence base for CHW-delivered hearing care interventions is nascent.[26,27] Nevertheless, community-based models represent an evolving model of hearing care. With the growing number of older adults with hearing loss,[28] shifting national policies,[29] and rapid evolutions in commercially available amplification devices[30,31] and portable audiometric technologies,[32–35] community engagement for developing community-based approaches to hearing health care will be critical areas of study and involvement for hearing health care providers and researchers.

PUBLIC HEALTH APPROACHES TO ADDRESS HEARING CARE DISPARITIES

Community Health Workers as a Delivery Model for Underserved Populations

A community-based health workforce is not a new concept in the United States.[23,36,37] In addition to "CHWs," these lay health workers also may go by other related titles including "promotoras (de salud)" among Hispanic communities, "public health aid," "peer counselor," "patient navigators," and "community health aides."[24,36–38] These roles have historically been employed to reach low-income, minority, and high-risk populations in underserved areas[23] from frontier Alaskan Native reservations[37] to dense urban neighborhoods like New York's Harlem.[38] CHWs can be found in diverse settings including community-based organizations, clinics/hospitals, schools, homes, and community centers.[39] CHW-delivered programs have focused on a variety of health areas including hypertension, diabetes management, immunizations, cancer, maternal and child health, nutrition, tuberculosis, and HIV/AIDS.[24] CHW-delivered programs improve health outcomes and address health care disparities, particularly in vulnerable populations, and are considered cost-effective given their utilization of a paraprofessional workforce.[24,40]

CHWs traditionally serve as liaisons between health care providers and at-risk populations.[36] Their scope of work can include conducting screenings, educating their communities about disease prevention, coordinating connections to the health care system, assisting with continuity of care, and providing informal counseling, social support, and advocacy.[38,40,41] CHWs are usually involved under the supervision of referring health care providers as members of a comprehensive team.[36,37,40] They serve a critical role as frontline workers who share the same ethnocultural background, language, and/or geographic base as patients. These qualities uniquely position CHWs with keen awareness for delivering and framing culturally appropriate services that considers patients' values and needs.[23,24,37,39,40] Several reviews also highlight the effectiveness of CHW-delivered interventions in improving self-management skills, particularly for chronic conditions such as diabetes,[39,40] and provides a framework for applying these efforts to the self-management skills required in addressing age-related hearing loss. For example, one intervention program improved self-management skills through a series of structured CHW-delivered group education meetings about diabetes mellitus including

glucose self-monitoring and individual counseling using motivational interviewing techniques.[42]

Similar to other health behaviors that CHWs manage, such as medication adherence or increasing physical activity, the adoption and use of hearing care is a health behavior where community- and patient-level factors can greatly influence an individual's actions. This applies to whether hearing care involves the use of hearing aids and/or communication strategies.[43] CHW-led interventions can support behavior change, increase knowledge and satisfaction, and improve outcomes.[44] Additionally, CHWs also can educate health care professionals about the specific needs and relevant cultural nuances of the population receiving services.[20] This partnership strengthens the overall cultural humility and communication skills of the health care system.[36,41]

The nature and extent of trainings that prepare CHWs vary, and depend on the breadth of duties and specific job description.[36] A 2016 systematic review of CHW-directed interventions revealed that among 24 studies that reported length of training, the duration ranged from 4 to 240 hours with an average of 41.3 hours and a median of 16.5 hours. Shorter trainings tended to prepare a CHW for basic responsibilities such as recruitment, and longer trainings prepared a CHW for more complex duties such as care management and coordination.[40] Training curricula involve didactic classroom lectures, interactive learning, knowledge/skills assessments, and/or supervised field experiences.[36,37,40]

As of June 30, 2016, twenty-five states and the District of Columbia had laws addressing various domains of the CHW workforce including infrastructure, professional identity, training and certification, and financing. Six states (MA, NE, NM, OH, OR, TX) had enacted workforce development laws with either required or authorized legal authority for CHW core certification processes, and seven states (AK, IN, ME, MN, NY, VT, WA) had financing laws that authorized Medicaid or other insurer reimbursement streams for services.[45] For example, a credit-based CHW training curriculum in Minnesota is available at community and technical colleges. For those who complete it, certain services are reimbursable under Medicaid if the CHW works under the supervision of a Medicaid-approved health care provider. Minnesota is credited as the first state with a sustainable funding mechanism for supporting this frontline workforce that addresses health disparities through targeting underserved communities.[46] According to a 2016 CDC report that studied the potential public health impact associated with enacted state laws, the CHW workforce is considered an emerging area of interest for policy makers.[45]

Integrating Emerging Technologies into Hearing Health Care

Rapid developments in technologies offer renewed opportunities for investigating novel approaches aimed at increasing access to hearing care for underserved populations. Technology innovations include direct-to-consumer amplification products that are already available on the market, which include self-fit and self-adjust devices that may minimize the need for repeat visits to a clinic.[30,31] This has implications in reducing the burden of transportation and time coordination for planning clinical visits that are often needed for maximizing user experiences with devices. The lower costs of emerging technologies also highlight the improving affordability of innovations used for hearing loss management, which can represent influential factors in steering people's health care decisions.[19] Other developments include the availability of portable audiometric equipment that are capable of screening audiometric thresholds in remote settings. Examples include the tablet-based ShoeBOX Audiometer[32] and the hearX group's smartphone-based platforms.[33,34] These innovations enable the delivery of reliable audiometric assessments outside of the traditional clinic-based model, including in community-based primary care settings by generalist CHWs in South Africa.[35] The availability of these technologies highlight the need for further investigating the necessary workforce infrastructure to optimize the utility and application of emerging technologies in effective care delivery beyond assessments.

New and alternative products and equipment provide advantages for the audiology field to assume leadership in responding to the needs

of older adults and increasing accessibility of hearing health care. By embracing and integrating these technologies in the development and investigation of novel solutions, the field has opportunities to expand the reaches of hearing health care to underserved communities with audiologists involved as critical care team members. Through capitalizing on emerging technologies as innovative tools for increasing hearing health care accessibility, the field may have a proactive role in designing initiatives aimed at reducing and eliminating hearing health disparities.

Adapting a Community Health Worker Model for Hearing Care

Community-based delivery models for hearing care are an emerging area of research. Recent pilot studies demonstrated the feasibility, acceptability, and preliminary efficacy of community-based interventions in underserved areas for addressing hearing health care disparities.[26,27] In one pilot study (*Oyendo Bien*), an investigative collaboration in a rural Arizona community developed a Spanish language, culturally relevant hearing health education outreach program for older adults from Hispanic/Latinx backgrounds and their families.[26] CHWs from the local federally qualified health center (FQHC) were trained in relevant content areas and served as cultural brokers and nonclinical community health educators.[47] Through the program, CHWs educated older adults with hearing loss about hearing health and promoted self-efficacy in hearing loss management through communication strategies and behavioral change techniques. After 1 year, participants reported taking subsequent actions in hearing loss management, which included talking with other family members about their hearing loss and seeking follow-up with hearing health care services.[26] The efficacy of the program is currently under investigation in a randomized controlled trial (NCT03255161).

Another program in Baltimore, MD (*Baltimore Hearing Equity through Accessible Research and Solutions; HEARS*), based in urban, subsidized senior housing communities, targets hearing health care disparities among predominantly minority and low-income older adults. The ongoing program incorporates education on age-related hearing loss management through communication strategies and the provision and fitting of a low-cost, over-the-counter amplification device. Results from the recently completed randomized controlled pilot study of the community-based intervention demonstrated improvements in self-reported hearing handicap as measured by the Hearing Handicap Inventory for the Elderly-Screening version (HHIE-S) that were similar to results observed with traditional approaches using hearing aids.[27] Further investigation of the program's efficacy through a multisite randomized controlled trial is currently ongoing (NCT03442296).

There are similarities between initiatives for engaging the CHW workforce and those targeting other paraprofessionals and support personnel in audiology such as peer mentors and audiology assistants. The Peer Mentor Training Certificate Program at Gallaudet University trains persons with hearing loss to provide support, advocacy, and outreach to others with hearing loss.[48] Use of audiology assistants also is suggested as a way to meet increasing demands for audiology services. As reviewed by Hamill and Andrews, potential roles of audiology assistants are currently under discussion in the field and could include recruitment of patients or home visits in the community.[49] Along with these similarities, several aspects of engaging CHWs as paraprofessionals are distinctive. CHWs are trusted and often embedded members of their communities and may therefore have particular capacity to improve the cultural responsiveness of hearing health care service delivery and to reach underserved and/or vulnerable individuals. These areas represent a unique paraprofessional role for CHWs and a novel application of an established public health model for hearing health care. Beyond the use of trained community representatives as CHWs, community engagement is a defining aspect of developing the CHW delivery model and its responsiveness to hearing health care disparities.

Community-Based Participatory Research as a Framework to Address Health Disparities

Community-based participatory research (CBPR) is an investigation paradigm described as a

Table 1 Principles of Community-based Participatory Research[52]

1. Maintain collaborative, equitable partnerships throughout the research process
2. Appreciate the value of all individuals on the team and the community
3. Build on the community's assets
4. Uphold co-learning and build capacity among all partners
5. Commit to long-term partnerships and foster genuine relationships
6. Embrace the iterative and cyclical nature of progress
7. Share findings and lessons learned with all parties
8. Balance research and tangible actions to ensure all parties benefit
9. Prioritize public health problems of local relevance and work to address the multiple determinants of health

Source: Adapted from Israel et al.[52]

strategy for targeting health disparities.[50,51] Table 1 outlines the nine principles of CBPR as described by Israel and colleagues.[52] While a comprehensive description of the theoretical bases of CBPR principles are beyond the scope of this review, the approach can be summarized as a collaborative research partnership between academic institutions and community partners. Community partners can include leaders from community-based organizations, such as religious leaders, elected local officials, key community members, and representative members of the target demographic. The core concept of CBPR is equalizing power dynamics and influence across everyone involved in the investigation, particularly between academic researchers and community members.[51] CBPR approaches are also presented as rooted in research ethics and measurable by moral standards.[53] The framework prescribes an ongoing co-learning process between everyone involved in a research project that would have something to gain through advancing a community-based initiative (often termed project "stakeholders"). These collaborations and engagements support the development of solutions that tackle issues and concerns voiced by the community members. By integrating the equitable participation of all stakeholders, both researchers and community members, in the design and implementation of public health initiatives, proposed solutions achieved through joint efforts to improve outcomes that are most relevant to the involved stakeholders.[25]

Literature on the utility of community engagement strategies and approaches in behavioral intervention research report an overall effectiveness in improving health behaviors, self-efficacy, and health outcomes for disadvantaged populations.[54] Of particular relevance to hearing health care, community engaged interventions lead to improvements in health behaviors related to self-management, which are critical in chronic diseases as well as the management of age-related hearing loss. For example, Kim and colleagues studied the effects of a community-based, CHW and nurse team–delivered intervention aimed to promote self-management skills for type 2 diabetes in a Korean American community through a randomized controlled trial with a waitlist control. Utilizing CBPR principles, the self-help intervention program for diabetes management (SHIP-DM) improved the program's overall cultural sensitivity by engaging the target demographic in its design and implementation. When compared with the control group, the study team reported a statistically significant improvement in diabetes-related self-efficacy and quality of life.[42] Levin and colleagues developed an intervention study similarly with CBPR concepts that focused on a predominantly African American neighborhood in Baltimore, MD, and lowering the prevalence of hypertension through a CHW-delivered intervention. Results from the 4-year randomized controlled trial showed positive findings post-intervention, including significant decreases in mean systolic and diastolic pressures and a significant increase in the number of participants living with adequately controlled blood pressure.[55] Consistent theme throughout these examples is the importance of building an effective working relationship with all stakeholders that is built on trust[53] and the demonstration of a longterm commitment by all partners.[52]

Given the critical need for a foundation of trust and a collaborative working relationship in community-based initiatives, advocates of CBPR highlight the importance of receiving funding and support for pilot studies. In addition to these efforts building a research program, they also allow greater opportunities and time for project partners to develop effective relationships for fostering sustainable and desirable outcomes.[53] While factors of systemic and social inequalities contributing to health disparities are complex,[20,21] further historic legacies of injustices committed against ethnic minority communities in biomedical research have cultivated a lack of trust.[50] General patterns of distrust extend into observations of attitudes toward the health care system, particularly among non-Hispanic black communities as compared with non-Hispanic white counterparts.[56] Achieving health equity is a long-term commitment, and CBPR proponents describe integrity and humility as the most important values in the practice for tackling issues of inequity and disparities.[50]

Applying Community-Based Participatory Research to Hearing Care

Few studies have approached hearing health disparities research through CBPR. The *Oyendo Bien* pilot study leveraged a longstanding relationship between an academic institution and a rural FQHC to conduct systematically a community needs assessment and build a basis for steering subsequent work.[57] Findings from qualitative assessments informed the iterative development of the pilot program by adapting them into core intervention components.[26] Applications of CBPR helps translate research findings into social change by integrating community participation from the beginning.[51,58,59]

The *Baltimore HEARS* pilot study engaged the intervention development process similarly by ensuring that community representatives, including residents from low-income senior housing and building staff members, regularly participated in focus groups and interviews.[27] This proactive step to involve stakeholders early on in a research initiative helps foster ownership in a study's process, goals, and interpretation of findings among the intended audience and ensures the developed products remain responsive to the community members' needs and priorities.[50] In *Baltimore HEARS*, initiatives aimed at integrating perspectives from target users informed the design of the intervention materials through guided feedback of the visual aids and take-home references.[27]

Another demonstration of equitable power distribution in accordance with CBPR principles is through capacity building. This can manifest with academic research teams training community members in research methodology including knowledge surrounding protection of human subjects as well as analysis, interpretation, and dissemination of study findings.[50] Table 2 provides examples of adapted applications of CBPR principles in research initiatives.[60] These principles should be incorporated throughout all phases of the research process, from identifying target outcomes, designing materials, setting up recruitment strategies, to planning for the dissemination of results. As an example, the *Baltimore HEARS* team hosted an open forum during a "graduation ceremony" with participants at the end of the study to share the pilot study results and invite feedback on the interpretation and dissemination of findings as well as insights for future implementation.[27]

Applying a CBPR approach to research in community-based hearing care also should involve taking steps to ensure sustainable outcomes that can continue to benefit others following a project's conclusion. The approach can serve as a means to share resources and training to build the capacity of community members and partners and minimize their reliance on external bodies, such as an academic institution. For example, *Oyendo Bien* trainings increased the CHWs' knowledge of how individuals and families may experience hearing loss and how to connect with available local and state resources. Skills development included training in how to communicate effectively with individuals with hearing loss.[47] The knowledge acquired through the research initiative can remain in use beyond the study, and its application offers the potential to reach more beneficiaries even after a project finishes. Drawing on strategies for community engagement and creating sustainable effects that promotes

Table 2 Applications of Community-based Participatory Research Principles in Collaborations between Academic Institutions and Community Partners[60]

Principle	Translation	Application
1. Maintain collaborative, equitable partnerships throughout the research process	Establish that everyone's voice is vital for ensuring sustainable results; this dynamic begins in the beginning	a. Agree upon how to address one another (e.g., first names vs. formal titles) b. Identify shared goals and values c. Set clear expectations for mutual respect and open dialogue
2. Appreciate the value of all individuals on the team and the community	Every community is complex and not monolithic; respect unique differences	a. Identify and define "the community" and the focus of the initiative b. Include community representatives in all discussions c. Acknowledge and reinforce why each member is involved on the team
3. Build on the community's assets	Everyone is the expert of something; identify and reinforce the value that each partner offers	a. Do not assume what each partner's expertise would be; create a platform for everyone to share what insights/skills they offer b. Agree upon rules that balance distribution of power (e.g., no decisions are final unless there is majority consensus)
4. Uphold co-learning and build capacity among all partners	Everyone has something to learn throughout the research process; uphold mutual dignity by committing to sharing and asking questions	a. Ask openly about the implications of a decision on community members and academic institutions b. Share scientific rationale underlying research design and methodology with community partners, including the implications of manuscript publications c. Include community partners in the analysis and dissemination of results
5. Commit to long-term partnerships and foster genuine relationships	Be authentic in developing relationships; commit to being present to strengthen working partnerships	a. Communicate regularly b. Meet routinely as a team; agree on the frequency of meetings c. Discuss expectations of meetings, such as timing, attendance, and refreshments d. Demonstrate group commitment by showing up and supporting other initiatives or events beyond the primary research project

Table 2 (*Continued*)

Principle	Translation	Application
6. Embrace the iterative and cyclical nature of progress	Progress follows a nonlinear trajectory; be flexible	a. Identify where each partner has flexibility, and where limitations exist that need to be accommodated (e.g., schedule conflicts, deadlines) b. Acknowledge as a team that the research process is a marathon (intentionally paced) and not a sprint
7. Share findings and lessons learned with all parties	Pass along the study's results and conclusions broadly and in meaningful ways	a. Collectively decide where/when the research project ends b. Share information in a way that is easy to access with clear language and visuals c. Promote a sense of ownership of data and findings among all partners d. Discuss publication authorship and the extent of involvement by interested team members early in the process and throughout the study e. Define ownership of the materials/data early in the process f. Cultivate relationships with partners beyond data collection
8. Balance research and tangible actions to ensure all parties are benefitting	Aim for a balanced solution and outcome where everyone benefits	a. Identify as a group what "success" looks like from the start b. Identify immediate needs along the timeline and strategize ways to address them while longer-term objectives are still in-progress c. Leave time for open discussions and troubleshooting
9. Prioritize public health problems of local relevance and work to address the multiple determinants of health	Learn about existing local health problems; recognize the legacy of systemic and social factors' impact on health and well-being; respect people's determination of equity	a. Learn from each partner and community representative b. Involve representation of the target demographic in produced materials that highlights relevance of the message c. Appreciate that people's health and well-being are influenced by multiple, often intertwined factors

Source: Adapted from Burke et al.[60]

self-management capacities among community members, both pilot programs have built upon strengths of the communities served and involved community partners in shared decision making. The literature documents these factors as contributors to empowerment, equity, and sustainability in community settings.[51] Through the utilization of embedded and trusted community members in CBPR and CHW-delivery models, public health approaches to hearing care offer expanded approaches to the delivery of patient-centered care.[40]

CONCLUSION

Hearing health care disparities exist in the United States along racial/ethnic and socioeconomic domains.[15–17,19] National reports have charged the field of audiology with investigating alternative and innovative delivery models for increasing the accessibility and affordability of hearing health care for underserved and vulnerable populations.[18,19] Public health initiatives have historically utilized CHWs to address concerns surrounding the lack of accessible health care for high-risk and underserved demographics.[21,24,26,36–38] Numerous reviews have documented the effectiveness of this community-based workforce in a variety of health care arenas,[24,40] and CBPR is a recommended research framework to develop solutions for reducing health disparities.[25,50,51,53] Preliminary evidence pertaining to the efficacy of community-based aural rehabilitation interventions is emerging.[26,27]

Advances in technologies utilized for hearing health care, including direct-to-consumer amplification[30,31] and portable audiometric equipment,[32–35] extend the potential for provisions of innovative hearing care beyond traditional clinic-based settings. There is also a growing recognition of the need for novel delivery models for hearing loss management.[19,61] Aural rehabilitation researchers and providers have an opportunity to respond to the needs of a diverse aging population. By integrating public health practices as one strategic approach, the field of hearing health care can be actively involved in these evolving conversations and contribute to advancing innovations in clinical care to achieve hearing health equity.

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