ABSTRACT

Title of Dissertation: VALUES IN AMERICAN HEARING HEALTHCARE

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Doctor of Philosophy, 2024

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The long-term objective of this research is to create a more inclusive, patient-centered hearing healthcare system that aligns with all stakeholders' diverse values and needs. This dissertation explores the values shaping hearing healthcare through three complementary studies. Chapter 2 analyzes the introduction of over-the-counter (OTC) hearing aids, revealing a values shift from traditional audiology's focus on accuracy, safety, and subjective benefit to prioritizing access and affordability. Implementing an OTC service delivery model for hearing healthcare promoted values different from those of traditional audiology. Still, the creation of OTC offers affordances that enable us to create more patient-centered hearing healthcare systems to reflect stakeholders' values. Chapter 3 validates a comprehensive list of values in audiology through a national survey of audiologists, confirming alignment with best-practice guidelines. Previous work developed a codebook of values based on textual documents representing best practices in traditional audiology, and it was essential to validate these findings by directly engaging with audiologists. Chapter 4 develops a codebook based on the values of individuals with hearing difficulties, cat-

egorizing their concerns into Material, Social, and Healthcare domains. Results from this study highlight the importance of considering the values of individuals with hearing loss, which encompasses not only the use of hearing aids and affordable hearing healthcare but also concerns regarding the effectiveness, usefulness, and social implications of hearing aids. Together, these studies underscore the balance between efforts to improve accessibility and the need to maintain patient-centered outcomes, suggesting that future research should focus on understanding how values intersect with the daily lives and decision-making processes of all people with difficulty hearing.

Values in American Hearing Healthcare

by

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Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2024

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Dedication

I would like to express my sincere gratitude to each participant who took part in this research and shared their time, stories, and experiences with me. Your openness and willingness to discuss your needs and perspectives brought a richness and depth to this dissertation work that would not have been possible otherwise. It is through your voices that we are able to see the gaps and opportunities in hearing healthcare more clearly. Each one of you has contributed to shaping a future where hearing healthcare can be more personalized, accessible, and truly reflective of the diverse experiences of those it serves. Your insights are paving the way for more compassionate and responsive solutions, and I am profoundly grateful for the opportunity to learn from you. Thank you for your generosity in sharing your lives with me.

Acknowledgments

I would like to thank my mentor, Dr. Eric Hoover, whose impact on my career and life would be impossible to adequately describe given the constraints of this document. Words cannot convey my gratitude and admiration. One of the most-repeated phrases in dissertation acknowledgements is: "I could not have done this without you." While this is certainly true, I also *would* not have done this without you, which I think is an important distinction. If I had the choice, I'd do it again. All I can say is thank you for being the best PhD advisor that anyone has ever had, ever. I'd like to thank my dissertation committee, Drs. Katie Shilton, Samira Anderson, Matthew Goupell, Yi-Ting Huang, and Danielle Powell, for the countless when2meet emails, zoom meetings, forms signed on my behalf, and thorough critical evaluation of the work presented here. I'd like to especially thank Samira for helping me feel less alone in the experience of having geographically-distant loved ones. I'd like to thank Dr. Dave Eddins for providing me with the invaluable experience of joining the world of hearing science research in your laboratory, and for being instrumental in my initial pursuit of a PhD. Thank you for convincing me of my potential and teaching me the critical skills of writing both academic-esque emails and scientific research papers. I'd like to thank Drs. Erick Gallun, Estaben Sebastian Lelo de Larrea-Mancera, Aaron Seitz, Tess Koerner, and Trevor Stavropoulos for teaching me what it means to collaborate, how to be an enthusiastic scientist, and how much fun you can actually have at a work conference. I would like to thank Training Grant T32 DC-00046 from the National Institute of Deafness

and Communicative Disorders for the financial support that made this research possible. I am very grateful to Drs. Catherine Carr and Sandra Gordon-Salant, whose leadership throughout my training have been instrumental in my development as a researcher.

I would like to thank Dr. Michelle-Hoon Starr for caring as deeply about the issues of audiology as I, and for your commitment to improving the lives of people with hearing loss. You are an inspiration as a clinician, and the living embodiment of these values in practice. I'd like to thank Madisen Bonner for entering my academic life at the moment I needed you the most, and for your invaluable contributions to this work in the final hours. I can't wait to see the amazing things that you accomplish in your life. I'd like to thank Drs. Sittiprapa Isarangura, Rachel Moldenhauer, Marjan Davoodian, Seongsil Lee, and Mckenna Dyjak for being my academic family and favorite work friends. Thank you so much for caring about my wellbeing and for letting me cry in the lab all the time.

I would like to thank my parents, Bob & Pam Palandrani and Raj & Shireen Menon, and all of my grandparents, for your unwavering support and encouragement. You've never doubted my abilities or decisions, and your confidence in me became my confidence in myself. I am only here because of you. I'd like to thank my husband, Feroze Menon, for loving me enough to marry me five times in two countries during this PhD. Thank you for learning more about hearing healthcare than you probably ever cared to, and for being a constant sounding board for my schemes, ideas, and melodrama. Thank you for every single time you prioritized my needs above your own. You're the best teammate I could have ever asked for. I'd like to thank my very best friend, Dr. Madison Dyjak, for being the first person to celebrate my victories and accept my defeats without judgement. Thank you for always showing up for me in the most important moments and for carrying me through when the simulation is at its most chaotic. I'd like to thank

my siblings, Kristen Palandrani, Marissa & Cory Phinney, Michelle & Tom Jebb, Flynn Jebb, and Pallavi & Gaev Mehta, for helping me remember who I am. Each holiday, party, and wedding was a high point when the PhD journey, and life in general, was at its most difficult. Thank you to my entire family, especially Bradley, Matthew, & Lauren Phinney and Daniel, Caroline, Anna, & Emma Jebb for your unconditional love.

Finally, I'd like to thank Tim Burton and his cast for the cult classic film Beetlejuice, and even more so for releasing a Beetlejuice sequel during the darkest depths of my dissertation writing. Thank you to Danny Elfman for composing the Beetlejuice score that was the constant background throughout the writing of this dissertation.

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Chapter 1: Introduction

1.1 The epidemic of untreated hearing loss

According to the Centers for Disease Control and Prevention, hearing loss is the third most common chronic health condition among American adults and is a leading public health concern (CDC, 2015). Nearly half of individuals older than 75 years have difficulty hearing, however, hearing loss does not only affect the elderly population. Approximately 15% of adults in the United States over the age of 18 report some trouble hearing, and approximately one in three people in the U.S. between the ages of 65 and 74 have hearing loss (NIDCD, 2023). Based on nationally representative audiometric data in the U.S., it has been estimated that 25% of women and 50% men between the ages of 20 and 69 have at least a mild hearing impairment (Ciletti & Flamme, 2008). The true extent and impact of hearing loss on the U.S. population remains an area in need of research (NASEM, 2016).

Despite the well-documented functional (Bainbridge & Wallhagen, 2014), social (Vas et al., 2017), economic (Neitzel et al., 2017), and cognitive (Livingston et al., 2020) consequences of living with hearing impairment, very few individuals who could benefit from treatment seek it. Only 20% of adults with hearing loss report using a hearing aid (Mamo et al., 2016), and for those who adopt devices, the average delay from diagnosis to treatment is approximately 9 years (Simpson et al., 2019). Hearing loss negatively impacts quality of life for older adults,

with hearing-impaired individuals reporting less satisfaction from life overall compared to their normal-hearing peers (Ciorba et al., 2012). The World Health Organization reports that if every person who could benefit from amplification wore a hearing aid, then the years lived with disability (YLD) could be reduced by 59% (WHO World Report on Hearing, 2018).

Historically, efforts to improve hearing healthcare have focused on solutions that modify individual traits associated with low rates of hearing aid uptake in adults. Existing research indicates that perceptual factors like self-perceived loss and stigma should be modified on an individual patient basis to increase engagement with treatment (Jenstad & Moon, 2011). Manchaiah et al., (2015) emphasize the importance of societal attitudes in influencing individual acceptance of hearing aids, suggesting that educational campaigns may help mitigate stigma and improve acceptance. Other studies point to patient education initiatives as a solution to increase engagement in hearing healthcare systems by improving health literacy among adults with lower levels of education (Speros, 2009). It has been shown that many users lack comprehensive knowledge about their devices, which can lead to underutilization (Picou, 2020). While tools have been developed to facilitate best practice health literacy recommendations, currently, these tools have been validated with a predominantly White population (e.g., Arnold et al., 2019) and may not adequately address the unique challenges faced by diverse populations (Tran et al., 2020).

Another avenue for improving American hearing healthcare engagement is the introduction of new service delivery models that aim to help individuals overcome barriers to treatment. For example, teleaudiology was introduced to increase access for those who experience barriers to attending clinic appointments and can reduce the costs associated with traveling long distances in remote areas (Muñoz et al., 2021). Recent high-profile critiques of the state of hearing healthcare services established that access to hearing healthcare and the cost of devices are the largest bar-

riers to treatment (President's Council of Advisors on Science and Technology, [PCAST], 2015; National Academies of Sciences, Engineering, and Medicine [NASEM], 2016). To address these issues, legislation was passed that introduced a new class of amplification devices to be sold directly from manufacturer to consumer (Over-the-Counter Hearing Aid Act, passed as part of the FDA Reauthorization Act HR 2430, §934 of 2017). The introduction of novel service delivery models like these presents the opportunity to develop evidence-based solutions that directly address patient needs. If future hearing healthcare service delivery models address the factors that contribute to an individual's hearing healthcare-seeking behaviors, then rates of treatment for hearing loss could be improved dramatically, improving quality of life for millions.

1.2 Value-sensitive design applied to hearing healthcare

Value-sensitive design (VSD) is widely used to develop solutions that preserve stakeholders' values. Several definitions of values have been proposed, but the most commonly recognized was published by Schwartz (1994): "A value is a belief pertaining to desirable end states or modes of conduct, that transcends specific situations, guides selection or evaluation of behavior, people, and events, and is ordered by importance relative to other values to form a system of value priorities." In qualitative research, "values" is an expansive and inclusive term for designing solutions that meet both moral and practical goals (Shilton, 2018) and can serve as a method for better understanding relationships between people, information, and technology (Fleischmann, 2013). VSD is an approach that comprehensively accounts for human values throughout the entire research and design process (Friedman et al., 2002).

Designing healthcare solutions using VSD can promote patient-centered care by address-

ing issues that are important to specific patient populations. Designing healthcare solutions for users' values can help ensure that stakeholders' needs are met, and that the solution will be successful. Thus, VSD methodology applied to hearing healthcare presents the opportunity to enable individuals to generate and incorporate their values for consideration in the development of solutions that serve their needs. The deregulation of the hearing aid market, especially through the introduction of over-the-counter (OTC) devices, provides a unique opportunity to leverage value-sensitive design (VSD) in developing patient-centered solutions. By focusing on the values and needs of individuals with hearing difficulty, VSD ensures that innovations in hearing healthcare, including OTC devices, align with patient preferences, abilities, and ethical considerations. In a deregulated market, where consumers have more autonomy in choosing devices, VSD can guide the development of products and services that overcome barriers to adoption.

1.3 Qualitative content analysis

One framework for analyzing values is qualitative content analysis (QCA), a method that is especially useful for the analysis of written text. Conducting QCA means intensely examining language and classifying a large amount of text into efficient categories to derive meaning from communication (Weber, 1990). QCA can be applied to any type of recorded communication, including but not limited to transcripts of interviews, documents, video tapes, or unstructured discourses (Mayring, 2004). This methodology relies on coding, the process of a human reader symbolically and iteratively assigning one or more attributes (codes) to a portion of textual data (Saldana, 2009; Locke et al., 2020). Software packages like NVivo 12 Pro (QSR 202 International Pty. Ltd., 2018) facilitate efficient coding of large amounts of text by allowing users to "tag" and

subsequently categorize segments of textual documents to analyze coded data and identify trends and patterns. Over time, the iterative coding process converges to a consistent set of values, reflecting the underlying themes and perspectives within the data.

QCA is well-suited for analyzing the multifaceted and sensitive phenomena related to healthcare (Hsieh & Shannon, 2005; Elo & Kyngas, 2008) and has been used broadly to better understand aspects of care that are important to stakeholders like patients, families, and healthcare professionals (Curtis et al., 2001; Knudsen et al., 2012). To identify specific aspects of end-of-life care that should be improved, Curtis et al. (2001) conducted focus groups to elicit the priorities of doctors, nurses, and patients with terminal diseases. The result was a set of interventions that focused on areas of importance to patients that were not previously taught or emphasized to physicians. Within audiology, QCA has been used to better understand treatment decisions by coding and analyzing interviews with stakeholders (Laplante-Levesque et al., 2010). By applying qualitative content analysis to hearing healthcare, we can identify values in transcripts of communication elicited from stakeholders through focus groups or survey responses (human values) and identify values in documents that represent hearing healthcare service delivery models (system values).

1.4 Portable auditory testing and predictive factors of hearing healthcare utilization

The motivators historically associated with the pursuit of hearing healthcare include objective audiological factors such as a higher degree of hearing loss measured by the audiogram and difficulty understanding speech in the presence of background noise (Barnett et al., 2017).

Objective measures of auditory function, which were once restricted to a laboratory or clinic setting, are now widely used remotely, and can even be implemented using patient-owned devices in the home (Shapiro et al., 2020; Lelo de Larrea-Mancera, 2022; Gallun et al., 2018; Peng et al., 2022). The degree of hearing loss is most typically characterized through pure-tone audiometry testing (ANSI S3.21-2009), which has been implemented remotely with tablet-based and stand-alone systems (e.g., shoebox audiometer; Rourke et al., 2016). Pure-tone audiometry is the gold-standard measure of hearing, yet many adults who present with the same audiogram often report very different perceptions of their hearing abilities (Weinstein & Ventry, 1983). In this case, suprathreshold auditory tests that measure the perception of sounds audible to individuals can help in differential diagnosis. The portability of these tools allows for access to reliable, efficient testing in populations where visits to a laboratory or clinic are not feasible.

In addition to objective measures of hearing loss severity, subjective perception of difficulty with communication and acceptance of the condition also drives treatment preferences (Humes & Dubno, 2021). Using self-report measures to screen for hearing loss in rural communities can help mitigate barriers to obtaining hearing healthcare (Brennan-Jones et al., 2016) and some have even argued for self-report as a diagnostic standard in audiology (Vermiglio et al., 2018). In clinical practice, self-report questionnaires are primarily used for treatment validation, serving as a measure of success from the patient's perspective, as well as establishing readiness to engage with treatment. Other personal and perceptual factors that have been associated with seeking treatment for hearing loss, like health literacy and number of communication partners, can be measured with validated outcome questionnaires (Osborne et al., 2013; Montano & AlMakadma, 2012). Asking stakeholders about their abilities and preferences directly through validated questionnaires can provide an efficient, cost-effective, and reliable method for measuring hearing

difficulty among other predictors of engagement in hearing healthcare.

1.5 Reader's orientation to the dissertation structure

In this dissertation, three studies were undertaken. First, an analysis of the values in the over-the-counter hearing aid service delivery model. Second, a nationwide survey of audiologists comparing their values to best-practice guidelines. Third, semi-structured interviews to elicit values from interviews with individuals who have difficulty hearing, including users and non-users of hearing aids. In the following dissertation chapters, each paper will be addressed in turn, followed by a chapter on overall conclusions and future directions across all studies.

Chapter 2: Over-the-counter hearing aids challenge the core values of traditional audiology[1]

2.1 Introduction

Hearing loss is the third most common chronic health condition among Americans, affecting approximately two-thirds of adults over 70 years (Bainbridge & Wallhagen, 2014). Despite the high prevalence of hearing loss and its associated consequences, less than 30% of adults who could benefit from amplification devices seek them (Dammeyer et al., 2017). Hearing aid adoption is a complex issue that may be affected by a variety of individual factors, such as self-perceived degree of hearing impairment, technology commitment, socioeconomic status, psychomotor function, and self-reported health status (Jorgensen & Novak, 2020; Nixon et al., 2021; Tahden et al., 2018). Systemic factors also mediate the use of hearing aids among those who could benefit, and the National Institute on Deafness and Other Communication Disorders made it a goal to understand and eliminate these systemic barriers (Donahue et al., 2010). Two high-profile expert analyses of hearing health care in the United States identified broader systemic forces that contribute to untreated hearing loss, published by the President's Council of

[1]Menon, K. N., Hoon-Starr, M., Shilton, K., Hoover, E. C. (2024). Over-the-counter hearing aids challenge the core values of traditional audiology. Journal of Speech, Language, and Hearing Research, 1-11. These data were presented at the International Hearing Aid Research Conference in Tahoe City, CA (August 2022). This work was supported in part by training Grant DC-00046 (awarded to Katherine N. Menon) from the National Institute of Deafness and Communicative Disorders

Advisors on Science and Technology (PCAST, 2015) and the National Academies of Sciences, Engineering, and Medicine (NASEM, 2016). Both reports provided an evidence-based critique of current hearing healthcare practices in the United States and identified several issues that might contribute to the apparent preference for non-use of hearing aids. The reports concluded that lack of access to a hearing health care professional and the high cost of devices are the most significant barriers to adopting hearing aids. To overcome issues related to access and affordability, the expert analyses recommended that the Food and Drug Administration (FDA) introduce a new class of hearing aids that can legally be sold direct to consumer. Legislation was subsequently passed in 2017 that introduced a new class of amplification devices to be sold over the counter (OTC; Over-the-Counter Hearing Aid Act of 2017, passed as part of the FDA Reauthorization Act HR 2430, §934 2017, of U.S. Congress, 2017). In 2022, the FDA issued a finalized rule establishing the legalization of OTC hearing aids (U.S. FDA, 2022). Beginning October 17, 2022, adults over the age of 18 years with perceived mild-to-moderate hearing loss were enabled to independently purchase hearing aids without consulting a hearing health care professional.

OTC hearing aids were explicitly justified as an effort to alleviate issues identified in the PCAST and NASEM reports (Warren & Grassley, 2017), but they are not a panacea. Multifaceted, individual, and systemic factors contribute to the low rates of hearing aid use by people who could benefit from them, and OTC hearing aids address a subset of the systemic barriers identified in the reports. OTC hearing aids are an opportunity for the market to produce effective solutions. The development of effective solutions leveraging the OTC model will require further examination of the objectives that motivated the regulatory changes. We can use values as a framework to evaluate and critique novel hearing health care solutions, whether those solutions reflect the OTC model or the traditional model of hearing health care, where traditional audiol-

ogy refers to hearing health care provided by a hearing health care professional in the United States. Furthermore, values can be used to understand how the introduction of the OTC model represents a challenge to the values of traditional audiology, which, as the dominant model of hearing health care, was the source of many systemic barriers identified by PCAST and NASEM. Although access and affordability are valued in traditional audiology, accuracy, safety, efficacy, and other values drive the provision of hearing health care in that model (Menon et al., 2023). By gaining a deeper understanding of the values that underlie different hearing healthcare models, we can potentially reduce unintended adverse consequences that major regulatory changes may have on patients and consumers.

This study leverages value-sensitive design (VSD), an approach for the design of technologies that embody specific values (Friedman et al., 2002, 2013). Values are principles or qualities appreciated as important by an individual or system. VSD assumes that by eliciting values of different stakeholders and identifying values in products and services, we can design solutions that better reflect stakeholder values. In recent years, VSD has been applied in health care research to inform both the development of ambulatory therapy technologies for patients in their homes and information and communication technologies for patients with chronic diseases (Dadgar & Joshi, 2018; Mueller & Heger, 2018). Our work is the first to apply this methodology to hearing health care (Menon et al., 2023). The goal of this work is to leverage values to encourage the millions of people who could benefit from amplification to obtain the services they need or to reduce the delay in getting those services (Simpson et al., 2019). This will be accomplished by matching the values of hearing healthcare products and services to the values of underserved patient populations. First, it is necessary to understand the values inherent to the systems of hearing health care that are designed to serve people with hearing difficulty.

Our recent work developed a comprehensive list of values in traditional audiology through an iterative textual analysis of documents representing the ethics, procedures, and outcome measures used in audiology clinical practice (Menon et al., 2023). In this study, we analyzed documents representing traditional, clinical audiology in order to identify the values instantiated by the current dominant model of hearing health care in the United States. Three categories of documents representative of traditional audiology were selected: questionnaires, clinical practice guidelines, and codes of ethics. These documents were selected, because they represent dimensions of intended and enacted values in traditional audiology (Shilton et al., 2013). Questionnaires represent enacted audiology values, because audiologists use them to assess outcomes and determine treatment success. Clinical practice guidelines are a record of what audiologists do, following best practice recommendations where available, and, therefore, document both dimensions of intended and enacted values in clinical practice. Codes of ethics represent intended values that define moral behavior for audiologists, as determined by professional organizations. Although the documents chosen for analysis did not encompass all aspects of audiology clinical practice, it is unlikely that including additional documents would have expanded the list of values because of the methodology used (Curtis et al., 2001). The final list of values in traditional audiology was divided into three categories: instrumental, patient use, and moral values. Instrumental values included accuracy, cost, design, efficiency, evidence-based, objective benefit, and safety. Patient use values included comfort, ease of use, health, satisfaction, self-efficacy, and subjective benefit. Moral values included access to care, autonomy, privacy, equity, and professional duties. The values identified in traditional audiology documents were then rank ordered according to the number of times each value appeared across documents. The current study applied VSD to hearing health care by identifying values in documents representing the introduction of the OTC

model and contrasting them with values in traditional audiology.

Our central hypothesis was that the introduction of OTC hearing aids reflects the prioritization of access and affordability over all other values and the deprioritization of core values of traditional audiology that could compete with access and affordability. This was evaluated with two research questions. The first research question was if the implementation of the OTC model shares the same values as the critique documents that motivated its creation. This was evaluated by comparing the rank order of values in documents representing the critical motivation to create OTC compared to the regulatory documents that defined OTC hearing aids. The similarity of values rankings between these documents was used to determine the extent to which the introduction of OTC hearing aids represented a coherent values framework that could be contrasted with the values of traditional audiology. The second research question was if the introduction of OTC hearing aids represents a challenge to the values of traditional audiology. This was evaluated by comparing the rank order of values between OTC documents and traditional audiology documents. A positive correlation between the values in OTC and traditional audiology would reject the central hypothesis that the introduction of OTC hearing aids represents a targeted reprioritization of values in hearing health care.

2.2 Method

2.2.1 Procedures

A summative content analysis (Hsieh & Shannon, 2005; Morse & Field, 1995) was performed to identify the values expressed by the text in documents listed in Table 2.1, including two critique documents representing the motivation to create an OTC model (PCAST and NASEM

reports) and two regulatory OTC documents representing the implementation of OTC hearing aids in the United States (Final FDA regulations on Establishing OTC Hearing Aids; OTC Hearing Aid Act of 2017). The rank order of values found in documents representing OTC hearing aids were compared to the rank ordered values found in traditional audiology documents reported in Menon et al. (2023). The complete list of the 33 documents representing traditional audiology can be found in the Appendix of Menon et al. (2023). The PCAST and NASEM reports represent intended values in hearing healthcare, because they describe the motivation to create a new hearing health care model. The OTC Law and FDA regulations are our best representations of enacted values in hearing health care, since they describe principles of the model that have been translated into concrete laws, regulations, and policies. It is critically important to analyze the enacted values in OTC hearing aids to ensure that intended values driving the creation of the system manifest in the actual implementation of the model.

Two team members independently read materials and methodically assigned meaning to text data by tagging relevant passages with the appropriate value(s), a process referred to as coding (Locke et al., 2020; Saldaňa, 2009). The codebook of values in hearing health care developed in Menon et al. (2023) was used to guide our analysis. The codebook contains a comprehensive list of values that includes a definition, a short description, and examples of how that value appears in the text. Four documents (listed in Table 2.1) were analyzed using NVivo 12 Pro (QSR International Pty Ltd., 2018), a software program that facilitates the textual analysis of unstructured documents. This tool was used to identify sections of content in which the meaning of the text corresponds to one or more values as defined in the codebook.

Table 2.1: Source material for qualitative content analysis

Source Material	**Category**	**Represents**
Over-the-Counter Hearing Aid Act of 2017	OTC regulation	OTC implementation
Final FDA regulations on Establishing Over-the-Counter Hearing Aids (2022)	OTC regulation	OTC implementation
NASEM Report (2016)	Critique document	Motivation to create OTC
PCAST Report (2015)	Critique document	Motivation to create OTC

OTC = over the counter; FDA = Food and Drug Administration; NASEM = National Academies of Sciences, Engineering, and Medi-cine; PCAST = President's Council of Advisors on Science and Technology

Following independent coding, the data were merged via consensus. Passages with non-trivial disagreement between the two coders were discussed until a consensus was reached. The use of multiple coders allows for broader possibilities for interpreting and understanding data (Fonteyn et al., 2008), and ensuring intercoder agreement improves consistency and accuracy of results (Fernald & Duclos, 2005). After coding was complete, quantitative data were extracted from the software to compare the relative importance of values within and between documents. There are multiple ways to quantify the results of the coding process. For this study, we calculated the frequency of each value by counting the total number of words coded to that value. A total word count was used instead of a proportional index, because the documents differed greatly in length and scope, making a proportional index weigh too highly the values relevant to the scope of the shorter documents. We operationally defined the priority of a value as the frequency of coding references to that value in the text. By defining coding frequency, and thus importance, as the number of words coded, we are assuming that the authors of the documents dedicated more

text to issues that they valued more.

2.2.2 Statistical analysis

Kendall's rank correlation was used to test the similarity of the rank order of values. The correlation between rankings was determined at the alpha criterion of $\alpha = .05$. Kendall's rank distance was used to quantify the magnitude of the difference between documents in the importance of values. Rank distance counts pairwise differences between ranked lists. If one value is ranked above another value in a document, that pair of values would add to the ranked distance if they appeared in the opposite order in a comparison document. A normalized rank distance of zero indicates that the two lists are identical and one indicates that the lists are in reverse order.

2.3 Results

The first goal of this study was to evaluate if the documents that represent the implementation of OTC share the same values as the critique documents that motivated its creation. Figure 2.1 shows the frequency of values in each of the analyzed OTC documents. Table 2.2 shows the rankings of the number of coding references for each value in critique documents and OTC regulatory documents. Kendall's rank correlation revealed no statistically significant correlation between the ranks of referenced values in regulatory and critique documents ($\tau = .294$, $p = .096$). The normalized Kendall rank distance (Kd) was calculated to evaluate the number of misaligned pairs between these two ranked lists. The result was $K_d = .353$, indicating that approximately 35% of code pairs were in the reverse order in the critique documents compared to the OTC regulatory documents.

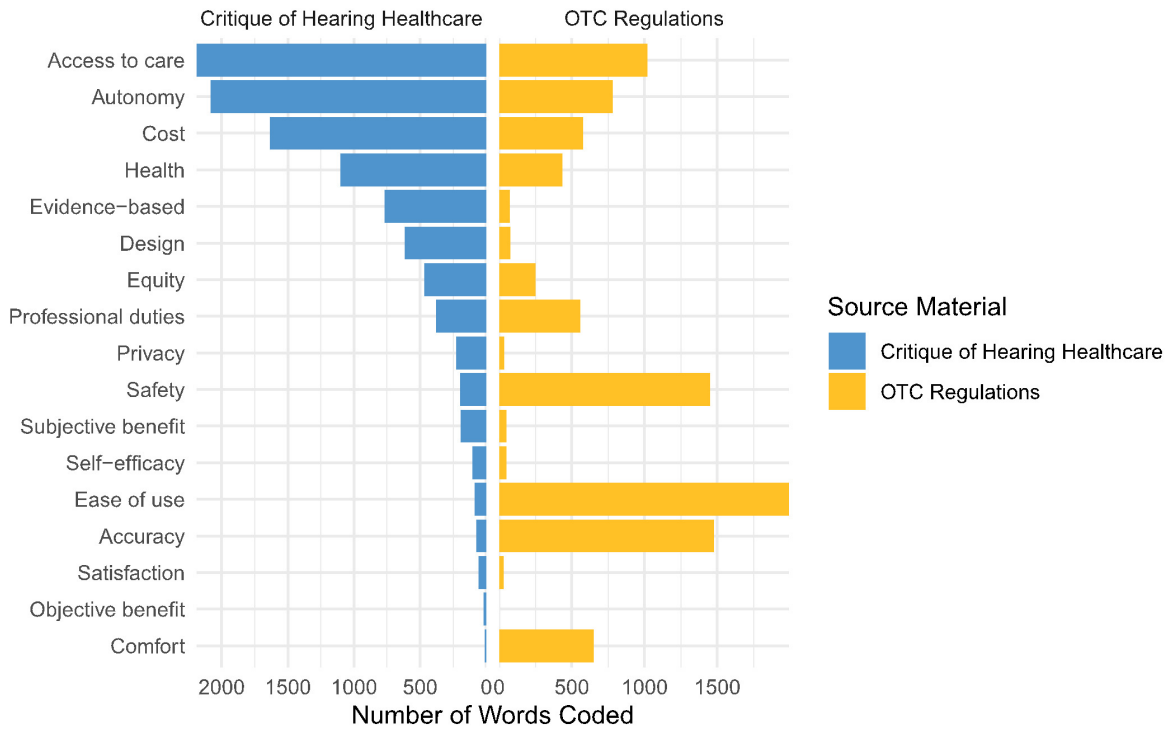

Figure 2.1: Frequency of each coding reference representing values in critique documents and regulatory OTC documents, sorted by the frequency of values coded in the critique documents.

Table 2.2: Rankings of the number of coding references for each value in critique documents and OTC regulatory documents

Value	**PCAST**	**NASEM**	**Total Critique Documents**	**OTC Bill**	**FDA Regulations**	**Total OTC Regulations**
Access to care	3 (748)	1 (1442)	**1 (2190)**	2 (200)	4 (819)	**4 (1019)**
Accuracy	15 (16)	12 (60)	**14 (76)**	6 (15)	2 (1463)	**2 (1478)**

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Table 2.2: Rankings of the number of coding references for each value in critique documents and OTC regulatory documents (Continued)

Value	**PCAST**	**NASEM**	**Total Critique Documents**	**OTC Bill**	**FDA Regulations**	**Total OTC Regulations**
Autonomy	1 (911)	2 (1174)	**2 (2085)**	1 (204)	6 (579)	**5 (783)**
Comfort		16 (13)	**17 (13)**		5 (652)	**6 (652)**
Cost	2 (866)	3 (771)	**3 (1637)**		7 (578)	**7 (578)**
Design	5 (583)	14 (35)	**6 (618)**		11 (77)	**11 (77)**
Ease of use	12 (34)	13 (56)	**13 (90)**	5 (25)	1 (1968)	**1 (1993)**
Equity	11 (39)	6 (431)	**7 (470)**		10 (252)	**10 (252)**
Evidence-based	7 (139)	4 (630)	**5 (769)**		12 (74)	**12 (74)**
Health	4 (642)	5 (459)	**4 (1101)**	4 (34)	9 (401)	**9 (435)**
Objective benefit	14 (20)		**16 (20)**			
Privacy	8 (113)	8 (115)	**9 (228)**		15 (36)	**15 (36)**

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Table 2.2: Rankings of the number of coding references for each value in critique documents and OTC regulatory documents (Continued)

Value	**PCAST**	**NASEM**	**Total Critique Documents**	**OTC Bill**	**FDA Regulations**	**Total OTC Regulations**
Professional duties	6 (243)	7 (136)	**8 (379)**		8 (560)	**8 (560)**
Safety	10 (95)	10 (103)	**10 (198)**	3 (41)	3 (1412)	**3 (1453)**
Satisfaction	13 (28)	15 (33)	**15 (61)**		16 (31)	**16 (31)**
Self-efficacy		9 (107)	**12 (107)**		13 (52)	**13 (52)**
Subjective benefit	9 (104)	11 (90)	**11 (194)**		15 (51)	**14 (51)**
Total Words Coded (N)	**4581**	**5655**	**10236**	**519**	**9005**	**9524**

Note: Bolded values indicate total rankings across document groups. PCAST = President's Council of Advisors on Science and Technology; NASEM = National Academies of Sciences, Engineering, and Medicine; OTC = over the counter; FDA = Food and Drug Administration.

The second goal of this study was to evaluate whether documents representing the OTC model share the same values as documents that represent the traditional audiology model. The results of the first analysis showed that the critique and regulatory documents prioritized values differently, so each set of documents was compared to traditional audiology separately. Figure 2.2 shows the number of words coded to each value in OTC and traditional audiology documents, and Table 2.3 shows the ranked order of values found in OTC regulation documents compared to the ranked order of values found in documents that represent traditional audiology (data from Menon et al., 2023). Calculation of Kendall's τ revealed no statistically significant correlation between the ranks of referenced values in regulatory and critique documents ($\tau = .072, p = .709$). The normalized Kd was also calculated to evaluate the number of misaligned pairs between these two ranked lists. We found that $K_d = .464$, indicating that approximately 46% of code pairs were in the reverse order in the OTC regulatory documents compared to traditional audiology documents.

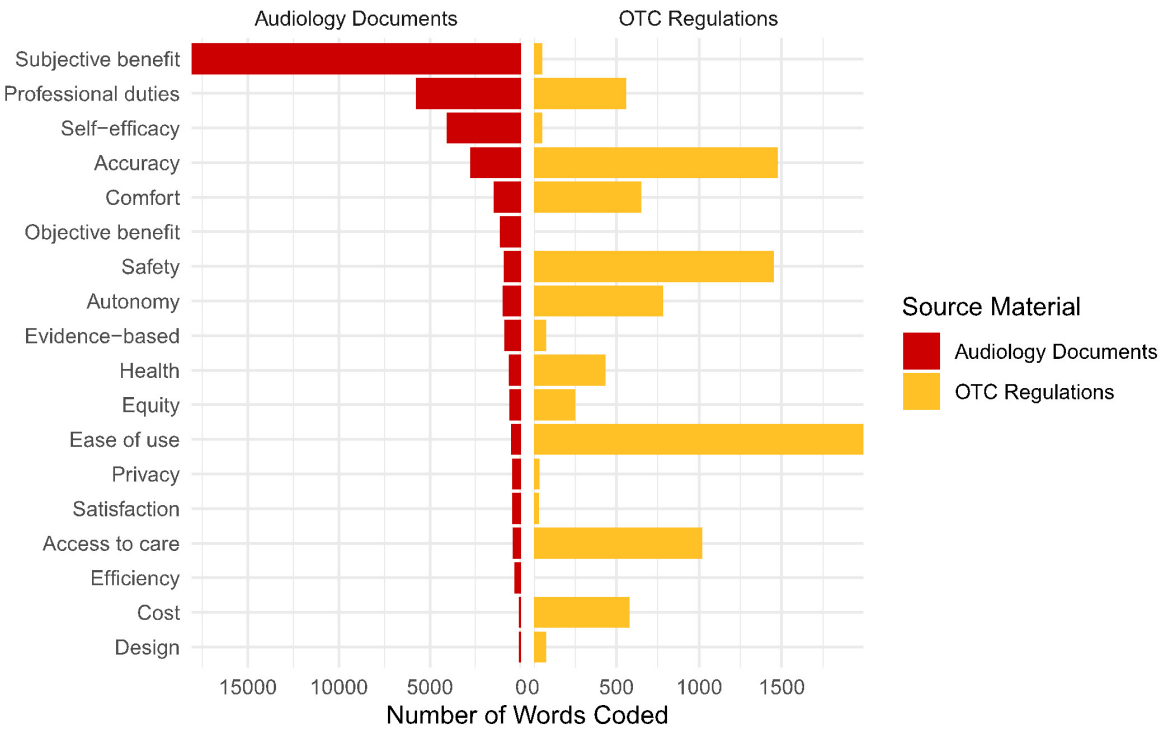

Figure 2.2: Frequency of each coding reference representing values in traditional audiology documents and regulatory OTC documents

Table 2.3: Rankings of the number of coding references for each value in traditional audiology and over-the-counter (OTC) regula-tory documents.

Value	Traditional Audiology Documents	Total OTC Regulations
Access to care	15 (463)	4 (1019)
Accuracy	4 (2800)	2 (1478)
Autonomy	7 (1003)	5 (783)
Comfort	5 (1504)	6 (652)
Cost	17 (115)	7 (578)
Design	18 (104)	11 (77)
Ease of use	12 (549)	1 (1993)
Efficiency	16 (366)	
Equity	11 (637)	10 (252)
Evidence-based	9 (913)	12 (74)
Health	10 (677)	9 (435)
Objective benefit	6 (1148)	
Privacy	13 (495)	15 (36)
Professional duties	2 (5755)	8 (560)
Safety	8 (954)	3 (1453)
Satisfaction	14 (494)	16 (31)
Self-efficacy	3 (4070)	13 (52)
Subjective benefit	1 (18082)	14 (51)
Total Words Coded (N)	**40139**	**9524**

Note: Bolded values indicate total rankings across document groups

The PCAST and NASEM reports were evaluated to determine whether the critique of audiology that motivated the development of OTC shared the same values as traditional hearing health care. Figure 2.3 shows the number of words coded to each value in critique documents and traditional audiology documents, and Table 2.4 shows the ranked order of values found in critique documents compared to the ranked order of values found in documents that represent the traditional audiology (data from Menon et al., 2023). Calculation of Kendall's τ revealed no statistically significant correlation between the ranks of referenced values in audiology and critique documents ($\tau = -0.137, p = .454$). The normalized K_d was also calculated to evaluate the

number of misaligned pairs between these two ranked lists. We found that $K_d = .569$, indicating that approximately 57% of code pairs were in the reverse order in the OTC regulatory documents compared to traditional audiology.

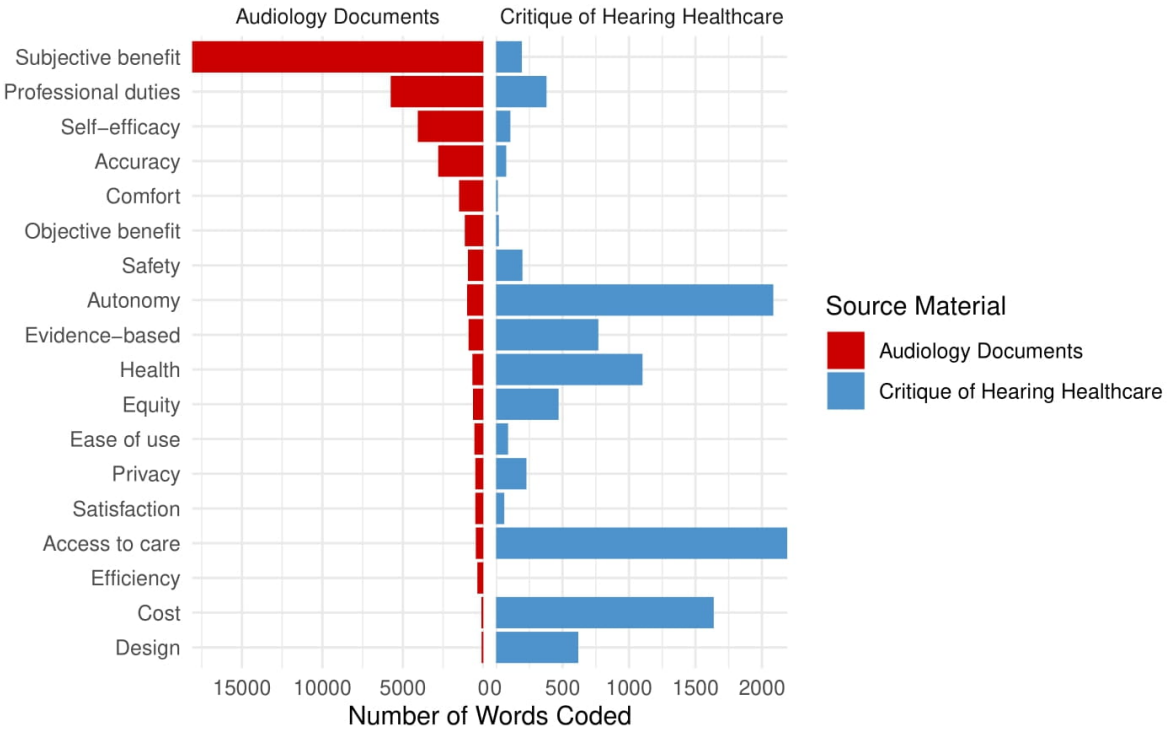

Figure 2.3: Frequency of each coding reference representing values in traditional audiology documents and critique documents.

Table 2.4: Rankings of the number of coding references for each value in traditional audiology documents and critique documents.

Value	Traditional Audiology Documents	Total Critique Documents
Access to care	15 (463)	1 (2190)
Accuracy	4 (2800)	14 (76)
Autonomy	7 (1003)	2 (2085)
Comfort	5 (1504)	17 (13)
Cost	17 (115)	3 (1637)
Design	18 (104)	6 (618)
Ease of use	12 (549)	13 (90)
Efficiency	16 (366)	
Equity	11 (637)	7 (470)
Evidence-based	9 (913)	5 (769)
Health	10 (677)	4 (1101)
Objective benefit	6 (1148)	16 (20)
Privacy	13 (495)	9 (228)
Professional duties	2 (5755)	8 (379)
Safety	8 (954)	10 (198)
Satisfaction	14 (494)	15 (61)
Self-efficacy	3 (4070)	12 (107)
Subjective benefit	1 (18082)	11 (194)
Total Words Coded (N)	**40139**	**10236**

Note: Bolded values indicate total rankings across document groups

2.4 Discussion

2.4.1 Comparison of values in critique documents and OTC regulations

We applied the codebook developed in Menon et al. (2023) to systematically assess the values in source material relating to the justification and implementation of OTC hearing aids. Our central hypothesis was that the development of an OTC regulatory category represents a values shift relative to the values of traditional audiology, prioritizing access, and affordability over all other values in hearing health care. The first objective of this study was to compare the fre-

quency of values referenced in critique documents (PCAST and NASEM reports) and regulatory OTC documents (OTC Law and final FDA regulations) to determine whether the implementation of the OTC model shared the same values as the critique documents that motivated its creation. Although there was no significant correlation between the ranks of referenced values, Kendall's rank distance test showed that approximately two-thirds of values were in the same rank order in both documents (35% misaligned), indicating moderate agreement between the two lists of rankings.The motivation for the critique of audiology reported by PCAST and NASEM was to evaluate cost and access to care as barriers to hearing aid use (Donahue et al., 2010). The OTC regulations prioritized these values, although not as highly as the critique documents. In the OTC regulatory documents, access to care is ranked 4/18 and cost is ranked 7/18 compared to 1/18 and 3/18, respectively, in the critique documents. This is evidence that OTC regulation generally addressed the values that motivated its creation.

The top 3 most frequently coded values in the critique documents were those that supported the creation of OTC hearing aids: access to care, autonomy, and cost. In the critique documents, the introduction of OTC hearing aids was intended to improve access and affordability and to support autonomy by making it possible for people to self-administer hearing health care. This contrasts with the three values most coded in the OTC regulations: ease of use, accuracy, and safety. Ease of use arguably supports autonomy consistent with the values of the critique documents, reflecting the need for devices to be used independently without a hearing health care professional. However, accuracy and safety reflect concerns that are not aligned with the critique documents' focus on reducing barriers to hearing aid use. In the OTC regulations, the high ranking of accuracy was due to the amount of text dedicated to electroacoustic requirements and technical specifications that must be met by a device prior to its registration as an OTC hearing

aid. Examples from the final FDA regulations include limits on maximum output (Output Sound Pressure Level 90, OSPL90), the full-on gain value, output distortion control, and self-generated noise levels. The high ranking of safety likely reflects the FDA's core responsibility of establishing the safety of a medical device. According to the FDA, "there is reasonable assurance that a device is safe when it can be determined, based upon valid scientific evidence, that the probable benefits to health from use of the device for its intended uses and conditions of use, when accompanied by adequate directions and warnings against unsafe use, outweigh any probable risks" (21 CFR 860.7). Ensuring safety and accuracy in the implementation of OTC hearing aids is an obvious benefit to consumers but will add to the cost of the devices. Safety and accuracy are values that do not directly support the goal of reducing barriers to hearing aid use and prioritizing safety and accuracy above access and affordability reflects differential value prioritization between critique and regulatory documents.

The prioritization of equity and evidence-based practice was elevated in critique documents relative to regulatory documents. In the context of hearing health care, equity is defined as "fairness in treatment or outcomes" (Menon et al., 2023). Thus, the high prioritization of equity in the critique documents reflects the goal of ensuring that individuals receive effective hearing health care regardless of their background or circumstances. Equity was ranked 5/18 in critique documents, contrasted with 10/18 in the regulatory documents. The low priority of equity in OTC regulatory documents, on the other hand, represents a potentially important values conflict between the intentions of the authors of the critique and regulatory documents. Devices and services consistent with the values of the regulatory documents could reinforce existing inequities in the hearing healthcare system.

Evidence-based practice was ranked 4/18 in critique documents, which promoted expand-

ing hearing health care research and the translation of this research to patient care. In contrast, OTC regulations ranked evidence-based practice 12/18. Large sections of the NASEM report (e.g., Chapter 3: Health Care Services: Improving Access and Quality) were devoted to exploring ways in which evidence-based practice can improve quality in the provision of care by hearing health care professionals, stating "evidence-based clinical practice guidelines and standards of practice can be used to educate health professionals, inform practice patterns, and facilitate widespread adherence to best practices." The PCAST report listed the lack of adherence to evidence-based practice by hearing health care professionals as a reason for eliminating the need to obtain hearing aids through a provider, stating "studies of dispensers have found that average dispensing rates of various hearing-aid features do not follow evidence-based practice (EBP) guidelines." Both documents criticized the poor adherence to evidence-based practice by hearing healthcare professionals and used this argument to support the introduction of an OTC model. Deprioritizing evidence-based practice risks sub-optimal hearing healthcare outcomes but may support the broader goal of getting a large quantity of affordable products on the market. Disagreement between critique and regulatory documents reflects difficulty balancing the cost and importance of evidence-based practice.

2.4.2 A challenge to the values of traditional audiology

The second objective of this study was to determine if the introduction of OTC hearing aids represents a challenge to the values of traditional audiology. Overall, there was agreement between the values found in documents representing traditional audiology and the values found in documents that represent OTC hearing aids. Seventeen of the 18 values identified in traditional

audiology documents were also identified in OTC documents, suggesting a fundamental similarity in values between the two models. values in OTC critique and regulatory documents differed, rankings for each set of documents were compared separately to traditional audiology documents. Calculation of Kendall's τ revealed no statistically significant correlation between the rank order of values in traditional audiology documents to either critique or regulatory documents, consistent with a difference in rank order but not a reversal (negative correlation). Kendall's rank distance test showed that 50% of all code pairings were misaligned between rank order lists of values found in traditional audiology and OTC regulatory documents, consistent with a random reshuffling of the lists, and 65% of code pairings were misaligned between traditional audiology and critique documents, indicating greater disagreement than would be expected from random chance. Although they shared most of the same values, results were consistent with a reprioritization of values rankings for traditional audiology compared to both sets of OTC documents.

The goal of creating the OTC hearing aids category was to improve accessibility and affordability of amplification devices. The values of cost and access to care were central to critique documents, which recommended the introduction of OTC hearing aids to address barriers for individuals who may have previously been hesitant or unable to seek care. In contrast, traditional audiology ranked access (15/18) and cost (17/18) among the least important values. By shifting access and cost from near the bottom of the list in traditional audiology to the top of the list, the critique documents represent a direct challenge to the values of traditional audiology.

The most striking difference between the values of traditional audiology and OTC was in values related to patient benefit. Subjective benefit, the benefit from treatment that is perceived by the patient, ranked 1/18 in traditional audiology documents. Objective benefit, the benefit from treatment measured as improved performance on a task, was ranked toward the top at 6/18

in traditional audiology documents. The critique documents clearly did not prioritize these values, ranking subjective benefit 11/18 and objective benefit 16/18. In OTC regulatory documents, subjective benefit was in the bottom three values (14/18) and objective benefit was the only value with zero coding references (18/18). The stated intent of the FDA in creating the OTC regulations to ensure safety and efficacy (U.S. FDA, 2021). When the efficacy of an intervention is evaluated in traditional audiology, the metrics used typically measure subjective or objective benefit, or both, as reflected in the high ranking of these values in audiology clinical practice guidelines and questionnaires (Menon et al., 2023). Subjective metrics typically assess changes in perceived activity limitation, participation restriction, or quality of life, and objective metrics typically assess speech perception in noise. One major implication of the shift away from patient benefit is that the efficacy of OTC hearing aids will not necessarily be evaluated based on the same criteria used to evaluate audiology interventions. OTC hearing aids may instead be evaluated by the values prioritized by either the critique documents or both critique and regulatory documents, such as cost, access to care, and ease of use. One can argue that barriers to access and affordability have been effectively reduced if there are readily available devices that people can afford, even if those devices provide little subjective or objective benefit. The shift away from prioritizing subjective and objective benefit raises concerns about the impact of OTC hearing aids on the overall quality of hearing health care.

OTC hearing aids are only relevant to adults with perceived mild-to-moderate hearing difficulty. Adults between the age of 50 and 69 years who have mild hearing difficulty represent the largest population of American adults with unmet hearing healthcare needs (Humes, 2023). Thus, an OTC model targeting this specific patient population could provide an alternative hearing healthcare choice for millions of Americans with mild-to-moderate hearing difficulty. How-

ever, individuals with severe hearing loss, children, and those who cannot reasonably expect to self-fit hearing aids will not benefit from any improvement in access and affordability from the OTC model. Although the reprioritization of values in the OTC model may meet the needs of some individuals, addressing issues of access and affordability for all individuals will, according to the audiology critique documents, require reprioritizing these values within traditional audiology. Access and affordability (cost) are values in traditional audiology and, although they are low in the values prioritization, there are ongoing efforts targeting these values. Access and affordability are being addressed by other changes in audiology that are occurring parallel to the introduction of OTC hearing aids, such as the expanded use and availability of telehealth solutions (Bush & Sprang, 2019; Muñoz et al., 2021) and proposed changes to Medicare coverage (Lin et al., 2022). The success of these changes may depend on the priorities of the methods used to evaluate them, whether metrics of access and affordability are used rather than metrics of individual benefit that are traditionally used in audiology. Outside of the OTC model and the large, albeit limited population it targets, the issues with hearing healthcare service delivery identified by the critique documents can be addressed by targeting the values of access and affordability.

2.4.3 Limitations

A limitation of the current study is the operational definition of values prioritization from the frequency of coded text references. We operationalized the rank order priority of values by counting the number of coded references to each value in the texts and verified that other methods of ordering coding references did not change the rank order. The limitation of this approach is that it is possible that some values are a high priority and yet not mentioned frequently in the

documents. The act of ranking values in a definitive order is inherently challenging. Different methodologies, such as conducting surveys among audiologists or other stakeholders, might produce distinct rank orders based on their perspectives and priorities.

The purpose and motivation of the selected documents can significantly influence the resulting rank order. For example, FDA policy dictates many issues that must be addressed in establishing a medical device, so the authors of that document were not free to elaborate on issues they considered most important, unlike the authors of the critique documents. Nevertheless, FDA policy reflects a values system that directly influenced the regulatory definition of OTC hearing aids. The values prioritization in the FDA document reported in this study was consistent with the fact that the document was the product of a regulatory process with multiple constraints rather than the opinion of its authors. In reference to authors of the critique documents, the PCAST group was largely independent of the field of hearing health care, while the NASEM groups incorporated diverse stakeholders representing audiology, academia, industry, individuals who are deaf or hard of hearing, and others. Their document content, topic selection, and language reflect their values regarding hearing health care. Nevertheless, the validity of this work depends on the selection of specific documents and the rank order of values in these documents as representative of the prevailing values of the associated model.

2.4.4 Future Directions

OTC hearing aids represent an opportunity to expand the market for hearing aids for adults with perceived mild-to-moderate hearing loss. Previous research shows that consumers tend to prefer engaging with services and products that align with their values (Vinson et al., 1977).

The results of this study indicate that the OTC hearing aids model challenges the values of the traditional audiology model, which may provide an alternative mode of treatment that respects and aligns with a wider range of personal values and preferences. For example, OTC hearing aids may be a desirable hearing healthcare solution for consumers who highly value ease of use, safety, and accuracy. The critique and regulatory documents analyzed here were foundational to the OTC model but do not represent the present and future implementation of OTC hearing aids. Moving forward, traditional audiology and OTC hearing aids may work synergistically to reduce barriers to hearing health care. Audiologists may incorporate OTC hearing aids into their clinical practice by offering them as a cost-effective and accessible point of entry for patients with mild-to-moderate hearing impairment. As OTC and traditional audiology continue to advance in tandem and intersect, new values prioritizations may emerge to better serve a diverse range of individuals with different hearing abilities. Future work should focus on patient-centered outcomes by eliciting values from all stakeholders including those who could benefit from amplification but have not yet decided to seek care. Mismatches between the values of patients and the systemic values of hearing health care could explain the apparent non-use of resources among those who could benefit. Leveraging VSD methodology will allow us to better understand the values of those who experience hearing difficulty and to develop hearing healthcare solutions that reflect the values of specific populations, including groups that are underserved by traditional audiology. OTC hearing aid regulations facilitate the use of VSD to bring products and services to market that are consistent with the values of underserved patients.

2.5 Conclusions

This study tested the hypothesis that the introduction of the OTC hearing aid model represents a challenge to the values of traditional audiology. We found that the values of documents representing the introduction of the OTC model highly prioritized values consistent with reducing barriers to access and affordability of self-administered hearing health care, in contrast to the low priority of these values in traditional audiology. Elevating these values was consistent with the goal of reducing barriers to the use of hearing aids. Values highly prioritized by traditional audiology—subjective and objective benefit were down graded to a low priority in OTC documents. Although the reprioritization of values may benefit some people who are under-served by the current model, it is important to consider the critique of traditional audiology more broadly and explore other solutions to address the remaining barriers to access and affordability. Further research is needed to develop new solutions that align with the values of under-served patients, parallel to or facilitated by the OTC model.

Chapter 3: Alignment of audiologists' values with best-practice standards: Insights from a national survey[2]

3.1 Introduction

There is a critical need to increase help-seeking behavior among the millions of American adults with hearing loss who could benefit from hearing health care resources (Donahue et al., 2010; World Health Organization, 2021). The introduction of novel service delivery models such as telehealth and over-the-counter (OTC) hearing aids (Muñoz et al., 2021; U.S. Food and Drug Administration, 2017) presents an opportunity to further develop evidence-based solutions that directly address patient needs. This study extends previous research utilizing value-sensitive design (VSD) to guide innovation in hearing health care toward solutions that embrace stakeholder values. Gaining information about the values of individuals can help us understand the factors guiding their decision making and has significant predictive power in anticipating behaviors, attitudes, and preferences (Schwartz, 2007). It has been demonstrated that consumer behavior is driven by the perception that products and services reflect their values (Brunsø et al., 2002; Tanrikulu, 2021). VSD is a qualitative research approach that has been used across fields to design

[2]Menon, K.N. & Hoover, E.C. (in press) Alignment of audiologists' values with best-practice standards: insights from a national survey. American Journal of Audiology. These data were presented at the 51st Annual Scientific and Technology Conference of the American Auditory Society in Scottsdale, AZ (February, 2024). This work was supported in part by training Grant DC-00046 (awarded to Katherine N. Menon) from the National Institute of Deafness and Communicative Disorders.

systems that account for human values (Friedman et al., 2002). VSD provides methodology for designing systems and technologies that embody specific values (Friedman et al., 2013). Understanding the values of patients and how those values are reflected in hearing health care products and services may be the key to reducing the burden of untreated hearing loss.

Audiologists are central stakeholders in the field of hearing health care, serving as the primary service provider for patients seeking care for hearing loss in the United States. Gaining a better understanding of audiologists' values can provide insight into the underlying factors that shape their approach to patient care. The primary focus of this study is to better understand the values surrounding the prescription and dispensing of amplification devices. Hearing aids were made the primary focus in an effort to elucidate the reasons behind the low uptake of treatment among adults with hearing loss, despite hearing aids being the principal intervention. Our previous valuesbased work (Menon et al., 2023) encompassed a wider range of diagnostics and treatments across various audiology subspecialties, providing a comprehensive overview of audiological values. The current study focused on hearing aids to specifically address the persistent issue of untreated hearing loss in the United States. By narrowing our focus, we aimed to uncover the underlying value-based provider factors that may contribute to the reluctance of individuals to seek treatment, thereby advancing our understanding of this public health concern and informing strategies to improve hearing aid adoption rates.

In our previous work, we compiled a comprehensive list of audiology values by coding values embedded in documents representative of best practice of audiology (Menon et al., 2023). The documents chosen for analysis were a valid representation of the standard of clinical care by selecting documents that embody specific dimensions of values relevant to VSD (Shilton et al., 2013). Three categories of documents were analyzed—clinical practice guidelines, codes of

ethics, and questionnaires. Clinical practice guidelines were analyzed because they are a record of what audiologists do, following best-practice recommendations where available. Codes of ethics were included because these documents dictate moral behavior for audiologists as determined by governing organizations related to the profession. Clinical questionnaires were included because they are the primary tool used by audiologists to assess outcomes and determine treatment success. Values were derived through iterative coding, a process of assigning symbolic meaning to text data (Locke et al., 2020). We aimed to estimate the relative importance of values overall and within each document category, using rank order comparisons of the frequency of each coded value (Hsieh & Shannon, 2005). The frequency of coding references served as a proxy for importance, with values exhibiting more coding references ranked higher on the list and those with fewer references ranked lower. Through leveraging a VSD approach and careful selection of documents, the codebook reported in Menon et al. (2023) represents a list of values that hold significance in the context of current best practices in the field.

The methods used in Menon et al. (2023) identify potential values. Potential values are inert, prescriptive guidelines (Shilton et al., 2013)—values that exist in theory but are not necessarily enacted in the world. In contrast, performed values are those that a person or system materializes in the world. Performed values can be elicited from people by asking directly about the importance of their values through interviews, surveys, or focus groups. The potential values identified in audiology documents may not align with the performed values of modern audiologists. The practical application of values by audiologists may deviate due to several factors. The limited availability of up-to-date guidelines may lead to a difference between the theoretical values presented in audiology documents and the evolving practices enacted by audiologists in their real-world scenarios.

An example of the limitations of outdated clinical practice guidelines is in the American Speech-Language Hearing Association (ASHA) guidelines on the provision of hearing aids in adults (ASHA, 1998), most recently updated by Valente (2006). Valente (2006) highlighted the need for regular updates in best-practice guidelines within audiology, but that document remains the most recent revision. The document omits many contemporary aspects of audiological care such as diversity, equity, and inclusion; telehealth; remote management; OTC devices; and many other topics. More recent documents representing audiology best practices have been published and were included in our analysis, with the most recent being standards of clinical practice (Audiology Practice Standards Organization, 2021), but these documents were intended to codify standards rather than supersede aging clinical practice guidelines. Codes of ethics were the only documents coded in Menon et al. (2023) that are regularly updated.

The current study sought to validate the list of potential values obtained from documents representing best-practice audiology by eliciting the performed values of practicing audiologists. The methods used to identify a list of values in Menon et al. (2023) may have missed values that are important to practicing audiologists. Engaging with audiologists in a large-scale survey is an opportunity to identify missing values. In Menon et al. (2023), we ranked the relative importance of values based on their frequency of appearance in audiology documents. The rank order derived from audiology documents primarily reflects the emphasis placed on certain values within an academic and policy-oriented context. However, when we elicit the performed values of audiologists, a different rank order may emerge. This distinction is important, as the rank order of performed values may directly influence the decisions made by patients regarding their health care, for example, the uptake and use of hearing aids. Patients, when deciding on their health care choices, may be more likely to prioritize choices that align with their personal

perceptions and experiences (Kelly-Powell, 1997). Therefore, understanding the rank order of values as perceived and enacted by audiologists in practice is critical for delivering care that aligns well with patient values. This perspective may differ from that of audiology policymakers, who likely prioritize potential values based on overarching public health considerations and regulatory frameworks. Balancing the priorities of health care providers and policymakers ensures a comprehensive understanding that has the potential to enhance patient satisfaction and contribute to the development of effective audiology policies.

In this study, our primary goal was to validate the existing list of audiology values. To achieve this, we set subgoals. First, we aimed to elicit the stated values of audiologists, gaining insight into what they consider important in the prescription and dispensing of amplification devices. This was achieved by administering a values-ranking survey to a representative sample of audiologists in the United States. Next, we aimed to identify any values that may be missing from our original codebook of values, ensuring a comprehensive understanding of the diverse values held by hearing health care providers. By validating and expanding the original codebook, this study improves its applicability and relevance to current audiological practice, ultimately supporting more effective patient-centered hearing health care. Lastly, we sought to determine the rank order of these performed values and compare this to the ranking of potential values outlined in best-practice audiology documents. This comparison allows us to assess the alignment between idealized recommendations and real-world practices. Audiologists ranked values from most to least important, establishing an overall group order, which was compared to the overall order of values found in best-practice audiology documents (Menon et al., 2023).

3.2 Methods

3.2.1 Survey development

Values survey materials were constructed following published guidelines for survey development (Burns et al., 2008; Passmore et al., 2002). All survey items were written based on previous work identifying values in the system of best-practice American audiology such that values were drawn directly from the codebook of values in hearing health care (Menon et al., 2023). Using this codebook ensures that a comprehensive values inventory is embedded in the empirical data collection method (Fleischmann, 2013). An initial survey was assembled by writing one statement for each codebook value that was intended to capture the definitions and examples from the codebook in a way that is meaningful to audiologists. Once an initial draft of the values ranking survey was developed, the battery was reviewed individually by colleagues, including five audiologists, one colleague who is an expert in VSD, and several Doctor of Audiology (Au.D.) students in the Department of Hearing and Speech Sciences at University of Maryland. The survey was then modified based on colleague feedback.

The survey consisted of four main sections. Section 1 consisted of a screening question to ensure that respondents are audiologists and meet inclusion criteria (i.e., "Are you an audiologist?") and displayed informed consent information approved by the university institutional review board. Section 2 consisted of the values survey, in which respondents were asked to sort and rank a list of 18 items that represent values in hearing health care. The items included in the survey are shown in Table 1. In this portion of the survey, respondents were invited to contribute other values that did not appear in the initial battery: "If there are any values not listed here

that you would categorize as [most important/very important/ important/less important] to you, please type them below." Section 3 consisted of an eight-item demographics survey asking questions about personal demographics and professional environment. Finally, Section 4 consisted of a final open-ended question inviting respondents to share anything else they would like researchers to know about their responses: "Is there anything else you would like the research team to know about your responses to this survey?" The entire survey took approximately 10 minutes to complete. All responses were anonymous, and respondents were able to skip any demographics question that they did not wish to answer. All participants provided electronic consent for study participation, and all procedures were approved by the University of Maryland Institutional Review Board Package Number 2055445.

Table 3.1: Values Ranking Survey Items

Instructions: Below you will see 18 items that have been identified as values in audiology. Please sort each item into the box that best matches how important YOU think it is within the field of audiology. The boxes range from 1 (Most Important) to 4 (Less Important). You may only add up to 6 items in each box. Please sort ALL items into boxes.
Access to care: My patients are able to receive services without excessive travel.
Accuracy: My patients' test results are correct and devices are fit to prescriptive targets.
Comfort: The physical fit of devices does not cause pain.
Cost: My patients find the price of my products and services acceptable.

Continued on next page

Table 3.1: Values Ranking Survey Items (Continued)

Design: The style and aesthetics of devices are important.
Ease of use: My patients receive the training to use their devices independently.
Efficiency: The time invested by me and my patient is used effectively.
Equity: I treat all patients with dignity and respect despite personal differences.
Evidence-based: My professional activities are supported by scientific research.
Health: I refer patients for disorders requiring medical intervention.
Objective benefit: Results from aided testing or audibility indices indicate patient benefit.
Privacy: I protect my patients' health information and other private data.
Professional duties: I adhere to standards of conduct and codes of ethics in my field.
Safety: I do not cause harm to my patients through device settings or physical interactions.
Satisfaction: My patients find that devices and services meet their expectations.
Self-efficacy: My patients can overcome the challenges imposed by their hearing ability.
Subjective benefit: Results from questionnaires or self-report indicate patient benefit.

3.2.2 Procedures: Values survey data collection

Participants were first asked to sort items listed in Table 1 into four categories that reflect different levels of importance: 1 = *most important*,2= *very important*,3= *important*, and 4 = *less important*. Respondents sorted each item into the box that best matches how important feasibility of the rank order central to this study, respondents were limited, placing up to six items in each box. This was to prevent all items from being placed in the "most important" box. Next, participants were asked to rank values within each box based on the level of personal importance. The directions for this secondary ranking activity read: "Please arrange the following group of values in order from MOST important to you at the top to LEAST important to you at the bottom. It can be difficult to rank the importance of unrelated values, but try your best to put items that you feel are most important toward the top of the list and items that are less important, although maybe still important, toward the bottom of the list." After ranking values in each category, respondents were shown the prompt: "If there are any values not listed here that you would categorize as [most important/very important/important/less important] to you, please type them below." Directed content analysis (Hsieh & Shannon, 2005) was used to analyze the new values suggested by respondents using framework from the codebook of values in hearing health care established in Menon et al. (2023). Members of the research team familiar with the codebook read individual statements provided by respondents to identify values represented by the codebook and search for values that did not already appear in the existing list. This process is referred to as coding (Locke et al., 2020; Morse & Field, 1995). Responses were first coded by each study author separately, and then study members met to resolve discrepancies. All discrepancies were resolved through unanimous agreement.

3.2.3 Recruitment

Audiologists were primarily recruited from professional association mailing lists. The link to the study was e-mailed directly to audiologists who were members of the ASHA Special Interest Group 6: Hearing and Balance Sciences: Research and Clinical Applications, Group 7: Auditory Rehabilitation, Group 8: Public Health Audiology, and Group 9: Pediatric Hearing and Hearing Disorders. Audiologists were also recruited online through postings of virtual flyers containing a link to the study on the social media sites Facebook (http://www.facebook.com), LinkedIn (http://www.linkedin.com), Twitter (http://www.twitter.com), and Instagram (http://www.instagram.com), where the post could been seen and shared by individuals that the primary investigator is connected with. Some respondents were recruited through personal contact, in which study personnel directly e-mailed the study link to audiologists.

A waiver of documentation of consent from the institutional review board of the University of Maryland, College Park, was obtained because these were anonymous web-based surveys that fulfilled the requirements for such a waiver. We obtained participant consent electronically, rather than with a written statement of consent including the participant's signature.

3.2.4 Statistical Analyses

Kendall's rank distance test (Kendall, 1938) was used to quantify the magnitude of difference in the importance of values between audiology best practices and audiologists. Kendall's rank distance test counts pairwise differences between ranked lists. If one value is ranked above another value in a document, that pair of values would add to the ranked distance if they appeared in the opposite order in a comparison document. A normalized rank distance of 0 indicates that

the two lists are identical, and 1 indicates that the lists are in reverse order.

3.3 Results

3.3.1 Participants

We received responses from 759 audiologists. In the analysis, we included data from the 289 U.S.-based audiologists across 46 states who completed the entire survey, shown in Figure 1. The survey was available for two consecutive months from July 20, 2023, to September 20, 2023, via the Qualtrics web tool. Confidentiality was maintained as no identifying information such as name, e-mail address, or social security number was collected. All data downloaded from the Qualtrics web page were stored in a password-protected electronic format. The demographics of respondents are shown in Tables 2 and 3. Geographic location of respondents is shown in Figure 2.

3.3.2 Representativeness of Survey Data

An assumption of the methods used to analyze survey data was that the rank order of values has a central tendency across audiologists. We used a subgroup analysis to determine differences in values across demographic categories of survey respondents. The survey reached a group of audiologists across the United States, with demographic characteristics representative of the field of audiology and with a dominant majority of respondents being non-Hispanic, White females. As a result, there was not enough variation in the race, ethnicity, or gender of study respondents to evaluate rank order differences in these categories. Respondents varied in the categories of age, geographic location, and primary professional specialization. We used pairwise Kendall's tau

comparisons (Kendall, 1938) among subgroups to determine if the rank order of values differed within these categories. Kendall's rank correlation coefficient represents the degree of similarity between each pair of ranked lists. For all subgroups within the categories age, geographic location, and professional focus, the pairwise Kendall's tau values indicate that most pairs of lists exhibit relatively high levels of agreement, ranging from approximately 0.71–0.84. The aggregate Kendall's tau value confirms that, on average, the ranked lists are highly similar, with an overall Kendall's tau ranging from approximately 0.81–0.83. The results are shown in Figure 3. Across these demographic factors, the rank order of values was markedly uniform. Accuracy was the top ranked value in all subgroups with one exception in which it was ranked second. The bottom two values, access to care and design, were consistent across all subgroups. The results of the subgroup analysis support the assumption that the rank order of values has a central tendency within audiology and, to the limited extent that diversity exists within audiology, varies little across audiologists.

3.3.3 Addition of New Values

An objective of this study was to identify values in audiology that were missing from the original codebook of values in hearing health care (Menon et al., 2023). We received a total of 43 responses to the prompt: "If there are any values not listed here that you would categorize as [most important/very important/important/less important] to you, please type them below." The complete list of suggested new values is shown in 3.6. While many respondents suggested additional values for consideration, we found that all suggested values were encompassed by one or more existing values reported in Menon et al. (2023). For example, one respondent suggested

"Making appropriate medical referrals" as an additional value. The definition of the value of health in the codebook of values in hearing health care is "diagnosis and/or referral for medical conditions." Therefore, this suggested response would fall under the value of health. As another example, one respondent suggested "Regain communication function with friends, family, and co-workers" as a new value. This suggestion falls into the category of subjective benefit, since the codebook lists "Improvement in audibility, intelligibility, localization, clarity, sound quality; reduction in activity limitation; decrease of participation restriction; perception of self; reduction of listening effort" as examples of how this value may appear. A complete list of statements and how they were interpreted relative to values outlined in Menon et al. (2023) is available in 3.7.

Two responses suggested the addition of a value related to family-centered care (FCC), "Respect for patients/families to make decisions based on their values," and "Family-centered care: My patients, along with their significant others, can participate in sessions related to their hearing health care." The concept of patient-centered care (PCC) can be considered a metavalue because the components that make up PCC are themselves values (e.g., autonomy, self-efficacy, evidence based). FCC and PCC share these components, but they differ in defining the family as a whole as the target of intervention rather than the individual (Ekberg et al., 2023; Epley et al.,2010). No new value was added to the list of values in the present study because the language used by respondents did not explicitly differentiate patient versus family centeredness. Future work eliciting values from different stakeholders in hearing health care should explore the degree to which it is relevant to consider the family and other communication partners separately or in addition to the patient.

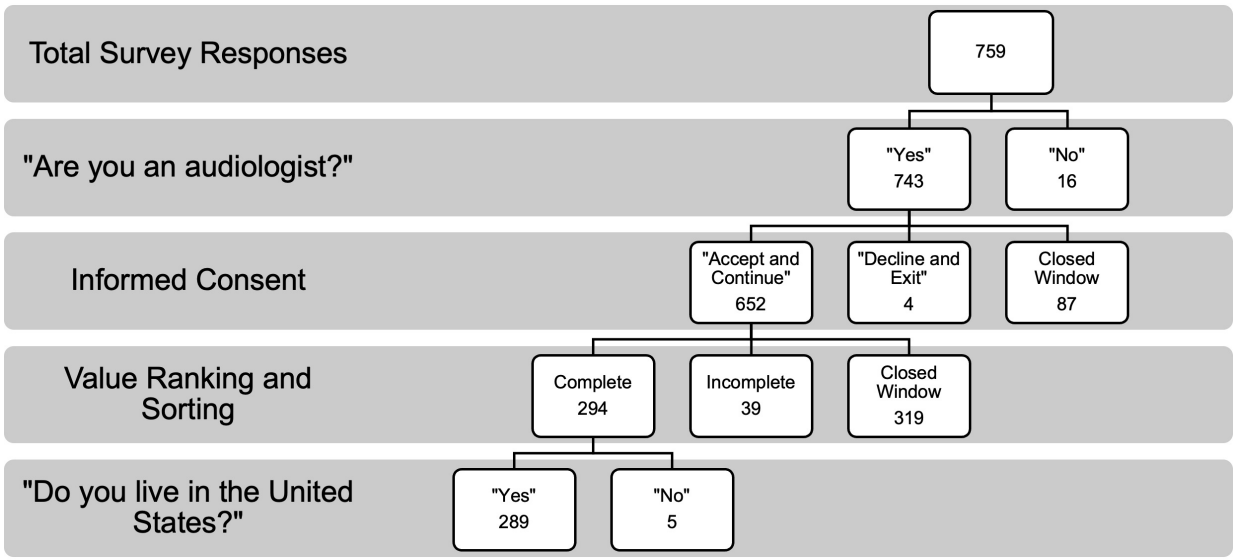

Figure 3.1: Breakdown of survey completion across 759 respondents

Table 3.2: Demographics Characteristics of Audiologist Respondents

Question	N of 289	Approximate %
Gender: Please select the gender that you most identify with		
Male	41	14%
Female	241	83%
Non-binary/third gender	1	$< 1\%$
Do not wish to answer	6	2%
Race: Please select the race that you most identify with		
African American	3	1%
Asian	6	2%
Caucasian	261	90%
Multiracial	1	$< 1\%$
Native American	2	1%
Do not wish to answer	16	6%
Ethnicity: Please select the ethnicity that you most identify with		
Hispanic	6	2%
Not Hispanic	270	93%
Do not wish to answer	13	4%
Age (years): Please select your age		
18-24	1	$< 1\%$
25-34	75	26%
35-44	83	29%
45-54	49	17%
55-64	45	16%
65+	30	10%
Do not wish to answer	6	2%
Education: Please select the highest degree you have earned		
M.A., M.S.	22	8%
Au.D.	232	80%
Ph.D.	31	11%
Sc.D.	2	1%
M.B.A.	1	$< 1\%$
Do not wish to answer	1	$< 1\%$
Income (dollars): Please select your approximate household income in dollars		
¡ 25,000	1	$< 1\%$
25,000 – 50,000	4	1%
51,000 – 75,000	17	6%
76,000 – 100,000	54	19%
101,000 – 125,000	67	23%
151,000 – 175,000	59	20%
200,000+	58	20%
Do not wish to answer	29	10%

Table 3.3: Professional Characteristics of Audiologist Respondents

Question	N of 289	Approximate %
Geographic Environment: Which of the following best describes the geographic environment where you are employed?		
Rural	40	14%
Suburban	137	47%
Urban	109	38%
Do not wish to answer	3	1%
Primary Focus: Which of the following best describes your primary professional focus?		
Administer balance/ vestibular testing	7	2%
Conduct research	9	3%
Dispense hearing aids	97	34%
Teach	16	6%
Work with adult diagnostics	65	22%
Work with cochlear implant patients	11	4%
Work with pediatric population	49	17%
Support audiologists	3	1%
More than one of these choices	15	5%
All of the above	3	1%
Other (please explain)	13	5%
Do not wish to answer	1	$< 1\%$
Professional Environment: Which of the following best describes the professional environment where you are employed?		
ENT office/ outpatient facility	60	21%
Hospital setting	50	17%
Private practice	82	28%
School setting	12	4%
University setting	37	13%
VA/ Military	5	2%
Non-profit	5	2%
Research setting	2	1%
Manufacturer/ Industry	10	3%
Retired	4	1%
Government	2	1%
Public health	2	1%
Other (please explain)	17	6%
Do not wish to answer	1	$< 1\%$

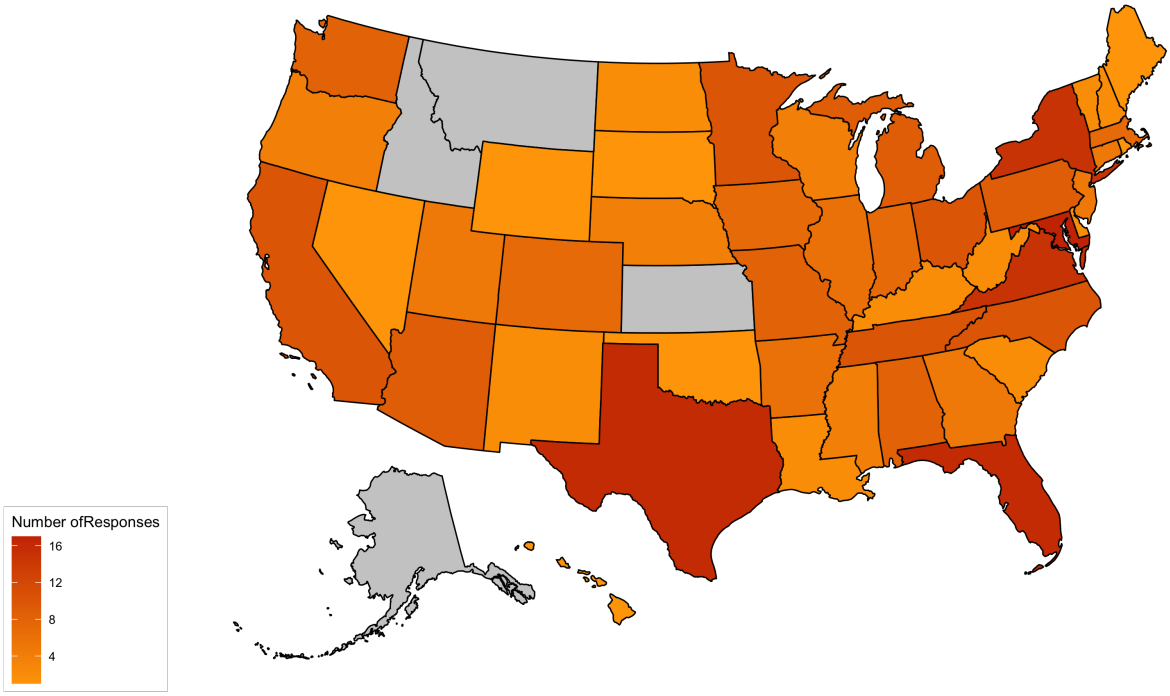

Figure 3.2: Responses to the question: “Please enter the U.S. state where you live.”

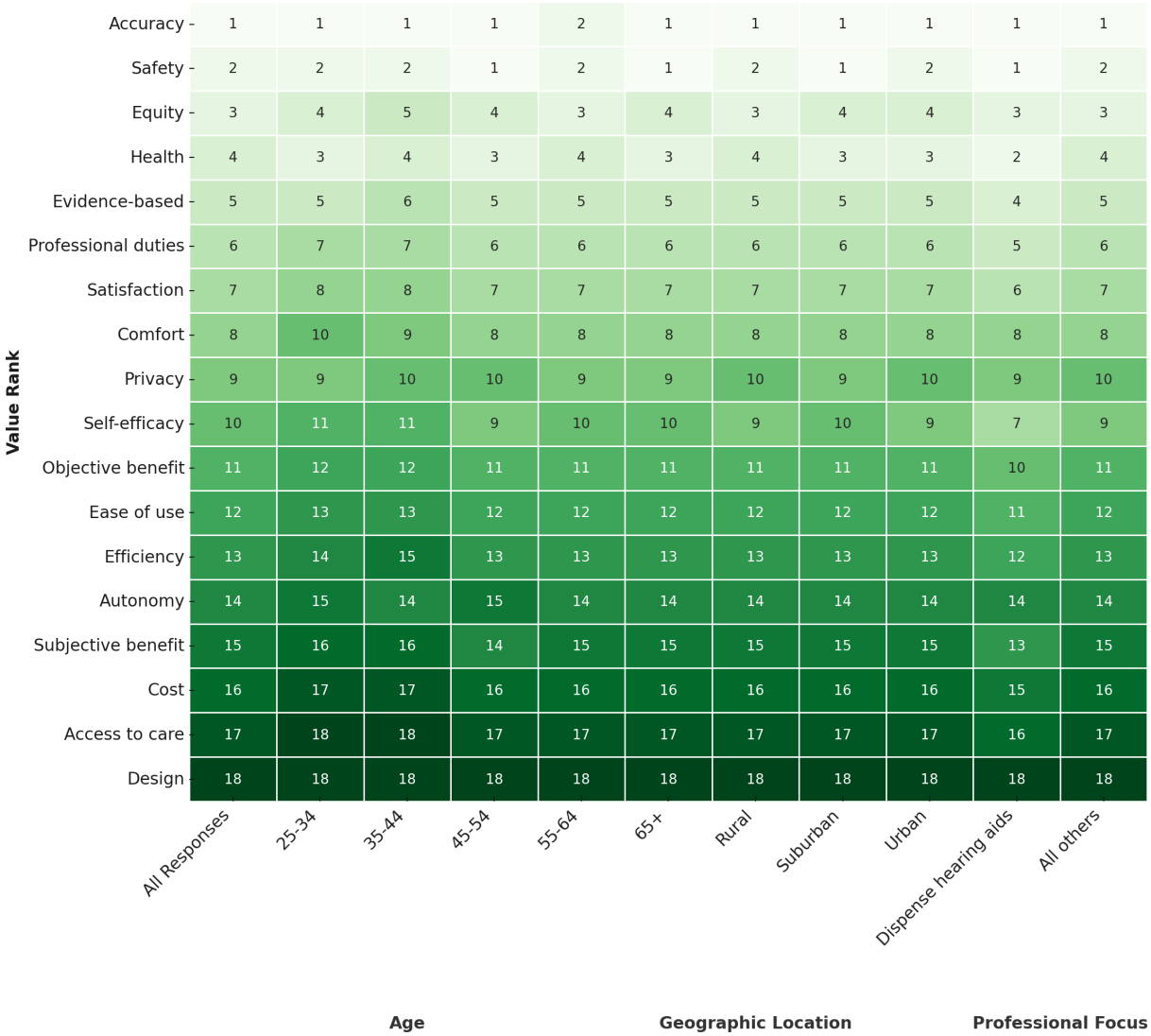

Figure 3.3: Subgroup analysis of value rankings across demographic categories of age, geographic location, and professional focus compared to overall group rankings.

3.3.4 Audiologists' values rankings

Overall group rankings were determined by calculating the mean ranking position of each value among 289 respondents, shown in Figure 4. This relative ranking of values among audiologists was compared to the ranking of values found in audiology best practices (Menon et al., 2023). Kendall's distance $(K_d) = 0.346$, indicating that approximately 35% of code pairs were

in the reverse order in the audiologist survey compared to audiology documents. A Kendall's distance of 0.35 indicates that while there are some differences in the ordering of the rankings between the two data sets, there is still a substantial amount of agreement. This relatively low level of discordance suggests that respondents' values generally align well with established best practices; however, professional experiences might lead to different priorities in performed audiological care.

We received a total of 45 responses to the final open-ended question: "Is there anything else you would like the research team to know about your responses to this survey?" Responses primarily discussed general survey feedback and clarification as to current employment. The complete list of respondent feedback is shown in 3.7.

Audiology Documents *(N words coded)*	**Value Rank**	Audiologist Survey *($\bar{x}$ ranking position)*
Subjective benefit *(18,082)*	**1**	Accuracy *(4.37)*
Professional duties *(5,755)*	**2**	Safety *(5.30)*
Self-efficacy *(4,070)*	**3**	Equity *(6.28)*
Accuracy *(2,800)*	**4**	Health *(6.51)*
Comfort *(1,504)*	**5**	Evidence based *(6.96)*
Objective benefit *(1,148)*	**6**	Professional duties *(7.20)*
Autonomy *(1,003)*	**7**	Satisfaction *(8.33)*
Safety *(954)*	**8**	Comfort *(8.66)*
Evidence based *(913)*	**9**	Privacy *(9.09)*
Health *(677)*	**10**	Self-efficacy *(9.52)*
Equity *(637)*	**11**	Objective benefit *(10.05)*
Ease of use *(549)*	**12**	Ease of use *(10.17)*
Privacy *(495)*	**13**	Efficiency *(11.72)*
Satisfaction *(494)*	**14**	Autonomy *(11.74)*
Access to care *(463)*	**15**	Subjective benefit *(11.73)*
Efficiency *(366)*	**16**	Cost *(12.71)*
Cost *(115)*	**17**	Access to care *(14.46)*
Design *(104)*	**18**	Design *(16.20)*

Figure 3.4: Comparison of values rankings between audiologists and documents that represent the best-practice provision of audiology

3.3.5 Comparison to values in best-practice documents

Another objective of this study was to compare the relative prioritization of values in best-practice hearing health care to audiologists' prioritization of the same values. We compared the rank order of potential values found in best-practice audiology documents (Menon et al., 2023) to the overall rank order of performed audiologist values determined in this study. Kendall's

rank distance test showed that approximately two thirds of all values were in the same rank order when comparing survey responses to the number of words coded to each value best-practice documents, indicating substantial agreement between the order of the two lists. The similarity in rank order likely reflects the fact that the documents used to generate the rank order in Menon et al. (2023) were developed by audiologists to encode audiology practice. To the extent that they differ, the ranked order of each list represents the priorities that underlie its source. The documents included in Menon et al. (2023) represent the potential values of audiology, whereas the survey results represent the values audiologists perform or intend to perform in their clinical practice.

3.4 Discussion

3.4.1 Top 3 Audiologist Values: Accuracy, Safety, and Equity

We conducted an online survey to systematically assess the prioritization of values in hearing health care among U.S.-based audiologists. The results of this study validate the existing list of audiology values and provide insight into the current priorities of hearing health care providers. Through a values-ranking survey, stated values were elicited from of a representative sample of audiologists, highlighting the importance they place on various aspects of their practice, particularly in the prescription and dispensing of amplification devices. The survey responses revealed that the values identified in documents outlining best practices remain relevant and applicable, with a substantial alignment between the values prioritized by audiologists and those outlined in best-practice audiology documents. The absence of additional values from the largescale survey of audiologists suggests that the list established in Menon et al. (2023) is comprehensive and

accurately reflects the values practiced by audiologists. The rank order analysis demonstrated agreement between the recommendations in best-practice documents and the real-world values performed by audiologists, thus reinforcing the utility of the codebook of values in hearing health care in guiding effective and patient-centered hearing health care interventions.

The three values ranked most highly by audiologists were accuracy, safety, and equity. Accuracy, defined in this survey as "my patients' test results are correct and devices are fit to prescriptive targets," was ranked as the most important value among our sample of respondents. This is consistent with previous work showing that clinical test results are among the most important factors for audiologists when making decisions (Boisvert et al., 2017). There is evidence that accuracy is valued across the field of hearing health care as a whole; accuracy is highly prioritized in both best-practice audiology documents and regulatory documents that describe the implementation of OTC hearing aids (Menon et al., 2023, 2024). The widespread promotion of routine real-ear measurement (REM) in clinical practice (Amlani et al., 2017; ASHA, 2006) underscores the importance of accuracy in audiological care, yet fewer than 30% of audiologists consistently perform REM (Mueller & Picou, 2010; Valente et al., 2018). REM is only one of the many objective tests that audiologists perform, with other critical testing including audiometric threshold testing, speech audiometry, and tympanometry, all of which require precise results to ensure accurate diagnoses and effective treatments (ASHA, 2006; OpenAI, 2023). The high value placed on accuracy by survey respondents reflects its crucial role in enhancing patient outcomes, suggesting a need to address barriers to the consistent implementation of these practices.

Safety (ranked 2/18) is another core value among our sample of audiologists, reflecting the Hippocratic principle to "first do no harm." While the larger field of otolaryngology is generally regarded as a "safe specialty" due to low morbidity/mortality rates (Danino et al., 2017),

it is possible to harm audiology patients with inappropriate interventions. Within clinical audiology, harmful device settings or physical interactions can lead to further hearing loss, physical discomfort, or other complications (Macrae, 1991).

The high prioritization of safety among our sample of audiologists indicates a commitment to protect patients from potential harm or discomfort as the result of audiological intervention. In a practical sense, ensuring safety helps avoid potential legal ramifications. If a patient is harmed due to negligence or oversight, the provider may face lawsuits, financial repercussions, or loss of licensure (Domico, 1993). The high prioritization of equity (ranked 3/18) from audiologists reflects the goal of ensuring that individuals receive effective hearing health care regardless of their background or circumstances. Audiologists prioritize that every individual be treated with respect and dignity, regardless of their background or personal differences. By emphasizing equity, audiologists appear to affirm this fundamental right and can work to reduce health care disparities that might arise from socioeconomic factors, racial biases, or other systemic issues (Abrahams et al., 2023; OpenAI, 2023). When patients perceive that they are being treated with equity, it can foster a sense of trust, which is crucial for a beneficial relationship (Ford-Gilboe et al., 2018). A trusting patient–provider relationship can lead to better communication, which is essential for accurate diagnosis and effective treatment (Drossman et al., 2021; Fox & Chesla, 2008). One respondent explained, "As an audiologist and owner of a small private practice— my success is 100% based on the quality of care for patients, which results in trust, respect, patient personal confidence and care," and continued, "my patients trust me to do what is best for them, not what is written in the books and journals, not what everyone else is doing, and not what the researchers tell us we have to do." Every patient comes with a unique background and set of experiences, and treating patients equitably allows audiologists to gain a holistic understanding

of their patients, leading to more personalized and effective care. When patients feel heard and respected, they may be more likely to trust their health care provider and experience success when adhering to the prescribed treatments (Martin et al., 2005; OpenAI, 2023).

However, equity also appears to be a politically loaded, divisive term among audiologists. In this study, the audiology statement that accompanied the value "equity" was as follows: "I treat all patients with dignity and respect despite personal differences." This was the only definition given to the value equity, and the word equity did not appear in any other part of the survey. Despite this, some responded with critical feedback regarding the use of the word equity in this survey: "'Equity' is a woke term that is originally derived from Marxism. Please do away with all woke terminology as it is divisive in our profession. Stay focused on the audiology profession and not on the damaging effects of political agendas." The same respondent continued, "Eliminate woke terminology and related questions. Those political agendas are divisive and not unifying. It is a major disservice to the audiology profession to inject political agendas into the wonderful work we do for our patients and our profession." However, other respondents had different attitudes toward the word equity: "The word is 'equity' is a deceiving term. I agreed with your description of equity, which is often different than the description of equity in greater society." Another respondent took issue with only specific aspects of equity: "I treat every patient with dignity and kindness, and it is important to me, however, I am not a supporter of the continuing [education] requirements for gender equity." Despite this conflicting feedback, equity was ranked as the third most important value among respondents, indicating that this value is highly prioritized by audiologists.

3.4.2 Bottom 3 Audiologist Values: Cost, Access to Care, and Design

The three lowest ranked values, cost, access to care, and design, are all potential barriers limiting the use of hearing health care. The value of cost (ranked 16/18) encompasses several facets of hearing health care, including aspects related to money, warranty, price of devices, and payer. Before claiming that cost is a low priority to audiologists, we must first acknowledge that the way cost was presented in our survey may have affected its ranking. Our survey presented cost as related only to the price of devices paid by patients. Respondents indicated a broader definition of cost in their suggestions for additional values. One suggested facet of hearing health care that could be encompassed by cost is provider compensation. Respondents wrote that audiologists "need to have higher pay across the board and be more valued" and " . . . should bill appropriately and completely for services rendered and receive compensation commensurate with those services." Payer and bundling were additional cost-related concerns specifically mentioned by respondents. In certain environments, audiologists consider cost paramount. One respondent wrote, "I work in a very rural area with a wide range of patients coming from all over the state. I want to make sure I am fulfilling my role as an audiologist, providing them with quality care, and then helping with cost/travel. My practice offers low budget hearing aids to allow patients to have high quality aids while still being able to receive care from an audiologist." This statement suggests that both cost and access to care are high priorities in the context of rural audiology.

Nevertheless, cost was ranked toward the bottom in our results and some audiologist statements reinforced this low ranking. One respondent stated, "some people find everything too expensive." Several respondents explained that because of adequate third-party coverage, cost had no impact on their clinical interactions. "Because I work for the military, the cost of products

and services is not a consideration when providing care . . . " wrote one respondent. Another at a Veterans Health Administration (VA) clinic wrote " . . . with VA, cost is not an issue for the patient and not listed as a high priority for the provider." Third-party coverage outside of the military and VA is poor but improving in the United States (Jilla et al., 2023; Windmill, 2022), including increased coverage of hearing health care by Medicare (Arnold et al., 2024; Tipirneni et al., 2019). Coverage for hearing aids by Medicare— which explicitly bans such coverage at this time—may be on the horizon (Lin et al., 2022; Medicare Hearing Aid Coverage Act of 2023; Willink et al., 2019), and this would likely cascade into near-universal coverage for hearing aids by private insurers, similar to the introduction of Medicare Part D prescription drug coverage more than a decade ago (Duggan et al., 2008; OpenAI, 2023). Our results suggest that the cost of hearing health care services is a lower priority than most other concerns.

Audiologists reported access to care (ranked 17/18) as a low priority, and this may be due to several contextual factors. Audiologists operate within a broader health care system, and regional disparities in health care infrastructure can limit access to care. An individual audiologist working in most clinical settings can do little to improve the travel and wait times experienced by patients and may feel powerless to address these systemic challenges. However, the increasing availability of telehealth solutions for device fitting and troubleshooting, counseling, aural rehabilitation, and other audiology services empower audiologists to improve access to care (Brice & Almond, 2022; D'Onofrio & Zeng, 2022). Community health workers have been shown to facilitate hearing health care in underserved areas (Coco et al., 2023; Marrone et al., 2022; Nieman et al., 2022). Some respondents valued access to care; one emphasized that "patients can choose where they go for healthcare, and how far they travel," pointing out the shortage of hearing health care professionals in underresourced rural areas (Powell et al., 2019; Pudrith et al., 2021).

It is important to consider audiologists' prioritization of cost and access to care in the context of the changing landscape of hearing health care. Cost and access to care are considered a major barrier to the use of hearing health care services (Donahue et al., 2010; National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Board on Health Sciences Policy, Committee on Accessible and Affordable Hearing Health Care for Adults et al., 2016; President's Council of Advisors on Science and Technology, 2015), leading to the introduction of OTC hearing aids (U.S. Food and Drug Administration, 2017). OTC hearing aids challenge conventional payment structures in the field of hearing health care and may affect the perception of cost among practitioners (Coco, 2024; Sheffield et al., 2022). The elevation of cost and access to care, along with autonomy, represents a values shift in hearing health care from the audiology model of maximizing individual benefit to a public health model of maximizing the number of people receiving care (Menon et al., 2024).

Design was ranked in the lowest position (ranked 18/18) in both our analysis of best-practice documents and in the audiologist survey. In this survey, the value design was associated with the statement, "The style and aesthetics of devices are important." This statement was interpreted by at least one respondent in the context of device recommendations, indicated by their statement, "Style and aesthetics are important but should not be the only determinant as to whether the device is the best one for the patient." Here, the appearance of the device was implied to be in competition with its ability to benefit the patient. However, appearance is related to the stigma of hearing aids, and stigma is a major barrier to hearing aid use (Erler & Garstecki, 2002; Johnson et al., 2005). The results of this study suggest that audiologists are primarily concerned with maximizing individual patient benefit, as indicated by the high ranking of accuracy and values related to satisfaction and benefit, and less concerned about barriers to hearing health care,

which include the three lowest ranked values of design, cost, and access to care.

3.4.3 Study Limitations and Critical Feedback

This survey focused on amplification devices, primarily the prescription and dispensing of hearing aids. Several respondents noted that they would have liked to "see more areas of audiology represented beyond prescriptive/ dispensing." One respondent stated, "Everything was focused on devices. Nothing was offered re: [. . .] diagnostic testing, balance etc. Perhaps that was intent of the survey, but our profession is not just about devices. . .. " Since this survey was written to focus on aspects of audiology that have to do with treatment from devices, it is possible that the values of audiologists with specialties other than hearing aid dispensing were not fully captured. For example, "I do not fit or dispense hearing aids. I have a vestibular specialty, thus most of these responses were geared towards dispensing audiologists" and "Your survey is limiting as it appears to focus on hearing aid fitting(s) and the design seems to make me answer a question I would not necessarily answer the way presented. I worry it is misleading and does not allow me to really address what your research question is supposed to address. The survey comes across as a way to put an answer in a category that does not depict the way I think about audiology at all." This investigation may not have comprehensively captured certain values differences inherent in audiology due to limitations in the data set stemming from an insufficient number of valid responses. Additionally, the survey design did not specifically address the identification of values differences among specializations within audiology, such as those associated with vestibular, occupational, and educational domains. Consequently, the outcomes may not fully capture the entire spectrum of values conflicts within hearing health care, underscoring the

need for more targeted methodologies in future research to systematically explore and capture nuanced variations in professional values across different audiological specializations (ASHA, 2006; OpenAI, 2023).

A limitation of this study was introduced by the tools chosen via the Qualtrics web application. To facilitate the sorting and ranking of values, the question type "pick, group, and rank" was used. However, there were multiple issues with the parameters of the question type and the user interface. First, we were unable to ensure that respondents sorted all values into categories ranging from most to less important. This resulted in 38 responses where audiologists ranked more than one but less than 18 of the listed values. These 38 responses were eliminated for the final analyses since overall group rankings are biased with partial nonresponse data (Brick & Kalton, 1996). The second issue was that some respondents found the user interface for the "pick, group, and rank"–style questions difficult to complete on some mobile devices. Respondents reported that "The first part of the survey is not very mobile friendly" and that "It was hard to drag and drop things on an iPhone." While the Qualtrics interface was designed specifically for use with mobile devices, some respondents found it cumbersome to complete the sorting and ranking activities on their mobile device. This could have led to fewer complete responses from audiologists who received the survey link.

Another possible limitation regarding this survey study is the validity of the ranking strategy. Respondents reported concerns about their ability to judge the rank order importance of values or found it acceptable to sort items into different boxes but had difficulty ranking values within boxes. One respondent reported that it was " . . . hard to rank and prioritize items as so many overlap and are of equal importance." Another said, "The answers for the first three categories were difficult to classify as degrees of importance as all of categories are important." We

expected audiologists to experience a moderate amount of difficulty while completing the sorting and ranking activities, as we predicted that all values would be important to respondents having started from a list of values in audiology. Some respondents were concerned that the methodology behind this survey was designed to trick or embarrass audiologists: "This survey seems to place my answers in a box and corners me into a thought process I do not agree with necessarily. I feel like the survey is designed to trap my answers and potentially view [an] outcome that is not accurate. . . . " Another respondent noted that they are "somewhat concerned about how these data will be presented, by forcing rankings of clearly important issues to be 'less important.'" We anticipated this concern and attempted to mitigate it both in the survey instructions and in the labeling of categories, where the lowest level of importance was labeled "Less Important" rather than, for example, "Unimportant." The chosen methodology inherently results in some values ranking lower, and it would be incorrect to interpret a low ranking in our results as unimportant. Despite these limitations, giving audiologists an opportunity to rank values provides insight into how audiologists prioritize and enact different values in practice, in contrast to the word count method used to rank values in Menon et al. (2023). Understanding the relative priority of values provides insight into the processes that underlie the complex decision making in audiological practice.

3.5 Conclusions

We validated a comprehensive list of the values of best-practice audiology and identified the rank order of values of hearing health care providers. The fact that no additional values were added to the list after eliciting values from audiologists using a large-scale survey indicates

that the list established in Menon et al. (2023) is comprehensive and reflects the performed values of practicing audiologists. The performed values of audiologists and potential values of the best-practice audiology system largely align, with two thirds of values in the same rank order in both lists. Eliciting values of hearing health care providers in this study will facilitate future comparisons between audiologist and patient values. If audiologist values are not aligned with values of non-users of hearing health care, potential solutions can be developed tailored to the values of specific populations. Such solutions may reduce barriers to hearing health care and reduce the individual and societal burden of untreated hearing loss in the United States.

3.6 Chapter 3 Appendix A: Classification of emerging values from survey respondents

Table 3.4: Classification of Emerging Values from Survey Respondents

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Making appropriate Medical referrals	Most important	Health	”Diagnosis and/or referral for medical conditions”
My contribution to community monetary and time based	Most important	Professional duties Cost	”Scope of practice” ”Related to money”

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
The ability for provider to be fairly compensated	Most important	Cost	”Related to money”
I treat my patients as people first and then as patients.	Most important	Equity	”Fairness in treatment or outcomes”
Patient satisfaction	Most important	Satisfaction	Stated as codebook values
Regain communication function with friends family and co-workers	Most important	Subjective benefit	”Reduction in activity limitation; decrease of participation restriction”
Satisfaction subjective benefit evidence-based	Most important	Satisfaction Subjective benefit Evidence-based	Stated as codebook values

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Creating a good relationship with the patient	Most important	Satisfaction	”Customer service”
Making sure patients are comfortable with their devices.	Most important	Comfort	”Physical fit”
Select tests ethically and do not give in to unnecessary tests to be able to charge more and cover yourself from lawsuits	Most important	Professional duties	”Licensed provider’s adherence to standards for professional conduct”

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Patient education about the importance of early treatment of hearing loss	Most important	Autonomy	”Patient education”
Respect for patients/families to make decisions based on their values	Most important	Autonomy Equity	”Patient’s ability to act independently” ”Fairness in treatment or outcomes”
Patient-Centered Care	Most important	Meta-values; prioritizing values as a concept	N/A

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Helping them understand the impact of hearing loss and how these aids will and will not help	Most important	Autonomy	”Patient education”
Patients are satisfied and happy with their care and their devices.	Most important	Satisfaction	”Customer service; decision to keep devices”
Values versus minimal expectations and minimal standard of care	Most important	Non-values statement/ general survey feedback	N/A
I think all of these are important - hard to rank	Most important	Non-values statement/ general survey feedback	N/A

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Assuring outcomes are appropriate and favorable for patients.	Most important	Satisfaction	N/A
There wasn't an item on the first list that wouldn't fall under "Most Important"	Most important	Non-values statement/ general survey feedback	N/A
Most of the other choices are encompassed by #1 and #2.	Most important	Non-values statement/ general survey feedback	N/A
This survey seems to place my answers in a box.	Most important	Non-values statement/ general survey feedback	N/A
Bilingual communication	Most important	Equity	"Cultural and linguistic diversity"

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Having a specialty	Most important	Professional duties	”Scope of practice”
Self-Confidence: restore patient confidence in themselves	Most important	Self-efficacy	”Self-advocacy; confidence”
Independence: My patients are more independent in controlling their own lives	Most important	Autonomy	”Patient’s ability to act independently”
Adherence to professional guidelines.	Most important	Professional duties	”Licensed provider’s adherence to standards for professional conduct”
Advocacy for patients who have HL	Most important	Self-efficacy	”Ability to act as one’s own advocate”

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Compensation	Most important	Cost	”Financial considerations”
Pts are able to be seen without waiting several months for svcs.	Most important	Access to care	”Availability of providers ability to purchase devices”
Counseling benefit	Most important	Autonomy	”Patient education”
Understanding of insurance billing benefits	Most important	Cost	”Related to money warranty price of devices payer”
Patients subjectively indicate that their quality of life has improved.	Very important	Subjective benefit	”Benefit from treatment that is perceived by patient”

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Although accuracy and objective benefit are very important	Very important	Subjective benefit	”Improvement in audibility intelligibility localization clarity sound quality”
Patient is provided with an array of appropriate hearing aid styles.	Very important	Design Autonomy	”Physical or aesthetic characteristics” ”Patient education”
Use of objective validation (REM)	Very important	Accuracy	”Fit to target”
They should not leave in pain.	Very important	Comfort	”Absence of pain or constraint”
Not all patients can have complete control of their hearing health care decisions.	Very important	Autonomy	”Patient’s ability to act independently”

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
Family-centered care	Very important	Autonomy	”Patient’s ability to act independently”
The patient determines whether the hearing instruments are of benefit to them.	Important	Subjective benefit	”Benefit from treatment that is perceived by patient”
Timely access to hearing services.	Important	Access to care	”Ability to obtain diagnostics devices treatment and services”
Do patients find VALUE in the services provided?	Important	Satisfaction	”Meeting user needs and desires”
Staying up to date and collaborative care.	Important	Professional duties	”Collaboration with other professionals”
Some people find everything too expensive.	Less important	Cost	”Financial considerations”

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	CATEGORY	CODEBOOK VALUE	JUSTIFICATION FROM CODEBOOK
Patients can choose where they go for healthcare and how far they travel.	Less important	Access to care	”Patient’s ability to obtain diagnostics devices treatment and services”
Accessibility for people with physical limitations.	Less important	Equity	”Accommodation”
I only care about how the device looks if it matters to the patient.	Less important	Design	”Form-factor aesthetics packaging”
Style and aesthetics are important.	Less important	Design	”Physical or aesthetic characteristics”
”Equity” is a woke term that is originally derived from Marxism.	Less important	Equity	Stated as codebook value

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Table 3.4: Classification of Emerging Values from Survey Respondents (Continued)

SUGGESTED NEW VALUE	**CATEGORY**	**CODEBOOK VALUE**	**JUSTIFICATION FROM CODEBOOK**
If there is even a question.	Less important	Non-values statement/ general survey feedback	N/A

3.7 Chapter 3 Appendix B: Comments from survey respondents

IS THERE ANYTHING ELSE YOU WOULD LIKE THE RESEARCH TEAM TO KNOW ABOUT YOUR RESPONSES TO THIS SURVEY?

Table 3.5: Comments from Survey Respondents

Really I do a pretty even mix of diagnostics and hearing aids.
Because I work for the military the cost of products and services is not a consideration when providing care and this may influence results of the survey.
We work with pediatric patients but also pediatric cochlear implant patients.
Somewhat concerned about how these data will be presented by forcing rankings of clearly important issues to be 'less important.'
The word is "equity" is a deceiving term. I agreed with your description of equity which is often different than the description of equity in greater society.
The answers for the first three categories were difficult to classify as degrees of importance as all of categories are important.
Hard to rank and prioritize items as so many overlap and are of equal importance.
Thank you for doing this work!
No.

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Table 3.5: Comments from Survey Respondents (Continued)

Really I do a pretty even mix of diagnostics and hearing aids.
As an audiologist and owner of a small private practice – my success is 100% based on the quality of care for patients which results in trust respect patient personal confidence and care. My patients trust me to do what is best for them not what is written in the books and journals not what everyone else is doing and not what the researchers tell us we have to do. The most important thing (that was not in your survey questions) is listening. Hearing aids will only be worn when patients want to wear them. A hearing aid worn is better than one sitting in a drawer. Listen to what they want and need – then it is easy to exceed their expectations.
The first part of the survey is not very mobile friendly.
I don't dispense hearing aids and other amplification devices; I assess balance function.
No.
My head is spinning regarding the possible use of this data or at least where you will go next with this. Not sure hitting on futuristic issues. Hope this helps.
We pride ourselves at our practice at providing each patient with best practices and evidenced-based practices while still selling hearing aids from ALL manufacturers and any level of technology/style of device they like. We make sure we do our part in making sure we provide the best practices/best devices and they get to have the autonomy in choosing what is best for their lifestyle.

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Table 3.5: Comments from Survey Respondents (Continued)

Really I do a pretty even mix of diagnostics and hearing aids.
I feel that audiologists should be educating our patients about not only hearing aid technology but educating them between the difference between aids and OTC devices. Furthermore we should be taking the time to educate patients regarding the connection with cognitive health and untreated hearing loss. We should be teaching our students that with hearing aids there are 4 clinical outcomes: improved cognitive health, improved mental health, decrease in tinnitus, and decrease in falls. I don't feel the current Au.D. programs do this. I have been a preceptor for over 20 years and I am teaching my students about these outcomes. Educating the patient at least for me is a top priority and making sure we refer out for medical intervention as needed.
The last question asked my primary responsibility. I listed teaching but would say that precepting while working with patients is my primary responsibility.
Was hoping to see more areas of audiology represented beyond prescriptive/dispensing.
Everything was focused on devices. Nothing was offered regarding counseling, aural rehab, and diagnostic testing balance etc. Perhaps that was the intent of the survey but our profession is not just about devices.
I would have liked to answer these questions without the options of National and State laws and Ethics being included. Very interesting!
Very important topic - good luck!

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Table 3.5: Comments from Survey Respondents (Continued)

Really I do a pretty even mix of diagnostics and hearing aids.
It is impossible to accurately rank priorities. If we say we follow best-practices, that means we care about objective & subjective measures and we care that someone can use their devices, their devices are comfortable, we refer for medical consult etc. so where we rank those is less important?
I don't dispense hearing aids in my current role.
I note all of the values mentioned in this survey are patient-focused. Obviously, audiologists have values of self-interest as well as values regarding their interactions with coworkers, colleagues, industry partners, and the community.
Making sure patients understand comorbidities and that having a device is not enough.
I was at a large CI and dispensing facility in the past. I am answering from my experience when I was a clinician and not based on my industry role.
I work in ENT. We primarily focus on evaluating adults and children for hearing loss and various hearing disorders. Half my time is spent doing diagnostics and the other half dispensing.
I treat every patient with dignity and kindness and it is important to me, however I am not a supporter of the continuing education requirements for gender equity.

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Table 3.5: Comments from Survey Respondents (Continued)

Really I do a pretty even mix of diagnostics and hearing aids.
Some values were a given and I didn't deem them as a "value." Hearing aids causing pain? Code of ethics? Also, I wish there had been a category of transparency in Marketing and transparency in the cost of services.
No, I don't think so. Thank you.
It was hard to drag and drop things on an iPhone.
Eliminate woke terminology and related questions. Those political agendas are divisive and not unifying. It is a major disservice to the audiology profession to inject political agendas into the wonderful work we do for our patients and our profession. Audiology is a "profession" not a "field."
Every item listed is important. We strive to meet all of those details in daily care of our patients. However, with VA, cost is not an issue for the patient and not listed as a high priority for the provider.
Thank you for a reasonable questionnaire. I appreciate it.
Your survey is limiting as it appears to focus on hearing aid fitting(s) and the design seems to make me answer a question I would not necessarily answer the way presented. I worry it is misleading and does not allow me to really address what your research question is supposed to address. The survey comes across as a way to put an answer in a category that does not depict the way I think about audiology at all.

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Table 3.5: Comments from Survey Respondents (Continued)

Really I do a pretty even mix of diagnostics and hearing aids.
AuDs need to have higher pay across the board and be more valued. My husband is a physician and as soon as somebody asks that in conversation, it's as though their demeanor changes towards him. Please excuse the typos as I am working and doing this on the side.
I'm not currently practicing.
I work in a very rural area with a wide range of patients coming from all over the state. I want to make sure I am fulfilling my role as an audiologist providing them with quality care and then helping with cost/travel. My practice offers low-budget hearing aids to allow patients to have high-quality aids while still being able to receive care from an audiologist.
I have an equal focus on medical diagnostics and fitting amplification.
I worked in a Clinic setting dispensing hearing aids to adults for 16 years and have only recently switched to an Educational Audiology setting for a school district. My responses were based on my previous experience.
I also teach undergraduate and graduate students in an SLP program in NYC and I am in the process of credentialing for a company that subcontracts to the VA hospitals to perform audiometric assessments for veterans seeking military pension and compensation.
I do not fit or dispense hearing aids. I have a vestibular specialty thus most of these responses were geared towards dispensing audiologists.

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Table 3.5: Comments from Survey Respondents (Continued)

Really I do a pretty even mix of diagnostics and hearing aids.
Most responses were from my time working at a private practice as I no longer dispense hearing aids.

Chapter 4: What would it take for you to seek help for your hearing difficulty? Identifying values that drive hearing healthcare decisions

4.1 Introduction

Untreated hearing loss affects a significant proportion of American adults, contributing to substantial public health challenges (CDC, 2015), and certain demographic groups experience a disproportionate impact (Nieman et al., 2016; Bush, 2021). Despite the widespread availability of hearing aids, many individuals who could benefit from amplification do not use them, with factors such as cost, ease of access, and personal perceptions contributing to nonuse (Donahue et al., 2010). However, these factors likely vary greatly across individuals, underscoring the need for tailored, patient-centered solutions. Value-sensitive design (VSD) offers a framework for creating such solutions by addressing the specific needs of individuals or demographic groups (Friedman et al., 2013). To apply this approach effectively, it is essential to first elicit and understand the values of people with hearing difficulty, ensuring that any intervention aligns with their unique preferences and experiences.

It is critical to understand the values inherent to hearing healthcare systems to evaluate their effectiveness in serving people with hearing difficulty. A previous study identified core values embedded in traditional hearing healthcare delivery (Menon et al., 2023). Through an iterative

analysis of clinical guidelines, codes of ethics, and patient questionnaires, we found the values most emphasized in the traditional audiology model to be subjective benefit, professional duties, and self-efficacy. These values emphasize both the professional responsibilities of audiologists and the patient experience, particularly the perceived benefits and empowerment associated with hearing care. Recent regulatory changes in the United States introduced over-the-counter (OTC) hearing aids and challenged values in the traditional audiology model. Menon et al. (2024) used values as a framework to evaluate and critique the OTC hearing aids model and found that values were reprioritized to reduce barriers to hearing aid access and use. Access to care, autonomy, and cost were values central to the OTC model, shifting the focus away from professional oversight and toward empowering individuals to take greater control over their hearing health. This reprioritization reflects the difference between the public health goal of getting adequate care to everyone who needs it and the audiologists' goal of providing the best care to their patients and families. A nationwide survey of U.S.-based audiologists revealed that the values of hearing healthcare providers tend to align with the traditional audiology model, with the most highly prioritized values including accuracy, safety, and equity (Menon & Hoover, *in press*). The shift toward OTC hearing aids challenges these values, and without personalized fitting and professional oversight, audiologists expressed concerns about the precision and safety of hearing care as patients manage their own devices. While OTC aids improve access and affordability, they may also deepen disparities in the quality of care for those who require more individualized support. As the field shifts toward new models, such as OTC hearing aids and tele-audiology, it is essential to understand how these changes align with the values of those seeking care. Understanding patient values will facilitate individual decisions about service delivery options and guide the development of solutions targeting currently underserved populations.

Value-sensitive design (VSD) offers a robust framework for creating solutions by integrating stakeholders' values, needs, and preferences into the design process (Freidman, 2002; Fleischmann, 2013). In healthcare, this approach can ensure that technologies and interventions are effective and aligned with users' values. VSD is frequently used to design solutions that meet moral and practical goals (Shilton, 2018), making it particularly relevant in patient-centered care models. In a previous study, Berry et al. (2017) elicited values directly from people with multiple chronic health conditions through semi-structured interviews. The study found that participants did not perceive their values to be relevant to their healthcare needs and tended not to communicate them with healthcare providers. This underscores the need to explicitly include values in the provision of care. Including values in the design of systems provides information about individuals' decision-making and has significant predictive power in anticipating behaviors, attitudes, and preferences (Schwartz, 2007). Designing healthcare solutions for users' values can help ensure both efficacy and adoption. Thus, VSD methodology applied to hearing healthcare is a way to overcome the problem of untreated hearing loss in the United States.

In order to increase the number of Americans who engage with hearing healthcare, it is essential to understand the factors that drive individuals to pursue treatment. Degree of hearing loss, including both objective hearing assessments and subjective self-reported hearing disability measures, is currently the best-documented indicator of help-seeking behavior (Garstecki & Erler, 1998; Barnett et al., 2017; Humes & Dubno, 2021). Many studies have used demographics to predict who will seek treatment for hearing difficulty. Although there are areas of disagreement across studies (for a review, see Knudsen et al., 2010), there is a consensus that vulnerable populations are disproportionately underserved in hearing healthcare. The prevalence of untreated hearing loss is markedly higher among adults who report low socioeconomic status (Mamo et al.,

2016). Comparing adults matched by age and degree of hearing loss, racial and ethnic minority groups (i.e., individuals who identify as Black or Hispanic) are less likely to adopt a hearing aid than their White, non-Hispanic peers (Bainbridge & Ramachandran, 2014; Nieman et al., 2016). Untreated hearing loss has been estimated to be twice as common in rural areas (Brennan-Jones et al., 2016), and adults in rural communities are at greater risk for delayed hearing aid acquisition than those in urban communities (Bush, 2021; Chan et al., 2017). Patients and providers in rural communities tend to be less aware of the benefits of diagnosing and treating hearing loss (Bush & Sprang, 2019). Different factors may explain why disproportionately few individuals in these demographic groups pursue hearing healthcare.

Research studies focusing on the experiences of individuals with hearing loss provide valuable insights into the challenges and needs of this population. Prior work regarding hearing help-seeking and rehabilitation explored the barriers and facilitators influencing individuals' decisions to seek help for hearing impairment (Laplante-Lévesque et al., 2012). Qualitative methodology revealed that the stigma, lack of awareness, and personal beliefs may hinder help-seeking in audiology. At the same time, support from social networks and positive interactions with healthcare providers are key facilitators. These outcomes are supported by Hickson et al. (2014), who found that individuals with more positive attitudes toward hearing devices and greater support from significant others were more likely to be successful hearing aid users. Another qualitative study exploring the perspectives of experienced hearing aid users regarding their interactions with audiology services found that many users prefer individualized questions to enhance their assessment and rehabilitation experiences (Parmar et al., 2021), which aligns with findings from Pichora-Fuller (2015) that underscore the significance of audiology assessments in populations at risk of cognitive decline and suggest that effective communication in audiology settings is crucial

for improving patient outcomes.

The Oyendo Bien Pilot Study (Marrone et al., 2017) illustrates how interventional audiology can address disparities in hearing health care. Focus groups revealed that participants experienced increased self-efficacy and reduced stigma surrounding hearing loss after engaging with audiology services, indicating the potential for positive behavioral changes following supportive interventions. In addition, a study examining factors influencing the accuracy of subjective assessments of hearing impairment revealed that individuals often struggle to recognize their hearing loss accurately and urge audiologists to employ comprehensive diagnostic tools and effective communication strategies to better assist patients in understanding their conditions better (Kamil et al., 2015). The need for improved communication in audiology settings is supported by other studies that emphasize the burden of hearing loss on individuals due to communication barriers faced in audiology settings and the necessity for improved accessibility and awareness among audiology staff (Smith et al., 2024). Together, results from these studies emphasize personalized care and effective communication to adapt to the unique needs of patients. Eliciting and addressing the concerns and barriers faced by individuals with hearing difficulty are crucial for improving the overall quality of care, health outcomes, and satisfaction with interventions.

Attitudes toward hearing healthcare have been evaluated as an explanation for why people do not seek care and a target for intervention. Studies documenting attitudes toward hearing aids and the loss of hearing ability highlight various complex factors that may influence device use. The perception that hearing aids are a marker of aging and incompetence can deter aging adults from hearing aid adoption (Ruusuvuori et al., 2019; Scharp & Barker, 2020). Internalized stigma often causes individuals to feel conscious of their self-image and the stigma associated with visible hearing loss (da Silva et al., 2023), especially among working adults who may fear

repercussions in professional settings (Emmett & Francis, 2015). Comfort and appearance of devices are key determinants for hearing aid use and satisfaction (Manchaiah et al., 2021; Basheer et al., 2021), and these aspects tend to be more important than financial barriers regarding long-term acceptance and ongoing use (Perez & Edmonds, 2012). While technological advancements have improved device capabilities in recent years, technological sophistication can be a deterrent among older adults who perceive a lack of need or inability to effectively use such features (Tahden et al., 2018). Users and potential users of hearing aids also express concerns about the general maintenance and upkeep of devices, including cleaning, battery replacement, and technical troubleshooting issues (McCormack & Fortnum, 2013). Targeting attitudes about hearing aids and the need for professional care can improve care-seeking behavior. Individuals with less stigma toward hearing loss (Barker et al., 2017) and poorer self-reported health status (Nixon et al., 2021) are more likely to adopt and use hearing aids. Concerns about hearing aids can be mitigated by greater health literacy (Wells et al., 2020) and the support of family and communication partners (Saunders et al., 2012).

Financial considerations further complicate the decision to seek hearing healthcare. Studies indicate that the average price for a one hearing aid in the United States is approximately $2,500 (Warren & Grassley, 2017; Jilla et al., 2023). This high out-of-pocket expense often discourages individuals from pursuing hearing aids, particularly among older adults who may be on a fixed income (Mamo et al., 2016; Windmill, 2022). The perception that higher-priced devices correlate with better quality and performance persists, leading consumers to believe that more expensive options are necessary for satisfactory outcomes (Bennett et al., 2021). Lack of insurance coverage for hearing aids further exacerbates the financial burden on users. Medicare and most private insurance plans do not cover hearing aids, meaning individuals must bear the total cost themselves

(Warren & Grassley, 2017; Reed et al., 2018). Efforts to get Medicare coverage for hearing aids have not succeeded to date. The introduction of OTC hearing aids has sparked discussion about the potential for lower-cost alternatives to disrupt traditional pricing structures and improve access (Blustein et al., 2022). Knoetze et al. (2024) investigated user perspectives regarding the cost of hearing aids and the impact on device uptake through a qualitative content analysis of responses from a cross-sectional survey involving 241 adult participants. Results showed that both prescription and over-the-counter hearing aid users perceive cost as a significant barrier to uptake, with participants advocating for increased transparency in pricing and financial assistance in efforts to enhance accessibility. This highlights the critical role of increased awareness and availability of financial assistance in improving adoption rates and overall quality of life for individuals with hearing loss.

This study aims to elicit values through semi-structured interviews from a convenience sample of individuals with hearing difficulty, including users and non-users of hearing aids in urban and rural settings. This approach will establish a baseline inventory of values, providing a foundation for a better understanding the needs, abilities, and preferences of individuals with hearing difficulty. The insights gained from this study can be used to enhance patient-centered care and facilitate the design of service delivery models that ensure that individual needs are met. In addition to semi-structured interviews, objective and subjective tasks that index hearing ability were administered to better characterize the participants in this sample.

4.2 Methods

4.2.1 Participants

Recruitment was conducted via convenience sampling in two distinct geographic locations meant to capture users and non-users of hearing aids from urban and rural communities. Urban-dwelling participant recruitment was primarily conducted through a research pool established from patients of the University of Maryland Hearing and Speech Clinic, and through University of Maryland outreach programs at health fairs and senior centers in the Baltimore-Washington D.C. metropolitan area. Rural-dwelling participant recruitment was conducted via word-of-mouth in Essex County, New York. Inclusion for participation was determined by age, self-reported hearing difficulty, English fluency, and no self-reported history of neurological impairment that would affect the ability to participate in focus group discussion sessions. Sample size was determined by data saturation, the point at which few new themes or insights emerge from additional semi-structured interviews (Guest et al., 2006). All participants provided written consent for study participation, and all procedures were approved by the University of Maryland Institutional Review Board. Participants were compensated at a rate of $15 per hour. Consent and data collection were completed in-person in a single session lasting no longer than two hours.

4.2.2 Semi-structured interviews

Participants engaged in active discussion and voiced their opinions, needs, experiences, and values in a semi-structured interview related to their hearing difficulty. Interviews took place at UMD College Park Campus (College Park, MD), Rockville Senior Center (Rockville, MD),

at a local business in Ticonderoga, NY, and in participants' residences. In each location, the interviewer and participants were seated in a quiet room. Participants assessed their need for hearing aids to facilitate communication during the interviews, with verbal confirmation of their ability to adequately hear the interviewer. Hearing aid users were not specifically instructed to wear their devices and many did not. The interviewer implemented strategies to facilitate communication, such as turning off fans or air conditioning units and orienting the seating to facilitate speechreading. All data collection was performed between May and August of 2024. Each interview included between one and three participants. During interviews, a member of the research team served as the discussion moderator and led the session, focusing on the perception of, attitudes toward, and barriers to seeking and obtaining hearing healthcare services and hearing aids. A moderator guide was developed to facilitate the continuation of discussion based on published literature for values elicitation through semi-structured interviews (Woelfer et al., 2011; Yoo et al., 2013a; Friedman et al., 2017). The moderator guide, shown in Appendix 4.6, lists ten categories of discussion topics related to understanding participants' hearing ability and its effects and understanding participants' treatment decisions involving hearing aids. Audio and video of each interview was recorded. The recordings were then converted to text transcripts using Adobe Premiere Pro automated transcription generation processed locally on laboratory computers and manually edited verbatim by study personnel.

Qualitative content analysis of transcripts was performed in NVivo 14 Pro (QSR International Pty Ltd., 2018). Conventional content analysis methods were adapted from Hsieh and Shannon (2005) to achieve our goal of extending existing knowledge about consumer attitudes, experiences, and decision-making processes as they relate to hearing healthcare and the use of hearing aids. The coding process was guided by both inductive and deductive approaches, allow-

ing the derivation of values from the data while also considering pre-existing theoretical frameworks relevant to the research question (Vaismoradi et al., 2013). This dual approach enables researchers to balance empirical findings with theoretical knowledge (Lillekroken, 2019). Conventional content analysis was performed in three distinct phases.

The goal of Phase 1 was to establish initial coding categories by identifying key concepts as initial coding categories. Members of the research team determined operational definitions for each category based on theory, existing knowledge, and themes identified in the first thirteen interview transcripts. Transcripts were read to identify overarching themes (Tesch, 1990). A round-table discussion was conducted to establish coding categories with members of the research team who were familiar with previous literature and the transcripts. Based on shared ideas and themes that were identified, a preliminary codebook of nineteen values was established. Each value was accompanied by a working definition and examples of representative text from interview transcripts (Potter & Levine-Donnerstein, 1999).

The goal of Phase 2 was to perform qualitative content analysis of transcripts based on values listed in the preliminary codebook. In this phase, meaning was symbolically assigned to transcript text, allowing values to emerge through an iterative coding process (Locke et al., 2020; Saldaña, 2009). Each transcript was coded by one or more members of the research team. Coders identified values in transcript text that were listed in the initial codebook and searched for values not included in the existing coding scheme (Miles & Huberman, 1994; Morse & Field, 1995). Coders kept detailed notes on impressions, thoughts, and initial analyses (Hsieh & Shannon, 2005). Any values found in the text that were not categorized with the initial coding scheme were noted, along with adjustments to the codebook labels, definitions, and examples from the text.

The primary objective of Phase 3 was to iteratively refine and finalize the codebook categories that have emerged from the coding of transcripts. This phase involves collaborative discussions among team members who review notes and observations made throughout the coding process. Iterative refinement enhances the clarity and relevance of categories, ensuring they reflect participants' experiences and perspectives (Hsieh & Shannon, 2005). Each discussion was intended to identify new values that may not have been initially recognized, refine the definition of values, and ensure that the analysis was representative of the data. Following each discussion, the preliminary codebook was systematically reorganized through the merging of similar codes and the separation of codes representing distinct concepts. The resulting codebook should consist of meaningful categories that accurately reflect the content of the transcripts. Accompanying examples of themes extracted from the transcripts were included to illustrate how the categories manifested in the participants' narratives, facilitating critical evaluation the success of the codebook development process (Gale et al., 2013).

4.2.3 Subjective and objective hearing measures

Participants were screened for subjective hearing difficulty for inclusion in the study by asking, "Do you have difficulty hearing in everyday life?" All participants responded in the affirmative to that question. To further evaluate the perceived hearing ability of participants in our sample, question AUQ054, which assesses the general condition of hearing, was adapted from the National Health and Nutrition Examination Survey (NHANES; Centers for Disease Control and Prevention) audiometry questionnaire section. This question, which asks participants to self-report their hearing status in everyday situations without the use of hearing aids, provides

a straightforward measure of perceived hearing trouble. Responses range from ”deaf” to ”excellent hearing”. Responses to this single question accurately reflect different levels of hearing difficulty, as confirmed by other measures of hearing performance and subjective experiences (Humes, 2024), helping to identify deviations from typical hearing patterns and understand the prevalence of perceived hearing difficulties within the study sample.

The Revised Hearing Handicap Inventory (RHHI) was employed to assess the subjective hearing ability of participants in this sample. The RHHI is a validated self-report measure that evaluates the perceived social and emotional effects of hearing loss (Cassarly et al., 2020). Participants responded to a series of statements reflecting various listening situations and emotional reactions, with each item scored on a scale from 0 (no handicap) to 4 (significant handicap). The total score, ranging from 0 to 100, indicates the overall degree of perceived hearing handicap, with higher scores reflecting a greater subjective impact of hearing loss on daily life. This battery was chosen for its sensitivity to the personal and social dimensions of hearing difficulties.

Participants' ability to identify keywords in a target sentence amid two masking sentences was assessed using the three-talker speech-on-speech masking method by Marrone et al. (2008). This spatial release from masking method (SRM) method was adapted for progressive tracking by Gallun et al. (2013), and validated for a young, normal-hearing population with administration via the Portable Automated Rapid Testing (PART) for auditory assessment application by Lelo de Larrea-Mancera, (2020). SRM assessments were administered through the PART application via Apple iPad (8th generation) and Sennheiser HD280 Pro supra-aural headphones.

In this task, participants were asked to identify two keywords spoken by a target talker by selecting the specific position related to the color and number combination on a grid consisting of four colors by eight numbers. In each condition, the target was presented directly in front

of the listener in a virtual spatial array and stimuli consisted of a single male talker from the CRM corpus (Bolia et al., 2000). Target sentences included the call sign "Charlie," followed by the keywords. Targets were fixed at an RMS level of 75 dB SPL. To familiarize the participant with the task, five trials of target sentences, in the absence of background noise, were presented. In the event that a participant indicated that the familiarization trials presented in quiet were inaudible or not understandable, the RMS stimulus level was increased by increments of 5 dB until the participant reported that the target level was "loud, but OK." In each following condition, the target was presented simultaneously in the presence of two masker signals which consisted of competing male talkers uttering sentences with different call signs and keywords. In the 'collocated' condition, all three sentences were presented directly in front of the listener. In the 'separated' condition, the masker sentences were presented at 45 degrees to the left and right sides of the target sentence. Progressive tracking for each condition included 20 trials in which the masker level was elevated in steps of 2 dB every two trials, resulting in two responses at each of the ten target-to-masker ratios (TMR). When the target level was presented at 75 dB SPL, the masker level progressed from 65 to 83 dB SPL. When the target level was increased for a given participant (e.g., target at 80 dB) the masker levels were increased by the same unit (e.g., masker progressed from 70 to 88 dB SPL). The maximum RMS level of the target was limited to 90 dB SPL to avoid exceeding the output limits of the iPad. Participants requiring a target level exceeding the output limit either attempted the test at the maximum level or the researcher ended the test after familiarization.

Following scoring methods established by Gallun et al. (2013) and normed by Lelo de Larrea-Mancera, E. S. (2020), threshold was calculated by subtracting the number of correct responses from 10 dB. Negative TMR thresholds indicate that threshold performance (approxi-

mately 50% correct) could be achieved when the target was at a lower level than the maskers and positive TMR thresholds indicate that the maskers must be lower in level than the target. The SRM score was estimated by subtracting the threshold in the separated test from the threshold in the co-located test, where 0 dB indicates no SRM, positive values indicate improvements in performance with spatial separation, and negative values indicate reduced performance with spatial separation.

4.3 Results

4.3.1 Study sample characteristics

A total of 46 adults participated in this study. One participant was omitted from the final analysis due to the failure of audio and video recording equipment during the interview portion of the study. Thus, data from 45 participants, including 20 men and 25 women between the ages of 31 and 94 years (mean age 67 years), were included in the analyses. In this sample, the majority of participants identified as non-Hispanic Caucasian (N = 33), with smaller proportions of participants identifying as African American (N = 8), Asian (N = 2), and Multiracial (N = 2). One participant identified as Hispanic Caucasian. Rural-Urban Commuting Area (RUCA) codes were used to classify the location of residence as they provide a nuanced classification of geographic regions based on population density, urbanization, and commuting patterns. Participants residing in areas with RUCA codes between 1 and 3 (N = 24) were classified as "urban-dwelling," while those living in regions with RUCA codes between 7 and 10 (N = 21) were classified as "rural-dwelling." Educational attainment was high relative to the general population, 64% reported at least a bachelor's degree. Of those who reported household income, 68% reported an income

between $50,000 and $149,999 and 11% reported an income below that range. English was the primary language for 98% of participants. Regarding health and auditory health, 51% reported having no chronic conditions, and 40% of participants reported experiencing tinnitus in the past 12 months. Demographic and health-related variables describing participants in this sample can be found in Tables 4.1 4.2.

Table 4.1: Demographic and health characteristics of the study sample

Demographic or Health Variable	**N of 45**	**Approximate %**
Geography: Geographic environment as defined by Rural-Urban Commuting Area Codes		
Rural-dwelling	21	47%
Urban-dwelling	24	53%
Race: Select the race that you most identify with		
African American	8	18%
Asian	2	4%
Caucasian (white)	33	73%
Multiracial	2	4%
Ethnicity: Select the ethnicity that you most identify with		
Hispanic	1	2%
Not Hispanic	44	98%
Gender: Select the gender that you most identify with		
Female	25	56%
Male	20	44%

Table 4.2: Demographic and health characteristics of the study sample

Demographic or Health Variable	**N of 45**	**Approximate %**
Education: What is the highest level of education you have completed?		
High School Diploma or GED	5	11%
Associates or Technical Degree	6	13%
Some college, but no degree	5	11%
Bachelor's Degree	11	24%
Graduate or Professional Degree	18	40%
Income: What was your total household income before taxes during the past 12 months?		
Less than $25,000	2	4%
$25,000-$49,999	1	2%
$50,000-$74,999	8	18%
$75,000-$99,999	8	18%
$100,000-$149,999	10	22%
$150,000-$200,000	5	11%
$200,000+	4	9%
Do not wish to answer	7	16%
Demographic or Health Variable	**N of 45**	**Approximate %**
Primary Language Spoken: Is English the main language that you speak at home?		
Yes	43	98%
No	1	2%
Additional Languages Spoken: Please type the number of other languages that you speak well		
1	1	2%
2	2	4%
None	41	93%
Number of Chronic Conditions: Please type the number of chronic diseases or medical conditions that you have other than hearing loss		
0	23	51%
1	2	4%
2	10	22%
3	6	13%
4	3	7%
Do not wish to answer	1	2%
Tinnitus: In the past 12 months, have you been bothered by ringing, roaring, or buzzing in your ears or head that lasts 5 minutes or more?		
Yes	18	40%
No	26	58%
Don't know	1	2%

All participants reported difficulty with hearing in their daily lives or had been formally diagnosed with hearing loss prior to enrolling in the study. Participants were classified as hearing aids ”users” if they had ever one or more OTC or prescription hearing aids. Those who had no previous experience with hearing aids were classified as “non-users.” In this sample, 19 out of 45 participants reported ever using a hearing aid. Among hearing aids users, most (N = 9) had worn hearing aids for two to five years. Most users reported wearing their hearing aids eight or more hours a day (N = 13), while some reported using them intermittently (N = 6). Most users had their hearing aids fit by a healthcare professional (N = 16), with twelve users obtaining their hearing aids from an audiologist, three from an over-the-counter service delivery model, and four from another healthcare professional or dispensing company. Information about hearing aid use patterns and mode of purchase is shown in 4.3.

Table 4.3: Hearing aid use among participants in this study sample

Hearing Aid Use Variable	**N of 45**	**Approximate %**
Hearing Aid Use. Have you ever worn hearing aids?		
Yes	19	42%
No	25	58%
Number of Years Wearing Hearing Aids		
1 or fewer	3	7%
2-5	9	20%
6-10	4	9%
10 or more	3	7%
Not Applicable	26	58%
Number of Hours Wearing Hearing Aids Daily		
0-3	5	12%
4-7	1	2%
8-10	5	13%
11-14	3	5%
15-16	5	10%
Not Applicable	26	58%
Hearing Healthcare Professional Involvement in Hearing Aid Fitting		
Yes	16	34%
No	3	9%
Not Applicable	26	58%
Method of Purchase		
Audiologist	12	26%
Otolaryngologist	1	1%
Costco	2	5%
Miracle Ear	1	2%
Over-the-counter from online retailer	3	9%
Not Applicable	26	58%

To better describe this sample of participants, subjective and objective hearing assessments

were administered. All participants self-reported their hearing status in everyday situations without hearing aids in response to question AUQ054, adapted from the National Health and Nutrition Examination Survey (NHANES) audiometry questionnaire section. Answer choices included 'Excellent,' 'Good,' 'A little trouble,' 'Moderate hearing trouble,' 'A lot of trouble,' and 'Deaf.' Participant answers were generally evenly distributed within this study sample between' Good' and 'A lot of trouble.' No participants selected the responses 'Excellent' or 'Deaf.' Responses to question AUQ054 are shown in Table 4.4 and Figure 4.1.

Perceived Trouble Hearing. Which statement best describes your hearing (without a hearing aid, personal sound amplifier, or other listening devices)?

Table 4.4: Responses to the NHANES Perceived Trouble Hearing Question AUQ054

Response	**N of 44**	**Approximate %**
Excellent	0	0%
Good	9	20%
A little trouble	14	31%
Moderate hearing trouble	16	36%
A lot of trouble	6	13%
Deaf	0	0%

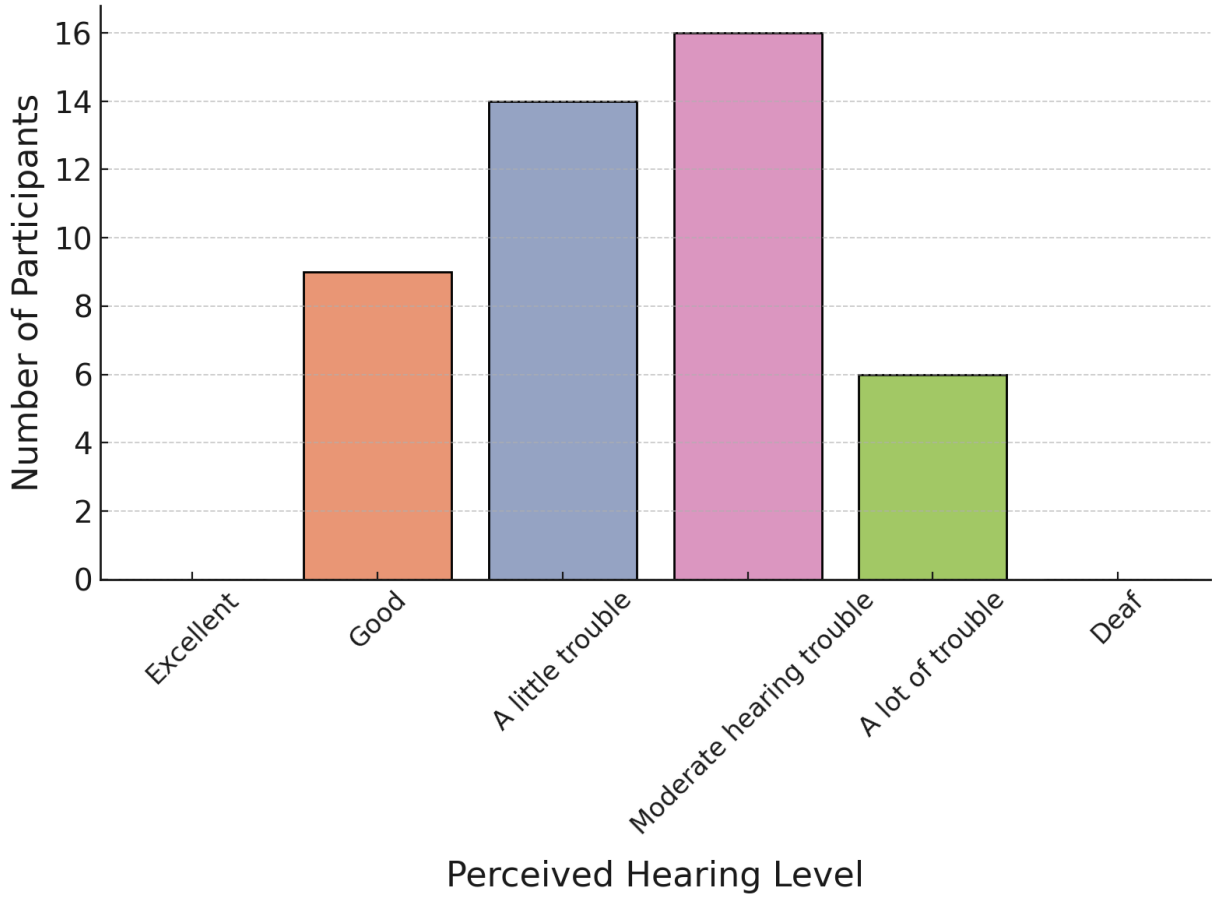

Figure 4.1: Distribution of self-reported hearing ability among participants, based on the NHANES Perceived Trouble Hearing Question (AUQ054). Bars represent the number of individuals who reported each level of perceived hearing difficulty, ranging from 'Excellent' to 'Deaf.'

All participants completed the Revised Hearing Handicap Inventory (RHHI; Cassarly et al., 2020). For this inventory, a total score between 0-16 indicated no hearing handicap, 18-42 indicated mild to moderate handicap, and a score between 44-100 indicated significant handicap. A total of 25 participants scored in the range of no handicap, 18 scored in the range of mild to moderate handicap, and two scored in the range of significant handicap. Mean and standard deviation scores among users and non-users of hearing aids in rural and urban environments are shown in Table 4.5 and Figure 4.2. A two-way analysis of variance (ANOVA) was conducted

to examine the effects of hearing aid use and geographic location on RHHI scores. The analysis showed a significant effect of hearing aid use ($F(1,41)=5.60$, $p=0.023$), where hearing aid users (mean 23.3, SD 17.6) in this sample reported a significantly higher RHHI (greater perceived handicap) than non-users (mean 13.3, SD 12.8). Additionally, there was a significant effect of geography ($F(1,41)=8.69$, $p=0.005$), indicating that participants in urban (mean 23.5, SD 17.6) environments reported a significantly higher RHHI (greater perceived handicap) compared to rural (mean 10.6, SD 9.2). The interaction effect between hearing aid use and geography on RHHI score was not significant ($F(1,41)=0.002$, $p=0.967$). A one-way ANOVA was conducted to determine whether there were significant differences in RHHI scores across levels of NHANES self-reported hearing difficulty. The analysis revealed no significant differences in mean RHHI scores across the levels of NHANES self-reported hearing difficulty ($F(3, 41) = 1.116$, $p = 0.354$), indicating that perceived handicap did not vary based on self-reported hearing difficulty.

Table 4.5: RHHI raw scores from users and non-users of hearing aids in rural and urban environments

	Mean (Standard Deviation) RHHI Scores		
	Rural-dwelling participants	Urban-dwelling participants	**Total**
Hearing Aid Users	16.25 (7.67) N=8	28.36 (21.18) N=11	**23.26 (17.60)** **N=19**
Hearing Aid Non-users	7.08 (8.47) N=13	19.54 (13.57) N=13	**13.31 (12.77)** **N=26**
Total	**10.57 (9.19)** **N=21**	**23.58 (17.64)** **N=24**	

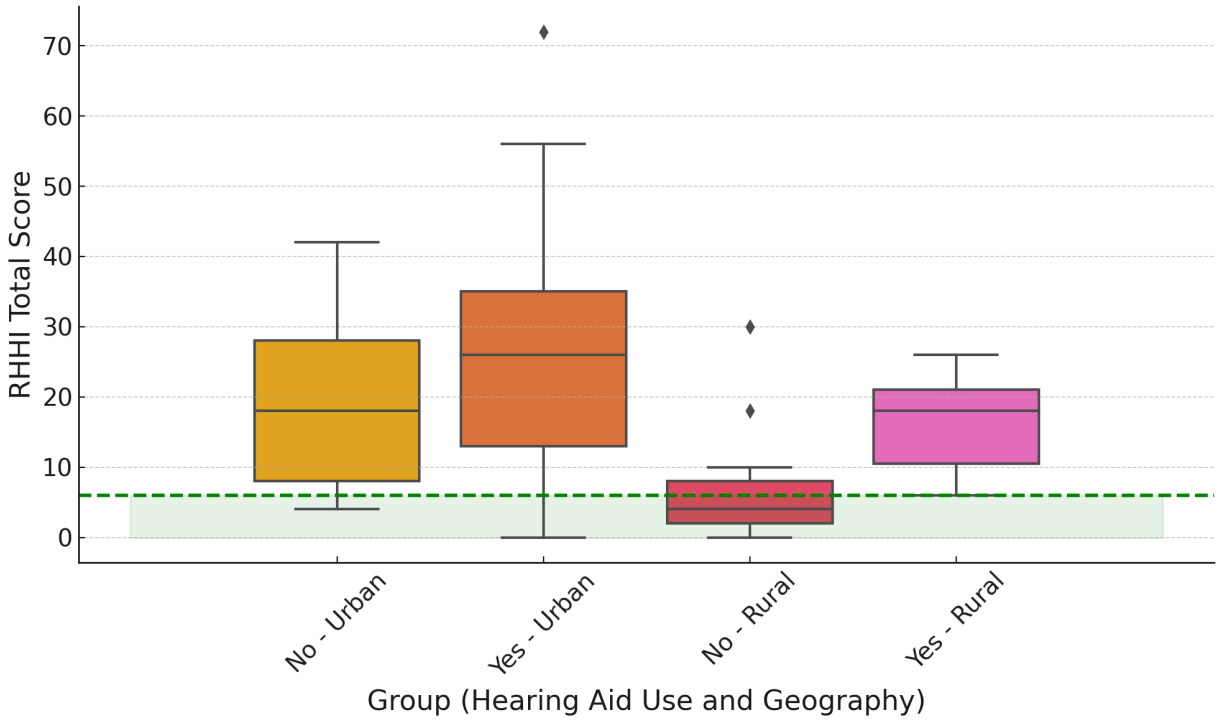

Figure 4.2: Revised hearing handicap inventory scores by hearing aid use (Yes/No) and geographic location (Urban/Rural). A horizontal dashed line at 6 represents the cutoff score for clinically detecting hearing loss (defined as a $PTA > 25$ dB HL in the worse ear; Cassarly et al., 2019).

A total of 30 participants completed the Spatial Release from Masking assessment (SRM; Gallun et al., 2013). SRM thresholds could not be obtained for 15 participants. Of those, 12 were unable to complete the task at the limits of the equipment, reflecting significant hearing impairment. Three participants completed the task but data were uninterpretable due to equipment malfunction or experimenter error. Mean and standard deviation TMR scores for the co-located and spatially separated conditions, along with the total release from masking for hearing aid users and non-users who completed testing, are provided in Table 4.6, while performance for urban and rural participants are shown in Table 4.7. Figure 4.3 shows SRM performance segmented by hearing aid use and geographic location. A two-way analysis of variance (ANOVA) was conducted to examine the effects of hearing aid use and geographic location on SRM benefit,

which is the difference between the TMR in the collocated and spatially separated condition, indicating the benefit of spatial separation on speech understanding in noise. The analysis showed no significant effects of hearing aid use ($F(1,26)=2.34$, $p=0.138$) or geography ($F(1,26)=1.69$, $p=0.205$). This suggests that neither hearing aid users and non-users or urban- and rural-dwelling participants showed significantly different benefit of spatial release on speech understanding in noise. Additionally, a one-way ANOVA was conducted to determine whether there were significant differences in SRM across levels of NHANES self-reported hearing difficulty. The analysis revealed no significant differences in mean SRM across the levels of NHANES self-reported hearing difficulty ($F(3, 26) = 1.768$, $p = 0.178$), suggesting that SRM did not significantly vary based on participants' self-reported hearing difficulty as categorized by the NHANES levels. Lastly, a Pearson's correlation analysis was conducted to explore the association between SRM performance and RHHI scores. The results revealed no significant correlation ($r = 0.03$, $t(28) = 0.153$, $p = 0.88$), indicating no relationship between SRM and perceived handicap in this sample. A post-hoc power analysis indicated that the test had insufficient power (0.052) to detect a statistically significant correlation, suggesting that this sample size was likely too small to reliably identify a meaningful relationship between the variables.

Table 4.6: Performance on the spatial release from masking task among hearing aid users and non-users

Mean (Standard Deviation) SRM Scores	**Co-located condition TMR**	**Separated condition TMR**	**Total Release from Masking**
Hearing Aid Users (n=11)	2.73 (1.91)	1.77 (2.23)	0.97 (3.10)
Hearing Aid Non-users (n=19)	0.50 (3.47)	3.32 (2.02)	2.82 (3.22)

Table 4.7: Performance on the spatial release from masking task among rural- and urban-dwelling participants

Mean (Standard Deviation) SRM Scores	**Co-located condition TMR**	**Separated condition TMR**	**Total Release from Masking**
Urban-dwelling participants (n=13)	3.25 (2.16)	2.13 (2.68)	1.11 (2.16)
Rural-dwelling participants (n=17)	3.00 (1.87)	0.07 (3.17)	2.93 (3.14)

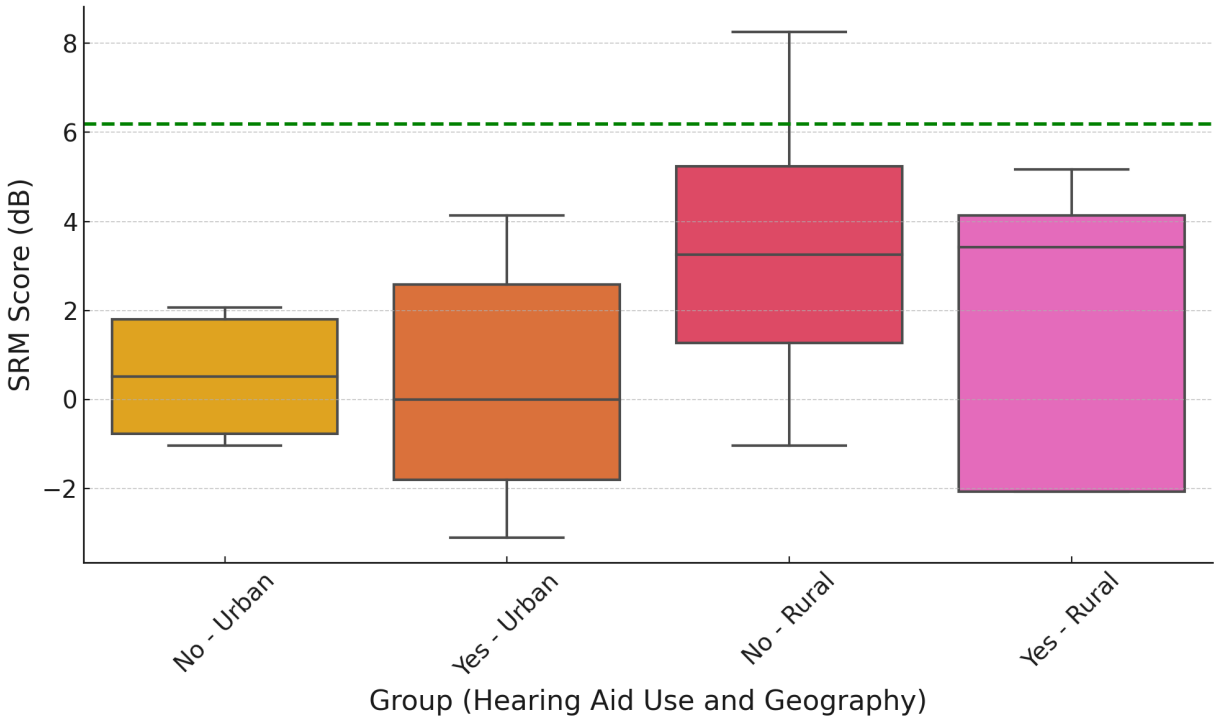

Figure 4.3: Spatial release from masking performance segmented by hearing aid use (Yes/No) and geographic location (Urban/Rural). A horizontal dashed line at 6.19 dB represents the mean normative threshold for young, normal-hearing listeners reported by Lelo de Larrea Mancera (2020).

4.3.2 Codebook of values

The primary goal of this study was to elicit values from users and non-users of hearing healthcare services and hearing aids. The analysis revealed several fundamental values that par-

ticipants associated with their experiences of hearing difficulty, which were categorized into three main themes: Material, Social, and Healthcare. Material values included Aesthetics, Comfort, Finance, Maintenance, Technology, and Consumer Attitudes. Social values included Community, Knowledge, Respect, Socioemotional, and Support. Healthcare values included Hearing Ability, Aided Hearing Ability, Access, Health, and Provider. The codebook, shown in Table 4.8, contains the label and definition for each value, along with examples where the values manifested during semi-structured interviews. Figure 4.4 visualizes the taxonomy of these values. A full description of the values elicited from semi-structed interviews can be found in Appendix 4.7.

Table 4.8: Codebook of values elicited from individuals with trouble hearing

Value Label	**Definition**	**Examples**
Material Values		
Aesthetics	Related to appearance, style, design	• Form factor • Size of device • Visibility of device • Ability or desire to wear devices discretely • Appearance-quality tradeoff • Device color
Comfort	Absence of pain or discomfort	• Physical fit of device • Stability and retention of device in ear • Ease of putting on and taking off the device • Uncomfortable sounds generated by device

Continued on next page

Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Finance	Financial considerations	• Price of devices • Costs associated with visiting a health-care provider • Insurance coverage • Warranty • Trial period and return policy
Maintenance	Ongoing practices to achieve optimal hearing health and/or the effective function of devices	• Perceived degree of mastery over general maintenance • Frequency with which issue occurs or one must seek support • Concern with loss or damage to devices • Cleaning of devices and replacement of parts • Charging devices
Technology	Ability to select, fit, and adjust hearing aids for optimal outcome	• Ability to use and manage technology • Ability to connect multiple devices • Bluetooth and streaming compatibility • Troubleshooting as a barrier to use • Self-fitting and programming • Device features beyond amplification

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Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Consumer Attitudes	A consumer's preconceptions, attitudes, and feelings about hearing aids	• Preferred service delivery model • Stigma and stereotypes related to use of hearing aids • Hearing aids shown in media or advertisements • Comparison to other health-related devices (e.g., eyeglasses) • Safety and health concerns related to devices • Trust in reputable product • Quality of devices related to cost • Self-described identity and personality traits • Frequent behaviors that inform decision-making processes
Social Values		

Continued on next page

Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Community	Ability to express and exchange information, ideas, or emotions	• Social connection with others • Quality of communication with peers • Interpersonal interactions and relationships • Social withdrawal or isolation • Influence of community on hearing-related decisions • Providing outreach, advocacy, or education
Knowledge	Understanding and awareness of one's hearing health and available resources	• Knowledge about hearing loss and devices • Ability or desire to do one's own research • Access to reliable sources of knowledge • Familiarity with hearing healthcare system and audiology • Understanding of test results and communication with provider

Continued on next page

Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Respect	Ensuring fairness all while honoring their inherent worth and dignity	• Treating people with hearing difficulty or hearing aids with dignity • Attitudes toward disability • Acceptance and support from others • Providing accommodations • Services for senior citizens and the elderly population • Healthcare access and equity • Privacy and confidentiality in healthcare
Socioemotional	Social and emotional experiences related to hearing	• Emotional reactions to hearing ability, devices, or health • Ability to function optimally in personal and professional environment • Participation or restriction in social events • Mood or affect • Extent to which individuals disclose their hearing ability to others • Use of communication strategies

Continued on next page

Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Support	Experience of being provided assistance and resources from others	• Assistance with daily functioning • Assistance with device maintenance • Mode or source of assistance • Independence and reliance on community to manage health or devices • Emotional support from community • Ease with which support can be obtained
Healthcare Values		
Access	Ease of ability to obtain hearing care or devices	• Ability to obtain healthcare resources • Travel in terms of distance or time • Availability of providers regionally • Choice of providers • Wait time for appointments • Referrals as a barrier • Ability to drive or leave home unassisted

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Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Aided Hearing Ability	Expectations and experiences about the overall usefulness of hearing aids for improving hearing abilities	• Perceived helpfulness of devices from one's own or others' experiences • Improvement in speech or sound quality • Ability to different target speech from background noise • Helpfulness with focus • Helpfulness with regulating loud sounds
Health	Ability to function and maintain well-being throughout the aging process	• Quality of Life • Comorbid chronic conditions • Disability and handicap • Expectations for aging • Tinnitus management • Chronic noise exposure • Medical solutions for hearing loss • Ability to function in the context of daily life and activities • Importance of hearing in the context of overall health • Risk of falls or cognitive decline related to hearing and device use

Continued on next page

Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Hearing Ability	One's understanding of how well they are able to hear sounds across various environments	• Environmental factors that impact hearing ability • Experiences with distorted sounds • Anecdotal evidence of difficulty hearing • Results from objective hearing measures • Ability to understand speech in social settings • Ability to hear and understand television or telephone • Subjective point at which care is necessary • One's own voice quality • Sensitivity to loud or uncomfortable environmental sounds

Continued on next page

Table 4.8: Codebook of values elicited from individuals with trouble hearing (Continued)

Provider	Perception of the roles, motivations, and competencies of healthcare professionals and associated services	• Relationship and personal engagement with provider • Ability of provider to accurately diagnose and effectively treat health conditions • Perceived level of support from provider • Perceived expertise of provider • Validation or compassion from provider • Financial motivates of provider • Role of different providers in device sales and fitting

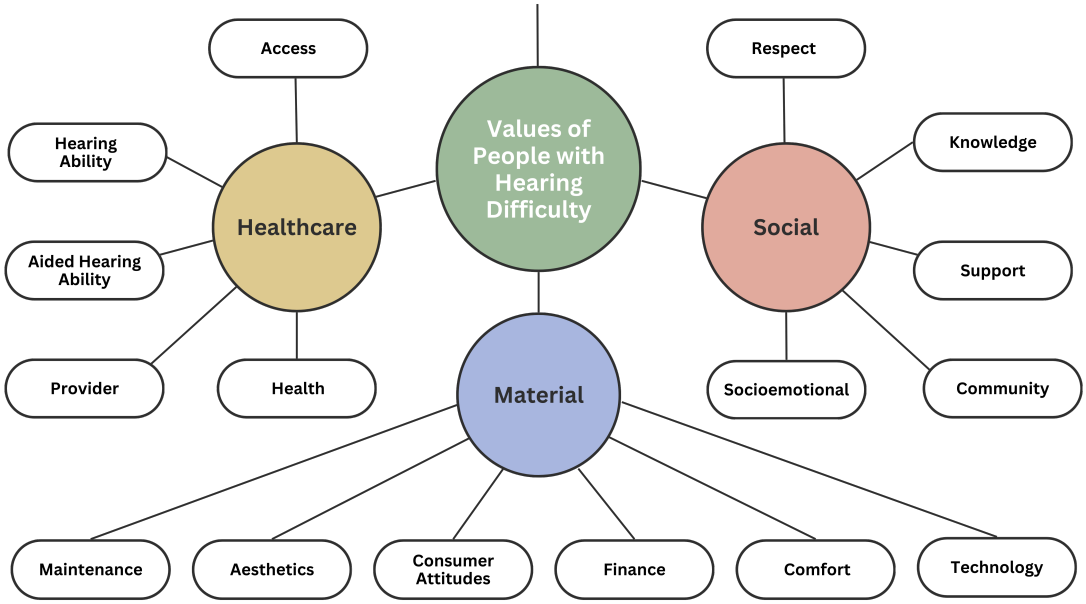

Figure 4.4: Taxonomy of values elicited through semi-structured interviews with stakeholders who have difficulty hearing

4.4 Discussion

The goal of the current study was to better understand how hearing healthcare affects the daily lives of individuals with hearing loss, revealing perspectives that go beyond traditional approaches to treatment. Our analysis of interview transcripts resulted in a list of sixteen values that comprehensively reflect hearing-related experiences and preferences from a convenience sample of 45 diverse individuals with perceived hearing difficulty. There are many factors that contribute to hearing healthcare utilization, with cost, access, and stigma frequently cited as major barriers (Donahue et al., 2010; Knudsen et al., 2010; Knoetze et al., 2023). The results of this study provide a more comprehensive understanding of the context in which individuals with hearing difficulty make decisions related to engagement with hearing healthcare resources. Our previous research identified values in traditional audiology and the nascent OTC model (Menon et al., 2023; Menon et al., 2024). The present study expands this research to the patient, revealing barriers to hearing healthcare at the intersection of hearing ability, the experience of hearing loss, and the role of hearing in people's lives. A comprehensive discussion of the values identified here and their context in the literature on facilitators and barriers to hearing aid use is in Appendix B. The three major categories of values identified were Material, Social, and Healthcare. Material values included aesthetics, comfort, finance, maintenance, and technology. Participants expressed concerns about the appearance and visibility of hearing aids, often seeking smaller, more discreet devices. Many participants discussed the preconception that larger hearing aids would improve one's hearing ability more effectively, acknowledging in many cases that smaller devices are more discreet:*"You know, I'm convinced no matter how small they make it, the doctor would say to me, no, you got to wear the big guy"*. However, drawbacks associated with smaller

devices included the ability to manipulate small device parts or accessories for maintenance: *"So, if you have a problem seeing or handling things, it's difficult to put a small device in"* and the fear of losing and subsequently being unable to locate non-visible device: *"I don't really care too much that it's invisible. I don't care about that. I just want something that's not going to get lost"*. Comfort and physical fit were frequently discussed, and many users emphasized the importance of a painless and secure fit. Many hearing aid users expressed satisfaction with the physical fit of their devices, mentioning that after a brief period of adjustment, the sensation of wearing a device in their ear became barely noticeable. Again, a drawback associated with the inability to physically feel the device in one ear was the possibility of not noticing should a hearing aid fall out: *"I don't even know they're in my ear after I put them in in the morning. I go all day. And that's, that gives me a feeling that if I lose one of them, I better know it immediately, or else it's going to be lost"*. Non-hearing aid users were often apprehensive about their ability to adapt to wearing an ear-level device, drawing on experiences wearing other earpieces or hearing protection: *"The only comparison I can tell you is that when I got earbuds... and I was listening to whatever it was, and they started to bother me and I kept moving them around, and then it was like, forget it"*. The emphasis on comfort, described in Appendix B: Comfort, supports findings from Manchaiah et al. (2021) that found the comfort of devices in one's ear is a key factor in determining the longevity of hearing aid use. Financial considerations, including the high cost of hearing aids and lack of insurance coverage, were prevalent barriers, leading participants to carefully balance cost with perceived benefits:

> *"It's expensive. I mean, you know, it's hard to say because how do you put a price on being, on what you're missing? You know, how do I, how do I put a price? If you*

say something to me and I don't understand you, what does that cost? Does it cost anything? Is it worth $5,000, is that too much money? So it's hard to put a value on it"

Many hearing aid users reported that the cost of devices was a barrier that delayed the uptake of hearing aids, supporting data from Simpson et al. (2019) that estimated an average delay from diagnosis to treatment of 8.9 years. Participants expressed a strong desire for increased availability of financial assistance to purchase devices, especially for senior citizens and those with multiple chronic health conditions or disabilities:*"It should be looked at in the same light as, what if I couldn't afford to buy these? To have to walk around in silence?"* Participants explained their perceptions about how cost and quality relate in terms of effectiveness of hearing devices, with many concluding that any low-cost device was an inherently inferior product: *"Like my mother would always say, you get what you pay for"*. A comprehensive discussion of cost-quality analysis described by participants can be found in 4.7 *Consumer Attitudes*. Maintenance, including cleaning and handling of the devices, was generally described as a simple process by hearing aid users. However, non-users were reluctant to adopt a device associated with maintenance and upkeep demands: *"I don't need another complicated thing to deal with"*. Hearing aids with rechargeable batteries were desirable for users and non-users alike, however, concerns about rechargeables related to duration of battery life and inability to charge their devices while traveling without the charger. Technological features like Bluetooth connectivity and the ability to change hearing aid settings from a smart phone elicited mixed reviews. Participants described how the degree to which they are able to use technology in general influenced their willingness to engage with technological features specific to hearing aids: *"I told [the audiologist] I'm a techie.*

I want something high-end. I want something I can control if possible". Several expressed frustrations over technological complexity with concerns that more features may impair ease of use, supporting findings from Tahden et al. (2018) describing how technological sophistication can be a deterrent among those who perceive a lack of need or inability to effectively use those features. Still, others highly valued technological complexity and stated that the ability to use their hearing aids for streaming audio was an essential part of their daily routine.

Social values reflected participants' experiences with their community, including the impact of hearing loss on communication and social interaction. The social category encompassed socioemotional, community, respect, knowledge, and support-related values. Many participants discussed the difficulties they faced in maintaining social connections due to their hearing issues, often leading to feelings of isolation. The common theme discussed in the context of social withdrawal was an inability to communicate in the presence of background noise. Some hearing aid users found that the use of devices can exacerbate difficulty hearing in noise in certain environments:

> *"I didn't want all those sounds in the background. And the lower you make it, it makes the sounds in the background lower, but it makes your hearing not as high as you would want, so I'm lowering everything. I don't need hearing aids anymore, let's take them out and not use them."*

Non-users were primarily concerned with preconceptions about an inability for the device to help in such environments:*"I heard from my father that, something about the background noises would affect the hearing or the hearing aid. I hope they can improve that".* The connection between untreated hearing loss and social isolation has been well-documented (Mick et al.,

2014), and some participants described how they perceive an individual's typical social habits and personality have a causal effect on the decision to use hearing aids, as opposed to an untreated hearing loss directly causing social isolation:

> *"But I mean, if you're not social when you're 70 or 75, you don't put your hearing aids in. I noticed that people, you know, that don't go out and socialize don't wear it. So then they go to Walmart, they don't put them in because, you know. So I think if they got a lot of family, do a lot more social, I think they have more of a tendency to wear their hearing aids."*

The varying degrees to which each participant was comfortable using communication strategies often determined their willingness to partake in social engagement: *"I tell them ahead of time. Otherwise, I think people just look at you funny, like, why do I have keep repeating? Just communicate it up front when you have a problem, right?"*

The role of family and community support was highlighted as critical in motivating individuals to seek hearing healthcare, while the social stigma associated with hearing aid use remained a significant concern for some. Participants discussed the frequency with which they must ask others to repeat themselves and how communication partners adapt or react to changes in one's hearing ability and behavior:

> *"My conversations with my family, you know, I'm always saying, 'what'd you say?' and so it's, you know, it's either they won't say it again, they get upset… and I'm like listen, you know that I'm having issues hearing. So why are you getting upset?"*

Breakdowns of spousal and familial communication often put strain on relationships and in-group social dynamics:

"Well that's just between me and my husband, like I said the last year it's been, you know. I, and, I would refuse to repeat myself. I mean it was to the point that I went nope. I think you hear half of it anyway. And, you're wearing me out. And like, I mean, I actually got testy with him."

Participants described the significance of loved ones' involvement with their hearing-related decisions, underscoring findings from Hickson et al. (2014), who found that those with more support from significant others were more likely to be successful hearing aid users. Respect was emphasized by participants, with many discussing the need for accommodations and other modes of support for those with hearing difficulty or hearing aids. Treating others, regardless of background and abilities, with patience and empathy were key socioemotional aspects discussed by nearly every participant:

"I think it is important for education, for people that don't have a hearing problem to learn to navigate being with people who do, or are beginning to exhibit signs of it. And that is patience, and it is listening."

Most participants perceived hearing loss to be stigmatized at a societal level, however, many reflected on how these attitudes have changed positively over time, underscoring the variety of perceptions elicited from Scharp & Barker (2020) through interviews with hearing aid users. Participants also valued knowledge related to seeking unbiased sources of information about hearing aids and hearing healthcare resources:

"I would talk to people. I would go online and try to find websites that I thought I could trust. I'd do a lot of that kind of stuff, reading it. And that's what I like to do anyway. So that won't be a problem."

In this domain, the primary topic of discussion was effective research strategies and sources of information, with participants often describing a preference for either autonomous, self-directed information seeking or provider-directed care and expertise. In the context of OTC hearing aids, these differing preferences may be an underlying driver in the decision to engage with a hearing healthcare service delivery model that necessitates the involvement of a provider. This theme carried over to the value of support, with many participants expressing that the ability to obtain assistance from a hearing healthcare provider was paramount: *"But again, my concern about making sure that it's set up specifically for me to maximize the benefits, right? So I presume that means I need to see an audiologist at some point to get that measurement."* A complete discussion of the perceived benefits associated with hearing healthcare providers can be found in 4.7 *Provider and Consumer Attitudes*

Healthcare values related to participants' aided and unaided hearing abilities, general health, interactions with healthcare providers, and ability to access healthcare. Again, the ability to hear conversation and function optimally in the presence of background noise was a ubiquitous concern among hearing aid users and non-users alike. Many participants described how their realization of hearing difficulty often emerged gradually, with many not recognizing the extent of their difficulty until it began to impact their daily lives:

> *"I think I was in denial because I kind of thought it was cell phone... but then at home I was having problems with the landline too like, okay, okay. And then and then I said, wait a minute, every time I go to a function, like whether there's loudspeakers or someone, some music playing, or a restaurant was really giving me really difficult time. And I didn't, it just didn't register that I had hearing loss."*

This often led to ambiguity about their perceived need for devices and the true severity of their functional impairment:

> *"It's kind of hard to know when to go down the hearing aid route, because it's tempting to do it. I don't want to do it before I need it. I don't need to have another thing in my life that, you know, whatever. So it's kind of. I'm kind of trying to figure out when that, how to know when to do that."*

A complete discussion regarding the cost-need analyses described by participants related to device uptake can be found in4.7 *Hearing Ability* Appendix B: Hearing ability. Several hearing aid users reported a mismatch between their expectations of hearing aids and the actual improvements they experienced, particularly in noisy environments. Most hearing aid users reported some benefit from use in less noisy situations, such as one-on-one interactions or small group gatherings, with the amount of subjective benefit varying among the group: *"No, it was never like, wow, what a difference. But I did notice, like when I would wear them in Tai chi... that I could actually hear more of what she was saying."* Reflections on the positive impact that hearing aids have on their daily lives included re-establishing connections with loved ones and mitigating other health-related concerns were prevalent: *"It's pretty important because, even when you meet with your physician. There's going to be things you miss if you can't hear him. So being able to hear what the guy says is actually very helpful."* In general, the perception of aided hearing ability varied with each participants based on factors not only related to improved hearing ability, but also on the intersection of sound, communication, and activities identified as important by the participant. Trust in healthcare providers, particularly audiologists, played a vital role in device adoption, with participants relying on providers' expertise to navigate the complex landscape of

hearing aid options:

> *"[The audiologist's] perspective on the different hearing aids that are out there... if they are, you know, issuing, prescribing hearing aids to people, I'm sure they get feedback from them as to this, this right here works well. This doesn't work well."*

However, participants emphasized the need for clearer communication from providers about the benefits and limitations of different devices, highlighting the need for audiologists to employ effective communication strategies that better assist patients in understanding their conditions better (Kamil et al., 2015). Values related to access in healthcare revealed the greatest differences between urban-dwelling and rural-dwelling participants in terms of travel barriers, choice of providers, and quality of care. These factors have been shown to systematically delay acquisition of hearing healthcare resources among patients in rural communities (Chan et al., 2017), and rural-dwelling participants in this study described the real-world gaps in care they have experienced in hearing healthcare and other specialty medicine:

> *"But health care in general, like a neurologist. I had a couple MRIs done on my brain, and they want a neurologist to view them. And I have been since March trying to find a neurologist... and the health care is, they're so overwhelmed that they're months out. I haven't even got a call back yet with a, with an appointment date."*

A full discussion of the disparities in access described by participants can be found in 4.7*Access*

Hearing healthcare is a relational experience shaped by interactions and connections with others. The values that shape individual decisions to seek treatment or adopt hearing aids are interwoven into each individual's life. Values such as access, financial considerations, and trust in provider expertise do not simply coexist, they interact in competing and complementary ways that

influenced participants' decisions and perspectives. For example, while cost remains a critical barrier (Knoetze et al., 2024), our findings (discussed in Appendix B under Consumer attitudes and Finance) highlight how financial considerations are intricately linked to perceptions of device quality, trust in over-the-counter versus prescription devices, and ultimately, the perceived worth of hearing healthcare in relation to one's daily functioning. Studies tend to focus on specific issues in isolation, necessitating the argument that a particular issue is a causal factor determining hearing aid candidacy or use. Using the framework of values, we can begin to understand how these factors relate in real-world decision-making.

The inclusion of an underserved, rural population positions our work in dialogue with the foundational studies that highlight demographic disparities (Nieman et al., 2016; Brennan-Jones et al., 2016), the stigma of hearing loss (Erler & Garstecki, 2002; Laplante-Levesque et al., 2012), and the rise of new hearing healthcare models (Warren & Grassley, 2017; Blustein et al., 2022; D'Onofrio & Zeng, 2022). The introduction of OTC hearing aids was the culmination of an initiative led by the National Center on Deafness and Other Communication Disorders (NIDCD) to evaluate barriers to access and affordability (Donahue et al., 2010). The regulatory burden of prescription hearing aids and other factors were identified as major barriers to access and affordability, resulting in the recommendation to allow OTC hearing aids to be approved for sale to adults with perceived mild to moderate hearing loss (NASEM, 2016; PCAST, 2015). This directly addressed the lack of hearing healthcare providers in rural communities (Coco, 2023). However, even among our participants in a rural community, access and affordability were but two values impacting their decision to seek care. A solution designed to target access and affordability will not address the many other values affecting the decision to seek hearing healthcare.

Value-sensitive design is a path forward for reducing the burden of untreated hearing loss. Integrating values into the design of hearing healthcare solutions facilitates a patient-centered approach. Values as a framework for decision making can help providers and policymakers interpret competing stakeholder priorities and align service delivery models more closely with the lived experiences of people with hearing loss.

4.4.1 Representativeness of study sample

This study included perspectives from a diverse group of men and women ranging in age from 31 to 94 years, providing a broad view of hearing healthcare experiences throughout the lifespan. The sample included users and non-users of hearing aids, offering valuable insights into the factors that influence hearing aid adoption and barriers to care. Participants were drawn from both rural- and urban-dwelling areas to gain a more comprehensive understanding of how geographic location impacts access to and engagement with hearing healthcare. Participants were representative of their community in terms of socioeconomic status, race/ethnicity, and the number of comorbid chronic health conditions reported, ensuring that findings reflect the diverse health, lifestyle, and cultural factors that inform decision-making. By incorporating this level of diversity, this research aimed to capture a wide range of values and perspectives to help ensure that future hearing healthcare solutions are designed to meet the needs of diverse populations. Prior to enrolling in this study, each participant confirmed that they experienced difficulty in their daily lives or had been formally diagnosed with hearing loss. Together, objective and subjective assessments including Spatial Release from Masking (SRM), Revised Hearing Handicap Inventory (RHHI), and National Health Examination Survey (NHANES) question AUQ054 provided

a summary of participant hearing abilities.

All participants completed the RHHI, which measures one's perceived social and emotional impacts of hearing loss. Cassarly et al. (2019), determined that the cutoff score for detecting hearing loss (defined as a $PTA > 25$ dB HL in the worse ear) was 6. Sensitivity and specificity were approximately 73% for the RHHI, making this tool effective for screening hearing loss in adults. Analyses showed that within this sample, users of hearing aids reported significantly higher levels of perceived hearing handicap compared to hearing aid non-users. On average, hearing aid non-users had a mean RHHI score of 13.31 (SD=12.77), indicating mild to moderate handicap, whereas hearing aid users had a higher mean score of 23.26 (SD=17.60), indicating a greater perceived impact of hearing loss. Additionally, participants in urban (mean 23.5, SD 17.6) environments reported a significantly higher RHHI score compared to rural (mean 10.6, SD 9.2). Fifteen participants in this sample scored below the 6 cutoff that predicts clinical hearing loss, despite reporting perceived hearing difficulty or diagnosed hearing loss to meet the inclusion criteria.

Participants also responded to question AUQ054 adapted from the National Health and Nutrition Examination Surveys asking them to rate their perceived hearing ability without hearing aids. Humes (2024) found that responses to this single question accurately reflected different levels of hearing difficulty, as confirmed by other measures of hearing performance and subjective experiences. Responses from participants in this sample were distributed ranging from 'good' to 'a lot of trouble.' Although each participant reported perceived hearing difficulty or diagnosed hearing loss to qualify for enrollment, 20% of participants reported having 'good' hearing. These self-assessments reveal that participants without hearing aids acknowledge some degree of hearing difficulty, but they may not perceive their difficulties as severe enough to warrant device

use.

SRM testing assessed participants' ability to separate speech from background noise, particularly when the noise is coming from different spatial locations relative to the target speech signal. All SRM testing was performed without the use of hearing aids. Although hearing aid users generally performed more poorly on SRM measures (mean 0.97 dB, SD 3.10 dB) compared to non-users (2.82 dB, SD 3.22), no statistically significant differences in SRM performance were revealed between hearing aid users and non-users or urban- and rural-dwelling participants. Lelo de Larrea-Mancera et al. (2020) reported an SRM average of 6.19 dB (SD=3.32) based on a sample of young, normal-hearing adults using the Portable Automated Rapid Testing (PART) platform, which closely aligns with similar findings in prior research that administered SRM testing within this population (Gallun et al., 2018; Jakien & Gallun, 2018). The elevated thresholds elicited from participants in this study suggest that these individuals likely find it more difficult to utilize spatial cues in noisy environments, underscoring the auditory challenges they described in daily communication.

No statistically significant associations were found between any of the three objective and subjective measures—RHHI, SRM, and NHANES—in this study. Despite testing for potential relationships, the results did not reveal any meaningful correlations. It is possible that the sample size was insufficient to detect any true associations, and a larger sample may be needed to achieve adequate statistical power for identifying significant relationships in the data.

4.4.2 Limitations

This study, while providing insights into the values and experiences of individuals with hearing difficulties, is not without limitations. The use of a convenience sample drawn from urban and rural areas means that the findings cannot be generalized to the broader population of adults with hearing loss. While the results are comprehensive in capturing the experiences and values of the participants in this study, the sample lacks the diversity needed to reflect the full spectrum of demographics and hearing healthcare needs across the U.S. population. Nevertheless, the findings are representative of the sampled populations, providing a nuanced understanding of how hearing healthcare intersects with their lives.

Another limitation concerns the spatial release from masking (SRM) testing. The SRM task, which assessed participants' ability to identify speech in the presence of competing talkers, was limited by our ability to accommodate more severe hearing loss. The combination of output limits and TMRs tested in the progressive scan prevented accurate measurement of SRM thresholds for 12 participants. Data from three participants were uninterpretable due to equipment malfunction or experimenter error. These issues limited our measurement of the objective hearing abilities of participants.

This study relied heavily on self-reported data from the measures of perceived hearing difficulty and interview transcripts. While these provide robust qualitative insights, the subjective nature of self-reporting may introduce bias, particularly in relation to participants' perceptions of their own hearing difficulties and healthcare decisions. Moreover, the cross-sectional nature of the study limits our ability to assess how values and decisions related to hearing healthcare may change over time or in response to new hearing aid technologies or models of care. A

longitudinal design, including changes in both attitudes and the use of hearing technology, would help address these limitations and further expand our understanding of hearing healthcare needs across different populations.

4.5 Conclusions

In this study, a comprehensive codebook was developed to capture the values of people with hearing difficulty, including both hearing aid users and non-users. The codebook provides a detailed understanding of the participants' experiences and decision-making processes concerning hearing healthcare. It was structured around three primary value categories: Material, Social, and Healthcare, each reflecting key aspects of the participants' hearing-related needs and challenges. The development of this codebook marks a significant step in understanding the multifaceted values that shape individuals' decisions about hearing healthcare. By capturing these values, the study provides a framework for designing solutions that are patient-centered, aligning with the real-world needs of individuals with hearing difficulties. Future research should focus on refining these value categories and exploring how they interact with emerging trends, such as OTC hearing aids and telehealth services, to better address the barriers to hearing aid adoption and improve overall hearing healthcare outcomes.

4.6 Chapter 4 Appendix A: Values focus groups moderator guide

Have you ever considered seeking treatment for your hearing difficulty?

[If yes]
- What were the main factors or triggers that led you to decide to seek treatment?
- Please describe any experiences with family, friends, or work that influenced your

decision to seek treatment.

- Please tell me about some of the environments or situations where you noticed you were having the most difficulty hearing.

[If no]

- What were the main factors that led you to decide against treatment?
- Please describe any experiences with family, friends, or work that influenced your decision to not seek treatment.
- Please tell me about some of the environments where you notice you are having the most difficulty hearing.

Have you ever worn hearing aids?

[If yes]

- How long have you been wearing them?
- Prior to wearing hearing aids, did you realize the extent to which you were having difficulty hearing in your daily life?
- Are there any aspects of the hearing healthcare system that you wish were different during your treatment journey? Is there anything that could have been easier for you?
- Do you still see an audiologist regularly? What is typically your reason for scheduling those appointments?
- Are you happy with the distance that you are required to travel to your provider?
- Tell me a little bit about what you do and do not like about your hearing aids.

[If no]

- What changes in the system would make you more inclined to pursue treatment?
- Are there specific factors that have deterred you from wearing hearing aids?

- If you decided at some point that it is time to go buy hearing aids, would you feel comfortable with the amount of knowledge you have about how and where you would get them?

What are your initial thoughts or feelings when you hear the term "hearing aid"?

- How would you describe society's perception of hearing aids?
- Do you think there is a positive, neutral, or negative connotation with hearing aids?
- What do you think the reasons behind that connotation might be?
- Do you feel the perception of hearing aids has evolved over time?

[If wears HAs] Did your perception of hearing aids change after you started wearing them?

Some people with hearing difficulty choose to visit an audiologist to obtain hearing aids because they like to receive care and counseling from a healthcare professional. Other people with hearing difficulty choose to purchase over-the-counter hearing aids from a retail or online seller because they like the convenience associated with independently purchasing their own hearing aids. Are your views more similar to one person or the other?

[If OTC]
- If you bought OTC hearing aids, what would some of your concerns be?
- Do you think that you would be comfortable managing and self-programming the hearing aids independently?
- Would you want the option to contact a support agent/representative to help with management and troubleshooting?

  - What would be the ideal service delivery model for you to obtain OTC hearing aids? Would you choose to go to a storefront and purchase them or order them to be delivered to your home?

According to a recent study, the average cost for hearing aids in the United States is nearly $5000 for a pair. Do you find this an acceptable price to pay for hearing aids?

- What is the maximum amount that you would be willing to pay for hearing aids?
- What kind of warranty or free trial period would you expect to come with your hearing aids?

Imagine that you are designing the perfect product that restores your hearing. Please describe this product with as much detail as possible. There are no wrong answers.

- What are the features of this product?
- How would it help with your hearing difficulty?
- How would it sound?
- How would you be able to obtain this product?
- How much would it cost?

If you could take a pill and instantly resolve your hearing difficulties, what would that pill do? Please list all of the beneficial effects that the pill would have on your ability to listen and hear.

- How would the benefits of this pill impact your life?

- **[If wears HAs]** How would taking a pill compare to wearing your hearing aids?

Please tell a short story about a time when your hearing ability has influenced your participation in social gatherings or events.

- You may describe social situations or activities that you avoid or find difficult to participate in due to your hearing difficulty.
- How do you cope with or adapt to these restrictions?
- Are there any communication strategies that you use to compensate for your hearing difficulty in these situations?

Please tell a short story about a time when your hearing ability has affected personal relationships with family and friends.

- You may describe an experience with a loved one that was shaped by your hearing difficulty or how you communicate with loved ones about your hearing needs.
- Do you feel that family or friends make an effort to accommodate your hearing challenges?

Is there anything else that you would like to share about your hearing difficulty or how it has affected your life?

4.7 Chapter 4 Appendix B: Discussion of values elicited from interviews

The following appendix contains an in-depth discussion about the values elicited from participants during semi-structured interviews. All quotes from participants are shown verbatim with the exception of repeated words or instances where words were removed from utterances for brevity as indicated by ellipses.

4.7.1 Material Values

4.7.1.1 Consumer Attitudes

"So now there's a million things on the market. And it's just like buying anything. You don't know what's good, what's bad, what's good for you, whatever. That would be daunting for me to try to figure that out." Here, the value of consumer attitudes relates to one's preconceptions, attitudes, and feelings about hearing aids in general. With the recent advent of over-the-counter hearing aid legalization in the U.S., a frequent topic discussed was the comparison of prescription and OTC hearing aids and preferences for the differing service delivery models. Reasoning about the benefit or value of OTC hearing aids was often discussed in terms of a cost-quality analysis, with a large majority of users questioning the drawbacks of buying a lower-cost device. The association between quality and cost was prevalent, with many concluding that any low-cost device was inherently inferior: *"Like my mother would always say, you get what you pay for."*

Preconceptions about the quality of over-the-counter devices and the perceived benefit of a provider's involvement in the device adoption process (see Appendix B:*Provider* 4.7.3.4 for a discussion) were the most frequently discussed concerns related to OTC. There was general confusion and ambiguity about the quality of OTC devices. Even participants who stated that they would be more likely to pursue devices through an OTC model had concerns about the relative quality when comparing prescription and OTC devices:

> *"And you know trying to get the best I could, you know what I mean, I'm sure that you're going to be prescribed something better than you're getting at Walgreens. I'm not 100% sure of that. But you know, I don't know, technology's come a long ways*

probably."

Users of prescription hearing aids who were less than satisfied with their devices reasoned that lower-cost OTC hearing aids might provide even less benefit: *"I'm assuming they're awful because these that are so expensive are awful."* Specific concerns related to the quality of OTC devices included the appropriateness of a given device for one's individual hearing needs and the ability to fit or adjust a device adequately:

> *"Yeah probably they just, it's probably something you can just turn up and, and you know it's not adjusted to exactly what your need is. You know they are cheaper. I don't know, do they adjust them or fit them properly? I'm not sure."*

These preconceptions about cost versus quality seemed to be critical in participants' reasoning about purchasing devices. Due to poor perception of low-cost devices, many participants expressed that they would be willing to spend more on a device that they considered trustworthy:

> *"But I was wondering how reliable that was. Again, you might find they just don't fit and don't service what you need to hear. And then you want to hear, and then you have to go right back to the audiologist and get this straightened out because you bought so many in trying to fix the problem."*

Though discussed by a large majority, the connotation between lower-cost hearing aids and inferior quality was not ubiquitous. Regarding entry-level purchasing, some non-users reported that they would be more likely to adopt a lower-cost device to assess its benefits before making a more substantial investment:

"You might not get the same quality, you know, as the audiologist, but you know, like say $500. You know you start this, you know, just to try it out too as well to see, you know, if you're comfortable with it as well."

These participants were generally less concerned about the specifics of the given device's fitting accuracy. They found the experience of seeking a reasonably priced and effective hearing aid frustrating relative to other areas of consumer purchasing:

"So if you only have like a Cadillac available, and someone wants to drive like a Corolla, well then, okay, if you're not selling Corollas, you're not going to make that money."

Extending the analogy of hearing aid purchasing with vehicle consumerism, hearing aid users who decided to buy lower-cost devices explained their rationale in weighing the cost with desirable features:

"It's like buying a really nice car. If it's something you want and it's worth it to you, you pay the money. If I thought there was a big difference between a $5000 one and a $1500 one, I'd pay the difference. Because it has a feature that helps me hear just a little bit better? I'd pay it. I didn't see the difference, so you know there's got to be some value there or I wouldn't do it."

While over-the-counter hearing aids were the primary topic of discussion regarding cost-quality analyses, this sentiment also applied to price ranges among prescription devices. Non-users had concerns about post-purchasing regret should they seek devices and be unable to obtain premium expensive products:

"But if I go to an audiologist and they're pushing me, well, you can get this one or that one, I probably would buck them and not do the most expensive one. And now I'm wearing it all the time going, it's good, but it could be so much better if I wasn't such a cheapskate, you know, that kind of thing."

Thus concerns about whether one might be compromising quality by choosing a less expensive option could serve as a deterrent to engaging with devices whatsoever. From a consumer standpoint, preconceptions about the device and attitudes toward purchasing in general appear to be critical factors in hearing aid purchasing decisions.

Another critical aspect of decision-making regarding device purchasing was the participant's perceived hearing abilities and need for devices. Descriptions of this cost-need analysis occurred in nearly every interview, and in general, willingness to adopt devices depended significantly on each participant's perception of their hearing difficulties and how this impacts their daily functioning and quality of life. It has been well-established that an individual's subjective perception of difficulty with communication and acceptance of their hearing condition drives treatment preferences and hearing aid adoption (Humes & Dubno, 2021). Participants generally felt that greater perceived need directly caused actions to seek solutions:

"I'm sure that like anyone, you know, you have your it's a trade-off if your hearing was so compromised you would put up with more and you'll be more patient. But if it's, you know, for marginally compromised, I'm probably less inclined to put up with it."

At face value, a consumer's cost-need analysis when purchasing devices is straightforward; one weighs the amount of money they are willing to spend against the benefit of making a purchase.

However, many socioemotional-related factors beyond hearing ability and finance complicate device adoption decisions:

> *"It's expensive. I mean, you know, it's hard to say because how do you put a price on being, on what you're missing? You know, how do I, how do I put a price? If you say something to me and I don't understand you, what does that cost? Does it cost anything? Is it worth $5,000, is that too much money? So it's hard to put a value on it."*

A key takeaway from participants in this sample was a sense of uncertainty regarding the optimal time to adopt devices:

> *"It's kind of hard to know when to go down the hearing aid route, because it's tempting to do it. I don't want to do it before I need it. I don't need to have another thing in my life that, you know, whatever. So it's kind of. I'm kind of trying to figure out when that, how to know when to do that."*

Subjective hearing ability can also further complicate the choice of which device to adopt: *"I mean, if you have like a mild hearing loss, like I guess I had when I started, then, you know, make a selection. But it's too hard now."*Participants explained their perceived functional abilities related to hearing and the effect this has on overall quality of life regarding adopting devices:

> *"I mean, it's frustrating sometimes, but not it's, I don't think it's changing the quality of my life right now. Like, I think I'm doing fine without it. And it's no different than the fact that I can't see as well as I used to."*

Each individual was unique in the importance placed on finance versus hearing ability, and for some, the cost-benefit analysis was more straightforward. Some non-users expressed that the device cost was too high no matter how significant their hearing problem was: *"Holy smokes, that's pretty high. I'll just suffer for a while. That's my reaction."* Others prioritized hearing ability and finance differently and indicated they would not hesitate to purchase devices when they perceive a need: *"No, because I knew I needed them. So I did, and I had means to get them, so I'm not gonna, you know, not get them if I need them."* Finances aside, there was a common preconception that hearing aids are appropriate only for individuals in older age or with debilitating hearing difficulties:

> *"So to me, it sounds like something that I am aware of now that I will need to pay attention to as I get older, but I have to meet some sort of certain threshold of bad hearing before I make the commitment to move, and I fully expect I will have to have a hearing aid at some point."*

This underscores a need to change perceptions about who could benefit from hearing aids on a societal level. The perception persists that hearing aids are not intended for individuals with mild perceived difficulty or those with normal audiograms who still wish to enhance their hearing. Barriers such as cost, device maintenance, accessibility, and stigma often deter those with mild hearing difficulties from seeking amplification solutions: *"Because I hear horror stories about that, and I... I hear they're expensive and it just makes me go like, oh, no. My hearing would have to very, very bad for me to go through all that."* The Over-the-Counter Hearing Aid Act specifies that OTC hearing aids are suitable for individuals with mild to moderate hearing difficulties, which raises a fundamental question: what accounts for the gap in public perception,

and how can society be better informed that wearing hearing aids for mild hearing challenges is both appropriate and acceptable? Future work should better address this issue, which ties into the ongoing debate about what constitutes an appropriate outcome measure for hearing aids with the advent of OTC. A clear understanding of the potential consumer market for hearing aids is essential to ensure that the devices reach those who would benefit, thereby improving overall outcomes in hearing healthcare. With stigma being a well-documented barrier to engaging with hearing healthcare resources (de Silva et al., 2023), it is unsurprising that another frequently discussed topic was societal perceptions of and connotations with hearing aids. This included discussions about stigma and stereotypes related to the use of hearing devices: *"But I think like everyone else, I think there is a stigma associated with hearing aids."* Participants' personal and societal views on the acceptance of hearing aids varied widely. Among those who discussed an apparent stigma, conversations were generally related to the appearance of devices (see Appendix B: *Aesthetics* 4.7.1.2), associations with disability (see Appendix B:*Respect* 4.7.2.4), and associations with older age. There was a general sense that hearing aids have not yet been normalized in society the way that other aids like corrective eyewear have been:

> *"I feel like a lot of people would, would have to be wearing [hearing aids] of all ages for people to think like, oh yeah, that's normal, I think I'd like to get some. Because so many people like wear glasses as an accessory that don't even need them. But like, you're never going to see that with hearing aids. You're only going to wear them if, you're only going to use them if you need them."*

An underlying theme in these discussions was the perception that the individuals who participants see or know wearing hearing devices tend to be senior citizens, leading to a strong association

between older age and device use. Each participant was asked a variation of the question, *"When I say the word hearing aid, what is your first reaction?"* and at least 10 participants said the word "old" in their response to this question. A commonly reported deterrent for hearing aid adoption and use was the perception that one was too young to wear devices: *"Part of my reluctance to get it is, I said, I'm not old enough to get hearing aids. You know, hearing aids are for old people, I don't want hearing aids."* The association of hearing difficulty as a symbol of aging may cause reluctance to engage with devices or hearing healthcare resources:

> *"Because it was a checklist of oh another thing of getting older. That's how it felt, you know, another thing of getting older, here we go again, kind of thing... and it's just one more thing that would be saying, you know, you're getting older. So you know, you look at it like, oh okay, I can avoid that discussion just by not going."*

Several hearing aid users expressed that although they had concerns prior to device adoption about age-related stigma, many stated that their attitudes changed after they started wearing devices:

> *"I mean I used to think of, oh, I'd look so old and they'd be terrible and I'd hate that. And but now I don't even, I don't even think it. After a few months of wearing them and no one said a word, I figured it's okay."*

Despite the prevalent age-related stigma reported by participants in this sample, most agreed that these attitudes have changed and will continue to change gradually over time. This applies to both personal perceptions of hearing aids as one ages, and societal views with the passing of time and changing cultural nuances. Several users remarked on how their attitudes toward devices have evolved and commented on the widespread use among peers their age:

"In my age group, it, I would say 50% of the people have hearing aids. So it's, you know, it's not an issue at all. I think when I was 70, I'm 81 now, when I was 71 it was an issue. But not anymore."

A handful of participants discussed the representation of individuals with hearing aids in popular media and reflected on how this might create more positive associations with hearing aids and older age in society:

"I really think that I was shocked to find that the Golden Bachelor TV show was so popular this year, and so that means a lot of seniors are checking in. And he had hearing aids, and two of the ladies in that group had hearing aids. And I think that affected some people positively like oh, okay. And they were functional and viable."

Interestingly, there were also a handful of participants who had neither a positive nor negative connotation with hearing aids and viewed devices in a more pragmatic sense: *"That's my perception about a hearing aid, there's nothing wrong about it. It's a tool to help you."* Among these participants, wearing a hearing aid was, in practice, more similar to using corrective eyewear:

"I don't have a negative view of hearing aids. I see them like I do glasses, and so they're just appliances that help me function better. I am very conscious of the fact that, a lot of people see these as harbingers of old age."

While perceptions of stigma varied individually, this sample of participants generally showed great respect toward the well-being of others in society. Most held non-judgmental attitudes about the actions that others take to improve their health and functional abilities:

"I don't have an absolutely, not any negative thought about that. I don't have anything against anything. People do whatever is necessary for their survival, and [the

hearing aid] is my survival."

4.7.1.2 Aesthetics

"It went from a big, ugly plastic thing behind your ear to kind of a cool device, so it's not too bad." Aesthetics values were generally related to the appearance, style, and design of hearing aids. An overarching theme related to the aesthetics of devices was their size and visibility. Participants reported a strong desire for a small hearing aid. The primary rationale to favor a tiny device was the ability to conceal it. Participants frequently used the word "vanity" to self-describe their identity in the context of willingness to adopt a large or noticeable device. Whether one could conceal a hearing aid by covering it up with their hair appeared to be a personal litmus test for acceptable visibility of devices among many users and non-users. Some participants perceived hearing aids in a more positive light due to improved size and discretion:

> *"Overall I know that, because of the guys I work with, so many of them have them, they have these really small ones now with a really fine, really small wire that's almost undetectable, that goes within your ear and I think nine out of ten people wouldn't be able to tell you that somebody was wearing it by looking at it."*

Improved design in terms of size and visibility was essential to these participants and also commonly cited as a reason for a more positive perception of hearing aids from a societal standpoint:

> *"But the product themselves seem to get, they're making progress in terms of they're no longer like the big clunky thing that you like kind of put on your ear. So I think there's progress visibly being made in the product itself that helps with the perception."*

Still, some participants did not prioritize aesthetics when adopting a device: *"And I wasn't too concerned with appearance. I'm not somebody who cares much about appearance. So I didn't care if the people saw them or not."* While a small hearing aid was most desirable overall, concerns were voiced surrounding the potential loss of a smaller device and the ability to manipulate small parts and accessories. Participants feared that with a small, non-visible device, there was a greater chance of losing and being unable to find a device should it be misplaced or fall out of the ear: *"I don't really care too much that it's invisible. I don't care about that. I just want something that's not going to get lost."* Participants also considered the fact that a small device would bear the consequences of having to manage small parts and may make the hearing aid more challenging to manipulate for those with poor vision or dexterity issues: *"So, if you have a problem seeing or handling things, it's difficult to put a small device in."* The tradeoff between visibility and ease of management should be considered alongside the physical size of devices. Relate to appearance, some participants emphasized a choice in color of their hearing aids. Inclusivity of appropriate product colors to better match a diverse variety of skin tones is a recognized issue with hearing devices (Kirjava & Faulkner, 2024): *"My only negative for it on a hearing aid has to do with the color. You know, they talk about a skin color. Well, it's not my skin color."* The lack of appropriate colors to match all skin tones could deter adoption. A desirable product might include matching the device and other external, visible parts of the hearing aid (e.g., receivers and earmolds) to a broader range of hair and skin tones. Other participants would opt for "*fun*" colors and reported adopting or the willingness to adopt devices that were not matched to skin or hair colors, like blue or pink. Though most participants would like a small device, some made clear that this aspect of the hearing aid is less important than improving their hearing ability:

"That shouldn't really compromise hearing, I really don't care what that thing looks like. If it works, I'm okay with it. But, you know, if push comes, if you get a choice, you obviously want to be a bit more discreet."

A frequently discussed preconception was that larger hearing aids would improve one's hearing ability more effectively. Participants discussed concerns about potentially sacrificing the quality of the hearing aid for choosing a smaller device. One deterrent for hearing aid use was the fear that one's hearing was so poor as to necessitate a larger device for effective outcomes:

"But you say hearing aid to me, I'm seeing the big thing on the side of your head. You know, I'm convinced no matter how small they make it, the doctor would say to me, no, you got to wear the big guy. So I'm not, I don't even want to go down that line."

Preconceptions about quality related to size and visibility may be a key determining factor in decision-making processes around device adoption.

Some participants described an ideal device that would not resemble a traditional hearing aid. In terms of discretion, rather than concealing a device, some participants would be more willing to obtain a visible device if it were more ambiguous or resembled other ubiquitous technology in terms of style. Some described acceptance of devices from a societal standpoint due to widely adopted listening devices that individuals of all ages use: *"And also everybody's walking around with those white plugs in their ears now. It's like it's cool, right? I mean, who cares?"* Others disagreed with this notion and reported that devices that do not resemble hearing aids may draw more attention: *"And I have seen the ones that they try to disguise, and right away, it almost makes you look at them more. Because you're going oh, what's wrong with his ear? Oh,*

it's a hearing aid." Many participants discussed a desire for a device integrated into eyeglasses. For eyeglass wearers, adding a device to something they are already used to wearing daily might better streamline ease of use and reduce visibility:

> *"I want some kind of device that was on my glasses rather than behind my ear. Just you know, something that would facilitate my hearing. And that would be one less thing to deal with, in the process of all that you got to do to get [yourself] together."*

4.7.1.3 Comfort

"If it's uncomfortable... you're not going to use it. If it's falling out all the time, you're not going to use it." The physical fit and absence of pain or discomfort from a hearing aid were valued highly among participants. Many hearing aid users reported satisfaction with the physical fit of their devices, noting that after an initial adjustment period, the physical sensation of wearing a device in the ear became unnoticeable. One perceived tradeoff with the inability to feel devices in one's ear, however, is the risk of not noticing should one fall out and an inability to subsequently locate a missing device:

> *"I don't even know they're in my ear after I put them in in the morning. I go all day. And that's, that gives me a feeling that if I lose one of them, I better know it immediately, or else it's going to be lost."*

Some hearing aid users were less satisfied with the physical fit and desired improved ergonomic design and softer or more flexible ear tips, earmolds, and domes. One participant described losing a dome in their ear canal: *"I've had twice, the bud get stuck in my ear, though. I had to go to the doctor both times, and they had to pluck them out. And the first time, I didn't*

know it was in there." Unpleasant sensations like itching and soreness from hearing aid use were also discussed: *"Are they comfortable? I wouldn't say that. No, they're not. I have to pull them out every once in a while because the, the rubber or whatever it is, they itch my ear."* Some participants felt dismissed when voicing concerns about comfort to hearing healthcare providers: *"When I said something about the hearing aid being uncomfortable, [the audiologist] said, oh yeah, you just have to get used to it. That seemed like an evasive answer. Like not a real answer."* Manchaiah et al. (2021) supports the idea that the comfort of devices in the ear is a key factor in determining the longevity of hearing aid use and should, therefore, be considered in the design or dispensing of hearing aids.

Non-hearing aid users often cited experiences with the comfort of other devices worn in their ears (such as earbuds, hearing protection, telephone earpieces, or ear plugs) when considering the importance of comfortable devices. Some described apprehension due to poor experiences with the fit of other devices:

> *"The only comparison I can tell you is that when I got earbuds and I was in the plane and I was listening to whatever it was, and they started to bother me and I kept moving them around, and then it was like, forget it. I had to get them out of my ear."*

The ease or length of time associated with adapting to wearing a device in one's ear was frequently discussed among non-users as a concern. Still, others were optimistic about their body's ability to acclimate:

> *"And I think the body has a way of adapting. And, you know, you have it stuck in your ear, it'd really annoying at the beginning. But within reason, I think it would be, the body would adjust very quickly to it."*

Retention and stability of the device in one's ear were crucial aspects of comfort. Many hearing aid users in this sample reported retention issues due to interference with other devices worn on the face or head. The widespread use of face masks due to the onset of COVID-19 presented challenges with device retention for many users:

> *"Oh, and when we were going through the pandemic. Now sometimes we still wear masks, I do on a plane. Well, that's a nightmare with the hearing aids, wearing a mask and knocking them off constantly with the mask."*

Eyeglasses, hats, and earrings also presented issues with hearing aid retention and use. Hearing aid users whose devices included a retention tail expressed a desire for a retention tail that is more comfortable and effective for mitigating loss.

4.7.1.4 Finance

"I can't think of anything else. Nothing else that I can think of that is so wrapped around money." Financial considerations or cost, a value that is central to the over-the-counter hearing aid model (Menon et al., 2024) and emphasized less in traditional audiology (Menon et al., 2023; Menon & Hoover, 2024) was essential to participants in this sample. One question that each participant was asked during the semi-structured interview was: *"According to a recent study, the average cost for hearing aids in the United States is nearly $5,000 for a pair. Do you find this an acceptable price for hearing aids?"* Nearly every participant expressed that this price is too high to be ideal. The cost of hearing aids was explicitly cited as a barrier to hearing aid adoption. Many users reported a delay in acquiring devices due to the high price alone: *"Took me about seven years to get my hearing aids because of the cost."* Participants also discussed preconceptions

about cost as a barrier to even the idea of engaging with hearing aids for non-users: *"And it really kept [my husband] for a long time from going to even investigate it because he said, 'I'm not spending that kind of money on hearing aids.'"* When asked how much money participants would consider an acceptable price for a pair of hearing aids, answers ranged from $100 to $5000. Some non-users expressed difficulty estimating an ideal but reasonable price, given a lack of familiarity with the hearing aid marketplace and device prices. Participants who were more comfortable spending $5000 for a pair of hearing aids described that this was due to their current financial circumstances, personality and spending patterns, as well as their awareness of device prices and financial planning for when the day comes to adopt devices. This highlights the socioeconomic factors that affect consumer willingness to purchase a device and identity and personality factors reported by Singh & Launer (2016).

Several participants used the word *"prohibitive"* to describe the cost of hearing aids. Prohibitive pricing was discussed in the context of seniors and individuals with severe hearing loss. Approximately two-thirds of American adults over the age of 70 years have clinical hearing loss (Lin et al., 2011) and the association of hearing loss and device use with the elderly population was frequently discussed among participants in this sample (see Appendix B:*Consumer Attitudes* 4.7.1.1 for this discussion). Since participants generally perceived seniors to have the greatest need for hearing aids, concern for seniors who might not have funds for devices was frequently discussed. Access to affordable, high-quality devices for seniors was emphasized to improve hearing ability for daily function and mitigate the risk of other overall health issues:

> *"This is a travesty. And all the dementia they're gonna get when they don't wear them and falling constantly, and then they're gonna end up in the hospital, an emergency*

room and gonna have to pay for them anyway with insurance."

Many comparisons were made between the need for hearing healthcare and dental care, underscoring common ideas about finance, cosmetics, and effects on overall long-term health between the two sectors of healthcare: *"I know they're expensive. But if you got to have them you got to have them. And it's just like going to the dentist and getting some new teeth... it's expensive but it's got to be done."* Others who conveyed that they were aware of the health risks tied to untreated hearing loss were skeptical of marketing and sales tactics that use the risk of health issues to promote hearing aid adoption: *"This new thing, actually new since five years ago is, you know, this plays very heavy with Alzheimer's. Yep. Somebody read that and went bananas. We're going to sell hearing aids by the gross now."* Awareness, knowledge, and education about health risks tied to hearing loss were generally desirable among participants. Still, marketing and sales campaigns should be careful not to give the perception that they are coercing potential users by threatening severe health consequences with scare-tactics marketing (Hill et al., 1998). Regardless of age, the idea that more should be done to reduce costs for individuals with a functional need for devices and insufficient funds to acquire them was prevalent: *"But once it affects you, you get a strong opinion about it. I'd hate to see someone walking around struggling for the sake of 1500 bucks. You know some people can't even afford to buy food these days."*

Similar to aesthetics, comparisons between hearing aids and other technology or health devices were frequently discussed in the context of cost. Many participants found it discouraging that the products they perceived to be similar in terms of technological features are associated with a much lower cost: *"Not worth it for that price right there. Not considering when you can get Bluetooth devices that can go in your ear, that, you know, you can get them for a couple hun-*

dred dollars now." Some participants attribute these comparably high prices to a lack of market competition: *"Computers came, the price came down over time because there was competition that was open. You could go to a store and you could see multiple different things. There's no openness about the competition here."* Compared to other expensive medical devices, the frequency with which replacement or upgrade of the device is necessary was a key factor in the decision to invest in the product:

> *"Okay, so, you know, I've invested $7,000 for my 11-year-old to get braces. Hopefully he'll only have them once, done. But with hearing aids... it's an investment that if you want to continue to hear you have to keep upgrading."*

Many addressed the concept of hearing and vision being comparable as essential functional senses, and the differences in costs of treating vision versus hearing issues were apparent. Non-users, in particular, commonly discussed the price of hearing aids relative to eyeglasses: *"No, I mean, and I wouldn't spend $5,000 on a pair of glasses. So they, it should be comparable."*

Warranty was discussed in terms of replacement for electronics failure, technical issues with the device itself, and replacement for a lost or physically broken device. Loss of devices, also discussed in Aesthetics and Maintenance, was a key concern among participants, and several hearing aid users reported having to replace at least one device since adoption due to loss or damage. Users whose device had been replaced at no charge expressed satisfaction: *"So when I lost it, it is still under warranty. So I'm lucky I get a new one, they replaced it."* These participants reported that the replacement procedures were generally easy and satisfactory. Users whose lost or broken device was not replaced free of charge expressed frustration specifically toward the fact that after a certain amount of time, it is difficult or impossible to replace a device with the same

product:

> *"One thing I can't stand about hearing aid companies is that you can't just buy another hearing aid to replace the one, you know I'm saying? It's like, oh, gee, we don't make those anymore. You have to get this whole new set."*

If bilateral wearers must replace one device, they may feel coerced into upgrading both devices and investing more money before they are ready. This sentiment applies when the user is satisfied with an older device but can no longer keep up with maintenance due to the retirement of their hearing aid as a whole:

> *"I couldn't get another, I can't, I mean, like I said, the lady found a part in the back. She goes, don't bring it again... because I can't fix it. She goes, nobody's going to fix it because nobody, they don't make it anymore. So you're going to have to get a new one."*

Replacement of devices due to electronic failure was primarily discussed in the context of a dead rechargeable battery, which seems to be one of the only drawbacks of rechargeable hearing aids (see more under Appendix B:*Maintenance* 4.7.1.5). Failure of a rechargeable battery was a primary reason for taking advantage of a device warranty for users, and experience with battery failure in similar electronics products was a frequently cited reason for the desire for a warranty, should a non-user decide to adopt devices.

Lack of insurance coverage was a chief concern related to finance and hearing aids. Users considered this a key determinant when deciding to purchase and adopt devices, with several users reporting some contribution from their insurance policy and others reporting no coverage

or reimbursement. Non-users cited the availability of insurance coverage for hearing aids as one of the first pieces of information they would seek in their decision-making processes:

> *"The only way I would go, like, entertain it is, oh does my insurance cover this? Then I'd go, yeah, okay. You know, if it's basically not coming out of my pocket, I'd say, why wouldn't I go and do something like that?"*

Many non-users were doubtful about the ability to obtain insurance coverage or financial assistance, which is a well-documented systemic barrier to device adoption and use (Warren & Grassley, 2017). Participants expressed frustration that healthcare procedures which may be considered cosmetic, like hearing, dentistry, and vision, are seldom included in standard insurance plans without accompanying policies, especially among Medicare beneficiaries: *"It should be part of your healthcare plan. Even though, like, sometimes eye coverage is separate, dental coverage is separate. Hearing, you know, usually that's on your own."* Not only does this restrict the ability to address functional health concerns adequately, but it also restricts the choice of providers:

> *"Well, there are some policies now from Medicare that will give it to you with teeth. But they give you the, like, the bare minimum of it. And you also have to go to, not nice to say but, more of an inferior place."*

Fixed-income participants described an economic situation in which they could not pay for devices out-of-pocket, but were placed in an income bracket such that financial assistance was unavailable: *"And I didn't qualify for help here. And they tried to help me get some assistance, but I was right in the middle."* Users favorably discussed non-insurance-related financial assistance programs, such as coverage of devices through their labor union or third-party policies like Care

Credit to pay for devices over time with little or no interest fees. Other ideas for non-insurance-related assistance included government policies and availability of tax incentives for healthcare: *"But if there was some relief there, governmental, you know, assistance with that as far as credits and things, I think that would be helpful to a lot of people. Yeah, yeah, the tax credits and things for healthcare."*

A discussion of cost-need analyses related to perceived hearing difficulty and willingness to pay for devices is described under Appendix B:*Consumer Attitudes* 4.7.1.1. Participants also described cost-quality analyses generally associated with preconceptions about the effectiveness of differently priced devices, also discussed in Appendix B:*Consumer Attitudes* 4.7.1.1.

4.7.1.5 Maintenance

"I don't need another complicated thing to deal with." Device maintenance was primarily discussed in the context of physically cleaning hearing aids and managing the manipulation and replacement of hearing aid parts. Maintenance in terms of physical cleaning was simple for most hearing aid users, describing a perceived mastery over using accessories like brushes to maintain cleanliness. The most notable cleaning issue that users reported an inability to address independently was a buildup of earwax in the devices:

> *"I wish there was a better way to keep them from getting clogged from earwax. And I don't mind brushing them at night, but that's not enough because within six months they were clogged up and I had to get them professionally cleaned."*

Some users reported issues manipulating small device parts such as domes, wax guards and filters, receivers, and tubes. However, these issues were often considered less impactful regarding overall

user experience. No participants reported dexterity issues that may interfere with their ability to handle small device pieces. However, they were aware that this might impact them in the future:

> *"I don't have arthritis, but a person who would have arthritis would not have been able to maneuver that. Thank God they're pairable with the phone because I think a person who can't maneuver little things or can't see tiny things would have a hard time maneuvering this mechanism here."*

The need for or availability of support from a provider or one's community in terms of help with general maintenance of devices is discussed in Appendix B:*Support* 4.7.2.3. Rechargeable hearing aid batteries were highly desirable among most participants in this sample. Traditional hearing aids that relied on disposable batteries were typically viewed unfavorably among participants:

> *"Well, I know my sister has a hearing aid... and she has to put batteries in them. And it's like, all the time it seems like she has to buy batteries, so I certainly wouldn't want anything that had batteries. I'd want one that you can charge."*

Several users who have had multiple devices reported switching from disposable batteries to rechargeables, and several non-users indicated that the ability to recharge devices would be necessary for overall satisfaction: *"Some of them are recharging. That would be the way to go for me. Recharge it at night instead of dealing with those teeny tiny little batteries."* Drawbacks and concerns associated with rechargeable batteries included the length of time with which a rechargeable battery is expected to last throughout the day:

> *"You know what I mean, how long do they hold a charge? I work 12 hour shifts... so*

I mean, if they're only, if you fully charge them, you know, and they last eight hours, it's not going to help me. I'd have to get some batteries."

Another tradeoff that users of rechargeable hearing aids discussed was an inability to charge their devices should they be traveling and forget the charger. In this case, there is no option to acquire a replacement charger with the ease of obtaining disposable batteries. However, hearing aid users with disposable batteries noted that due to the popularity of rechargeables, the availability and prevalence of traditional hearing aid batteries has decreased: *"It's got a like a size number ten battery in it. And a lot of the places, a lot of places don't even carry the batteries anymore because everything is going to rechargeable."* Users who do wear hearing aids with disposable batteries appreciated features that alert them to a low battery or need to change their battery and appreciated the inclusion of batteries with the purchase of devices from their provider or dispenser: *"I haven't, for five years I would say, I've never bought a battery for them. They gave me that many batteries... I've never bought a battery. And I still have batteries, probably for years to come."*

The risk of loss or damage impacted by the size or visibility of devices is discussed in Aesthetics, and the risk of loss or damage due to retention issues is mentioned in Comfort. Regardless of relative size and fit amongst the devices currently available in the market, hearing aids, in general, are typically a small and easily damageable product. Participants discussed the decision to not wear devices during social or leisure activities where they may benefit functionally from wearing the device but choose not to due to perceived increased risk of loss or damage. Several users and non-users expressed concerns about damage due to getting the hearing aid wet. There was a desire for improved features in terms of being able to more accurately locate a lost

device:

> *"I like the idea that... the phone can tell you if you drop them, where they're located, kind of, sort of in the region. I think that would be improved if it would it tell you exactly where it is."*

Others described ideas for mitigating damage: *"Oh, how about, some sort of an alarm of if they get wet?"* Participants challenged the concept of loss and damage associated with an expensive device through discussion of lower cost temporary-use products: *"An ideal product would be just one that you could buy over the counter... you don't care if you lose it, you don't care if you have to buy a new one. Like more disposable, if you will."* More discussion on ideas that challenge preconceptions associated with traditional hearing aids can be found in Appendix B:*Consumer Attitudes* 4.7.1.1.

4.7.1.6 Technology

"Especially with these, they connect to my iPhone. I can walk around and tell people, oh look, I can set it up for here, I can listen to Spotify on here. That's pretty cool!" The degree to which an individual participant described their ability to use technology in general seemed to influence their willingness to engage with technological features specific to hearing aids. Participants who identified as technologically savvy tended to express a greater desire for features like the ability to pair a hearing aid with a smartphone: *"I told [the audiologist] I'm a techie. I want something high-end. I want something I can control if possible."* Participants who perceived less mastery over technology were concerned that more features may impair ease of use:

> *"I don't want anything that's really complicated. I'm not, like, super techie. You*

know, and, I mean, I can figure things out if I need to, but I don't want something that's lots of bells and whistles. I just want basic."

Still, some participants self-identified with low levels of technology use and understanding and would appreciate the inclusion of advanced features nonetheless:

"I mean, I like technology, I'm just not savvy with it… like when I switched from a regular phone to an iPhone, which I did because I thought it was easier to use, I wanted the best iPhone, even if there's things on there I don't use. But I do like the idea of the capability of it doing that."

The chief concern among users and non-users was the ability to troubleshoot issues with Bluetooth technology. Several users indicated that when Bluetooth features, such as streaming audio from phone calls, media, or remote microphones worked, they were highly beneficial. However, when issues occurred, confidence in identifying or resolving the problem was low, leading to frustration:

"Well, a phone call, it used to be perfect because it was Bluetooth coming from the phone to my hearing aids. Now it's not perfect, I think something's interfering with the Bluetooth. I don't know what it is."

Another technology feature with mixed reviews among hearing aid users was the ability to adjust the volume or setting to specific environments on a device through their smartphone. Some users strongly preferred physical buttons on the device to make adjustments and reported satisfaction with the ability to do so:

"So it was nice and simple. Just the three buttons. You could change it depending on

your environment, no Bluetooth... you don't have to connect it to anything. It was really, to me the first time the simplest, least expensive thing was good."

Features allowing users to adjust to different environments were generally viewed favorably. Still, the perceived functional benefit was often ambiguous or low, and many users desired improved environmental settings:

"Yeah, I have different settings like, outdoor setting, a normal setting, a, crowd setting. So, like, if I'm out to dinner and there's restaurant noise or whatever, I put it on a crowd setting and it kind of drowns out the other conversations going on... I wouldn't say they're great, but they have a little benefit."

Still, some participants had little interest in adjusting settings and would desire a self-contained device: *"No, I want it automatic. I'm not gonna play with it, I'll have it all screwed up. Put in my ear, adjust it, and then be done with it."*

Users and non-users of hearing aids reported leveraging other, lower-cost ear-level technologies to mitigate trouble hearing in specific environments and scenarios. Over-ear headphones were used to listen to television at home to not disturb their partner with different hearing abilities, and used on airplanes to listen to media while overcoming large amounts of background noise. Many participants also reported using earpieces or in-ear headphones to talk on the telephone or communicate during online meetings, like Zoom. The common theme discussed related to the use of technology to facilitate hearing needs was the ability to have complete control over the device:

"If we're having a staff meeting or something that is like, we're not all in the same room, we're going to be on our computers. And I put my, my headset on and so does

everybody else. You know, so I can turn that up or down as much as I want."

Hence, the perceived degree of control and mastery over volume and setting when using a given device is a key point to consider in the design of hearing aids. A discussion of changing attitudes toward hearing aids due to technological advancements can be found under Appendix B:*Consumer Attitudes* 4.7.1.1.

4.7.2 Social Values

4.7.2.1 Community

"I'm constantly saying 'what?' And everyone at my house is like, oh my gosh, maybe you should get hearing aids." The codebook defines community as the ability to express and exchange information, ideas, and emotions with others. Hearing difficulty impacting the ability to establish and maintain social connections with peers and loved ones was a commonly discussed topic among this sample of participants. Often, this manifests in a breakdown of spousal and familial communication, putting strain on relationships and maintaining in-group social dynamics. The most salient example was the frequency with which one must ask others to repeat themselves and how communication partners adapt or react to changes in one's hearing ability and subsequent behavior:

> *"My conversations with my family, you know, I'm always saying, 'what'd you say?' and so it's, you know, it's either they won't say it again, they get upset... and I'm like listen, you know that I'm having issues hearing. So why are you getting upset?"*

Many participants described situations where they felt like family members did not adequately try to accommodate their hearing ability:

"I just personally feel, it's my daughter, it's not a stranger. So if you know that I'm having trouble hearing, then speak up all the time. You know, what's so hard about it, I'm saying 'what?' And then you got to repeat it louder. Start off there. You can always lower your voice later."

On the other hand, communication partners, regardless of their hearing ability, often grow tired of repeating themselves and may attribute their spouse or family member asking them to repeat to attention or habit instead of hearing abilities:

"Well that's just between me and my husband, like I said the last year it's been, you know. I, and, I would refuse to repeat myself. I mean it was to the point that I went nope. I think you hear half of it anyway. And, you're wearing me out. And like, I mean, I actually got testy with him."

Some participants agreed that while adjusting to changes in hearing, they tend to find themselves asking others to repeat out of habit to compensate for increased listening effort and cognitive processing:

"And [my wife] thinks sometimes I say 'what' out of habit first, while I'm thinking. And I thought about that, but I think when I do that, I am trying to think, because I'm trying to put together... I didn't hear the whole question. I heard a part of it. So was it was an automatic, 'what?' But now, because that bothers me, that now I just look at people and say, 'I can't hear you'... they react to that better than, 'what?'"

Thus, some participants feel they can mitigate problems with communication by setting clear expectations for their hearing needs and find that communication tends to improve when

they disclose their hearing difficulty directly: *"I tell them ahead of time. Otherwise, I think people just look at you funny, like, why do I have keep repeating? Just communicate it up front when you have a problem, right?"* For communication partners, changing behavior to better accommodate a loved one's hearing difficulty can be challenging, and efforts may go unnoticed or be mistaken for emotion-driven reactions:

> *"And I'll answer him, but he can't hear me. If, especially if I'm over there in the kitchen back to. So I'll turn around and I'll holler. And then he said, you don't need to holler. Just talk normal. I can hear you."*

The concept of mutual understanding and tolerance was a strong theme discussed in this context. Participants described the ability to have patience with others, and likewise, being essential:

> *"Friends and family, some are very patient with me once they realize the situation, but some are not. And a lot of people are very forgetful, as I have explained over and over and over to them that I can only hear in this parameter and that not that parameter. And so yeah, that's challenging sometimes, but I just, I'm patient with them and hope they're patient with me."*

The social and emotional consequences of hearing ability interfering with communication are discussed in Appendix B:*Socioemotional* 4.7.2.2.

Another frequently discussed topic involving family and community was the extent to which others' opinions and actions influence the decision to seek hearing healthcare and hearing aids. Spouses, children, and others who live with participants tended to be the most vocal and persuasive regarding involvement in one's decision to adopt devices. Some users described influ-

ence from a spouse or family member as the primary reason for, sometimes reluctantly, adopting devices:

> *"[My wife] would keep saying to me, you can't hear anything, why don't you get your ears tested and get hearing aids? I said, I'm not going to get hearing aids as long as I can hear. But then I seen these, so I bought them and they work."*

Language implying pressure from others was noted by users who described how family members noticed trouble hearing before they did, with statements like *"[My children] you know, they were they were instrumental in pushing me to get the hearing aids too"* and *"My husband kept pushing me. What are you going to do about this?"* Other users reflected on family members who were highly involved in their decision to adopt hearing aids in a positive light and were grateful for the ability to learn from the experiences of other users, highlighting the value of community and shared knowledge:

> *"My son-in-law's dad had hearing aids and he and I worked together... and quite often I would ask him to repeat what he said to me. And he looked at me and he says, you go down to [my audiologist] and get your ears checked, because you might be a good candidate for hearing aids. So I took his advice, what he said. Made an appointment, went down there, walked away with hearing aids."*

Several non-users recognized the strain that their hearing ability can have on communication with loved ones but did not perceive their hearing difficulty to have progressed to a point where intervention is appropriate or necessary: *"You know my wife will say, well you know you should go and get – it ain't up there yet."* Non-users sometimes expressed frustration when perceiving a family member's priorities to be unaligned with their own:

"You know, my sister has hearing aids, so she thinks I should be there tomorrow getting new ones, so I'm like, listen, I've got the money, I've got it saved for a certain thing, but I can't go running to doctors constantly."

Conversely, many users and non-users alike described being influential on others' decision to seek care or adopt devices:

"With [my husband], it was, yeah, I need hearing aids. My wife keeps telling me I need hearing aids… so he was already accepting that he was losing his hearing, and I may have forced that issue on him a little bit."

Each participant in this sample reported difficulty hearing and described instances of measuring perceptions of others' hearing difficulty against their own. The act of persuading others to adopt devices was reported most frequently when a participant, regardless of their hearing aid use, perceived a communication partner's difficulty to be worse. Hearing aid users who expressed satisfaction with the devices and aided hearing ability wanted to share the benefits with others they care about. Healthcare in general has long been shifting from a provider-directed model to a family-centered approach, where care decisions are made collaboratively with patients and their families to ensure that treatment aligns with the preferences and needs of both the patient and their loved ones (Oates et al., 2000). Audiology should also emphasize a holistic and personalized form of care, recognizing the critical role of family support in the hearing healthcare journey.

Aside from the influence that participants reported regarding family involvement with hearing care and vice-versa, several participants discussed providing outreach for hearing matters to members of their larger community. Some highly valued the knowledge gained through their own experiences with hearing healthcare and took care to share their expertise with others who

may benefit:

> *"And with other friends, we talked a lot about this situation once I was diagnosed and got my hearing aids, and now I counsel everybody. I think I've counseled maybe 30, 40 people in the past year... and I will go to the senior centers now and talk when I have a chance."*

Often, the act of providing outreach entailed assistance with device purchasing or choice of a device through sharing experiences with those who are just beginning their hearing healthcare journey:

> *"We were in a restaurant once, and the people at the table next to me were discussing the pros and cons of getting one of these. And there was a guy who was thinking about it, and his wife, I don't know who the other person was, they were kind of trying to talk him into it, you know, and so I stuck my nose in there and told them what I knew. And I don't know if it helped or not."*

Word-of-mouth knowledge and referrals were highly valued, especially among rural-dwelling participants. Many participants stated that they would prefer to gain information through speaking with someone they know personally rather than anonymous online reviews or recommendations from a provider, which is discussed further in Appendix B:*Knowledge* 4.7.2.5.

4.7.2.2 Socioemotional

"But once I was in a crowd, I noticed it right away. I had to ask people to repeat themselves. That was the worst part, and then I just gave up." The connection between functional hearing ability and social isolation has been well-established (Mick et al., 2014) and impacted many

participants in this sample: *"There are times that I choose not to participate because I just can't hear."* The common theme discussed in the context of social withdrawal was an inability to communicate in the presence of background noise. For hearing aid users, some found that devices exacerbate communication difficulties by amplifying unwanted noise. In these noisy environments, many users preferred not to wear devices:

> *"I didn't want all those sounds in the background. And the lower you make it, it makes the sounds in the background lower, but it makes your hearing not as high as you would want, so I'm lowering everything. I don't need hearing aids anymore, let's take them out and not use them."*

Non-users expressed a similar inability to separate target signals from background noise. They found that disclosing their hearing difficulty or using communication strategies is ineffective in these environments:

> *"And unfortunately, I just have to avoid big gatherings and noisy rooms because I just know I can't cope. And I don't even think, if I thought asking them to speak up a little bit would help, I would ask. It doesn't help because it's just too noisy."*

Thus, without a viable solution involving the use of devices, disclosure of hearing difficulty, or communication strategies, many participants reported avoiding noisy events like restaurants, weddings, and other large gatherings when weighing the socioemotional consequences: *"You know, sometimes I go to them even though, but more and more, I know I'm not going to hear, so and do less and less because, you know, and it's embarrassing not to hear."* A discussion on the impact of noisy environments on hearing aid users and non-users can be found in Appendix B:*Hearing Ability* 4.7.3.1 and Appendix B:*Aided Hearing Ability* 4.7.3.2.

Many users and non-users alike recognized difficulty functioning optimally in personal and social environments but chose to participate nonetheless: *"I don't feel like it's that bad, but I do hate it, you know, when we go to lunch and I can't hear everything, I don't like that, but it doesn't stop me from going."* Some participants described making a conscious choice to participate despite known difficulties and cope through the mindful use of communication strategies:

> *"I don't let it if it's something I feel that I really need to be hearing. Like in an auditorium, I get a closer seat. I'm fully aware of it. When they have the movies here, I sit in the first row because I want to hear it."*

Commonly used communication strategies included moving closer to the speaker or sound source, asking communication partners to adjust their speech (e.g., talk louder, slower, or more clearly) or the direction they are facing, asking communication partners to say their name or getting their attention before speaking, using physical gestures such as cupping a hand over their ear to convey difficulty listening, and requesting accommodations such as microphones or closed captions. There were varying degrees of comfort with disclosing hearing difficulties through communication strategies, and this was often described in the context of identity and personality: *"I think I'm just bold enough. Like, I'm definitely going, 'what are you saying?' You know what I mean? Yeah, probably my mom more, like, because she's too afraid to. I'm bold. I don't care."* Some simply find that a subtle indication of hearing difficulty is enough to ease communication breakdown in group settings: *"And people will do it automatically when you say, 'excuse me?' They say something I can't hear, I'll say, 'excuse me?' or 'could you repeat that?' They get the hint right away, I find."* If perceived social stakes are lower and information being conveyed is considered less essential, some participate more passively to avoid interfering with group dynamics:

"There's plenty of conversations where I'm happy to fake it. I will fake it. Like, if it's four people and I'm the only one who doesn't seem to be keeping up. I might just be like, yep, nod. I got every fifth word. I'll try to pay a little bit more attention or get the angle on the person's face that I want."

Many hearing aid users indicated that the ability to socialize optimally was a key driving factor in hearing aid adoption and use:

"And I find myself, which I absolutely hate at this point, and it's going to make me start wearing my hearing aid. 'What did you say? I'm sorry, I didn't hear you.' Yeah, I don't like that, I don't like that. And that's gonna force me to have them when I'm around people."

Related to the concept of social behavior driving device use, some participants perceived that an individual's typical social habits and personality have a causal effect on their decision to adopt or use hearing aids, as opposed to an untreated hearing loss directly causing social isolation:

"But I mean, if you're not social when you're 70 or 75, you don't put your hearing aids in. I noticed that people, you know, that don't go out and socialize don't wear it. So then they go to Walmart, they don't put them in because, you know. So I think if they got a lot of family, do a lot more social, I think they have more of a tendency to wear their hearing aids."

This supports the notion that an individual's self-described identity in terms of desire for social engagement as they age may be an underlying factor in their social participation and their perceived need for hearing care or devices.

Participants noted that social dynamics and behavior often differ personally and professionally. While communication breakdown was present in each scenario, participants felt higher stakes and more serious consequences due to difficulty hearing in a work or professional setting. Maintaining optimal functioning at work was a driving factor behind device adoption for users and non-users: *"So if I had to have it to keep my job and to teach classes and to, you know, then I would spend the $5,000. Begrudgingly, but I would spend it."* The degree to which others perceive one as competent in the workplace was among chief concerns, regardless of the specific professional environment. Those whose work depends on communicating with children reported struggling to understand high-pitched voices:

> *"Got downright embarrassing sometimes when a kid repeated whatever it was saying and I still couldn't understand it... partly because sometimes kids are a little bit shy and don't want to speak up and apparently it's their frequency, right? Comparatively high frequency voices. You know, so it did impact some of my presentations. Because of not being able to understand properly."*

Users and non-users who work in noisy environments and rely on technology to communicate with others expressed difficulty managing degraded signals, device use, and background noise:

> *"Especially when I'm running the boat, I have to actually turn the radio up fairly loud to hear it. And then that distorts the radio for me. So, you know, then I have to stop the boat if they call and turn the radio down so I can understand what they're saying. A lot of times with our old radios, I used to actually stop the boat and call them on the phone because I couldn't understand the radio."*

Those in authority or managerial roles find that others depend on their ability to communicate

clearly and appear well-informed:

> *"Sometimes I manage up to 1500 people in a factory. You don't want to be the boss having to ask people to repeat themselves all the time. For me? You want to give that appearance of always knowing what's going on, and you're not missing anything. So if you're always, and people say you can't hear what they're saying to you. Maybe it's just personal thing, but it hurts a leadership ability."*

Similar to personal situations, some participants described professional scenarios in which they will determine the importance of communication on a case-by-case basis:

> *"It's a little bit awkward, I suppose, but, well, it depends on the situation. If it's a meeting where it's important to get the information, then I'll be demanding. If not, then, if they're talking about the weather, that's not a big deal."*

This highlights how hearing abilities and needs can differ based on environment, communication partners, and willingness to use communication strategies. The desire and ability to engage in social interaction are intricately linked with hearing abilities in numerous complex ways, often accompanied by a range of emotional reactions. For a review of emotions elicited by device use, see Appendix B:*Aided Hearing Ability* 4.7.3.2.

4.7.2.3 Support

"People stood there with me. Let me tell you, all kidding aside, which is very seldom for me, I've been through a lot. And I've had a lot of support." Here, the value *support* generally relates to the experience of being provided assistance and resources from others. The primary resource of support discussed by participants in this sample was from family, friends, and community.

Older adults commonly discussed relying on adult children or grandchildren for assistance with managing health, hearing care or devices, transportation, finance, and technical troubleshooting. Participants geographically located near family members who serve as a support system stressed the reassurance this brings: *"That support is next door. I mean, and my daughter, she sleeps with her cell phone right next to her head. And you can call any time of day or night, and she answers."* Similarly, those who do not have easy access to family members for assistance expressed concern with their ability to overcome barriers related to seeking healthcare and using medical devices: *"But it's a real challenge for me, being by myself. I don't have grandkids or kids around to help me with technology."* Reliance on family members, however, can be accompanied by guilt or reluctance to impose on another's time or resources:

> *"The truth of the matter is, you know, the times we live in, [my daughter] is always busy. And sometimes she does so many things for me. And I don't want to keep on asking her for things that maybe she didn't consider necessary."*

Regarding hearing aid use, many participants stated that family members and loved ones were instrumental in their ability to obtain and use devices effectively. Aside from influencing the initial decision to pursue device adoption (discussed in Appendix B:*Community* 4.7.2.1), participants reported that family members assisted with locating and making appointments with hearing healthcare providers or device dispensers, providing transportation to various appointments, providing financial support for the purchase of devices, and providing assistance with device troubleshooting related to maintenance and technology. Participants expressed gratitude and felt fortunate to have support from family in their lives, whether the support be related to hearing healthcare or other socioemotional aspects of health and life in general:

"Like the first thing [my daughter] said when I had the surgery and I lost all my hair, everything. Before I even lost my hair she told me, 'let's go' and we went to a place and she bought me a wig. That's the kind of person she is. She comes to my apartment and she doesn't even tell me, 'Mom, I am here because I saw you need something.'"

Additionally, participants with a spouse or partner described instances in which they could serve as a support system by assisting their loved one:

"[My husband] has a tremor in both hands... and so he's worried about dropping them, he's worried about cleaning them. I told him I would help him, but if he didn't have anybody, it would be extremely difficult for him."

This underscores the power of shared knowledge and resources described in Community, and further highlights the importance of family-centered care. Support specifically for senior citizens and individuals with disabilities is discussed in Appendix B:*Respect* 4.7.2.4.

Users who had obtained their hearing aids through the traditional audiology model discussed different ways their audiologist provided support. Provider-directed support was typically discussed regarding a resource for information and knowledge, decision-making regarding choice of devices, device maintenance, and technological setup or troubleshooting. One perceived benefit of visiting an audiologist as opposed to adopting over-the-counter hearing aids was the concept of a reliable person being physically available for assistance:

"The audiologist was good in working with me and you see, you don't have, like he said, you don't have that kind of support [with over-the-counter]. I mean, you can call and talk to the people on the phone, but it's not the same."

Some participants also expressed that they tend to find healthcare professionals more trustworthy than other retailers who may have conflicting financial motives: *"I don't know if a doctor would help with that process or if there's somebody else. You know, a salesman is going to tell you whatever they want to tell you."* Users expressed the most satisfaction with support from providers in situations where they felt their audiologist demonstrated a sincere commitment to addressing their concerns and needs: *"[The audiologist] seemed genuinely interested in helping me."* However, concerns about the ease of access for provider visits and the financial implications of seeking professional support were stated. Participants reported difficulty with coordinating visits with their audiologist outside of regularly scheduled appointments, which can result in a lack of continuity in care:

> *"I can't physically see [the audiologist]. Now I do email her via the portal and she responds fairly quickly. But if I have to go in, as I did with the hearing aid to get that little white filter out, then I have to see somebody else."*

Participants also expressed disappointment when they must seek troubleshooting support from a provider that results in financial consequences without adequate knowledge or explanations:

> *"I went in because, because one hearing aid wasn't working and she charged me $60 because she said it has wax in it. I said, that's okay, she did something. So then I go back maybe a month later saying these hearing aids still aren't good enough. And she did look, she tested them. I don't know what she did. Charges me another $60. For what, I don't know."*

However, for participants who lack access to community support, issues addressed by providers that may appear more trivial, like device fitting and cleaning, can significantly impact their ability

to function and quality of life: *"But [the audiologist] always found the size that I needed. And like I said, they clean my hearing aid now too… and that's why I say they're my life saver."*

A handful of participants in this sample reported obtaining hearing aids through an over-the-counter model at some point and reported general satisfaction with the support provided by their dispensing agent or company. OTC users reported that professional support is available but expressed self-sufficiency and an infrequent need for support: *"Yeah, they, they reached out to me quite a few times. I ignored it. There's a web, they have a website that you can basically find out what you want."* For rural-dwelling users, the ability to obtain remote support and mitigate issues with travel distance was a crucial factor in their decision to adopt OTC devices:

> *"But they can, I think they can remote into them if I remember right. I think they could do that. I think they could remote into them from their side as far as making adjustments if they needed to, which was pretty cool."*

However, OTC users also expressed that more support could be provided to facilitate ease and convenience of device repairs should issues arise:

> *"I guess if they had, and maybe they do to have a, they send you a label, a mailing label and be like any time that, you know, there's something wrong, come to our website, print the mailing label, put them in an envelope, whatever, box, and ship them to us… not, okay, I got to look up the address, I got to go to the post office."*

OTC users who had purchased their device in a brick-and-mortar storefront, as opposed to ordering online, reported that there was seldom a reliable support source available to aid with the choice of devices:

> *"No, there wasn't anybody there who was knowledgeable at the pharmacy. Yeah. No. Yeah. I just went to the counter and said, do you have the over counter hearing aids? They said yes. And they said we have three and I think I probably picked the least expensive one."*

Non-users considering engagement with OTC hearing aids discussed preferred methods of obtaining professional support based on self-described personality traits, preferences, and typical consumer behaviors. For some, the essential factor in an ideal support delivery model included the availability of a *"real person"* to assist them and address concerns instead of automated systems: "*Oh, 100% of the time, a real person on the phone.*" However, while prominent, the desire for access to a "real person" was not universal. Others stated that they would prefer a greater locus of control and would desire a product that facilitates self-sufficiency with the device:

> *"I would want the support to be built into the product, package, whatever that looks like, because I don't want to have to then go and interact with this whole universe that I'm purposely avoiding. So the product itself would have to be pretty self-contained in terms of, yeah, my onboarding, my troubleshooting, and my overall ability to maintain it myself."*

Still, there were other ideas for levels of support in between physical access to one-on-one support from a professional and a completely self-contained device, including the ability to phone a 1-800 number, use a chat-bot or other automated system for help, obtain detailed instruction manuals, and visit a third-party establishment for troubleshooting issues. The need for and preferred professional support method was unique across participants, highlighting the individual differences that inform one's decision-making and consumer habits.

4.7.2.4 Respect

"Hearing aids, people who are having difficulty with them, and people still, even though they have them in, they perceive you as not being able to hear so they kind of gloss over you." This sample of participants highly valued treating others with dignity and consideration, regardless of background or circumstances. Commonly discussed topics included respect and support for those with hearing difficulty or hearing aids, individuals with disabilities, and senior citizens. Respect and dignity in this context pertain not only to direct outward behavior but nuanced ways in which differently-abled individuals may be subtly excluded or diminished by others in their community:

> *"You come in here with a walker and you got hearing aids, they just think you're debilitated to the point that you can't hear, you can't see. And they just compartmentalize you in that. There's no respect for the elderly really. And you know, you know, I don't know if it's the anxiety that they don't want to deal with getting there."*

For some, showing respect entails following the golden rule of treating others as you would want to be treated:

> *"Have the patience. And you have to not only have patience, but treat [people] as you would want to be treated, or your mother or father would want to be treated, you know. You have, you find some places... they talk to them any old way kind of way and like, would you want to be talked to like that?"*

Patience and empathy were frequently discussed themes related to treating those with hearing loss or hearing aids fairly and respectfully, emphasizing the need for individuals who don't have hearing problems to become more aware and understanding of those who do:

"I think it is important for education, for people that don't have a hearing problem to learn to navigate being with people who do, or are beginning to exhibit signs of it. And that is patience, and it is listening."

This relates to the perception that hearing concerns may be minimized or dismissed, leading to inequitable care or resources to resolve participation restrictions and functional impairment:

"It should be looked at in the same light as, what if I couldn't afford to buy these? To have to walk around in silence? Or like, in a restaurant, or that wedding? You know what I mean, I don't know if there's enough empathy for that."

Those who have had personal experiences with individuals who are Deaf or hard of hearing frequently reflect on the knowledge gained through these interactions to inform the way they interact with peers who have different hearing abilities:

"And I have to say that there is a, I think a carryover from the discrimination that deaf people have had over the over time… it's a, it's carryover I think from way back when. And we haven't changed that viewpoint. People who are Deaf are not necessarily hard of hearing people, which is, there's a confusion in people's minds about those two things."

Respect for those with hearing difficulty entails dignity and empathy and the availability of appropriate and effective accommodations for those with trouble hearing. Participants shared stories about personally facilitating accommodations for the hearing needs of others in professional environments and highlighted the impact this had on both the participant and the communication partner:

"I had a guy that worked for me that couldn't hear. He was Deaf… so I hired a signer to come in, to come in so he could be part of the group. And he, I mean, he never forgot that. I felt bad for the guy because no one ever took his wishes into account all the years he worked in our plant."

Other participants reported advocating for appropriate systemic accommodations and equipment to facilitate optimal functioning in the workplace:

"Sometimes too, I worked in the court system, I was a [language interpreter]. And the court did not recognize that the equipment provided is unsuitable for people who are using hearing aids. But I had to let them know that they need a different kind of hearing… equipment. It's not just going to be this one kind of thing. It's got to be the one that they can take their hearing aid off, or leave one on and use one, whatever, you know, works well."

Aside from respect for those with hearing difficulty, a commonly discussed topic was attitudes toward disability in general: *"Some people just resent anybody with disability. I think they're only thinking about their time, or their issue."* Therefore, some participants attribute a lack of respect for people with trouble hearing to the broader issue of stigma toward physical or cognitive disability:

"Years ago there probably was a bad stigma placed upon having hearing aids. You know, you attribute it to something other than not necessarily hearing loss, but maybe some type of disorder or some type of mental disease."

This relates to the stigma and preconceptions that may accompany a visible medical or assistive device worn by individuals and attitudes in response to the disclosure of health conditions:

"You know, I don't look at, you know, anybody that has a, you know, whether it's a disability or need, you know, some kind of aid to help them in some way, then, you know, it's usually legitimate. They don't want to wear that, you know, it's not something you want to, you know, I can't wait to get a hearing aid."

While several participants discussed the apparent societal biases toward individuals with disabilities or health conditions, many noted a perception that these preconceptions have changed over time. Many addressed the fact that personal perceptions of disability have changed with age, and cultural perceptions of disability have changed with time. Participants generally felt that acceptance, understanding, and empathy toward differently-abled individuals has increased in recent years, reducing antiquated prejudices and discrimination:

"I don't think it's as pronounced. Well, I think it's more like with anything anymore, with anyone that has, I guess I call it a disability or an issue. Years ago, people were they, I mean, they mocked disabilities, and, now they're more, people are more socially understanding of people that have things that are different. I mean, so yeah, absolutely it's changed for the better."

Equitable access to support for senior citizens and those with a disability was another frequently discussed topic related to respect. Participants who had experience related to providing care for others emphasized better support for individuals with multiple chronic health conditions or disabilities. Support can be essential for these individuals with reasonable access and the ability to adopt devices to facilitate ongoing effective use:

"I think the overall compliance with the equipment when issued. Are they wearing it? And then if they're just wearing it to the appointments, that's not effective. And

so how can you have good feedback, and how can you how can you actually regulate how they wear it? Do you write out a wearing schedule, do you call, who contacts, do you have a family member that can see that they're doing this?"

Concern was also expressed regarding the availability of support for older adults who may need more assistance with managing technology, maintenance, and troubleshooting: *"I would think for hearing needs, given the age range that most of them are servicing, you got to have a bit of support. Better support."* Ideas for better supporting senior citizens with hearing aids included specifically incorporating values that support older adults in the design of service delivery models:

"So for example, on the cell phone, I have consumer cellular, which maybe you've heard of them, but they're very good for senior citizens, because they have a human being that answers the phone. And whatever problem you have, they fix it. And I would like to work with a hearing aid company that is modeled that way."

Other ideas included better accommodations for facilitating technology use, especially for older adults who may not have reasonable access to transportation resources:

"I mean, I don't I mean yeah, you need tech support for older people and, and I mean, you know, you figure at $5,000 or, you know, a cost like that, you should have some mobile team, somebody mobile unit come out, given people who are older, you know, so you know, better support for it for those in an older population who, one don't have family members to, you know, come over and assist them if they need be or even take them."

It is essential to provide accommodations tailored to the diverse needs of different demographics to maximize the effectiveness and accessibility of medical devices and interventions, ensuring equitable outcomes for all.

4.7.2.5 Knowledge

"I didn't really know anything about this whole field before I go into this." In this study, knowledge is related to the understanding and awareness of one's hearing health and available resources. A prominent topic of discussion among participants was preferred research strategies and sources of information. Many participants self-described their identity as a person who actively seeks information about products and services:

> *"I would talk to people. I would go online and try to find websites that I thought I could trust. I'd do a lot of that kind of stuff, reading it. And that's what I like to do anyway. So that won't be a problem."*

Others self-described as being a person who is less interested in detailed information seeking: *"I'm not the kind of person to research every last detail, and my husband's more like that. I'm not like that."* This raises a question about how identity relates to decision-making processes and the idea of equitable access to resources and knowledge to inform decisions. One participant eloquently explained some of the nuances associated with fairness in opportunities to obtain information:

> *"And I think as you get younger, it's true that people, many people that I know are interested in primary source information, making their own decision, not having it filtered through a subject matter expert. But to be honest with you, I think it's kind of*

a bourgeois approach because you have the time on your hands to do that. So if you have the time on your hands to do that, great. Go ahead and educate yourself. Make your own decisions, be reasoned about it. But the reality is, is that there's plenty of other people that don't have the time to do that, so they have to rely on the subject matter expert, or they're not interested."

Users discussed preferred sources and types of knowledge in the context of research they did before adopting hearing aids or while seeking hearing healthcare, as well as knowledge gained throughout the hearing healthcare journey. Non-users discussed preferred research methods and sources of information in the context of prospective reasoning about seeking hearing healthcare or hearing aids in the future and comparisons to experience interacting with other healthcare sectors or products in the past. Most participants stated that they typically seek information through talking with family, friends, or community members who are knowledgeable, reading published literature and consumer reviews online, and visiting a healthcare provider. However, the participants' relative importance of these resources varied greatly. Whether the information source is people they know personally or online reviewers, it was important to participants that the individual providing knowledge had experiences engaging with the product or services:

"A real person, that would be big. Not someone they had picked out… when I first got these, I would ask a lot more people about what kind of device they had, you know, and most everybody else would go with what the audiologist recommended… they weren't like me, they didn't do as much research afterwards. They were like, well, if that's what you think."

Some participants considered knowledge from their community paramount:

"I would ask, assuming some of my other, my friends would probably be in the same boat. So I would definitely talk to people. 'What do you have? What did you do?' You know, whenever I have to go, you know, jump a hurdle like that, I usually talk to friends… good friends whose opinion matters to me and it counts."

Others preferred online reviews from other device users as primary information sources, allowing access to more experiences and impressions from others. However, participants familiar with online reviews as an information source were cautious regarding their overall credibility:

"You know, I've been reading a little bit more about reviews in general. It can be very deceptive. You know, it's just one person's isolated experience. I would think they'd be a little more accurate with something like hearing aids, you know, or a product, you know. When it comes to travel and things that it can be all over the park."

In regard to seeking information published online about hearing healthcare or devices, participants were selective regarding the trustworthiness of knowledge sources:

"And then doing the research, and when I do research on the internet, I don't just go down the rabbit hole. I always go to like NIH or Mayo Clinic or, you know, CDC, and I don't, so I, that's how I usually do research."

Others referenced independent, research-driven review platforms that provide thorough and unbiased evaluations of consumer products and services, like *Consumer Reports* and *Wirecutter*. Some participants noted how preferred research methods have changed over time due to the advent of online resources that may not have been available at the time of initial device purchase:

"And like I said, I know it's kind of weird to use the Yellow Pages, but that was that was before Google. I mean, you know, and I mean, that's all we had. If you wanted

to find something you ask somebody or look in the yellow pages. So yeah, didn't have the internet."

Several participants who reported a lack of interest or desire to seek primary source information indicated that they would prefer to consult a healthcare professional to gain knowledge and make decisions about hearing healthcare: *"No, no, [the audiologist] can handle it all. Because they know what they're doing. And I wouldn't, I wouldn't even know what to look for. Whatever they suggest, it's fine with me."* However, awareness about audiologists' role and ability to provide knowledge varied among participants who preferred information from subject matter experts: *"I guess now that I know there's more to know, I would like more explained to me. But I don't know if audiologists know all that, I don't know. I don't know what audiologists know and don't know."*A more detailed discussion on the perceived benefits of obtaining information from a healthcare professional or subject matter expert can be found under Appendix B:*Provider* 4.7.3.4.

A commonly discussed theme related to knowledge was that participants felt unprepared for navigating hearing difficulties and engaging with hearing healthcare resources and devices: *"Nobody prepared me for some of these things. I mean, and like I said, nobody in my family has had hearing problems."* Specific examples of knowledge that participants were interested in seeking included knowing the appropriate or optimal time to seek hearing healthcare or adopt devices, understanding underlying causes of hearing impairment, familiarity with diagnostic testing procedures, and reporting of objective results. For many, awareness of hearing health in general was low until hearing difficulty became problematic functionally. Participants desired increased societal awareness regarding the importance of hearing and hearing conservation knowledge:

"How do you make that more important? You know, it's like anything as we go

through life at certain times, people don't realize how smoking can be damaging, how noise. And they don't even, they can't feel the consequences. So, you know, we push ourselves sometimes farther than we should. It'd be nice, preventive is always the best."

A common idea expressed by hearing aid users was the perception that they had not fully realized the extent of changes in their hearing until they engaged with device use (more on this in Appendix B:*Aided Hearing Ability* 4.7.3.2) and reflected on the fact that many others probably do not realize the extent of their hearing changes:

"But one of the things I think that people don't realize is, I don't know if this is being addressed, is many people don't know what they've lost. And I think that, if I were to talk to the powers that be, so to speak, listen, you're missing a huge chunk of people that they don't know what they've lost."

Participants who have had personal experiences with family, friends, or community members with difficulty hearing tended to be more confident in their hearing healthcare knowledge. Each individual has different needs and preferences related to information seeking, which should be considered on a case-by-case basis when exploring factors driving engagement with hearing healthcare resources.

4.7.3 Healthcare Values

4.7.3.1 Hearing Ability

"Hearing is so precious. You know, I'd go without anything else to be able to hear better."

In this study, hearing ability is defined as one's understanding of how well one can hear sounds

across various environments. The most frequently discussed topic during interviews was one's perceived ability to hear without using a hearing aid. Questions were included in the moderator guide asking participants to describe their experiences with trouble hearing. Still, one unexpected topic elicited from these questions was how important participants consider hearing to be. Most participants spontaneously described or were prompted to explain, in a general sense, the importance of hearing in their daily lives relative to optimal functioning or in the context of other health and well-being concerns. The most commonly stated reasons for considering hearing important were concerns about underlying health conditions that may be causing hearing impairment, a reliance on hearing for significant social, professional, or community-related obligations, and the ability to have productive conversations with others. Effective management of various health issues can depend on efficiently communicating with providers for those with multiple chronic conditions: *"It's pretty important because, even when you meet with your physician. There's going to be things you miss if you can't hear him. So being able to hear what the guy says is actually very helpful."* Most participants who viewed hearing as less important did not consider their hearing difficulty to interfere significantly with their functioning or lifestyle. Many comparisons were made between vision and hearing, with several participants comparing restrictions on mobility and the ability to drive:

> *"You know, it's not like my eyes. Like I have to have my, I have to have my eyes because I can't drive. I can drive without my hearing aids. I can do just about anything. I can turn the TV up if I want to, I can turn the music up in the car if I have to. I can hear on the phone, mostly text now, people don't talk to you on the phone anymore."*

This range of perspectives highlighted the individualized nature of how hearing is prioritized, with some participants viewing hearing issues as less immediate until a significant problem arises. In contrast, others regarded it as integral to their survival and well-being.

Challenging listening environments emerged as a significant concern for participants, with many identifying background noise as a primary obstacle to effective communication. Restaurants, family gatherings, and social events were frequently mentioned as challenging. Anecdotes about restaurants, in particular, seemed to capture the frustration surrounding trouble with communicating in noisy environments:

> *"Most commonly what I think about it is when I'm in a restaurant. A restaurant, I can hear the kitchen noise, I can hear the background noise louder than it seems like the person sitting right in front of me, and I think that's where I notice it the most."*

Others echoed this sentiment, noting how the combination of multiple conversations, music, or kitchen noise made it nearly impossible to follow a conversation. Social gatherings, especially in large groups, also posed challenges:

> *"When I'm with a crowd. And especially with as many grandchildren as we have, and if we're at my daughter and son-in-law's house and everybody is there, I can't understand what anybody says because there's six, seven people all talking at the same time."*

Participants reported feeling overwhelmed by the competing sounds in these settings, even unaided, leading them to withdraw from social interaction (see Appendix B:*Socioemotional* 4.7.2.2 for a discussion). Several participants noted that background sounds like fans or electrical noise interfered with their hearing ability, even in quieter environments: *"I turn it up a little bit louder*

because I have a fan in there. And the blower for the air conditioner comes on. And I can't hear the TV when they're both running." The ability of a hearing aid to mitigate background noise was among the top features that this sample of participants would desire in a device, and a discussion on this can be found in Appendix B:*Aided Hearing Ability* 4.7.3.2. A number of participants also expressed heightened sensitivity to loud sounds, describing discomfort or irritation in environments with excessive noise. Common triggers included loud televisions, noisy social settings, and sudden, sharp sounds, which often felt overwhelming or startling. Commonly discussed scenarios included volume settings on televisions or loudness at events like concerts and movies that had become intolerable. Sensitivity to loud noises often extended to situations like public restrooms with hand dryers or environments with constant background noise, which participants found particularly jarring. This discomfort sometimes led participants to prefer quieter environments or take measures to minimize exposure to loud sounds.

The realization of hearing difficulty often emerged gradually for participants, with many not recognizing the extent of their difficulty until it began to impact their daily lives. Several described being in denial or attributing their struggles to other factors, such as faulty technology or environmental noise:

> *"I think I was in denial because I kind of thought it was cell phone, because my phone is old. That's all, I just need a new phone. But then at home I was having problems with the landline too like, okay, okay. And then and then I said, wait a minute, every time I go to a function, like whether there's loudspeakers or someone, some music playing, or a restaurant was really giving me really difficult time. And I didn't, it just didn't register that I had hearing loss."*

This slow recognition of hearing loss was reported frequently, with many individuals only seeking a hearing evaluation after repeated frustrations, such as struggling to hear in noisy environments or failing to understand children's speech. For some, it was the involvement of family members that prompted them to be aware of their hearing difficulties:

> *"It's something that I don't think is as bad as it is because, and the only reason it's even like, on my horizon is because my wife says to me, my daughter says it to me all the time. And that's, you know, so that's why. Otherwise, I wouldn't even recognize that about myself probably."*

Participants also expressed concern about the implications of progressive hearing loss, with several fearing that their condition might worsen with age: *"Over time, I know my hearing's getting worse, and I'm really scared that one of these days I'll end up being deaf."* Despite signs of subjective hearing trouble, many individuals remained unaware or unconcerned about their hearing loss until a formal diagnosis provided clarity: *"I got there and had a hearing test, and they said you probably need hearing aids. I could see, you know, just how awful it was and how it would just take a nosedive in the higher registers."* The sense of gradual loss in conjunction with interpreting the severity of their hearing difficulties was further complicated by the varying degrees of difficulty experienced in different settings. While one-on-one conversations might be manageable, group settings or environments with background noise often highlighted the extent of the hearing trouble. For many participants, the realization of their hearing difficulty was a process marked by denial, gradual awareness, and eventual acceptance, often made apparent through social interactions, family input, or unexpected challenges in their daily lives.

Participants frequently described their listening experiences in terms of sound distortion

and clarity; at times describing their hearing experiences in terms of audio quality associated with consumer electronics:

> *"My hearing is sometimes, I believe, a little distorted. So I compare that to when you have a pair of, you have a stereo set with some cheap speakers. And with expensive speakers you can kind of turn it up loud and retain the quality of the sound. With cheaper speakers, the sound gets distorted."*

This perception of distortion was particularly pronounced with certain voices or sounds, especially in higher frequencies, when multiple sounds overlapped, or when one perceived their communication partner to be speaking too softly, rapidly, or mumbling. Others compared their experience to *"hearing underwater"* or having something *"blocking everything"* which created a muffled or unclear sensation. Many participants expressed difficulty with specific sound elements, such as consonants or the initial words of a sentence, making conversations especially challenging. Many participants described an experience of being able to hear someone speaking but being unable to hear or process each word of an utterance:

> *"I can't make out every part of it. I can definitely hear people talking, but I just like I feel like I miss bits and pieces of it. And then if someone tries to ask me a question like, hello, there's no way I can listen to you, the air conditioner, and the TV at the same time."*

These descriptions highlight the nuanced ways in which sound quality is compromised for those with hearing difficulty, emphasizing the importance of clarity and the frustration that comes with distorted auditory input. Several participants described challenges with their perception of their voice quality, often noting that they were unaware of how loudly or softly they spoke due to their

unaided hearing ability. Some reported feeling that they were speaking at an average volume, only to be told by others that they were either too loud or too quiet: *"I feel like I'm talking loud, but I'm really talking low."* Others mentioned adjusting their voice based on their ability to hear themselves but had negative feelings about the social consequences of doing so: *"And it bothers me because then when people say it, and it gets quiet and I realize, wow, I'm talking really loud."* These experiences highlight the difficulty in regulating voice volume and clarity, often leading to social feedback that further complicates their self-perception of how they communicate.

Overall, the experiences of hearing difficulty, whether related to overall hearing ability, sound quality, or sensitivity to loud noises, significantly impacted participants' daily lives. These challenges often led to a greater awareness of the importance of hearing and prompted many to seek solutions. However, the extent of their loss and its implications were not always immediately apparent. As participants navigated their hearing difficulties, the nuanced ways in which sound quality and environment affected their lives underscored the complexity of hearing loss and the individual variations in its perception and impact.

4.7.3.2 Aided Hearing Ability

"So I just want the hearing aid to improve my hearing, period." In the codebook, aided hearing ability encompasses aspects related to expectations about the overall usefulness of hearing aids for improving hearing abilities. Users discussed their subjective aided ability in different environments and the extent to which various aspects of sound quality were improved with hearing aid use. Perceptions of functional device benefits varied widely across participants based on individual needs and abilities. Still, one overarching theme discussed was a hearing aid's ability

to filter or mitigate interfering sounds or background noise. The majority of users found the hearing aids to be lacking in this respect: *"You know, I wish they would block out more noise than they do. Like I said, they're not horrible, but background noise is my biggest issue. And that's not just with hearing aids, that's without hearing aids, too."* In terms of different listening environments discussed, restaurants were frequently listed among the most difficult regarding both aided and unaided hearing ability. Restaurants were likely the most prominent example discussed by both users and non-users due to the frequency of visits, the social demands of sharing meals, and the noise commonly found in these environments. Users attempted to mitigate difficulty hearing in noisy environments through the use of user-adjustable settings (see Appendix B:*Technology* 4.7.1.6 for a discussion). Still, they reported that this was often ineffective for overcoming background noise:

> *"Yeah, [restaurants are] my biggest one. And it's very annoying because, I thought the hearing aids were going to fix that, and it's not. It's not fixable. I set it to restaurant and forward talking and it still doesn't drown out enough of the background noise."*

Others leverage different technology in conjunction with hearing aids, such as remote microphones or FM systems. While they often report improved hearing ability from this, there can be other social consequences related to misunderstandings from others:

> *"I go to these lectures... and the speaker is like, about that far away from like the wall to me. I always come early, sit in the front, and I can't, still can't hear. And now I've really embarrassed myself because I go up and ask them if they mind, if I put [the remote microphone], if they have a lectern or something, or even a table, if*

I could put it there. And people are a little skeptical, I think they think I'm recording them or something."

Without a suitable solution for mitigating problems in the noisiest environments, many users reported turning off or taking out their hearing aids: *"I might well take my hearing aids right out and pick up as much as I can without them."* A discussion on the social consequences associated with an inability to communicate in noisy environments can be found in Appendix B:*Socioemotional* 4.7.2.2.

The amount of time users felt it took them to adjust to hearing aids was varied, with most reporting an adjustment period from weeks to months. The sound quality of one's voice was the most prominent example of something that took time to get used to: *"So I adjusted right off the bat. Matter of fact, the sound is a little different. The part that had to get more used to... was my own voice, because my own voice sounds different."* This, along with the experience of hearing ambient environmental sounds that they may not have noticed they could no longer hear prior to adopting devices:

"When I first got these, and they had an advertisement about the ears and about the rustling of leaves. I actually heard that... I heard rustling leaves, but then you go, what's that noise? What is this?... and so, it's been, like, hidden or buried, I don't know, or I just took for granted that I can hear, but I couldn't. I could actually hear the rustling of something."

Regarding hearing aid satisfaction in general, reactions varied widely. The large majority of users expressed majority of users reported some hearing benefit from aided use in less noisy situations, such as one-on-one interactions or small group gatherings, with the amount of subjective benefit

varying on a case-by-case basis: *"No, it was never like, wow, what a difference. But I did notice, like when I would wear them in Tai chi... that I could actually hear more of what she was saying."* However, some users described more impactful, immediate reactions to hearing aid use that greatly influence quality of life and socioemotional health. Hearing aid use allowing better connection and communication with loved ones was among the most valued benefits of device adoption:

> *"When I got the hearing aids, when they finally got delivered, we were entertaining our niece, great niece... I couldn't understand a damned thing she was saying. Yeah, it was awful. I felt terrible. And so she was there, you know, when I got my hearing aids. And then I knew what she was saying. It was like, oh, this is great. And I took her to one of our retiree group meetings. You know, all of us that used to work at that place. And I could hear the people down at the other end of the table. It turned out to be a great day."*

The restoration of sounds lost to hearing difficulty elicited unexpected emotional reactions from others who may not have realized the extent to which trouble hearing affected their daily lives:

> *"Right from the time I walked out the door, yeah, I could hear everything. Like I said, I'm not a super emotional kind of guy or something, but it was kind of like, oh, I got a tear in my eye. My God, I can actually hear birds. I said, I could never hear that before."*

Other impactful experiences with hearing aid use occurred when users received unexpected benefits in different aspects of their lives or general health. Participants reported that health or personal concerns related to balance, attention, focus, and listening effort were reduced using hearing aids:

"And my balance, it has helped a lot with my balance. Like I said, I can tell where my feet are I can tell if the surface changes and I know what I'm going to be on. Because part of neuropathy is you don't have a lot of feeling in your feet. So you can't really feel, like when, if you're on loose gravel or if you're on grass. But now I can hear, you know, look down I'm on the loose gravel. So I got to make sure I have my feet firm."

Overall, perceived hearing aid benefits tended to be based on the perceived need for devices, perceived improved ability to function optimally in a participant's daily life, and effects on social, emotional, or physical health. The nuanced factors driving longevity of use and the experiences described here highlight the individual and personal characteristics related to long-term hearing aid satisfaction.

Non-users of hearing aids in this sample discussed their expectations for how a device would improve their functional hearing ability. They often drew on hearing aid users' experiences to inform expectations for improved sound quality. Non-users talked less about the descriptors of sound quality that users discussed, such as clarity, sharpness, or naturalness of sounds, and instead tended to focus on how hearing aids might help reduce participation restrictions and improve functional abilities: *"I don't even know how it would help with sound quality. I mean, mostly I'm thinking of a noisy room and me being able to have a conversation with somebody in a noisy room."* The desire to mitigate the effect of background noise was as salient among non-users as it was for hearing aid users, with a vast majority stating this as the primary way hearing aids would help them function. There was a general concern among non-users that hearing aids may not be able to help with the environments that cause the most hearing problems: *"I heard from my*

father that, something about the background noises would affect the hearing or the hearing aid. I hope they can improve that." Attitudes toward the helpfulness of hearing aids differed based on each participant's subjective experience of their functional abilities. Several non-users stated that they did not adopt devices because they felt like their functional abilities were acceptable in most instances, and the hearing aids would not yield much benefit in more challenging listening environments:

> *"I mean, I don't feel like I have a severe hearing loss, and I think it's mostly just noisy situations. And I've heard that people that get hearing aids, it doesn't really help them a lot in those situations. So I don't think it's gonna, you know, be worth it for me to do it."*

An ideal device for these participants would be one that overcomes environmental listening barriers to facilitate optimal functioning in situations where communication is essential:

> *"The most important thing to me would be to be able to then hear the conversation with the person that you're with, and account for the background noise or the acoustics. Because really, what I'm trying to do is make sure that I take away from the personal or professional conversation, like I'm interacting in the way that I would like to act if I had full hearing."*

Others who had expressed sensitivity to loud sounds worried that a hearing aid might overamplify uncomfortable noises to the point where they might not facilitate long-term use: *"But I if I spent $5,000 or $6,000, I would hope that I liked them and I hope they would help. And I hope they wouldn't make everything so loud that I didn't like that part."* Still, some non-users were skeptical

that a device would help at all, given their understanding of the physiological causes behind their reduced hearing ability:

> *"See, because what she told me is that, I have, slight to moderately severe sensorineural loss of hearing that goes all the way down into my inner ear, the cochlea, and is likely not even improved by surgery or anything like that. So when you tell me that, and then you're going to tell me I'm hearing aid is going to help me? I don't think so."*

Others questioned the conventional use of hearing aids in restoring sounds lost due to elevated frequency thresholds. One participant challenged the field to create devices allowing users to experience what it is like to hear sounds outside the natural range of human hearing:

> *"I'd like to have a hearing aids that increase my ability to eavesdrop... in fact, I want to hear what dogs hear... what is it like for a dog, and also on the low end? Maybe I'm missing something on the bass side, I don't know."*

This participant noted how such features would act as a societal enabler to engage with devices earlier in life and change preconceptions about the association between hearing aid use and disability. More on societal perceptions of age-related device use is described under Appendix B:*Consumer Attitudes* 4.7.1.1.

4.7.3.3 Health

"You know, when you get older, you have to put up with a lot of crap, and there's no hiding it. You know, and the sooner you realize that the better off you are." In this codebook, health is defined as the ability to function and maintain well-being throughout the aging process.

Participants frequently discussed hearing loss in the context of other health concerns, with many emphasizing how its effects extend beyond just hearing challenges to affect physical balance, cognition, and overall well-being. Multiple participants described how the use of hearing aids effectively reduced falling and trouble with balance:

> *"And one of the problems I have is, between the compact regional pain syndrome, some neuropathy, and my brain, I fall a lot. So one thing I noticed with the hearing is it helped, actually, with my falling."*

This experience reflects a growing recognition of how hearing loss can compound spatial awareness and mobility difficulties, particularly as individuals age. Cognitive concerns also surfaced frequently, with several participants expressing concern about the link between untreated hearing loss and cognitive decline:

> *"I got educated a lot about it, and I thought, you know, if it's true that when you lose your hearing, you, you lose the sounds of those words and your brain doesn't get it back again, and that was kind of scary. So I said, okay, we should do that."*

This perspective underscores the growing concern that not addressing hearing issues could lead to broader cognitive impairments. This theme resonated strongly with participants aware of the potential long-term impacts on brain health. Other participants described how significant health events, such as brain surgeries or infections, had directly led to their hearing loss: *"I had brain surgery and the infection was in my ears. They had to take all the bones out of both ears, so that's why I have to wear hearing aids."* For many participants, hearing loss was not just an isolated issue but one intertwined with other significant health concerns. This interconnectedness

underscores the need for holistic approaches to hearing healthcare that address the full spectrum of impacts on an individual's overall health and quality of life.

Participants highlighted medical ear conditions and ear wax as significant factors affecting their hearing health and ability to use hearing aids. A handful of participants described a history of ear infections that caused prolonged hearing loss and often attributed their hearing difficulties to these early experiences: *"When I was a child, I was a diver in a swimming team. And I remember even back then, like, nine, ten years old, I was almost deaf for two or three months, completely, because the ear infections."* Participants reported visiting an otolaryngologist to address conditions including eustachian tube dysfunction, middle ear cholesteatoma, and external auditory exostoses, with some participants requiring surgical procedures to restore hearing: *"I had 90% blockage in each ear and, so even the doctors said we don't do this every day, so you know, that's not comforting. But, yeah, they did a great job."* Ear wax buildup was another commonly discussed challenge. Several participants noted that they routinely visit a healthcare provider for cerumen removal procedures and experience a subjective improvement in their hearing ability. However, the experience of ear wax removal varied widely, with some participants stating a strong preference for the method of cerumen removal performed by different providers:

> *"And [the audiologist] would clean out the wax in my ears and she would clean it out by going in with some tweezer looking tool and just yank it out, and it was so easy... what they do, if you go to your PCP to get the wax out, is they shoot this water and then it hits the back of your eardrum and it hurts. I've never had that experience before. And what the ENT does, which is better than that. He puts, he puts this thing in and sucks it out."*

For many, ear wax and medical ear conditions were ongoing concerns that interfered with their use of hearing aids. These issues often required specialized care to ensure they could use their hearing aids effectively, highlighting the importance of ear health management and functional hearing abilities.

Among participants in this sample, 18 out of 45 reported being bothered by ringing, roaring, or buzzing in their ears or head that lasted 5 minutes or more in the past 12 months. Tinnitus was described as a persistent and often overwhelming issue for many participants, with several describing it as a constant presence in their lives: *"It's omnipresent. From sunup to sundown, from one day to the next, never ending, never yielding. Always there."*For some, tinnitus was triggered by specific health events, such as hearing loss or balance issues: "*I woke up one morning and I was a little woozy and my equilibrium was off. I didn't have any balance, and my ears were ringing. So after a bit, my equilibrium returned, but the ringing has never stopped."* The emotional toll of tinnitus was evident, with participants who had the most severe levels of tinnitus describing the very serious implications on overall health and well-being:

> *"I just couldn't, I didn't want to deal with it anymore. And it was like, this is crazy, but it was like, you wanted to just end it. I just wanted to end life, period. And it's like, close my eyes and just let it be over with."*

Others described their tinnitus as more of a background hum, but still disruptive, especially in quiet environments: *"It's constant. So I don't like total quiet because it drives me crazy. So I like noise. I mean, I like the television, I like music, I like somebody talking to me. I like that, just to distract me from it, because if not, I focus on it."* The impact of tinnitus on participants' quality of life varied. For some, tinnitus was more bothersome than any perceived changes in hearing

ability: "*I'd keep the hearing loss if it meant I could get rid of the ringing.*" Despite the challenge of managing tinnitus, many participants had come to terms with its presence while still hoping for a better solution:

> *"I just wish that, there was, I wish there was some way, somehow, somebody could just find out more about tinnitus. Because it's I mean, a lot of people are dealing with it... there's no cure to a certain point. So it's like, it's a part of life, and I just wish somebody would come up with something."*

Some hearing aid users reported that devices help mitigate issues related to tinnitus: "*I noticed that when I don't have the hearing aids in then it's worse. I hear it right now... I guess because I'm paying attention to it. Most of the time, I don't notice it.*" While hearing aids did not eliminate tinnitus for most, they often helped mask or reduce the severity of the ringing, providing a perceived benefit beyond improving overall hearing ability. The distraction or enhancement of external sounds provided by the devices was cited as a way that hearing aids help mitigate tinnitus.

When asked about the possibility of a hypothetical medical solution, such as a pill, to address hearing loss, participants expressed a range of opinions. For some, the idea of a pill that could improve hearing was highly appealing: *"I'd take it in a minute."* The convenience of a medical solution was frequently cited as a significant benefit, with many explaining that taking medications is already part of their daily routine: *"I already take pills, so it'd just be another pill."* For individuals who found hearing aids cumbersome or inconvenient, the idea of a pill represented a more straightforward, less intrusive option that would integrate more seamlessly into their daily lives. However, not all participants were convinced that a pill would be an optimal solution and

would require much more information before considering engagement with a pharmaceutical solution for hearing loss:

> *"If it came down to a pill or a hearing aid, I'd have to consider how often you take the pill. What are the side effects? How often, is it daily, twice a day? How long does it last? Is there a shot that you say, you get a shot and it lasts for 30 days? And the cost versus other things. I'd look at all parameters. I wouldn't be adverse to take it. I take enough pills now, but it's an interesting concept. I don't think I've ever seen any research on it."*

Some expressed concerns about the potential side effects of such a treatment, noting the risks that can accompany medications. This hesitation reflected a broader concern among participants that while a pill might be convenient, it would need to be proven effective and safe before they would consider it an alternative to hearing aids: *"I don't want to be the first guy to try it. Let someone else be the guinea pig."*

While a medical solution like a pill appealed to many participants for its simplicity and ease of use, there was also a strong feeling of caution. Concerns about safety, side effects, and long-term impact tempered the enthusiasm for such a solution, and for many, the familiarity of hearing aids remained a preferable option. Several participants indicated they were more comfortable using hearing aids, as they were already accustomed to wearing devices and had effectively integrated device use into their daily routine. Others who were infrequent users of medications indicated that taking a daily pill might be more burdensome than hearing aid use:

> *"Well, I'm not a big pill person. So I probably wouldn't take a pill for it… if I really need a pill for a life threatening thing I will take it. But I think for a hearing aid I*

would be more comfortable having something in my ear."

Others described their thought process regarding the technological features they might sacrifice with a medical or pharmaceutical solution. For hearing aid users who highly valued technology capabilities like Bluetooth connectivity and media streaming, these features often became a key factor in their overall satisfaction and daily use. Medical solutions cannot replace these: *"Well, I'd lose some of that technology, right? Couldn't listen to Spotify... you know, you're losing the technology that you really didn't need, but it's nice to have."* For some, the preference for a pill versus hearing aids was shaped by their broader experiences with healthcare and technology. For these participants, taking a pill introduced more uncertainty compared to the familiar technology of hearing aids, which, despite their challenges, were viewed as reliable and well-established solutions. The discussion about medical or pharmaceutical solutions for hearing loss highlights the importance of balancing convenience with the need for trust in medical interventions.

For many participants, hearing loss was an inevitable part of aging, intertwined with other physical changes and health challenges. One participant remarked, *"Let me tell you, getting old ain't fun"* capturing the sentiment that age brings a host of health-related concerns, including declining hearing ability. Participants frequently reflected on how their hearing loss aligned with other signs of aging, such as vision problems or reduced mobility, noting that they had to make peace with these changes:

> *"But by this point in your life, you realize you're never going to be skinny, you're never going to be a famous singer, you're never going to be president, you know, and that's another thing that you're never going to be. You're never going to be a person that hears good. But in this time period, you know, there's great things that will help*

you."

This acceptance was accompanied by a practical approach to managing hearing loss as part of the broader aging process, with many participants expressing a willingness to seek healthcare resources to maintain their quality of life as they aged:

> *"But at my age now, I have no problem going to seek health care. You know, when I was younger, I never went to a doctor. But as you get older, it seems like you better start going. So I have no stigma about going to see somebody if I need to."*

However, treating hearing loss among older adults requires more than just providing technological solutions; it also calls for a holistic approach that considers individual preferences and overall health needs. This perspective underscores the necessity of ensuring that interventions align with health needs and each person's unique aging experience. A holistic approach that respects personal autonomy and recognizes the broader context of an individual's health is critical to ensuring effective, patient-centered care.

4.7.3.4 Provider

"I just I can't imagine not having an audiologist guide you through that." In this study, values related to *provider* included perceptions of the roles, motivations, and competencies of healthcare professionals and associated services. Users discussed their experiences interacting with hearing healthcare professionals, and non-users discussed experiences with other providers and expectations or reasons for visiting an audiologist in the future. The primary reason for visiting an audiologist among all participants was diagnostic hearing testing. Many non-users who stated a preference for engaging with an OTC service delivery model explained that they would

likely undergo diagnostic testing with a provider to better understand their hearing abilities before adopting devices: *"But I think the first thing I would do is like, get that confirmed that yes, your hearing is bad. Yeah, here's how bad right it is, that kind of thing."* Participants emphasized perceptions about how knowledgeable their provider is and how effectively they are able to communicate that knowledge with patients. Participants reflected on positive experiences when providers took care to understand their needs and convey information in a way that is accessible and understandable:

> "They're great. And they explain things to me in my terms and that's what I like. You know, they come out with the right terms I want to hear, you know, and they do an excellent job. That's my thing, they, you know, they do an excellent job, you know, with knowing what I want."

Participants were less satisfied when communication was unclear, and questions were left unanswered: *"Nobody took out the chart and said, here's what this data point means, you know. But then again there's probably a lot of people who don't care, I just get interested in that stuff."* When discussing values related to the provider, a fundamental concept was the extent to which participants perceived their provider took a genuine interest in them as a person and was knowledgeable about their health and lifestyle. This person-centered care dynamic goes beyond the transactional interactions typically associated with healthcare visits and can promote trust and comfort between providers and patients:

> *"But as far as [the audiologist] and I, we clicked. I don't know how to describe it... she recognizes me when I come. You know, she must have a ton of patients, but she knows who I am the minute I walk in. So, she's just been an excellent person for me."*

Person-centered care is tied closely with continuity in care, where the provider's ongoing knowledge of the patient's personal and medical history enables more personalized and effective outcomes. Both rural- and urban-dwelling participants expressed concerns about continuity in care in all healthcare sectors and how this can affect their experience with the provider: *"That's why I don't like the medical field today. I go in and I see a different PA every time. Well, who is this… what does he know about me?"*

Hearing aid users were generally satisfied with the support they received from audiologists regarding maintenance and technical troubleshooting (see Appendix B:*Support* 4.7.2.3). One aspect of audiological care that seemed ambiguous or poorly understood by participants was the provider's ability to use specialized software to fine-tune the hearing aid's settings: *"And when I would talk to the audiologist and she would do all these adjustments on her computer and, and I can't say it ever really made a difference."* However, some had an awareness of the concept of hearing aid fitting in a vague sense and considered this an important reason to obtain hearing aids from an audiologist: *"But again, my concern about making sure that it's set up specifically for me to maximize the benefits, right? So I presume that means I need to see an audiologist at some point to get that measurement."* Adjusting device settings to a patient's needs and preferences often involves adjusting amplification levels, frequency responses, and signal-processing features to ensure optimal performance. Still, several participants stated that this process was not adequately explained. With a lack of knowledge about hearing aid adjustments and perceived benefits, participants were skeptical about the necessity and value of these adjustments: *"And she said she's adjusting the hearing aids, but I can't tell that they've been adjusted. I've never walked out of her office and say, well, gee, I can really hear better now."* Improved communication about professional adjustments to device settings may help promote transparency in audiological care

and result in more effective patient-centered collaborative care.

Many participants valued an audiologist's knowledge about hearing aids and ability to communicate device benefits effectively above all else: *"So and probably because the [audiologist] wasn't a good salesperson, you know, I didn't go with it."* The recent legalization of over-the-counter hearing aids entails a service delivery model that does not necessitate interaction with a provider to obtain hearing aids. Thus, many participants discussed their perceived benefit from interacting with a provider in the context of adopting devices. The key takeaway from this discussion was that it is essential to participants that their audiologist was highly knowledgeable about hearing aids. Participants expect that audiologists can convey knowledge about different devices and levels of technology, benefits, and drawbacks associated with various devices and brands, as well as which devices might best suit one's hearing ability and needs. Ultimately, this was the critical difference between audiology and OTC among this sample of participants:

> *"So I could ask questions like, what's the difference between the Oticon and the Phonak and get a good answer and not a stupid answer. I mean, if all you're going to get is stupid answers, you might as well do OTC, right?"*

Participants were generally confident that audiologists were competent in this regard and appreciated when their research and preferences were acknowledged during the process of hearing aid selection, another concept that underscores person-centered, collaborative care:

> *"So [the audiologist] said, so before we go into what I suggest for you, tell me what [hearing aid] you picked out. I'm curious. And I told her mine and she said, guess what? I picked out the exact same two."*

Participants generally valued provider recommendations, highlighted by multiple participants

purchasing hearing aids worn and endorsed by their dispensing audiologist: *"So, it really came down to the audiologist. She was wearing a pair and said, I swear by these and I'm in the field. So I figured I'm just going to go for the best one. She likes it."* Participants characterized audiologists as knowledgeable sources of information about the effectiveness of devices not only through their clinical expertise but also through experiences of other patients with different products:

> *"[The audiologist's] perspective on the different hearing aids that are out there... if they are, you know, issuing, prescribing hearing aids to people, I'm sure they get feedback from them as to this, this right here works well. This doesn't work well."*

Overall, this underscores the importance of an audiologist's role in helping patients navigate the consumer landscape of hearing aids, which is further complicated with the advent of OTC. A discussion on perceptions of the quality, effectiveness, and convenience of prescription hearing aids versus direct-to-consumer devices can be found under Appendix B:*Consumer Attitudes* 4.7.1.1 Other commonly discussed reasons for the preference to visit a provider included ensuring the safety of device use: *"It's always better to work with somebody that's professional, to have, to know that you're getting the right thing. Because you can damage your hearing further if not, I would think"* along with general mastery of use:

> *"Because I feel like, going to them, they would probably would explain to me how to use it. I don't know if, if I myself with a hearing aid. Do you have to put it in a certain volume? They would be able to fit me for one, and they'll know what my problem is and deal with it better than me going and buying it over the counter and trying to read. Because a lot of times you can buy something and you read the instructions and you still don't know how to use it."*

Many participants who had previously visited an audiologist stated that, regardless of their satisfaction with the care received from the provider, they did not purchase prescription hearing aids due to financial reasons:

> *"I'm not spending an extra four grand to get it from this doctor. Anyways, that's kind of where I was at. And I'm getting the same ones from here. And they say they can make the adjustments for me, you know, as needed if I need, you know, things adjusted with them."*

Some participants had negative preconceptions about audiology in general due to connotations about ulterior finance-related motives:

> *"But, when I think of going to an ear doctor, not the ear-nose-throat doctor, but the hearing doc, okay? I'm thinking of them more like a car salesman. That's how I picture them. They're going to, I'm going to go in there. They're going to tell me I need something as soon as I walk in the door, and then they're going to try to sell me the best. So if I was, you know, to give them advice, they've got to change that picture."*

Others reported negative experiences with providers due to perceived importance on device sales rather than function problem-solving:

> *"And I've been through, like, three audiologists. They want to sell you another pair of hearing aids. That's all they want to do. She said that I have the best, so there's nothing she can sell me, right? I mean, if there were, I'm sure she'd tried to sell it to me."*

Some participants stated that they would have liked to purchase devices from their diagnostic provider if prices were more comparable to that of devices that can be obtained elsewhere: *"I've got to say, if they were covered and I would have paid the same thing, I probably just would have gone with the first person, the audiologist through my ear, nose and throat office."* Rural-dwelling participants who adopted OTC devices also noted that purchasing a hearing aid online can help mitigate travel concerns, highlighting the importance of access:

> *"If I have to go and have the hearing aid serviced. It's an hour and 20 minutes, an hour and 20 home. It's a three-hour excursion, at least. And so that's kind of discouraging, you know, not having something more accessible."*

Some OTC users and hearing aid non-users stated that they would likely choose to visit an audiologist in the future should their hearing difficulty become more significant or should OTC hearing aids stop addressing their functional hearing needs. Thus, the choice to engage with a provider may depend solely on one's subjective hearing abilities:

> *"I think if you demonstrated to me that I had a had a significant hearing problem, then I'd probably would be more inclined to go to an audiologist. Say, okay, you know, go to the expert. But if, I mean, if I thought that my hearing was extremely mild or whatever, I'd probably do the OTC thing and stick with that."*

Overall, attitudes and expectations about hearing healthcare providers varied widely, and participants emphasized that is important for audiologists to consider patients' individual and unique needs for effective care.

4.7.3.5 Access

"I like the convenience of being close, but we don't really have that option here." Here, access refers to the ease with which one can obtain hearing care or devices. Though this affected both cohorts, the topic of access elicited the most salient differences in the stated experiences between urban-dwelling and rural-dwelling participants. Hearing aid users typically discussed access in terms of their experiences interacting with hearing healthcare services and resources, and non-users typically discussed access in terms of experiences interacting with other healthcare sectors or with prospective reasoning about strategies for seeking hearing healthcare resources in the future.

The primary barriers that urban-dwelling participants reported were related to travel time to providers in terms of navigating high-traffic routes, the ability to drive oneself to appointments, ease of scheduling appointments, and wait times associated with visiting a provider. Most urban-dwelling participants lived in the Baltimore-Washington region and reported satisfaction with the availability of reputable healthcare providers: *"We have a number of very good hospitals around and we have a number of clinics associated with them."* Attitudes and experiences associated with visits to specific providers varied. Still, an important takeaway from these anecdotes was that urban-dwelling participants reported having reasonable access to choices when seeking hearing health services or healthcare in general. More choices facilitate autonomy in seeking care from a different provider should one be unsatisfied with the care previously received:

> *"So I went there and they're supposed to be one of the best in Bethesda. But so they didn't really help me. So I thought, well, I'll go to somebody else. So I've tried two different people, two different audiologists that people recommended. I just keep*

asking everybody, 'who's good?'"

Rural-dwelling participants were less familiar with the concept of "shopping for health-care," being limited by the number of available providers close to home. Many urban- and rural-dwelling participants in this sample reported an inability to drive at some point in their lives due to personal or health-related circumstances, highlighting the need for support with mobility and transportation: *"As you get older, there are a lot of people that aren't driving. So if you have to get a, a whatever for transportation or get someone to take you, it becomes prohibitive sometimes."* However, many urban-dwelling participants stated they could rely on public transportation to facilitate travel in these instances:

> *"There was one point where I couldn't drive… and I discovered the number five bus, which stops right on my corner practically. And then stops about two blocks away from the [the audiologist]. And so I was like, wow, I could even just do the bus. So I did that, I think I just did it once, maybe twice."*

Regarding travel time, traffic, rather than driving distance, was the most frequently reported barrier among urban-dwelling participants. Urban-dwelling participants explained that they tend to carefully schedule appointments at times when they can best avoid congested roadways and had grown accustomed to budgeting extra time for unexpected traffic issues when driving to appointments:

> *"I just try to make my appointments outside of the rush hour. At least going there. I don't care about coming back, but going there. But I was there last week. I'll be there again, I'm sure, in the near future sometime."*

In addition to travel logistics, the ability to make appointments for troubleshooting or spontaneous problems presented challenges for urban-dwelling participants:

> *"And trying to get an appointment with [the audiologist] if you haven't made an appointment already is very difficult. So if there were something that came up that I wanted to see her, I would have to see somebody else. And then that in fact happened one time, and it was just a minor thing that they had to fix."*

Several urban-dwelling participants attribute the long wait time when scheduling provider visits to the high demand for healthcare in their area. Although these participants expressed satisfaction with the quality and variety of nearby healthcare providers, they also acknowledged that urban settings likely have larger populations of individuals seeking healthcare: *"But you have to schedule, and it's a pretty busy, so it's hard to get in there. I guess everybody's having hearing problems. I couldn't believe I had to wait two months for an appointment."* Participants who were familiar with both urban and more rural environments explained their perception of provider-to-patient ratios and the effect this has on appointment wait time in different settings:

> *"So even though you have many, maybe more number of providers available, but I think probably more, more it's I think they, proportionally it's a lot larger number of people, patients there compared to in a rural area. That's the thing, the wait time is still... similar or maybe sometimes it can be worse than in rural areas."*

All rural-dwelling participants lived in the Adirondack region of upstate New York. The primary barriers that rural-dwelling participants reported were travel time in terms of distance to the nearest provider, which is further complicated by the ability to drive oneself to appointments,

along with a lack of choice of healthcare professionals due to a limited number of providers in one's geographic region. Travel distance to the nearest hearing healthcare provider or other healthcare specialist was the primary topic discussed by these participants, with most reporting a one-way travel time between 45 and 120 minutes and distance ranging from 45 to 100 miles. Additionally, participants explained that most routes necessitated navigating back roads or mountainous terrain for at least part of the trip to access highways, which can present barriers with inclement weather. Rural-dwelling participants frequently characterized this demand for travel as "*a way of life*," "*part of life*," or "*a fact of life*." Finding and traveling to healthcare specialists was described as a generally negative experience. Still, when weighing other aspects of their lives, participants recognized the costs and benefits of living in a rural environment:

> *"That's terrible, finding [a specialist] and driving. And where we live, you got to take the good with the bad. We got the beautiful environment, the beautiful lakes. We have the drive. It's like anything else you're going to manage."*

One rural-dwelling participant who had experienced living in more urban settings reflected on how, in urban environments, traffic and congestion made even short distances time-consuming, whereas, in rural life, the longer distances feel more acceptable:

> *"Yeah, it's part of my life. Because I think where I grew up originally, everything had to be timed around when the traffic was going to be there, and I was used to that, and that was frustrating in a different way. And it makes me laugh now because somebody says, you drive an hour to go to the eye doctor? Well, yeah, that's 60 miles. In Long Island, it took me an hour to go seven miles."*

Rural-dwelling adults explained how healthcare demands tend to increase with age, which can compound travel barriers. Most explained this with acceptance and pragmaticism:

> "It's just part of life to make the trip. I mean, we're going Thursday for [my wife]. I mean and, so we're, as we have grown old, we used to go to the doctor, dentist, something, two or three times a year. Now it's getting down so it's at least 2 or 3 times a month for each one of us."

Concerns about provider access differed between rural- and urban-dwelling participants as well. When a rural-dwelling participant was an established patient at a healthcare practice or with a provider, they typically reported acceptable wait times for scheduling visits. "*Usually if I need an appointment with [the audiologist], I'll have an appointment within 2 or 3 days. And that's fine with me. You know, that's that's, that's not a problem at all.*" However, seeking care as a new patient introduced daunting challenges. Participants described a high turnover rate among local healthcare providers, with many established and reputable providers retiring or moving away. The perceived exodus of trusted, established healthcare providers led to gaps in audiology, other clinical and medical specialties, and even family physicians: *"See, my primary care doctor continues to change. I'm at the point where I have no doctor again."* Often, seeking care from a specialist is a months-long process due to overburdened, thus unresponsive rural physicians:

> *"But health care in general, like a neurologist. I had a couple MRIs done on my brain, and they want a neurologist to view them. And I have been since March trying to find a neurologist… and the health care is, they're so overwhelmed that they're months out. I haven't even got a call back yet with a, with an appointment date. And it's been since March. They say it's in review, in review, in review."*

Some rural-dwelling participants preferred to travel longer distances to the closest major cities, like New York or Boston, due to perceptions of more experienced and trustworthy healthcare professionals or privacy and anonymity concerns. Regarding healthcare in general, hours-long travel to the nearest healthcare hub was often necessary for healthcare including major surgeries or pediatric healthcare specialists. Participants discussed the financial implications of the necessity for long-distance travel, highlighting the connectedness of access and affordability in healthcare, especially when there is a lack of insurance coverage or financial assistance to meet these demands:

> *"So [the pediatrician] said, well, we'll find you, you know, a pediatrician or that specializes in psychology, you know, that does this stuff. There is nobody within our district... so I argue the point, there's nobody within 200 miles of Ticonderoga that will specialize or that specializes in a child. And because it's a monthly program, you have to go monthly. We can't afford to drive, you know, 300 miles."*

Studies indicate that residents in rural areas experience greater delays in acquiring hearing aids and receiving necessary interventions due to the limited availability of specialized services nearby (Chan et al., 2017). More on perceptions of the roles, motivations, and competencies of healthcare professionals and associated services is discussed in Appendix B: *Provider* 4.7.3.4.

Chapter 5: Discussion & Conclusions

The three studies discussed here collectively provide insights into the values shaping hearing healthcare, encompassing audiological practices, emerging models like over-the-counter (OTC) hearing aids, and the perspectives of individuals with hearing difficulties. Together, these studies highlight the critical intersections between professional values, systemic barriers, and patient experiences in shaping hearing healthcare outcomes.

Chapter 2 focused on the introduction of OTC hearing aids and the values shift this represents relative to traditional audiology. Through a qualitative content analysis of critique and regulatory documents, we evaluated whether the values driving the introduction of OTC hearing aids align with those of traditional audiology. Analyses revealed a fundamental shift in values, where the values of documents representing the introduction of the OTC model highly prioritized values consistent with reducing barriers to access and affordability of self-administered hearing health care in contrast to the low priority of these values in traditional audiology. These values were elevated in audiology critique documents (ranked 1st and 3rd, respectively) but were deprioritized in traditional audiology, where access to care ranked 15th and cost 17th. In contrast, traditional audiology prioritized values such as subjective benefit (ranked 1st) and accuracy (4th), both of which were substantially lower in OTC documents. These findings suggest that while OTC hearing aids may improve accessibility, they may not deliver the same patient-

centered outcomes traditionally valued in audiological care, particularly with regard to subjective and objective benefit.

Chapter 3 built on the this by validating a list of values in traditional audiology through a nationwide survey of 289 U.S.-based audiologists. The survey asked participants to rank 18 values based on their importance in hearing healthcare, comparing the results to those found in best-practice audiology documents. The study found broad alignment between the values of practicing audiologists and those codified in clinical guidelines, with Kendall's rank distance indicating substantial agreement (= .81 to .83). The top-ranked values among audiologists included accuracy, safety, and equity, with accuracy being consistently ranked first across all demographic subgroups. This finding is consistent with the emphasis on clinical precision and safety in traditional audiology, as discussed in Menon et al. (2023). However, values such as access to care and cost were ranked lower by audiologists, reflecting a potential disconnect between the systemic goals of improving accessibility and the real-world priorities of practitioners. These results underscore the importance of addressing the values conflicts between audiologists and regulatory efforts to improve hearing aid uptake, particularly through models like OTC hearing aids.

Chapter 4 described the development of a codebook based on the values of individuals with hearing difficulties, including both users and non-users of hearing aids in urban and rural environments. This study captured participants' decision-making processes and subjective experiences related to hearing healthcare. The codebook was structured around three primary categories, Material, Social, and Healthcare, each representing critical aspects of participants' hearing-related needs. Material values included cost, aesthetics, and comfort, which were echoed in the systemic barriers identified in Chapter 2 and in Menon et al. (2023). Social values highlighted the importance of communication, social participation, and family support, reflecting the broader social

impact of untreated hearing loss. Healthcare values, such as trust in providers and realistic expectations of hearing aids, aligned with the emphasis on patient-centered outcomes found among audiologists in Chapter 3. These findings suggest that while accessibility and affordability are important, the subjective experiences of individuals must also be central to any efforts to improve hearing healthcare outcomes.

Taken together, these studies reveal a complex interplay between systemic efforts to increase accessibility, the values of healthcare providers, and the lived experiences of individuals with hearing difficulties. Chapter 2 highlights how regulatory shifts, like the introduction of OTC hearing aids, represent a challenge to the core values traditionally prioritized in audiology. Chapter 3 demonstrates that while practicing audiologists largely align with best-practice guidelines, they may not prioritize access and affordability to the same degree as regulators do. Chapter 4 emphasizes the need to consider the values of individuals with hearing loss, which include not only access to affordable care but also concerns about the effectiveness, usability, and social implications of hearing aids.

As we progress toward a more patient-centered model of hearing healthcare, the responsibility for addressing patient values must be shared by a variety of stakeholders. Ideally, we would empower patients to control the entire hearing health journey, but it is critical to acknowledge that other stakeholders have power and responsibility in many domains. For example, hearing aid design is in the domain of hearing aid manufacturers and patients and other stakeholders have little influence beyond selecting from available options. Audiologists and other providers have a central role in many domains, as they interact directly with patients and are positioned to integrate patient values into clinical decision-making. Providers have the opportunity to address several Social values in the context of clinical care. Audiologists should provide patients with compre-

hensive knowledge about their hearing abilities and help them navigate the consumer market for hearing healthcare products. In Chapter 4, participants with hearing difficulty emphasized the importance of a family-centered approach where care decisions are made collaboratively with both patients and their families. Audiologists can promote more personalized care by recognizing the critical role of family support in the hearing healthcare journey, thus emphasizing values of support and community. Counseling and auditory rehabilitation can address the functional and socioemotional effects of hearing difficulty, while ongoing discussions about material values like comfort, technology, and maintenance are crucial for long-term device satisfaction. Audiologists also play a key role in promoting healthcare values through appropriate referrals and clear communication of diagnostic results.

Policy-makers hold the power to shape the broader healthcare landscape by incorporating patient values into regulations, standards, and funding priorities. Influential groups such as NASEM and PCAST, which publish high-profile reports on that state of American hearing healthcare, can help guide public discourse and create momentum for change by advocating for the inclusion of patient values in hearing healthcare policy and practice. Recommendations from PCAST (2015) and NASEM (2016) directly lead to the implementation of an OTC hearing aid model and may influence the creation of future novel service delivery models which may address the persistent systemic values of finance and access. Policy-makers in congress can expand insurance coverage for hearing healthcare, including devices, diagnostic tests, and auditory rehabilitation, as well as offering financial assistance or subsidies for low-income individuals. By creating frameworks that ensure equitable access to services, particularly for underserved or rural communities, policy-makers have an important role in reducing disparities in hearing healthcare and improving outcomes for all individuals, regardless of their background or financial situation.

Other governing bodies in the profession of audiology (e.g., the American Speech and Hearing Association) can promote public health initiatives that raise awareness about the importance of hearing health and encourage early intervention, which may address multiple values in Healthcare and Social categories.

Manufacturers, who develop hearing aids and other assistive devices, are responsible for the technologies used in hearing healthcare. They must ensure that their products align with the diverse needs of patients, considering the range of preferences, capabilities, and cultural factors that influence device adoption and satisfaction. Hearing aid manufacturers can address all Material values, including aesthetics, technology, comfort, finance, maintenance, and consumer attitudes. Through the purposeful development of products that align with consumers' values and preferences, manufacturing agencies can shift preconceptions, attitudes, and feelings about hearing aids among the general public.

The National Institute of Health and other funding sources can play a critical role in research and innovation in hearing healthcare by prioritizing funding for studies that explore diverse patient and consumer needs, particularly those from underrepresented populations. Their support can drive the development of hearing healthcare interventions that align with patient values, such as improving the affordability of hearing aids and expanding access to auditory rehabilitation services. Academic research and training institutions can help address barriers to hearing healthcare by emphasizing the importance of performing values-based research and training future professionals to consider the lived experiences of individuals with hearing loss. Academia can contribute to shaping a more inclusive system by actively performing research studies that aim to align diverse stakeholder needs with values inherent to hearing healthcare service-delivery models. Together, these bodies can ensure that hearing healthcare evolves in a way that reflects

the full spectrum of patient needs, from financial accessibility to individualized care.

Future directions should focus on further eliciting values from underserved populations, particularly those who face additional barriers to accessing hearing healthcare, such as individuals from rural areas, lower socioeconomic backgrounds, and racial or ethnic minorities. By gaining a more comprehensive understanding of the values and needs of these populations, future research can develop more inclusive and equitable hearing healthcare solutions. Further research should investigate how new technologies, such as OTC hearing aids and tele-audiology, can be designed to align more closely with the values of both patients and providers, ensuring that accessibility improvements do not come at the cost of patient-centered outcomes.

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