

Health Disparities in Pediatric Cochlear Implantation: An Audiologic Perspective

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Objectives: A national survey of pediatric cochlear implantation (PCI) audiologists was conducted with three aims: (1) to determine if PCI audiologists perceive within their clinical practice a negative effect of low socioeconomic status (SES) on postimplant speech and language outcomes; (2) to understand their perceptions of the underlying factors leading to outcome disparities; and (3) to elicit suggestions for improving outcomes in disadvantaged populations. We hypothesized that audiologists would perceive reduced speech and language outcomes within their lower SES patient population, and that this noted disparity would be related to parental adherence (compliance) and access to habilitation.

Design: A survey containing 22 quantitative and open-ended questions was electronically mailed to a data base of 234 PCI audiologists. Forty-four percent (N = 103 of 234) responded to the survey, with the majority (98 of 103) answering all questions. Quantitative responses were analyzed using the Stata 9 statistical package with significance at $p < 0.05$. Qualitative responses were analyzed using standardized codebook and content analysis. Transcripts were read and coded for the main ideas expressed in each response. The codes were then analyzed for patterns and organized into subthemes that were then grouped into themes.

Results: Seventy-eight percent (N = 76 of 98) of respondents perceived an effect of SES on postimplant speech and language outcomes. Qualitative responses uniformly demonstrated audiologists' perception that lower SES patient populations were more likely to experience reduced speech and language outcomes. Two major themes emerged in audiologists' explanations of SES-related disparities: internal factors of parental influence (i.e., parental self-efficacy, adherence, and habilitation carryover), and external factors (i.e., inadequate therapy and lack of available resources). Three primary suggestions were offered for reducing the disparity: improvement in cochlear implant services (92%), increased emphasis on parental education and intervention (87%), and the development of stricter candidacy requirements (15%).

Conclusions: This study offers evidence to show that PCI audiologists note an SES-related disparity in the field of PCI. Respondents suggest the need for a broad and culturally sensitive effort to both increase access to qualified healthcare professionals and develop approaches that will aid parents in the at-home habilitation process.

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INTRODUCTION

Socioeconomic status (SES) has become a widely recognized determinant of health in the United States and around the world (Shavers 2007). Almost every area of healthcare is replete with evidence of SES-related disparities, and early investigations show that the relatively new field of pediatric cochlear implantation (PCI) is no exception (Tobey et al. 2003;

Connor & Zwolan 2004). Low SES—defined by low levels of education, household income, and accumulated wealth—often limits the extent to which individuals or groups can access the vital healthcare and other resources necessary to maintain good health (U.S. Department of Health and Human Services 2000). In the field of PCI, the effects of these limitations are becoming clear: a disparity is growing with respect to both cochlear implantation rates and postimplantation speech and language outcomes for children with hearing loss.

Several studies have demonstrated connections between outcomes and both ethnicity and income. Stern et al. (2005) determined that white children are implanted at relative rates five to 10 times that of Hispanic and African American children. A similarly significant disparity was noted in a study that examined income: children living in households with an annual income of less than \$25,000 made up only 12.8% of the PCI sample, compared with their U.S. population levels of 28.7%. By contrast, those households with annual incomes greater than \$100,000 comprised 23.6% of the sample, compared with the U.S. population level of 12.3% (Sorkin & Zwolan 2008). Importantly, SES is a factor not only in implantation rates but also in postimplantation speech and language outcomes. Tobey et al. (2003) found that SES was a significant independent factor in speech production in children implanted by 5 yr of age. Geers (2006) noted that higher parental income and education are important factors affecting language outcomes in children undergoing early implantation. Geers (2003) also found that reading competence was associated with higher family income level.

In an effort to confront growing inequalities throughout the U.S. healthcare system, the U.S. Department of Health and Human Services established the *Healthy People 2010* framework, which designates the elimination of health disparities as one of its essential goals (U.S. Department of Health and Human Services 2000). Specifically, the measures target improving the “hearing health of the nation through prevention, early detection, treatment, and rehabilitation,” including increased use of cochlear implants. The creation of these objectives reflects a growing understanding of the negative effects of low SES on health outcomes and represents a call to action for researchers in the field of PCI to fully investigate the mechanisms by which low SES leads to reduced outcomes, a sphere of research that remains largely unexplored.

What is clear from the literature is the central importance of the parental role in the postimplantation habilitation process (Spencer 2004; DesJardin & Eisenberg 2007; Zaidman-Zait 2007; Zaidman-Zait & Young, 2008). Parents are the first and most influential teachers of their children, and clearly ensuring that parents have early access to information and resources about all aspects of their child's hearing loss has the potential

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to aid them significantly in this role. As the population of children with CIs grows, and the habilitation burden shifts from implant centers to educational centers, parental influence will be a critical factor to successful speech and language outcomes (Archbold & O'Donoghue 2007). This reality heightens the need for healthcare professionals involved at all levels of care of children with CIs to understand the ways in which low SES might potentially hinder parents' ability to be their child's most effective teacher and advocate.

This national survey of PCI audiologists was conducted to identify audiologists' perceptions of specific factors that underlie SES-related speech and language outcome disparities and to elicit potential strategies to reduce those inequalities. PCI audiologists are in a unique position to provide insight on this topic because of their long-term role in the care of the child with a cochlear implant. This study pursued three specific aims: (1) to determine if PCI audiologists perceive an SES-related effect on outcomes within the context of their clinical practices; (2) to understand audiologists' perceptions of the underlying factors in outcome disparities; and (3) to elicit suggestions for improving outcomes in disadvantaged populations. We hypothesized that PCI audiologists would perceive reduced outcomes among their lower SES patient population, and that this noted disparity would be related to parental adherence (compliance) and access to habilitation.

MATERIALS AND METHODS

Subjects

Because of the lack of a national register, a database of 234 PCI audiologists was compiled from the clinic contact listings of two major cochlear implant (CI) manufacturing companies in the United States (Cochlear Americas and Advanced Bionics). Each contact's status as a PCI audiologist was confirmed via internet or phone.

The survey was electronically mailed using an online survey design service (SurveyMonkey.com). Subjects received a total of three survey invitations at 2-wk intervals. Of the 234 audiologists contacted, 106 (45%) responded to our survey. Of these 106 respondents, 103 (44%) completed the survey, and three (1%) refused to complete it without comment.

Survey

Survey content was developed by otolaryngologists, educators of children with hearing loss, and PCI audiologists, all with significant survey experience. Feedback on the survey was provided by investigators at the Center for Interdisciplinary Health Disparities Research and The Department of Health Studies at the University of Chicago. Content and wording were also informed by an unpublished pilot survey of PCI surgeons conducted previously.

The survey contained 18 quantitative and four open-ended questions (Appendix). With the exception of demographic questions, which appeared together on one webpage, questions appeared on individual, sequential webpages. Respondents answered questions in sequence, without knowledge of subsequent questions. Within a given topic (i.e., decision to implant, effect of SES on outcome, proposed solutions), open-ended questions preceded quantitative questions to minimize the potential for bias in the subjects' answers. Institutional review board approval was obtained from the University of Chicago.

Analysis and Statistics

Responses were entered directly into the SurveyMonkey.com website, stored on an online data base, and downloaded in de-identified format. Quantitative responses were analyzed using the Stata 9 statistical package (Stata 2005). Univariate statistics were performed using Wilcoxon-Mann-Whitney and independent samples *t* tests and Chi-squared analysis. Qualitative responses were analyzed by two investigators (E.K., D.S.), using standardized codebook and content analysis as described by Bunne (1999) and others (Miles & Huberman 1994; Schilling 2006). By using the complete response to each question as the unit of analysis, the investigators generated a set of codes for the main ideas expressed in each response. The codes were then analyzed for patterns and organized into subthemes that were then grouped into themes. Disagreements in coding were settled by consensus. Two independent, nonauthor reviewers applied the categorical scheme to 15% of responses selected at random, with a resulting inter-rater reliability of 73%.

The responses to question no. 8 were not included in the results because they related more to the preimplantation process and not postimplant outcomes. Question nos. 15 and 16 were interpreted and answered similarly by respondents and thus yielded redundant themes on qualitative analysis. Therefore, the themes that emerged from the analysis of both questions are presented in a single table (Table 1).

RESULTS

Demographics

Demographic data are summarized in Table 2. The respondents included PCI audiologists from 31 states with the majority ($N = 73$ of 103, 71%) having worked with PCI patients for at least 5 yr. Most respondents ($N = 93$ of 103, 90%) work as part of formal CI teams with 29 of 103 (28%) working at low-volume centers (<10 implants per year), 39 of 103 (38%) at centers that perform 10 to 29 implants per year, 19 of 103 (18%) at centers that perform 30 to 49 implants, and 16 of 103 (16%) at high-volume centers performing greater than 50 implants per year.

The majority of respondents had experience caring for children with CIs from low SES backgrounds with 53% (47 of 88) stating that at least 50% of their caseload was of low SES.

Disparities in PCI Outcomes

Seventy-eight percent ($N = 76$ of 98) of respondents perceived an effect of SES on postimplantation speech and language outcomes. When asked to elaborate on the nature of this effect, 94% (68 of 76) indicated that low SES negatively impacts outcomes and 5% (8 of 76) did not comment. There was not a significant difference between socioeconomic breakdown of caseload ($t = 0.52, p = 0.6$), center volume ($z = 1.16, p = 0.3$), or years of experience ($t = -1.9, p = 0.07$) between those who noted an effect of SES and those who did not.

Reasons for Poor PCI Outcome

As shown in Table 1, when audiologists elaborated on specific causes for perceived reduced outcomes, two themes emerged: factors of parental influence (i.e., self-efficacy, adherence, and habilitation carryover) and external resources (i.e., inadequate habilitation and economic and educational resources).

TABLE 1. Summary of perceived contributing factors to the SES-related disparity in postimplant speech and language outcomes

Theme (n)	Subtheme (n)	Representative excerpt
Internal Factors: parental influence (67)	Parental self-efficacy (28)	“[Lower SES parents] don’t always know to ask the questions about what they can do because they don’t have the concept of being able to fix anything”
	Adherence (42)	“... difficulty advocating for their children’s needs . . .” “... poorer language and speech as a result of poor follow-up care and often because equipment is not maintained consistently . . .”
	Habilitation carryover (41)	“... failure to comply with the requirements of our program” “The family may have greater difficulty carrying over and using strategies learned in intervention into their everyday lives” “... the fact that English is not the primary language spoken in the home will make aural habilitation more complicated . . .”
External resources (53)	Educational and economic resources (34)	“Socioeconomic factors make it more difficult for parents to meet the demands of intensive AR programs. They often lack the transportation, flexible work schedule, gas money to bring their child to services”
	Inadequate therapy (40)	“... cannot afford private habilitative services when public services are unavailable or inadequate . . .”

SES, socioeconomic status; AR, audiology rehabilitation.

Internal factors: Parental influence on the CI process • In the qualitative question regarding underlying factors for speech and language outcome disparities, nearly all respondents (N = 67 of 72, 93%) discussed the issues of parental influence in PCI outcomes. Critical aspects of parental influence included issues of parental self-efficacy, adherence, and habilitation carryover. Many respondents (N = 28 of 72, 39%) described a lack of parental self-efficacy that makes it difficult for low SES parents to advocate for their child in the healthcare and

TABLE 2. Summary of demographics of audiologists and PCI patient population

Demographics	n (%)
Audiologists	
Setting	
Urban	70 (69)
Suburban	25 (25)
Rural	6 (6)
Experience with PCI	
1–4 yr	30 (29)
5–10 yr	39 (38)
>10 yr	34 (33)
Center volume (implants/yr)	
<10	29 (28)
10–29	39 (38)
30–49	19 (18)
>50	16 (16)
Member of a CI team	
Yes	93 (90)
No	10 (10)
PCI patients	
The majority implanted at	
<3 yr old	74 (88)
3–5 yr old	2 (2)
>5 yr old	8 (10)
Percentage of patients of low SES	
0–24%	15 (17)
25–49%	26 (30)
50–74%	33 (38)
75–100%	14 (16)

PCI, pediatric cochlear implant; SES, socioeconomic status; CI, cochlear implant.

educational systems. One respondent noted that “[Lower SES parents] don’t always know to ask the questions about what they can do because they don’t have the concept of being able to fix anything.” Others described issues with adherence (N = 42 of 72, 58%). The following quotation was representative of adherence issues: “. . . most children on Medicaid have parents who do not have good follow-up or do not have ease of transportation to and from appointments . . . these children also tend to have more broken equipment more often.” With regard to habilitation carryover, one respondent noted that low SES parents “may have difficulty being their children’s best teacher,” whereas another noticed that many parents have a “lack of time to spend on auditory/speech/language goals at home.”

When asked to rank five potential nonmedical contributors for perceived outcomes differences, nearly equal proportions of respondents ranked low parental involvement in habilitation (N = 22 of 66, 33%) and nonadherence (non-compliance; N = 21 of 66, 32%) as the most frequently encountered (Fig. 1). Eighty-eight percent (84 of 95) of the audiologists noted that children with nonadherent (noncompliant) parents “often” or “always” have worse outcomes than those with adherent (compliant) parents. Seventy-eight percent (N = 76 of 97) of audiologists noted a greater percentage of nonadherent (noncompliant) parents among their lower SES patients. The caseload of this group of respondents did not differ significantly in socioeconomic breakdown from other respondents ($t = 0.02, p = 0.9$).

In a question related to implant candidacy and issues of adherence, 47% (47 of 101) stated they would either “never” or “rarely” recommend implanting a child whose parents demonstrate nonadherence during assessment, whereas 58% (N = 58 of 101) would never or rarely recommend implanting a child whose parents did not indicate a strong commitment to postimplant habilitation.

External factors: Inadequate therapy/lack of available resources • As shown in Table 1, inadequate therapy (34 of 72; 47%) and lack of educational and economic resources (40 of 72; 56%) also emerged as perceived factors that contribute

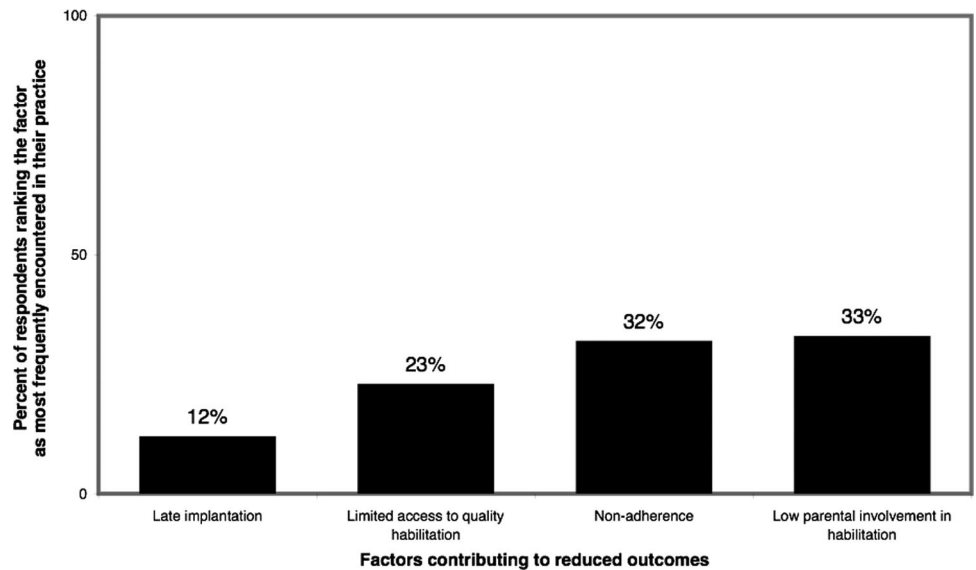


Fig. 1. Perceived nonmedical factors contributing to the socioeconomic status (SES)-related disparity in postimplant speech and language outcomes.

to outcome disparities. Respondents noted an overall lack of professionally directed therapy from all sources—school, private, and clinical. One audiologist stated, “. . . in our area the auditory verbal program for preschoolers is private. Parents with lower SES cannot afford the cost.” Many respondents cited limited educational and economic resources as large contributors to reduced outcomes ($N = 40$ of 72 , 56%). One audiologist stated, “Sometimes life is so difficult that the CI is less important than, say, electricity.”

Overall, two thirds of respondents ($N = 55$ of 82 , 67%) observe that their upper and middle SES patients receive better and/or more habilitation outside the clinical setting than PCI patients of low SES. Those who noted this difference in habilitation access were significantly more likely to note an effect of SES on outcome ($p < 0.01$, χ^2). In addition, those with a larger percentage of low SES patients in their practice were more likely to note differences in habilitation access ($t = -2.3$, $p = 0.03$). Notably, the majority of audiologists ($N = 45$ of 55 , 83%) believe that the primary responsibility for long-term habilitation lies with the public school system and early intervention (EI) programs rather than with clinics or private therapists.

Proposed Strategies

In response to an open-ended question, audiologists identified three main areas to be targeted in the effort to mitigate SES-related outcome disparities: improvement in CI services ($N = 55$ of 60 , 92%), increased parent-directed interventions ($N = 52$ of 60 , 87%), and the institution of stricter candidacy requirements ($N = 9$ of 60 , 15% ; Table 3).

In a follow-up question asking respondents to rank five potential interventions (Fig. 2), audiologists chose “increasing parental involvement in habilitation” as the most effective strategy for reducing outcome disparities ($N = 39$ of 65 , 60% ; $p < 0.01$, χ^2).

DISCUSSION

Disparities in PCI mirror the systemic inequities found across many fields within the U.S. healthcare system. Within the field of

PCI, SES is observed to be a significant factor in both rates of implantation and postimplant speech and language outcomes (Geers & Brenner 2003; Hyde & Power 2006; Sorkin & Zwolan 2008). These studies predominantly use quantitative approaches to analyze racial and SES disparities. To this point, the literature is largely silent on qualitative exploration of SES-related health disparities, particularly from the perspective of the healthcare provider.

As medical professionals striving to improve the quality of life for children with hearing loss regardless of SES, we are in a unique position to identify and understand these disparities and to help devise guidelines and national policies to eliminate inequities. An approach aimed directly at individuals of low SES background should be used because health policies with a less-directed focus may widen rather than attenuate health disparities. Antismoking initiatives, for example, more successfully reduced smoking in higher educated populations compared with lower educated groups. This differential success led to a significant disparity in smoking rates and to smoking-related morbidity and mortality (Adler 2003). This lesson—that without conscious effort and directed focus, health initiatives may disproportionately benefit higher SES individuals—should not be forgotten by those designing strategies to increase awareness and participation among lower SES parents of children with cochlear implants.

Research is an essential first step in understanding the causes of PCI disparities. Factors such as income, education level, societal environment, health behaviors, governmental health policies as well as these components’ synergistic interactions must be explored. As an initial step in the effort to gain insight into the underlying causes of disparities and potential strategies to confront these inequities, PCI audiologists were surveyed to elicit their perceptions and suggestions. PCI audiologists were targeted because of their in-depth and long-term relationships with children with CIs and their families. Although a definitive determination of root causes and potential solutions cannot emanate solely from a single national survey, this effort is an important first step in delineating highly specific areas that must be targeted for future research.

TABLE 3. Summary of strategies proposed by PCI audiologists to reduce the SES-related disparity in postimplant speech and language outcomes

Theme (n)	Subtheme (n)	Representative excerpt
Improve services (55)	Access (18)	“Our clinic is appalled by the quality of care lower SES patients receive and has begun building a ‘scholarship’ fund to assist with funding for MAPping and aural habilitation services at our center” “More access to speech-language services via public and private insurance” “More qualified SLPs and AVTs are needed in the geographical region” “Increasing the available service for habilitation”
	Convenience (27)	“Providing transportation and/or lodging to and from therapy, school, audiologic, and medical appointments” “Set up therapy in a place more convenient for the family”
	Quality (38)	“Increased provision of quality . . . of services in schools” “Have a close relationship with a counselor who speaks the family’s native tongue”
Parent intervention (52)	Counseling and support (18)	“Parents need contact with key personnel from the resource center at the implant center after implantation to alleviate parent stress/fear” “Opportunities for lower SES families to be in contact with successful lower SES children and their families”
	Education (17)	“Force parents to participate in sessions so they learn how to carry over the targeted goals to the home environment . . .” “We need better programs with parent education components”
Strict requirements (9)	Preimplant (3)	“Stricter candidacy guidelines”
	Postimplant (7)	“. . . see our patients monthly for 6 months, then bimonthly for the next 6 months. We keep pressure on them to comply with us as well as with the rehab program” “Make them pay for missed appointments”

PCI, pediatric cochlear implant; SES, socioeconomic status; SLP, speech language pathologist; AVT, auditory-verbal therapy.

This study demonstrates that PCI audiologists recognize the SES-related speech and language outcome gap that is documented in the PCI literature. The majority of respondents noted that low SES negatively affects speech and language outcomes in their clinical practice. In addition to confirming this link between reduced outcome and SES, this study explored the SES-related factors that contribute to outcome disparities so that these factors may be addressed and outcomes improved. In response to questions regarding the specific issues believed to contribute to outcome differentials, two themes emerged: internal factors of parental influence (i.e., parental self-efficacy, adherence, and habilitation carryover) and external factors (i.e., inadequate habilitation and the lack of available resources).

Parental Influence: Parental Self-Efficacy, Adherence, and Habilitation Carryover

Three internal factors of parental influence—parental self-efficacy, adherence, and habilitation carryover—were most frequently perceived by the respondents to be important components that affect speech and language outcomes among children with cochlear implants. The PCI literature reveals the interconnected nature of these factors and their roles in reinforcing and informing each other. For example, a 2007 study highlighted the strong relationship between parental self-efficacy—defined as parents’ overall perception of their competence in the parental role—and involvement, and the linguistic skills of young children with CIs

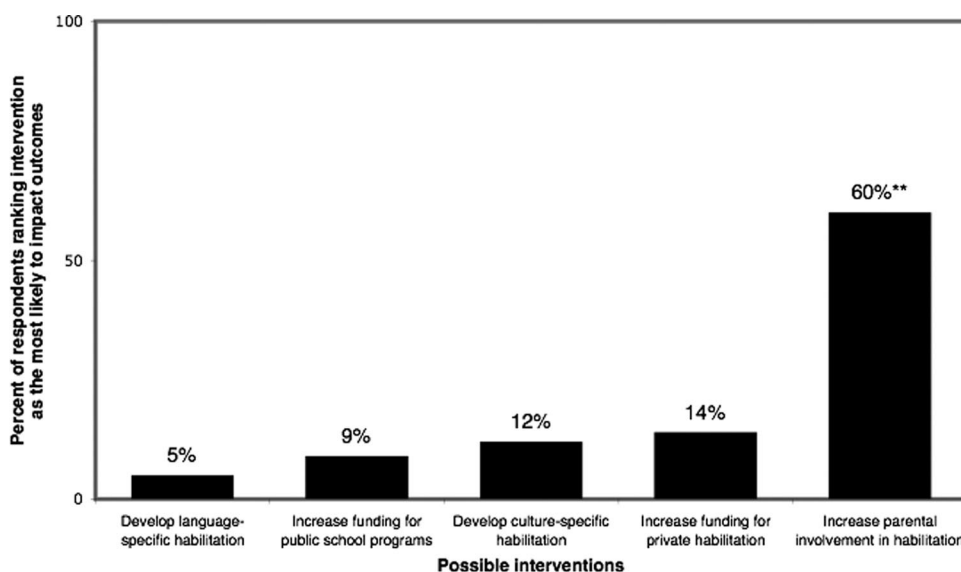


Fig. 2. Possible interventions for improving outcomes for low socioeconomic status (SES) children with cochlear implants.

(DesJardin & Eisenberg 2007). More specifically, greater parental self-efficacy has been correlated with increased utilization of high-level language strategies, such as open-ended questioning and parallel talk, by mothers at home with their children after implantation. Such habilitation techniques were associated with better language outcomes (DesJardin 2005).

In this survey, a majority of audiologists noted that PCI patients with poorly adherent parents often or always have worse speech and language outcomes than those children with parents who adhere more closely to the outlined habilitation program. Importantly, the respondents reported a higher percentage of poorly adherent parents in their low SES patient population. In the Proceeding of the National Academy of Sciences, Goldman and Smith (2002) examined the factors that have led to a reduced success in disease management as SES declines—a trend they refer to as the SES gradient. The study showed adherence to be a significant variable for SES gradients in health outcomes in both clinical trials and population-based settings.

Most encouragingly, Goldman and Smith found that issues of adherence were amenable to intervention. The creation of a successful intervention requires an understanding of the role that these internal factors have in aiding or inhibiting habilitation. Although further research is required to fully understand the link between parental self-efficacy and SES in the PCI population specifically, the literature does reveal that reduced parental self-efficacy limits parents' confidence in their ability to be their child's teacher, to serve as an ongoing advocate for their child, and to help their child adhere to an outlined habilitation program (DesJardin & Eisenberg 2007)—all of which are crucial to parents' ability to assist their children as they navigate the world of sound.

External Factors: Educational and Economic Resources and Inadequate Therapy

The majority of surveyed audiologists identified (1) a lack of educational and economic resources and (2) inadequate access to quality postimplant habilitation therapy as external factors that lead to the reduced outcomes seen among low SES families. Many respondents also stated that their lower SES families have fewer resources, such as time, money, and transportation, and often struggle with compounding issues of family size, childcare difficulty, and single parenthood.

The stark division between services offered at public schools versus private oral deaf schools demonstrates this unequal distribution of resources. Private schools offer more interventions at an earlier age than do public schools (Moog & Geers 2003; Sach et al. 2005; Barton et al. 2006; Sorokin & Zwolan 2008). Because they have access to both financial resources and adequately trained professionals, children enrolled in private oral deaf schools have higher levels of self- and parent-reported social and educational adjustment after implantation (Geers et al. 2003).

Lack of resources necessarily affects how families will approach the PCI process. Low education and the concomitant low-paying employment opportunities demand longer working hours to earn sufficient income. These long hours result in a less flexible schedule, which affects the ability to make and to keep appointments. This is exacerbated by reduced access to transportation. Perhaps, most directly, lack of income affects the ability to maintain equipment to keep the child "online." Of course, these internal and external factors are inextricably

linked in a cyclical feedback loop: according to our respondents, the external lack of resources is an important factor that negatively affects a parent's internal feelings of self-efficacy.

Suggested Solutions: Improving PCI Services, Increasing Parental Self-Efficacy, and Altering Candidacy Requirements

Improving PCI services • Survey respondents offered three approaches to diminish disparities in PCI. The first set of solutions focused on improving CI-related services by increasing access, convenience, and quality. Although confronting the true root causes of unequal access would require a direct attack on all of global poverty, some slightly less comprehensive steps may be taken to ease the burden for families of children with cochlear implants. A significant first step would be to expand and diversify the workforce of providers because there is currently a critical shortage of trained professionals (Parisier 2003). Some steps have been taken in this direction: programs such as Professional Preparation in Cochlear Implants have been developed to respond to the need for trained professionals. Increasing the number of providers, particularly those trained in issues specific to underserved communities, could aid in providing more inclusive, culturally competent care.

Additionally, changes must be made within EI programs and public school systems to improve the access to and quality of services for low SES children who rely on these sources so heavily. For example, a study might be conducted to investigate whether an SES-related disparity exists with respect to those who use these state-provided services. If, as the authors hypothesize, EI services are disproportionately used by higher SES families, then a directed education-based intervention could potentially increase the utilization of EI services by families of lower SES background. If, on the other hand, it is the lack of qualified service providers in economically challenged areas and/or longer waiting lists, policy changes might be enacted to attract qualified service providers to underserved areas (e.g., reimbursement rates, loan repayment). Similarly, the development of center-based aural habilitation programs in concert with programs such as Head Start or Ounce of Prevention might also address the more global issues affecting vulnerable children. Addressing these issues is particularly important because the majority of surveyed audiologists believe that the primary responsibility for long-term habilitation rests not within the medical clinic, but rather in public schools and EI educational programs.

Increasing parental self-efficacy • The next recommendation was to increase parental self-efficacy through education, counseling, and support. Respondents noted that programs aimed at increasing lower SES parents' involvement with the CI process could be effective at reducing outcome disparities for their children. Incorporating education and self-efficacy training into PCI programs may strengthen the parent-child interaction and improve parents' ability to be effective language models for their children at home. Additionally, respondents indicated that providers have the ability to facilitate a "self-help" network of support for low SES parents, which may increase parental self-efficacy and improve adherence. An

ideal solution for both the issue of improving PCI service quality and increasing parental self-efficacy might be a program that provides habilitation for the child and support and education for the parent. Harrigan and Nikolopoulos (2002) describe a successful program in which they were able to enhance the language development of children with CIs by improving the communication skills of their parents. This program involved a training course in which parents of children with CIs were taught to respond to their child's communicative initiations, rather than expecting children to respond to their parents' initiations. This approach allows children greater control and encourages them to fully use their language skills. This program was not only successful in teaching this technique but also resulted in a high level of satisfaction among the participants.

The potential success of such parent-inclusive interventions is revealed in a study conducted by Most et al. (2006) that compared literacy performances among children with hearing loss. All children in this study were involved in MICHA, an Israeli center-based EI program that considers parents to be "part of the rehabilitation team and guide(s) them in how to interact with the child to promote the child's communication as well as academic and social development" (24). The result of this study was the lack of finding an SES differential. The investigators hypothesized that this equity likely occurred because this type of EI may have "blurred any differences relating to socioeconomic variables" (24). The importance of early emphasis on language development skills is even more clearly described by Hart and Risley (1995) who show that the frequency of early language interactions with family members and economic resources are two of the most important factors in the development of a child's language skills. Together, these studies provide strong support for focusing national attention and resources on the effort to increase access to and utilization of public school and EI services while incorporating a parental education component into any such program.

Altering candidacy requirements • Finally, a small group of our respondents (9 of 60, 15%) suggested the institution of strict program requirements, both before and after cochlear implantation. Although stringent preimplantation requirements might yield a cursory improvement in the rates of adherence after implantation, such an effort may widen this health disparity rather than diminish it. By excluding the population that would be considered at highest risk for poor adherence, lower SES individuals would, the authors predict, likely be excluded more than those of high SES background. Similarly, increasing postimplantation demands—such as charging a fee for missed appointments—would place the greatest burden on lower SES families. That is, those most likely to miss appointments because of a lack of external resources would be the same people least likely to be in the position to pay such a fine. The authors predict that reducing access to PCI would likely push our field further from the ultimate goal of eliminating the disparity.

LIMITATIONS

Three limitations encountered in this study require discussion. First, a specific definition of SES based on annual household income or parental education level was not possible. Few, if any, healthcare providers have access to this informa-

tion about their patients. For that reason, low SES was defined as "public insurance, low education, or low household income." This definition assumed some provider knowledge about the insurance status of their patients and allowed the respondents to incorporate further knowledge of individual family education or income level if that information were available. PCI audiologists most likely made estimations as to the percentage of publicly insured patients within their clinical practice.

Second, the self-reporting nature of this survey-based study may have introduced a recall bias into the participants' responses: participants' reflections on instances in which SES affected outcome in their clinical practice may have led them to overestimate this effect in their responses to quantitative questions. However, the purpose of this article was not to prove the existence of SES-related disparities in the PCI population, but rather to determine whether providers recognize the SES-related disparity that has already been identified in the PCI literature. The crux of this article examines PCI audiologists' perceptions of the reasons for and potential solutions to these disparities. The ability to recognize these issues and to provide possible solutions that may help individual families of low SES is largely independent of the quantitative estimations. Finally, a potentially relevant response bias was, in all likelihood, introduced: those audiologists who chose to complete the survey were quite possibly more interested in and cognizant of disparity-related issues than those who chose not to participate. If this were the case, then in actuality, fewer providers recognize the existence of an SES-related disparity than is suggested by the findings from this study. If true, this only heightens the need for increased attention to research and education surrounding SES-related disparities within the PCI population—at the level of both the patient and provider.

CONCLUSION

The perspective provided by audiologists suggests that healthcare providers recognize the existence of SES-related PCI outcome disparities. Audiologists perceived internal parental factors and external resources to be major factors underlying PCI disparities and suggested that parent-directed interventions and improvement of PCI services may help to improve outcomes in disadvantaged populations. The underlying causes of the inequities examined here are multifactorial and, as such, the effort to develop solutions requires a diversified, broad, and culturally sensitive approach. This study is an early step in developing a framework for further research and intervention directed toward the ultimate goal of eliminating health disparities in the field of PCI. Persistence in this moral and medical effort is essential, for developing strategies that expand access to EI and empower parents as they guide their children through postimplant habilitation offers the greatest hope of providing all children with cochlear implants—regardless of SES—the opportunity to reach their full auditory and linguistic potential.

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APPENDIX: Survey**1. Do you work with PEDIATRIC cochlear implant (CI) patients (ages 0-18)?**

- yes
 no

2. Do you work as part of a formal cochlear implant team?

- yes
 no

3. How many years have you worked with pediatric cochlear implant patients?

_____ years

4. How many children does your team implant in a typical year?

Number of newly implanted children: _____

5. Of the pediatric CI patients you worked within the past year, what percentage received implants at the following ages:

<1 year _____ %
 1-2 years old _____ %
 2-3 years old _____ %
 3-5 years old _____ %
 >5 years old _____ %

6. In which state is your practice located?

State/Province: _____

7. Which of the following most closely describes your practice setting?

- Urban
 Suburban
 Rural

8. There are many reasons why those seeking pediatric cochlear implantation are not implanted. What are the most significant nonmedical reasons that you typically recommend against implanting a child?**9. Would you recommend implanting a child whose parents demonstrate noncompliance during assessment (i.e., miss appointments)?**

I would implant the child:

- Never
 Rarely
 Sometimes
 Always
 Often
 Other (please specify) _____

10. Would you recommend implanting a child whose parents do not indicate a strong commitment to postimplant habilitation?

I would recommend implantation:

- Never
 Rarely
 Sometimes
 Always
 Often
 Other (please specify) _____

11. In your experience, do pediatric CI patients with NONCOMPLIANT parents have WORSE speech and language outcomes than those with compliant parents?

They have worse outcomes:

- Never
 Rarely
 Sometimes
 Always
 Often
 Other (please specify) _____

12. Do you find a greater percentage of noncompliant parents among your lower socioeconomic status* patients?

*Markers of low socioeconomic status (SES) may include ANY OR ALL of the following:

- low income
 -low level of education/health literacy
 -public insurance

- Yes
 No
 Other (please specify) _____

13. In your practice, do you note an effect of socioeconomic status on speech and language outcomes for pediatric CI patients?

- Yes (skip question #14)
 No

14. I do not observe differences in postimplantation speech and language outcome because:

- my patients do not demonstrate differences along socioeconomic lines
 I do not have enough experience with pediatric cochlear implantation to determine
 my patients are all of the same socioeconomic status
 I do not know the socioeconomic status of my patients
 Other

(Skip question #15)

15. You stated that you note an effect of socioeconomic status on speech and language outcomes. In general, what is the nature of the effect you see?

16. Some studies have noted reduced outcomes for implanted children of lower SES. What do you think are the most important causes for reduced outcomes in lower SES patients?

17. Of the following possible causes for reduced outcomes in lower SES patients, which issues do you see most frequently? Please rank from 1 (most frequent) to 5 (least frequent).

- _____ Noncompliance (i.e., not wearing implant, not attending habilitation therapy)
 _____ Access to quality habilitation OUTSIDE the clinical setting
 _____ Low level of parental involvement in habilitation process
 _____ Late age at implantation
 _____ Comorbidities (medical/d evelopmental/neurological)

18. From your experience, can you suggest any solutions for improving postimplantation speech and language outcomes for lower SES pediatric CI patients?

19. Of the following possible solutions for improving postimplantation speech and language outcomes for low SES pediatric CI patients, which do you think would have the GREATEST IMPACT? Please rank from 1 (greatest) to 5 (least).

- _____ Increasing parental involvement in the habilitation process
 _____ Increasing government funding for public school-based habilitation
 _____ Developing language-specific habilitation programs
 _____ Increasing government funding for private habilitation
 _____ Developing culture-specific habilitation programs

20. How does the quality and/or quantity of postimplantation habilitation received OUTSIDE of your clinical setting compare for your lower SES versus middle/upper SES patients?

- Middle/upper SES patients receive BETTER and/or MORE habilitation
 Lower SES patients receive BETTER and/or MORE habilitation
 Patients receive the SAME habilitation regardless of socioeconomic status
 I do not know what kind of habilitation my patients receive outside of my clinic
 I do not know the socioeconomic status of my patients

21. Where do you believe the primary responsibility for a child's long-term postimplantation habilitation should fall?

- School program/early intervention (EI)
 Private therapy/tutor
 Clinic/hospital

22. By your best estimate, what percentage of your pediatric CI patients implanted the past year were of lower socioeconomic status?

_____ %

Please write in any comments you may have.

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