

Inclusive Soundscapes: Investigating access to pediatric cochlear implantation in Memphis

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Introduction

The presence of health-promoting options in our homes, neighborhoods, and schools significantly impacts our well-being. It is increasingly clear that these socioeconomic factors not only affect our healthcare access but also shape our healthcare management choices.

This study aimed to assess how race, social vulnerability index (SVI), and maternal age at birth influence pediatric cochlear implant (CI) access and outcomes.

Our hypothesis postulated that racial disparities would be evident, and that the SVI would have an effect on the timely diagnosis, acquisition and daily CI utilization.

Methods

This study was a retrospective cohort analysis of individuals aged 0 to 18 who received a CI at our center between the years 2000 and 2022.

SVI data from 2020 was obtained from the Center for Disease Control and Prevention.

One-way analysis of variance and linear regressions were used to determine the association between our variables of interest.

References

1. Mahendran et al. Racial Disparities in Adult Cochlear Implantation. *Otolaryngol Head Neck Surg.* 2022 Jun;166(6):1099-1105.
2. Omar et al. Sociodemographic disparities in pediatric cochlear implantation outcomes: A systematic review. *Laryngoscope.* 2022 Mar;132(3):670-686.

Results

General associations - Figures 1-3:

In our sample, bilateral CI constituted 46%, while unilateral CIs, whether accompanied by another functioning ear, accompanied by another deaf ear, or with an unknown status of the other ear, constituted 54%, 69%, and 41% of the sample, respectively.

Laterality of deafness (LOD) was significantly correlated with age at hearing loss diagnosis (AHL) ($p=0.005$), time from diagnosis to CI acquisition (TDCI) ($p<0.001$), and 6-month post CI speech score ($p=0.045$); (Figures 1a-1c).

Hours of CI use at 1y post CI was positively correlated with speech score ($p=0.033$), (Figure 2) but age at implantation was not ($p=0.812$).

Greater TDCI was inversely correlated with speech score 1y post CI ($p=0.007$), (Figure 3).

Sex was significantly associated with TDCI ($p < 0.001$).

Mean TDI (in days) by sex: Males – 639 (± 636); Females – 968 (± 1114).

Effect of SVI - Figures 4a-4c:

Patients from the highest to lowest SVI quintiles comprised 31%, 25%, 18%, 10%, and 14% of our sample, respectively (higher SVI = more vulnerable).

Having an SVI > 0.8 was significantly associated with AHL ($p = 0.007$), TDCI ($p = 0.007$), and speech score at 1y post CI ($p=0.002$) (Figures 4a-4c).

Effect of race - Figure 5:

Race was significantly correlated with SVI ($p < 0.001$).

Mean SVI by race: Black - 0.70 (± 0.26); White - 0.49 (± 0.27) (Figure 5)

After controlling for SVI and LOD, race was not significantly associated with any of our outcomes of interest.

Effect of maternal age:

Young mothers (<22) comprised 26% of the sample.

Maternal age at birth was not significantly associated with any of our outcome variables of interest.

Figures 1a-1c: Laterality of deafness and outcome variables

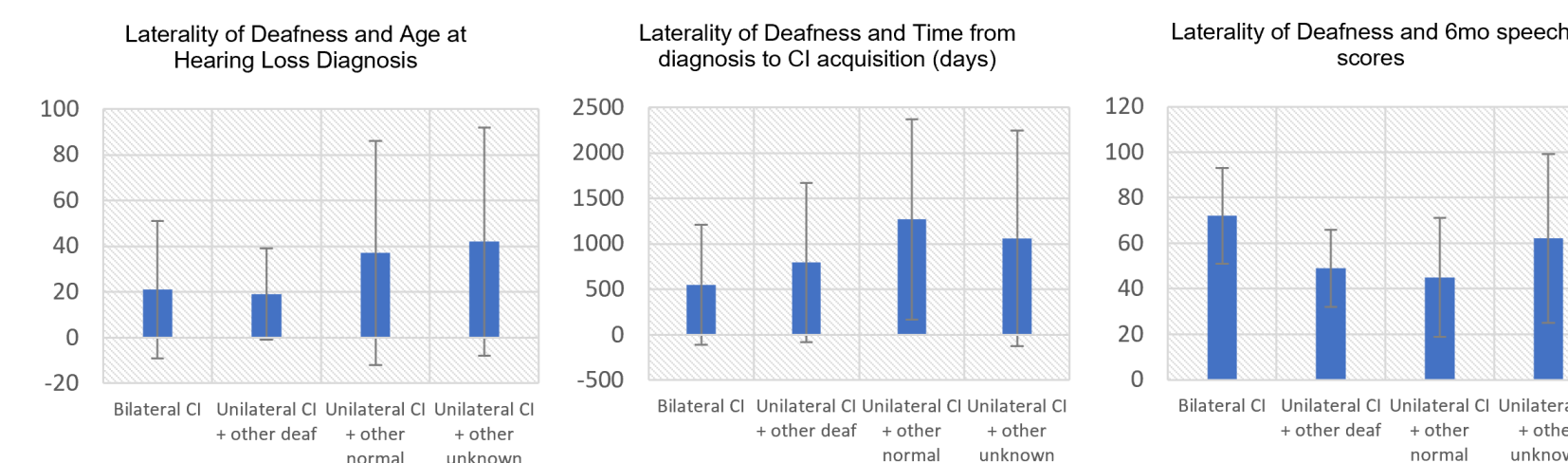


Figure 2: Hours of CI use at 1y post CI and speech score

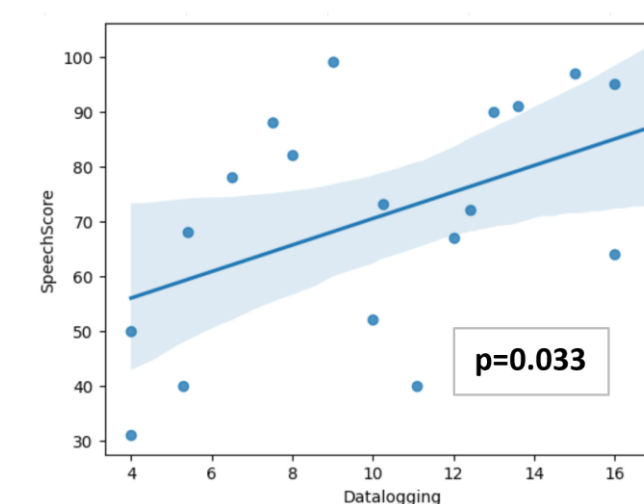
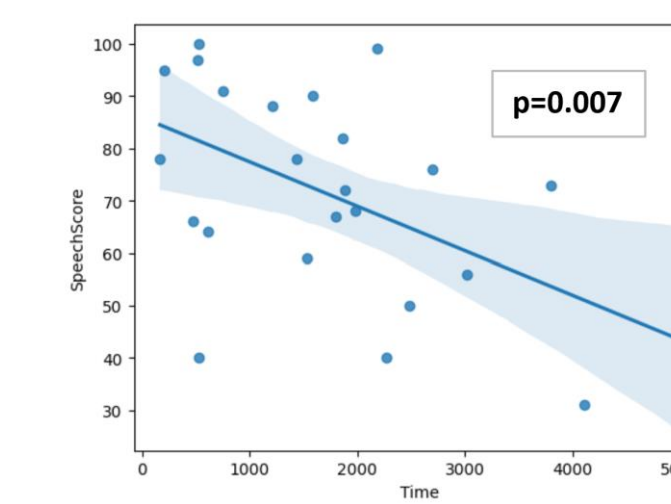


Figure 3: Time from diagnosis to CI acquisition and speech score at 1y post CI



Figures 4a-4c: SVI and outcome variables

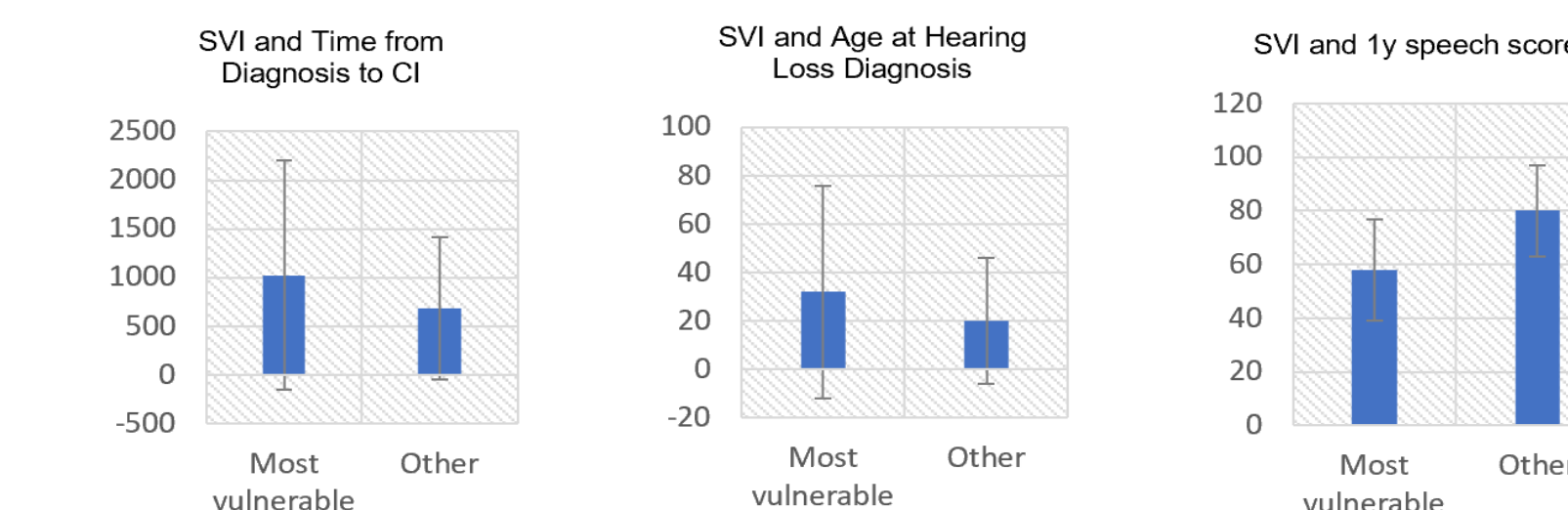
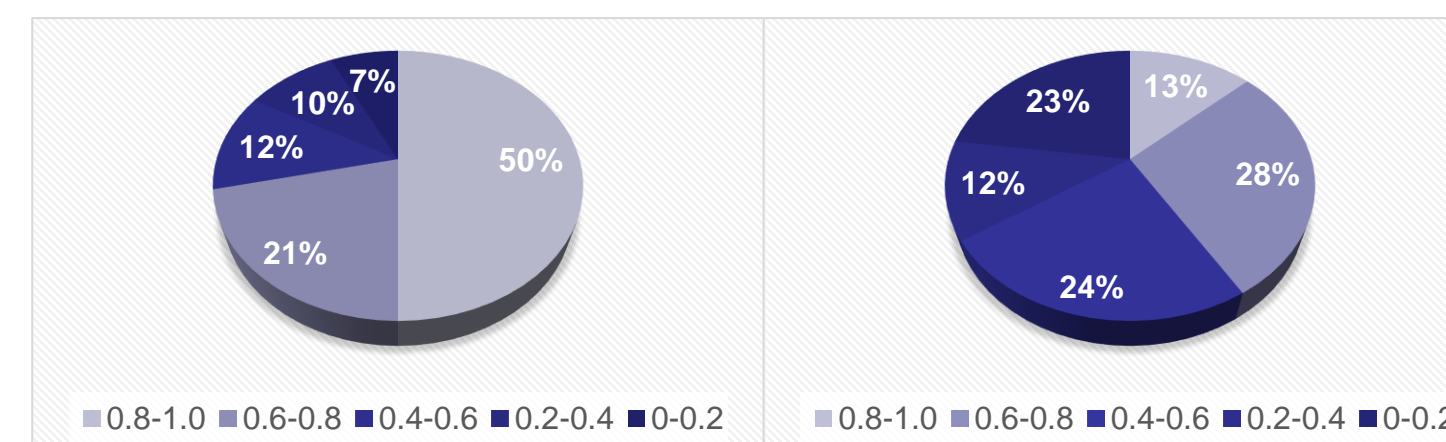


Figure 5: SVI by race – Black (left) and White (right)



Variable	Bilateral CI	Unilat CI + other deaf	Unilat CI + other normal	Unilat CI + other unknown	Total	p-value
Sex						0.44
Male	78	33	24	22	157	
Female	61	36	30	19	146	
Race						0.135
Black	52	27	30	20	129	
White	75	35	20	21	151	
Other	12	7	4	0	23	
Insurance						0.066
Private	36	29	18	6	89	
Public	98	37	36	33	204	
Government	1	1	0	0	2	
Uninsured	0	0	0	1	1	
Missing	4	2	0	1	7	
SVI						0.283
Most vulnerable	40	18	22	13	93	
More vulnerable	38	18	14	5	75	
Vulnerable	23	12	7	11	53	
Less vulnerable	15	4	6	5	30	
Least vulnerable	18	16	3	6	43	
Missing	5	1	2	1	9	

Discussion

This study confirms the impact of socioeconomic factors on cochlear implant access.^{1,2} Over 30% of pediatric CI recipients in our center come from areas with high social vulnerability (SVI), and Black patients, in particular, have a higher SVI compared to White patients.

We found that higher SVI is linked to delays in diagnosis and CI acquisition, as well as lower speech scores one year post-CI. This underscores the need for equitable access to CI services and tailored support for vulnerable populations.

Conclusion

This research will aid in the creation and delivery of specific interventions and assistance, with the aim of enhancing the well-being and life quality of pediatric CI recipients, irrespective of their individual backgrounds.