

# MarkeTrak IV: What Is The Viable Market For Hearing Aids?

By Sergei Kochkin

*Using only hearing disability data, four simulations were performed as a means of segmenting the current 20.6 million hearing-impaired Americans who do not own hearing aids into those who would appear to be viable customers for hearing aids now and those who should be viewed as future customers. The current market would appear to represent an immediate opportunity to the hearing aid industry of 7 million additional customers. At the current binaural rate and average selling price, this represents more than an \$8 billion opportunity at the retail level. There are also an additional 13 million people with milder loss who will eventually "come of age."*

## INTRODUCTION

In 1983, the Hearing Industries Association (HIA) conducted the first major study of the hearing-impaired market.<sup>1</sup> This study documented the size of the market, which was estimated at 7.3% of the U.S. population. The HIA survey measured one hearing-impaired person per household. Subsequent studies by this author indicate that about 11% of households with a hearing-impaired person also contain at least one additional hearing-impaired member. Thus, we estimate that in 1984 the incidence rate was 8.1% or 18.2 million individuals with a hearing loss. Hearing aid penetration at that time was 22.3%.

In a 1989 study, the National Institute of Deafness and Other Communication Disorders (NIDCD) estimated that the hearing-impaired population was 28 million, which equated to an incidence of 11.4%.<sup>2</sup> Of these 28 million people, NIDCD estimated that 2 million were profoundly deaf.

The National Center for Health Statistics determined that the hearing loss incidence in 1990-1991 was 8.6% of the U.S. population, up from 7% in 1977.<sup>3</sup> If the incidence of hearing loss has continued to progress at the same rate as it did from 1977 to 1991, then we would expect the incidence in 1996 was roughly 9.2% of the U.S. population or 24.4 million people.

As measured by the MarkeTrak surveys of the U.S. population, the incidence of hearing loss per 1000 households was relatively stable between 1989 and 1994, varying between 266 and 274 and settling at 269

in 1994.<sup>4-6</sup> This equates to 26.1 million people reporting a hearing difficulty or 10% of the U.S. population in 1994. Nineteen percent of this population (or 4.9 million people) describe their hearing loss as either "severe" or "profound." All MarkeTrak surveys used the National Family Opinion panel (as did the HIA survey in 1983).

In a late 1995 Project Pygmalion survey of 60,000 households using the Market Facts panel, we measured the incidence of hearing loss at 26.5% of all U.S. households, with a hearing loss incidence per hearing-impaired household of 1.11 persons (the same as the MarkeTrak survey).<sup>7</sup> This equates to a 1996 figure of 28.8 million-hearing impaired people, or 10.9% of the U.S. population.

It appears that MarkeTrak (early 1994), Project Pygmalion (late 1995), HIA (late 1983), and the Bureau of Census (1990) all underestimated the hearing-impaired population. This is because the Bureau of Census and U.S. market research panels both survey only households. Institutional settings such as nursing homes, retirement homes, and the military are not surveyed. Since some of these populations (e.g., nursing homes) would appear to have higher hearing loss incidences, conceivably the hearing loss population could in fact be much larger.

With modern estimates of hearing loss ranging from 24 million to 28 million and hearing instrument penetration at only 21% to 22% historically, it is of interest to determine the extent to which the more than 20 million hearing-impaired individuals who do not use hearing instruments are, in fact, current or future candidates for hearing aids. In the past we have conservatively estimated that if even 25% of the non-owner market were convinced to purchase hearing aids over the next 5 years that the market would double and retailers would realize an incremental \$1 billion a year.<sup>8</sup>

This is the fourth segment of a multipart publication that will cover significant trends and indices in the hearing instruments market. The previous three publications in this series explored the emerging CIC market opportunity as well as 10-year trends in the hearing aid market. This study will estimate the viable market for hearing aids using subjective measures of hearing loss.

## SURVEY METHOD

Previous studies in this series have documented the survey method, so it will not be repeated here. This study will concern itself only with comparing and contrasting the hearing aid owner (n=2929) and non-owner (n=3025) populations on subjective hearing loss characteristics. Thus, we will start with a description of the measures used in this paper.

### *Instrumentation*

**The Abbreviated Profile of Hearing Aid Benefit (APHAB)<sup>9</sup>:** The APHAB consists of 24 items scored on four six-item subscales: ease of communication (EC),

background noise (BN), reverberation (RV), and aversiveness of sounds (AV). The hearing aid respondents completed the APHAB under both aided and unaided conditions in the same administration by indicating the percentage of time they experience problems hearing under the situations described in the inventory, while hearing-impaired non-owners completed only the unaided APHAB.

A person's score on each subscale is the mean rating of the six items making up each of the subscales. An APHAB subscale was scored only if the respondent answered four or more items within a specific subscale. Scores range from 1% to 99% for all subscales.

In addition, we computed total APHAB scores by taking the mean of subscales EC, BN, and RV. The rationale for combining these subscales was based

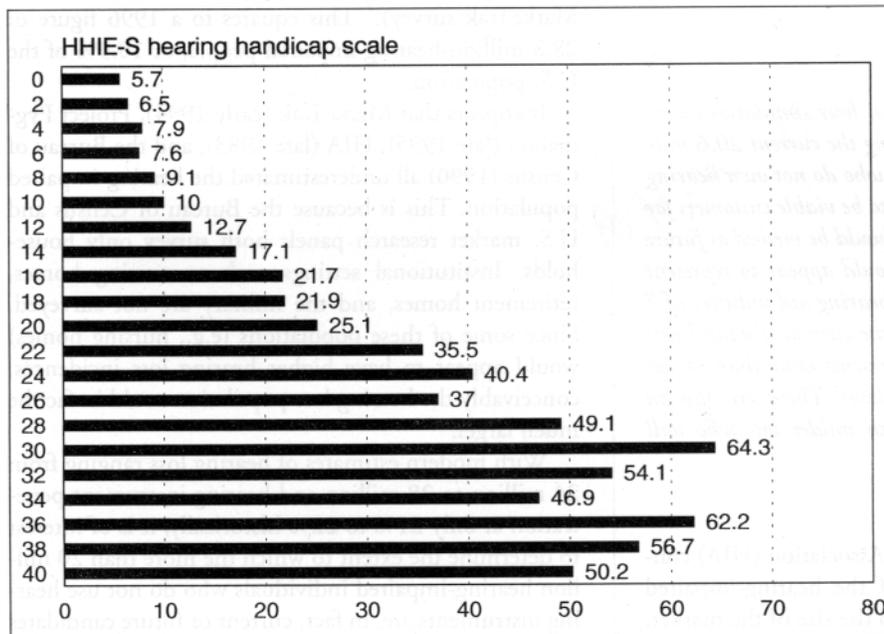
on the results of a factor analysis of the subscale total unaided scores.<sup>10</sup> There is no published relationship between subjective APHAB scores and clinical data (e.g., audiogram). Based on clinical experience,<sup>11</sup> it is believed that persons with unaided scores of 29% or less are "probable non-users or weak candidates," 30%-59% "possible users," and 60%+ "probable candidates."

**Hearing Handicap for the Elderly-Short Form (HHIE-S)**<sup>12,13</sup>: The

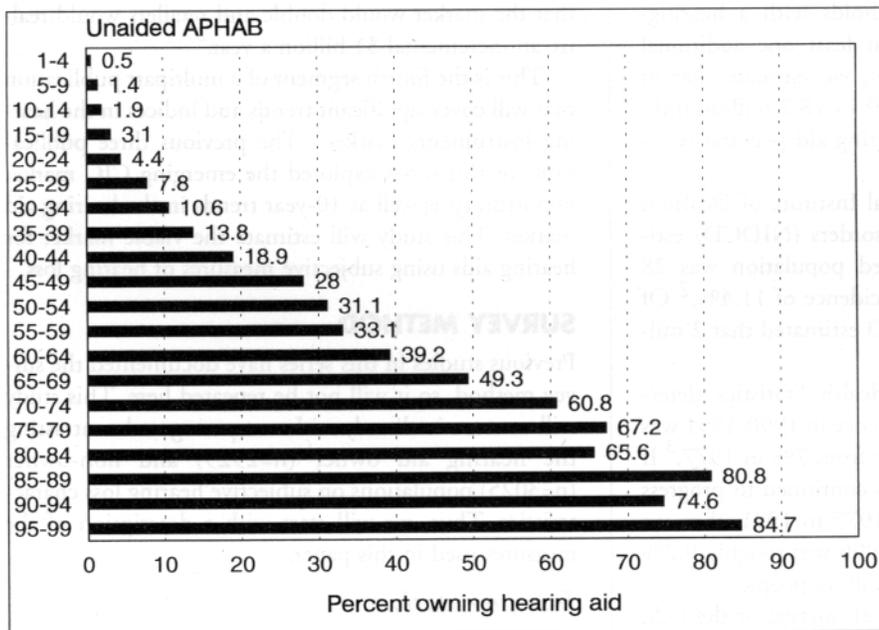
HHIE-S is a 10-item self-administered inventory measuring emotional and social problems associated with hearing loss. The subjects respond to questions about circumstances related to hearing by stating whether the situation represents a problem. A "never" response scores 0, "sometimes" scores 2, and "frequently" scores 4. (Note: The scaling was changed from a "yes," "sometimes," and "no" with agreement of the primary author of the HHIE-S, Barbara Weinstein, PhD.) The HHIE-S has been shown to be related to a clinical decision of hearing impairment based on actual audiogram data where hearing-impaired was defined as (1) 40-dB loss in both ears at either 1000 Hz or 2000 Hz or (2) 40-dB loss in either ear at both 1000 Hz and 2000 Hz. Individuals scoring in the ranges 0-8, 10-24, or 26-40 were shown to have respectively 13%, 50%, and 84% probabilities of hearing loss as defined by the above criteria.

**Gallaudet Scale:** The HIA survey<sup>1</sup> included an eight-point scale in which respondents indicated whether or not they can understand speech under the following conditions: "whisper across a quiet room," "normal voices across a quiet room," "shouts across a quiet room," and "loud speech spoken into their better ear." Respondents were also asked if they can "tell noises from each other," "hear loud noises at all," and "hear any sound or any noise." Individual scores ranged from 1 to 8 and typically they are classified into one of five groups: (1)-hear whisper, (2)-hear normal voice, (3)-hear shouted speech, (4)-hear loud speech in better ear, (5)-can't understand speech.

What makes the Gallaudet scale of particular value is that, like the HHIE-S, it has been validated against clinical information. The relationship between



**Figure 1**  
Hearing aid penetration as a function of hearing handicap as measured by the HHIE-S.



**Figure 2**  
Market penetration as a function of hearing disability as measured by the APHAB (mean of EC, BN, RV).

audiogram information (average dB loss better ear and standard deviation) per Gallaudet scale score was reported in the 1984 HIA report based on a 1970 study conducted by Schien, Gentile, and Haase (*reference not given*).

**Other subjective scales:** The following MarkeTrak survey single-item scales were used with both hearing aid owners and non-owners: perception of loss (mild, moderate, severe, profound), perception of problem hearing in noise (five-point scale ranging from "extremely difficult" to "not at all difficult"), perception of how problematic the individual's hearing is, and number of ears with hearing loss (1 or 2).

## RESULTS AND DISCUSSION

Table 1 (see page 38) compares the owner and non-owner populations on subjective hearing loss measures. First, the non-owner population on average is 13 years younger. Nearly 40% of the non-owners report that their hearing loss is mild compared to 6% of the owners. Not surprisingly, market penetration (percentage owning hearing aids-third column) is only 4% for individuals perceiving their hearing loss as mild. In the fifth and sixth columns, we have documented the population sizes in millions for both non-owners and owners for each of the levels of the various hearing disability measures. Only half of the non-owners have a hearing loss in both ears compared to three out of four of the owners. In addition, 25% of non-owners report that hearing is "quite/extremely difficult" in noise compared to 59% of hearing aid owners.

With respect to the Hearing Handicap Scale (HHIE-S), the non-owners scored on average 13.7 (out of 40) compared to 20.8 for hearing aid owners, indicating that people who own hearing aids are significantly more likely to experience social and emotional problems associated with their unaided hearing loss. The relationship between the HHIE-S and market penetration is documented in detail in Figure 1.

In general, penetration is highly related to handicap as measured by the HHIE-S. For instance, there is only a 6% market penetration of subjects who score a 0 while there is a 49.1% penetration if they scored 28. It would appear that there is a curvi-

linear relationship between the HHIE-S score and market penetration, in that penetration increases as a function of handicap from 0-30 and then either levels off or drops at the very high scores. The overall correlation between the HHIE-S and hearing aid ownership is 0.36 ( $p < .001$ ).

The relationship between the total unaided APHAB and hearing aid ownership (see Figure 2) is stronger ( $r = 0.5$ ,  $p < .001$ ) than that between the HHIE-S and hearing aid ownership. While the former relationship is also curvilinear, it does not level off like the HHIE-S; rather, it peaks at a 84.7% penetration rate for subjects with a hearing disability of 95% or higher. Hearing-impaired non-owners scored significantly lower than hearing aid owners on the total APHAB (mean = 33.6 versus 59.2) and on all APHAB subscales except aversiveness of sounds. Nearly half (47%) of the non-owners reported difficulty hearing < 30% of the time on a typical day compared to only 7% of hearing aid owners.

With respect to the Gallaudet Scale, the distribution of scores for both hearing aid owners and non-owners is documented from the 1984 HIA study in Table 1. We assume the same distribution of Gallaudet scores for the U.S. population in 1994 as existed in 1984, since the age distributions are nearly identical for the non-owner populations (1984 mean/std = 53.8/17, 1994 = 54.7/17.4,  $t = 1.36$ ,  $p < n.s.$ ); however, the owner population is older on average by 3.3 years (1994 owners = 68 versus 64.7 in 1984).

Using the above subjective measures, we will now estimate the viable market for hearing aids. What we are interested in is the possible incremental customers above the current 5.6 million hearing aid owners in the U.S., who are candidates now versus in the future.

### *Simulating The Viable Market*

**HHIE-S simulation:** If one were to simply use the known relationship between the HHIE-S and audiologic measures<sup>10,11</sup> and then apply this to the known HHIE-S distribution of hearing handicap scores, 31% of the non-owner population would be assigned a 13% probability of candidacy, 61% would be assigned a 50% probability, and only 8% would be assigned an 84% probability. Thus, according to the HHIE-S, 41.5%

of the non-owner market could be considered candidates for hearing aids, meaning that there are 8.6 million additional prospective customers, and a total market of 14.2 million, including current owners.

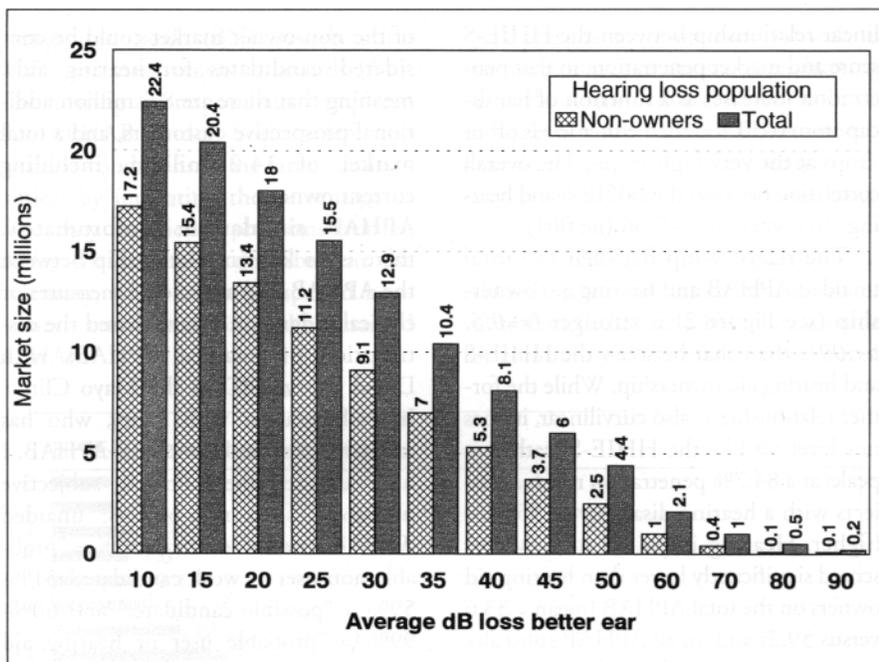
**APHAB simulation:** Unfortunately, there is no known relationship between the APHAB and audiologic measures or clinical judgment. I have shared the distribution of unaided APHABs with David Fabry, PhD of the Mayo Clinic. In collaboration with Fabry, who has extensive experience with the APHAB, I have assigned the following subjective probabilities to non-owners: unaided APHAB score of less than 30% = "probable non-user or weak candidate," 31%-59% = "possible candidate," and 60%-99% = "probable user or hearing aid candidate." The probabilities assigned were respectively 10%, 50% and 80%. A higher probability was not assigned to the "probable user" category since some of these could be profoundly deaf.

Applying these probabilities to the non-user population, we calculate that slightly more than a third (34.2%) of the non-owner population are candidates for hearing aids. That equates to 7.1 million additional customers and a total market size of 12.7 million.

**Gallaudet Scale simulation:** A simulation of the market size (non-owners and total market) by average dB hearing loss in the better ear is presented in Figure 3. We derived the market size by calculating the population size above each dB level. We did this by first converting dBs to z scores based on the known mean/standard deviation dB loss at each Gallaudet score and then consulting a normal distribution table. It is generally agreed in the industry that a 35-dB cutoff is indicative of hearing loss candidacy.<sup>14</sup>

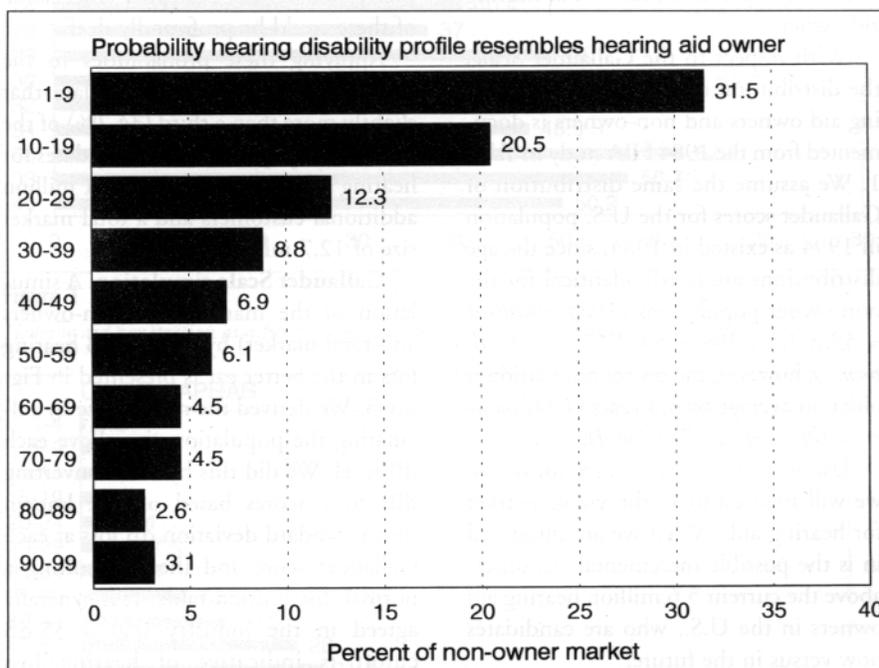
Using this cutoff, it can be seen that there are probably an additional 7 million candidates for hearing aids for a total market size of 12.6 million. A more conservative approach would be to take the total market with a loss of 35 dB or greater (10.4 million) and then subtract out the current owners (5.6 million) to arrive at an incremental customer base of 4.8 million.

**Multivariate hearing disability simulation:** Using only subjective hearing loss



**Figure 3**

Market size (in millions) as a function of average dB loss in better ear as estimated by the Gallaudet Scale.



**Figure 4**

Discriminant function probability of resembling a hearing aid owner based on multiple subjective hearing disability measures.

measures, we performed a stepwise discriminant function analysis to find those factors that predicted hearing aid ownership versus non-ownership. Discriminant function analysis is useful in that it finds the best subset of variables that separates the two populations (owners versus non-owners). Once we have found that subset of variables, then the procedure allows

us to calculate a probability that the overall hearing disability profile of the non-owner resembles that of the average current owner.

Those factors that statistically “predicted” ownership were: perception of hearing loss (mild, moderate, severe, profound), total HHIE-S score and interaction of HHIE-S total score with number

of ears impaired, perception of hearing loss in noise (single item), perception of problem caused by hearing loss (single item), all subscales of the APHAB except ease of communication (EC), and total mean APHAB as well as the square of the total APHAB. The overall model had a squared canonical correlation of 0.403 between the hearing loss profile and known hearing aid ownership (*Wilks lambda*  $\lambda = 0.597$ ,  $F(11, 3903) = 239.5$ ,  $p < .0001$ ).

Figure 4 shows the distribution of probabilities that the non-owner population resembles the hearing aid owner population. More than 50% of the non-owner population has a probability of “owner resemblance” of < 20% and only 20.8% of the non-owners have probabilities exceeding 50%. Using strictly the probabilities of ownership, the model predicts that only 27.7% of the non-owner market would be current hearing aid candidates. This equates to an incremental 5.7 million customers or a total market of 11.3 million.

## CONCLUSIONS

The viable market for hearing aids would appear to be at least double the current size of 5.6 million in the United States. For the four simulations, incremental customers ranged from 5.7 million to 8.6 million people. The average of all four simulations is 7.1 million additional customers with a total market size of 12.7 million.

All four simulations assumed that for non-owners to be driven to find a solution for their hearing loss, their hearing disability should be roughly equal to that of the current hearing aid owner.

An obvious question is, what about the other 13 million people who indicated they have a hearing loss? Should we write them off as never being candidates for hearing aids? I don't think so. One would expect that their hearing loss will progress and that they will eventually be candidates. Thus, we should view these milder hearing loss subjects as future customers. Future customers could be brought into the present by either repositioning hearing aids for people with an atypical hearing loss profile or by redesigning products to appeal to this particular segment.

We should also keep in mind that a more sophisticated model that takes into

account lifestyle variables and need for "refined hearing" might reveal that the viable market is even larger than reported in this paper. For instance, a mildly impaired subject who is an attorney with an above average situational need to hear in order to be effective in his/her occupation would be considered a viable candidate for amplification.

The current market would appear to represent an immediate opportunity to the hearing aid industry of 7 million additional customers. At the current rate of bin-aural fittings (60%) and average selling price (\$710), this represents an \$8 billion opportunity at the retail level. In addition, an

additional 13 million individuals with milder loss will eventually "come of age." In another 10 to 15 years, these people will be solid candidates for amplification. Thus, it would seem that communication and education should begin with this segment now if we are to optimize this opportunity in the future.

With recent advances in technology and continued enhanced training of the dispensing network we have never been better positioned to take advantage of this opportunity. Isn't it time that all the diverse interests in this industry banded together under a common cause, that is, to bring the gift of enhanced hearing to more people?

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**Table 1.**

Comparison of hearing-impaired non-owners and hearing aid owners on subjective listening disability measures.

Population Characteristic	Non-owners	Hearing aid Owner	Market Penetration	Market size (millions)	
	(n=3,025)	(n=2,929)		Non-owners	Owners
Average age	54.7	68.0			
Perceptions of hearing loss (%)					
Mild	37.5	6.0	4%	7.73	0.34
Moderate	49.8	51.8	22%	10.26	2.90
Severe	9.5	35.2	50%	1.96	1.97
Profound	3.2	7.0	37%	0.66	0.39
Ears impaired (%)					
One ear	48.8	24.4	12%	10.05	1.37
Two ears	51.2	75.6	29%	10.55	4.23
Problem hearing in noise (%)					
Extremely difficult	7.2	32.7	55%	1.48	1.83
Quite difficult	18.2	26.7	29%	3.75	1.50
Somewhat difficult	37.7	21.0	13%	7.77	1.18
Slightly difficult	29.6	11.1	9%	6.10	0.62
Not at all difficult	7.3	8.4	24%	1.50	0.47
Hearing Handicap Inventory for the Elderly (HHIE-S) Short form	(n=2,535)	(n=2,567)			
Average (mean)	13.7	20.8			
Score ranges (%)					
0	1.9	0.4	6%	0.40	0.02
1-9	28.9	9.2	8%	5.95	0.51
10-19	46.0	33.9	17%	9.47	1.90
20-29	18.9	35.9	34%	3.89	2.01
30-39	3.9	18.7	57%	0.80	1.04
40	0.5	1.9	50%	0.11	0.11
Abbreviated Profile of Hearing Aid Benefit - Unaided (APHAB)	(n=3,072)	(n=2,169)			
Average scores (means)					
Total (EC, BN, RV)	33.6	59.2			
Ease communication (EC)	26.6	51.8			
Reverberation (RV)	35.2	64.0			
Background noise (BN)	39.0	62.0			
Aversiveness of sounds (AV)	25.0	25.8			
Score ranges (% hearing problem)					
1-9%	6.6	0.3	1%	1.36	0.02
10-19%	19.7	1.9	3%	4.05	0.11
20-29%	20.6	4.9	6%	4.25	0.27
30-39%	17.9	9.1	12%	3.68	0.51
40-49%	14.5	16.2	23%	2.99	0.91
50-59%	10.6	18.5	32%	2.19	1.04
60-69%	6.3	17.5	43%	1.29	0.98
70-79%	2.3	14.6	64%	0.47	0.82
80-89%	1.1	10.5	71%	0.23	0.59
90-99%	0.5	6.5	79%	0.09	0.36
Gallaudet Scale (HIA, 1984) (%)	(n=778)	(n=428)			
1-hear whisper	22.3	4.9	6%	4.59	0.27
2-hear normal voice	57.3	28.6	12%	11.80	1.60
3-hear shouted speech	19.4	49.6	41%	4.00	2.78
4-hear loud speech in better ear	0.4	10.9	88%	0.08	0.61
5-can't understand speech	0.6	6.0	73%	0.12	0.34