
PREVALENCE OF DEAFNESS 1

Prevalence of hearing impairment in the elderly living at home

KATIA GILHOME HERBST, BA, MA and CHARLOTTE HUMPHREY, BA, M.SC

Research Fellow and Research Assistant, Department of Applied Social Studies, Polytechnic of North London

SUMMARY. Using pure tone audiometry, we assessed the prevalence of hearing impairment in a sample of elderly people living at home and aged 70 or more. Deafness was defined as an average loss over the speech frequencies at 1 kHz, 2 kHz and 4 kHz of 35 db or more in the better ear. We found that 60 per cent of the sample were deaf. This figure is substantially higher than previous estimates arrived at without the use of audiometry. We discuss some possible reasons for this discrepancy and consider the implications of this level of prevalence of hearing impairment for the health care of the elderly.

Introduction

THIS report gives an account of the prevalence of deafness among a sample of the elderly living at home. The findings are derived from a study carried out at the Polytechnic of North London, whose main objective was to find out whether the high prevalence of hearing impairment thought to exist in the elderly population is related to the high prevalence of mental disorder known to exist in that group (Kay *et al.*, 1964).

The prevalence of deafness in the elderly population in the United Kingdom has not yet been accurately established, but it is generally believed that about one in three of all those over retirement age suffers from impaired hearing, and that the proportion rises with age to about two in three among those aged 80 and over. However, the studies that have given rise to this assumption (Sheldon, 1948; Townsend and Wedderburn, 1965) have based their estimates entirely on information given by respondents in answer to questions about their hearing, or on the observation of interviewers. They have not used audiometric testing. There are at present no studies which have used audiometry to measure the prevalence of deafness in old people living in the community.

However, two recent studies of the elderly in residential institutions have used audiometry (Burton, 1976; Martin and Peckford, 1978), and they have suggested that between 60 and 90 per cent of residents in old people's homes suffer from impaired hearing. This proportion substantially exceeds Townsend and Wedderburn's (1965) non-audiometric estimate for an institutional population of 42 per cent.

Aim

It seemed reasonable to expect that using audiometric measurement techniques in the community might produce figures equally at odds with earlier estimates, and that deafness might be found to be much more prevalent among the elderly population than has previously been assumed.

Methods

The initial sample consisted of all 365 persons aged 70 and over registered with the central surgery of one Inner London group general practice. Forty-eight refused to participate and 46 were either untraceable, in hospital or on holiday during the fieldwork period. Eighteen respondents were subsequently excluded for a variety of reasons ranging from poor English to inadequate audiometry. Thus the final sample analysed consisted of 253 people (69 per cent of the initial sample). The age, sex and class distribution of the sample is given in Tables 1 and 2; but non-respondents did not differ significantly

Table 1. Age by sex (percentages in brackets).

Sex	Age in years				Total
	70-74	75-79	80-84	85+	
	No (%)	No (%)	No (%)	No (%)	No (%)
Male	46 (41)	34 (46)	7 (20)	5 (16)	92 (36)
Female	66 (59)	40 (54)	28 (80)	27 (84)	161 (64)
Total	112 (100)	74 (100)	35 (100)	32 (100)	253 (100)

Table 2. Social class of sample* (percentages in brackets).

I	II	III _n	III _m	IV	V	Total
3 (1)	22 (9)	24 (10)	123 (49)	58 (23)	21 (8)	251 (100)

*Registrar General's classification (Office of Population Censuses and Surveys, 1971). Two respondents were unclassifiable.

from respondents with regard to either age or sex. There were more women than men in the sample, especially in the older age bands. The lower socio-economic groups, especially skilled manual workers, were over-represented when compared with national figures (Office of Population Censuses and Surveys, 1973).

Home interviewing

All respondents were interviewed and given a hearing test in their own homes during a single session lasting approximately one and a half hours. The nonclinical environment inevitably placed some limitations on the degree of accuracy we could attain in the tests, since it was impossible to control the amount of background noise. However, a check on the validity of the audiometry was provided by the Royal National Throat Nose and Ear Hospital, where 25 of the respondents referred there for hearing aids were re-tested under clinical conditions. We found a high level of agreement (an overall mean difference of 0.3 db) between the average decibel levels of these respondents under clinical conditions and their average decibel levels at home.

Home interviewing was undoubtedly the most suitable way of estimating the prevalence of deafness, since it was essential to have as representative a sample as possible, and by going out to people in their homes we were able to include the housebound and those with restricted mobility. Such people accounted for almost 20 per cent of the sample. Being among the oldest and frailest of the respondents, they were also found subsequently to be some of the most deaf.

Testing for deafness

We used an Amplivox 2150 portable diagnostic audiometer, fitted with Amplivox audiocups in order to minimize background noise. Masking was not used as it was felt to be very tiring for elderly people, nor was it essential for the purposes of this study where the main interest lay in the better ear. Pure-tone audiometry (air conduction) was carried out over the speech frequencies at 0.25 kHz, 0.5 kHz, 1 kHz, 2 kHz and 4 kHz for both ears (Humphrey *et al.*, 1981).

Before we tested the respondents' hearing, we asked them for a brief self-assessment of hearing loss. Those who said they had difficulties were asked about the history of their hearing impairment, their experience of deafness and the use of aids (Humphrey *et al.*, 1981).

In all cases we examined the ears for wax. We recorded the presence of wax only when the meatus was

totally occluded. We also used Fry's (1961) word and sentence tests for speech audiometry. The main reasons for including speech discrimination in the study were to assess the feasibility of using it with a community sample and to assess its value as a measure of hearing difficulty. In the event we stopped after the first 167 respondents because of technical difficulties (background noise and variations in the distance between the output and the respondent), and because we seemed to be getting systematic errors from the test lists.

Criterion for deafness

After consulting the technical department of the Royal National Institute for the Deaf, we defined deafness as an average loss over speech frequencies (at 1 kHz, 2 kHz and 4 kHz) of 35 db or more in the better ear; a loss of 35 db generally being regarded as a degree of impairment which justified issuing a hearing aid. We decided to disregard the lower frequencies of 0.25 kHz and 0.5 kHz for two reasons. First, background noise is more problematic and less effectively reduced by audiocups at those frequencies (Martin *et al.*, 1971), so that the thresholds are more likely to be artificially depressed. Secondly, inclusion of the lower frequencies would have underestimated the severity of the type of high frequency loss typical of hearing impairment in old age.

All tests for significance in the text use a simple chi-square test.

Results

Using the above criterion we found that 60 per cent of the population under study were deaf, and that the proportion who were deaf rose with age to 84 per cent of those aged 85 and over. A further 14 per cent of respondents were found to have a unilateral loss of 35 db or more (Table 3).

Deafness was related to social class. Those in the Registrar General's Classes III_m, IV and V were sig-

Table 3. Type of hearing loss by age (percentages in brackets).

Type of hearing loss	Age in years				Total
	70-74	75-79	80-84	85+	
Normal hearing	No (%)	No (%)	No (%)	No (%)	No (%)
Unilateral loss	42 (38)	17 (23)	4 (11)	2 (6)	65 (26)
Bilateral loss	14 (12)	15 (20)	3 (9)	3 (9)	35 (14)
Total	56 (50)	42 (57)	28 (80)	27 (84)	153 (60)
	112 (100)	74 (100)	35 (100)	32 (100)	253 (100)

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Table 4. Bilateral deafness by age (percentages in brackets).

Decibel loss in the better ear	Age in years		Total
	70-79	80+	
35-44	No (%) 38 (39)	No (%) 8 (14)	No (%) 46 (30)
45-69	47 (48)	34 (62)	81 (53)
70+	13 (13)	13 (24)	26 (17)
Total	98 (100)	55 (100)	153 (100)

$\chi^2 = 10.387$ with 2 df $p < 0.01$.

nificantly more likely to have impaired hearing ($p < 0.01$). There was no significant difference between the proportions of men and women who were deaf. As regards age, the very old were not only more likely to be deaf than the 'young old', but their deafness was also more severe ($p < 0.01$) (Table 4).

We found in 25 per cent (57) of the sample that wax was blocking both ears, but that the presence of wax was not significantly related to deafness.

Self-assessment of deafness

As we suspected, the prevalence we found using audiometry is substantially higher than that noted in previous studies where estimates were based only on self-assessment. However, our figures for self-estimate are broadly comparable with earlier self-assessment studies (Table 5).

Some variation in the earlier results must be expected, given the differing samples and the different ways in which the information was collected. It is worth noting that the studies which based their assessment on the interviewer's observation (Sheard, 1971; Williamson *et al.*, 1964) found equally low figures. This is not surprising, given that deafness may well be difficult to observe during conversation.

There are a number of possible reasons for the discrepancy we found between deafness assessed subjectively and by audiometry. A few respondents (14) thought they were deaf when, by the criterion of the study, they were not. The majority of these people either had a significant unilateral loss, or reported suffering from tinnitus, or both. In the former case, the lack of agreement was partly due to differing interpretations of the question 'Do you think you are at all deaf?' As regards tinnitus, it might be expected that there would be some degree of conceptual overlap between feeling oneself to be deaf and having other problems related to one's hearing. The peculiarly intrusive nature of tinnitus apparently causes it to act as a major confounding variable.

Apart from these instances, most of the discrepancy between estimates of prevalence based on audiometry and on volunteered information derives from the large proportion of deaf people who persist in denying their

Table 5. Estimates of percentage prevalence of deafness in the elderly population based on self-assessment.

Author	Date	Age in years					
		60+	65+	70+	75+	80+	85+
Sheldon	1948	F 29	M 38	—	—	—	M F 60 68
Wilkins	1948	—	—	—	M F 28 25	—	—
Harris	1962	—	M F 35 30	—	—	—	—
Kay <i>et al.</i>	1964	—	37	—	—	—	—
Richardson	1964	—	—	—	—	50	—
Townsend & Wedderburn	1965	—	30	—	—	—	—
Brockington & Lempert	1966	—	—	—	—	54	—
Goldberg	1970	—	—	31	—	—	—
Nottingham Social Services	1973	—	—	—	32	—	—
Milne	1976	39	—	44	—	53	—
Abrams	1978	—	—	—	36	—	—
Present study (self-estimate)	1980	—	—	38	39	54	69
Present study (based on audiometry)	1980	—	—	60	69	82	84

disability. Denial of deafness has been noted many times (Wilkins, 1948; Townsend and Wedderburn, 1965; Cooper, 1976), and is generally attributed to a reluctance to accept the stigma associated with the handicap and its connotations of stupidity and decrepitude. An analysis of the denial of deafness in persons of employment age is currently being carried out by Gilhorne Herbst and will be reported elsewhere.

Discussion

Using audiometry to establish the prevalence of hearing impairment in old people is not a prerequisite for estimating the likely demand for hearing aids. For this purpose, subjective responses to a question about deafness may well be adequate, since those who do not acknowledge difficulties, for whatever reason, are unlikely to request or accept deafness-specific services.

Prevalence of deafness in the elderly

An awareness of the real scale of the disability may well be of value in influencing the attitudes of general practitioners and other health professionals towards their elderly patients, in that it would alert them to the existence of hearing difficulty. It has been asserted by Klotz and Kilbane (1962) that "there is a much greater tendency to complain of hearing loss where none can be

demonstrated than to deny one that clearly exists" (page 280). The present study suggests, on the contrary, that if somebody complains of difficulty in hearing he or she is probably correct. Even if patients are not bilaterally impaired they may well have a unilateral loss or suffer from tinnitus. The problem lies rather in recognizing the existence of hearing problems where they are not spontaneously mentioned by the patient.

Practical steps

In the present study, 36 per cent of those who knew or suspected they might have a hearing loss had never mentioned this to a doctor, despite the fact, also noted by Beaver (1973), that many of them regularly saw their general practitioner about other chronic disorders. Beaver suggests that the failure to take active steps to seek help for hearing loss reflects a passive acceptance, by both patients and doctors, of hearing impairment as a normal part of ageing for which little can be done. It is therefore worth reporting the extent to which we found that encouragement and information can change the picture. In the present study, 44 respondents accepted the offer of referral to the Royal National Throat Nose and Ear Hospital for hearing aids, and 18 to the social worker for the deaf for other, environmental aids. Only three people in each of these groups had initially been in any doubt about being deaf. All the others were fully aware of their hearing difficulties and had mostly been so for some years, yet they had not previously considered doing anything about it. However, they were very eager for referral once it was suggested by the research team. It is worth noting that 19 of the 44 people referred for hearing aids were so frail or immobile that they needed home visits, so that the availability of a domiciliary service was clearly crucial to their chances of obtaining aids.

The proportion of deaf respondents who possessed hearing aids before the study was 22 per cent. Following the referrals, the number with aids was more than doubled to 50 per cent, or 30 per cent of the whole sample. The financial implications of meeting a demand of this scale generally are undoubtedly alarming, but the demand should by no means be regarded as excessive, given the prevalence of the disability. It might be pointed out that with regard to the other common sensory defect in old age—failing sight—97 per cent of the present sample possessed spectacles, and that this level of provision is generally taken for granted.

The usefulness of hearing aids

Pessimism about the capacity of elderly patients to benefit from hearing aids is certainly one reason for the general apathy about referral. However, while bearing in mind the general limitations of hearing aids, which apply at any age, the evidence of the present study suggests that the majority of the elderly who possess hearing aids do in fact find them useful. Our numbers

are small, and must therefore be treated with caution but, nonetheless, 69 per cent (23) of the respondents already possessing hearing aids said that their aid helped a lot. Forty-five per cent (15) said that they wore their hearing aid 'always' or 'often', and though this is not in itself a large proportion, it is apparently no smaller than among the hearing-impaired of working age. The proportion of the latter wearing their aids 'always' or 'often' in a study of adults of working age who possessed NHS aids was 48 per cent (Thomas and Gilhorne Herbst, 1980). In so far as frequency of usage may be taken as an indicator of value, then the likelihood of the elderly with impaired hearing benefiting from hearing aids certainly seems comparable to that of younger people.

Conclusions

The findings of this study challenge conventional assumptions about the prevalence of hearing impairment in old age. These assumptions have led to a serious underestimate of the scale of the disorder. The 1977 report of the sub-committee appointed by the Department of Health and Social Security to consider services for hearing impaired people, is typical where it comments, in paragraph 80, that "The incidence of hearing impairment rises steeply with age and is *probably as high as 30 per cent* in the over 80s" (DHSS, 1977) (emphasis added). However, our study suggests that impaired hearing is in fact usual, not only for the over 80s but for those in their 70s as well. We believe that the incidence of impairment uncovered in this study gives cause for concern and that it should be given due consideration in the allocation of resources and in the practice of health professionals.

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Total coronary occlusion in transmural myocardial infarction

Three hundred and twenty-two patients (80 per cent of them men), admitted within 24 hours of having a transmural myocardial infarction, underwent coronary arteriography. Eighty-seven per cent of the 126 who were studied four hours after infarction had one totally blocked coronary artery; 65 per cent of 57 had a blocked artery at 12 to 24 hours after. Two patients did not survive the procedure. Since total occlusion is so often found in the early stages, coronary spasm or thrombus formation with subsequent recanalization, or both, may be important in the evolution of infarction.

Source: DeWood, M. A., Spores, J., Notske, R., et al. (1980). *New England Journal of Medicine*, **303**, 897-902.