Socioeconomic Inequalities and Hearing Health: Findings from the English Longitudinal Study of Ageing (ELSA)

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Aim

- Hearing loss (HL) is associated with negative physical, social, cognitive, economic and emotional consequences and its prevention requires understanding of its risk factors.
- Aim was to examine whether socioeconomic position (SEP) is associated with HL among older adults in England using a sample of n=8,529 participants, aged 50-89, from the seventh wave of the English Longitudinal Study of Ageing (ELSA).
- The ELSA is a longitudinal household survey dataset, of a representative sample of people aged 50 and older in England. It is the first study of its type globally to contain a broad array of biomarkers and information on the health, social, wellbeing and economic circumstances. It therefore offers reliable evidence to detect differences in hearing health among different subgroups, according to socioeconomic position (SEP).

Methods

Participants

The present study used data from the English Longitudinal Study of Aging (ELSA), wave 7, which collected between June 2014 and May 2015.

In wave 7, information was collected form 9,666 participants (8,249 core sample members). For the purposes of this study, the final analytical sample was n=8,529 participants, that were aged 50-89, gave their consent to have their hearing acuity measured by a screening audiometry device and did not have any ear infection.

Hearing Test

A handheld audiometric screening device (HearCheck) was used for the objective measurement of hearing acuity. This is a hearing screening test by Siemens, that tests for audibility of pure tone beeps, according to the number of tones that the respondent can hear for each sequence (at 1.0 kHz and 3.0 k Hz), per each ear [1]. The functional test sequence begins with a series of three sounds, that have decreasing volume at 1.0 kHz (55 dBHL, 34 dBHL, 20 dBHL) and afterwards another three sounds with decreasing volume at 3.0 kHz (75 dBHL, 55 dBHL, 35 dBHL).

Indicators of Socioeconomic Position

Markers of SEP [2] were the net household income, the net financial wealth quintiles, the self-reported occupation (managerial and professional; intermediate; routine and manual occupations) and the educational status (degree/higher education; A level; O levels CSE; foreign/other; no qualifications). Using multivariate logistic regression modelling, we evaluated the regression coefficients of HL, after adjustment for a wide range of confounders, such as gender, age, marital status, retirement status and non-medical determinants of health (body mass index, tobacco consumption, alcohol consumption and physical activity). Data were analysed using STATA/MP v.14.

Outcome

Hearing loss was defined as >35dB HL at 3.0 kHz, in the better-hearing ear. This is the level where intervention for hearing loss have been shown in the literature as definite beneficial [1]. Those with hearing loss were further subdivided into two categories, depending the number of tones heard at 3.0 kHz. Thus, we further explored potential differences in the association between SEP indicators and HL, according to the severity of HL, as measured by HearCheck (Table 1).

Moderate hearing loss	Moderate severe or severe hearing loss
Tones heard at **75 dBHL** and **55 dBHL** but not at **35 dBHL** (the first 2 of the three tones at 3.0 kHz heard)	Tone heard or not at **75 dBHL** and tones not heard at **55 dBHL** and **35 dBHL** (0 or 1 of the three tones at 3.0 kHz heard).

Table 1. The categorisation of those with hearing loss as measured by HearCheck

Results

Table 2 shows the results of multivariate logistic regression analysis with hearing loss >35dB HL at 3.0kHz as dependent variable and SEP indicators as independent variables. The Model B was adjusted only for age while the Model C was adjusted for age, marital status, retirement status, body mass index, tobacco consumption, alcohol consumption and physical activity. The adjusted regression coefficients of HL were largely increased for those with no qualifications, those in the lowest income and those in the lowest wealth quintile. The adjusted regression coefficients of HL were largely decreased for those in managerial and professional occupations versus those in routine and manual occupations.

Independent variable	b0 coefficient*
Education	-0.20 (-0.24 to -0.17)
Occupation (NS-SEC)	0.19 (0.13 to 0.26)
Net Household Income	-0.21 (-0.24 to -0.17)
Net Financial Wealth	-0.13 (-0.16 to -0.09)
Independent variable	**b1 coefficient****
Education	-0.11 (-0.15 to -0.08)
Occupation (NS-SEC)	0.24 (0.16 to 0.31)
Net Household Income	-0.11 (-0.15 to 0.06)
Net Financial Wealth	-0.14 (-0.19 to -0.10)
Independent variable	**b2 coefficient*****
Education	-0.14 (-0.19 to -0.08)
Occupation (NS-SEC)	0.16 (0.06 to 0.26)
Net Household Income	-0.07 (-0.34 to 0.19)
Net Financial Wealth	-0.10 (-0.14 to -0.06)

** Unadjusted regression coefficient*
*** Regression coefficient adjusted for age*
**** Regression coefficient adjusted for age, marital status, retirement status, Body Mass Index (BMI), tobacco consumption, alcohol consumption, physical activity*

Table 2. Multivariate logistic regression coefficient of n=8,529, aged 50-89 with hearing loss>35 dB HL t 3.0kHz or not as dependent variable and SEP indicators as independent variables

The non-medical determinants of health attenuated the log odds ratios that explain the association between HL with education, occupation, income and wealth in percentages of 27.3%, 33.3%, 36.4% and 28.6%, respectively (Table 2). This showed that the age was not the only and most important risk factor for HL in older adults.

In addition, the Hosmer-Lemeshow test showed goodness-of-fit of logistic regression models and the area under the ROC curve (AUC) showed diagnostic/predictive accuracy of hearing loss >35dB HL at 3.0kHz for the models of education, occupation, income and wealth in percentages of 78%, 76%, 77% and 68%, respectively.

Discussion

These results confirmed that modifiable lifestyle factors (the non-medical determinants of health) are patterns that are involved in the multiple simultaneously pathways of the association between socioeconomic position and hearing loss [1, 3]. People in a lower socioeconomic position may struggling with life conditions that may make them adopt health-damaging behaviours and to avoid health-protecting ones. That may be explained via the "social causation" hypothesis which suggests that social gradients in health are related to the differences in resources, support, knowledge and behaviour. Redressing hearing health inequalities requires attention to the fundamental drivers of social inequality, which determine education, occupation, income and daily living.

Summary

- This study provides evidence that there is a number of modifiable factors in the aetiology of hearing loss, thus a substantial proportion could be prevented or delayed.
- SEP was strongly associated with the likelihood of HL in older adults, with the higher levels of education, income and wealth being protective factors for HL, and the manual occupations increase the likelihood of HL.
- Several lifestyle factors may attenuate the relationship between SEP and HL, thus age may not be the most important factor for "age-related hearing loss".

References

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