ARTICLE

Socio-demographic characteristics, lifestyle factors and burden of morbidity associated with self-reported hearing and vision impairments in older British community-dwelling men: a cross-sectional study

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Abstract
Background: Hearing and vision problems are common in older adults. We investigated the association of self-reported sensory impairment with lifestyle factors, chronic conditions, physical functioning, quality of life and social interaction.

Methods: A population-based cross-sectional study of participants of the British Regional Heart Study aged 63-85 years.

Results: 3981 men (82% response rate) provided data. 27% (n=1074) reported hearing impairment including being able to hear with aid (n=482), being unable to hear (no aid) (n=424) and being unable to hear despite aid (n=168). 3% (n=124) reported vision impairment. Not being able to hear, irrespective of use of hearing aid, was associated with poor quality of life, poor social interaction and poor physical functioning. Men who could not hear despite hearing aid were more likely to report coronary heart disease (CHD) [age-adjusted odds ratios (OR) 1.89 (95%CI 1.36-2.63)]. Vision impairment was associated with symptoms of CHD including breathlessness [OR 2.06 (1.38-3.06)] and chest pain [OR 1.58 (1.07-2.35)]. Vision impairment was also associated with poor quality of life, poor social interaction and poor physical functioning.

Conclusions: Sensory impairment is associated with poor physical functioning, poor health and poor social interaction in older men. Further research is warranted on pathways underlying these associations.

Keywords: sensory impairments, hearing, vision, older adults, ageing

Background
Sensory impairment is a growing concern among older adults,[1] who form a rising proportion

of the population.[2] Hearing and vision impairments are common chronic conditions in old age.[3-5] It is estimated that 2.7 million people in Great Britain aged over 60 have a hearing impairment[6] and around 2 million people aged 65 years and over in the United Kingdom (UK) have a visual impairment.[7] The number of Britons aged 60 years and over is likely to increase from 14 million in 2011[2] to nearly 30 million by 2032[8] making age-related sensory impairment an increasingly important public health issue. There is however relatively little population-based research on the associations of these impairments and socio-demographic characteristics, physical functioning, quality of life and the overall burden of other health conditions including cardiovascular health problems in community-dwelling older adults. Also, few of these studies have been undertaken in the UK. Further investigations of the impact and contribution of sensory impairment to ill-health in older adults are needed both to assess the scope of the problem and to identify modifiable lifestyle factors associated with sensory impairment as potential targets for prevention. We therefore set out to examine the associations of self-reported vision and hearing impairments with socio-demographic factors and a range of health conditions in a population-based study of older British men drawn from general practices in 24 towns throughout the UK.

Methods

The British Regional Heart Study is a prospective study of cardiovascular disease and other outcomes in a socioeconomically and geographically representative sample of 7735 men aged 40-59 years from 24 towns in Great Britain who were first examined in 1978-80.[9] Ethical approval was provided by all relevant local research ethics committees. All participants provided written, informed consent in accordance with the Declaration of Helsinki.

In 2003, a postal questionnaire was sent out to all surviving participants. This paper is restricted to the 3981 men who completed the questionnaire.

Hearing impairment

The questions on hearing impairment included “Do you use a hearing aid?” and “Using a hearing aid if needed, is your hearing good enough to follow a TV programme at a volume others find acceptable?”.[10] Based on these questions, participants were divided into four groups: could follow TV and no hearing aid (could hear, no hearing impairment), could follow TV and used a hearing aid (could hear, used aid), could not follow TV and did not use a hearing aid (could not hear and no aid), and could not follow TV and used a hearing aid (could not hear despite aid). Overall hearing impairment prevalence was based on the number of participants who could hear with aid, could not hear and no aid, and could not hear despite aid (three groups of hearing impairment). Prevalence of overall hearing aid use was based on the total number of participants reporting they used a hearing aid.

Vision impairment

Vision impairment was based on the question “Using glasses or corrective lenses if needed, can you see well enough to recognise a friend at a distance of 12 feet/4 yards (across a road)?”.[11] This was used to group participants into those with vision impairment (poor vision) and without vision impairment respectively.

Lifestyle and socio-demographic factors

The men were asked whether they currently smoke cigarettes, have been a cigarette smoker in the past or never smoked. On the basis of frequency and type of activity a physical activity score was derived for each man and the men were grouped into 6 broad categories: none, occasional, light, moderate, moderately-vigorous and vigorous.[12] None or occasional activity was classified as ‘inactive’. Obesity was defined as a body mass index (BMI) of 30 kg/m^2 and over.[13] .The longest-held occupation of subjects at study entry (age 40-59 years) was used to define social class using the Registrar Generals’ Social Class Classification which allowed them to be grouped as non-manual and manual social classes.

Chronic conditions and physical functioning

Chronic conditions – participants were asked whether a doctor had ever told them that they had coronary heart disease (angina or myocardial infarction), stroke, arthritis, bronchitis, depression and diabetes. The men were also asked whether they had breathlessness or chest pain.

Falls – the number of self-reported falls in the past 12 months, analysed dichotomously (at least one fall vs no falls).

Disability – participants who reported difficulty doing any of the following activities on their own were described as having disability: taking the stairs, bending down, straightening up, keeping balance, going out of the house, and walk 400 yards. Walking mobility limitation was defined as reporting problems taking the stairs, going out of the house or walking 400 yards. The Katz Activities of Daily Living Index (ADL)[14] assesses difficulties undertaking bathing, dressing, eating, getting in or out of bed or chair, toileting, and/or walking across a room. The Lawton Instrumental ADL scale (IADL)[15] includes problems undertaking cooking, shopping, using public transport, managing money, and/or using the telephone. Reporting difficulty undertaking one or more activities in the ADL index and the IADL scale was defined as having ADL difficulty and IADL difficulty respectively.

Quality of life and social interaction

Quality of life – the following questions from the EuroQol-5D[16] were asked to assess quality of life and analysed individually: experiencing pain and/or discomfort, having mobility problems and experiencing anxiety and/or depression. Reporting moderate or extreme problems for each of these questions was classified as poor quality of life.

Social interaction – social interaction consisted of two aspects; social engagement and social isolation. A social engagement scale[17] with 'yes' and 'no' responses to participation in nine activities was used to assess social engagement. Participants were asked if they undertake any of the following activities on a weekly basis: voluntary work, go to the pub or a club, attend religious services, play cards or games, visit the cinema, restaurants or sports events, attend a class or course of study, and, if they sometimes go on day or overnight trips and if they have been on a holiday in the last year. Doing three or fewer activities was classified as low social engagement. Being socially isolated was classified as reporting the present state of health causing problems socialising and/or causing problems taking part in interests and hobbies.

Statistical analyses

Logistic regression models were used to assess relationships of visual impairment and hearing impairment with lifestyle factors, comorbidity, falls, physical functioning, quality of life and social interaction. Reference categories were no hearing impairment and no vision impairment, respectively. The regression models provided odds ratio (OR) with 95% confidence interval (CI) and were adjusted for the potential confounders age, social class, obesity, smoking and physical activity. For the adjustment, age was entered as a continuous variable. Social class (six levels), BMI (three levels), smoking (three levels) and physical activity (six levels) were entered as categorical variables. Analysis of combined hearing and vision impairment was not possible because of the small number reporting both impairments (N=57). In addition to logistic regression, log-binomial regression was carried out as a sensitivity analysis to test if the statistically significant associations in the log regression remained using log-binomial regression. Prevalence ratios (PR) with 95% CIs were obtained for variables that were prevalent in at least 10% of the sample and were statistically significant in the logistic regression model. The same confounders were adjusted for in both regression models. The logistic regression model is regarded to be more numerically stable than log-binomial regression.[18] Therefore we have presented the findings of the logistic

regression only. Participants not answering any of the hearing-related questions (N=38) and/or the question on vision (N=57) were regarded as missing. All statistical analyses were performed using SAS 9.3 software (SAS Institute, Inc., Cary, North Carolina).

Results

A total of 3981 men (response rate 82%) with a mean age of 72 years (range: 63-85) completed the questionnaire. The prevalence of overall hearing impairment and vision impairment were 27% (n=1074) and 3% (n=124) respectively. Prevalence of hearing impairment and vision impairment by age is presented in Table 1. The prevalence of overall hearing impairment and use of hearing aid increased with increasing age. However, there was no difference by age in the proportion of men who both could not hear and did not use a hearing aid. Vision impairment was more common in those aged ≥80 years (4%) than in men aged <70 (2%).

Table 2 shows the prevalence and associations for hearing impairment. All three groups of hearing impairment were more likely to be of manual social class compared to those with no hearing problem. Compared to men who could hear (no hearing impairment), those who could not hear, irrespective of use of an aid, were more likely to be obese. These associations remained even after adjusting for social class, physical activity and smoking. Men who could not hear despite using a hearing aid also reported increased odds of being physically inactive compared to men without hearing problem [OR 1.83 (1.32-2.52)]. Men who could hear with a hearing aid were not more likely to be physically inactive, current smokers and obese compared to men reporting no hearing problem. Smoking was not associated with any of the hearing impairment groups.

Compared to those who could hear, men who could not hear, irrespective of use of a hearing aid, were more likely to report fair/poor health with the highest odds in men who could not hear despite using an aid [OR 2.41 (1.75-3.31)]. Self-reported doctor-diagnosed CHD was associated with men who could not hear despite using a hearing aid [OR 1.89 (1.36-2.63)]. CHD risk factors including breathlessness and chest pain were associated with not being able to hear, irrespective of use of hearing aid. The strongest associations of CHD risk factors were seen in men not being able to hear despite aid being twice as likely to report breathlessness [OR 2.51 (1.78-3.54)], chest pain [OR 2.22 (1.60-3.10)] and having had a stroke [OR 2.08 (1.33-3.26)] compared to men reporting no hearing problem. All three groups of hearing impairment were further associated with arthritis and bronchitis. Diabetes was not associated with hearing impairment.

Only the group of men who could not hear despite using a hearing aid were more likely to report falls than those with no hearing problem [OR 1.62 (1.05-2.48)]. Disability was associated with all three groups of hearing impairment. Activities of daily living (ADL) and instrumental ADL (IADL) were associated with not being able to hear with the strongest association of IADL difficulty seen in men who used a hearing aid and could not hear [OR 4.66 (3.33-6.53)]. Men who could not hear had significantly higher odds of reporting pain/discomfort, mobility problems and anxiety/depression with the highest prevalence observed in men who could not hear despite a hearing aid (pain/discomfort [OR 2.68 (1.92-3.75)]; mobility problems [OR 2.65 (1.93-3.64)]; anxiety/depression [OR 1.79 (1.24-2.59)]. Those who could not hear, irrespective of use of hearing aid, were associated with low social engagement. However, this was attenuated on adjustment for social class, BMI, smoking and physical activity. All three groups of hearing impairment were further associated with a greater risk of being socially isolated with over 3 fold increased odds in men who used a hearing aid and could not hear [OR 3.29 (2.38-4.54)].

Table 3 shows the prevalence and associations for vision impairment. Men who reported vision impairment were more likely to be from manual class [OR 1.89 (1.30-2.75)] however the association did not remain after further adjustments. Vision impairment was significantly

associated with men who reported being physically inactive compared to those without vision impairment even after adjusting for social class, BMI and smoking. Smoking and obesity were not associated with poor vision.

Vision impairment was strongly associated with fair/poor self-reported health compared to those who could see [OR 2.61 (1.81-3.76)]. Poor vision was also associated with breathlessness [OR 2.06 (1.38-3.06)] and chest pain [OR 1.58 (1.07- 2.35)]. Indicators of low physical functioning associated with poor vision included falls [OR 1.82 (1.14-2.90)], disability [OR 1.90 (1.32-2.73)] walking mobility [OR 1.91 (1.31-2.78)], difficulties with balance [OR 3.17 (2.12-4.75)], ADL [OR 1.06 (1.04-1.07)] and, particularly, IADL [OR 3.68 (2.49-5.44)] compared to reporting no vision impairment. Vision impairment was also associated with mobility problems [OR 1.87 (1.30-2.70)], anxiety/depression [OR 1.66 (1.09-2.53)], low social engagement [OR 2.05 (1.40-3.00)] and being socially isolated [OR 2.60 (1.80-3.77)] compared to those with no vision impairment.

For variables that were prevalent in more than 10% of the study we carried out a sensitivity statistical analysis using log-binomial regression. The analysis showed that the findings remained statistically significant for the log-binomial model.

Discussion

Main findings of this study

This study examined the associations of hearing impairment and vision impairment with socio-demographic, lifestyle factors and health conditions in a cross-sectional study of a cohort of British men aged 63-85 years. Overall our findings show that not being able to hear, irrespective of use of hearing aid, and having poor vision are associated with reporting poor physical functioning, poor quality of life, poor social interaction and being from manual social class. Not being able to hear, irrespective of hearing aid, is further associated with an increased risk of chronic conditions and obesity.

What is already known on this topic?

Age-related hearing impairment has been associated with chronic conditions such as cardiovascular disease (CVD),[19, 20] however, these findings are inconsistent with other research demonstrating no association.[4, 21] Hearing impairment has also been associated with social isolation,[22] alcohol consumption[21] and smoking,[1, 4] although again this is not consistent.[4, 23, 24] There is also evidence that hearing impairment is associated with poor physical functioning (difficulty in performing activities of daily living (ADL) and instrumental ADL (IADL)) [23] and reduced quality of life.[25] Similarly, visual impairment in older adults has also been associated with CVD,[11] with vision impaired older adults being twice as likely to report CVD as those not having vision problems.[19] Age-related vision impairment has also been associated with diabetes[19] and smoking.[26, 27] Previous studies have also shown associations between vision impairment and both ADL and IADL difficulties,[28-30] falls,[11, 31] reduced quality of life[22, 25] and social problems.[19, 29]

What this study adds

The study findings add to the current literature on sensory impairment in several ways. First, we have investigated a range of factors including socio-demographic and lifestyle characteristics, overall burden of cardiovascular health problems and physical functioning in relation to sensory impairment providing a comprehensive picture of sensory impaired older adults. By exploring a range of factors our findings build on earlier studies and provide further insight to the problems associated with sensory impairments. For example, we explored some relationships few previous studies have investigated including the association between sensory impairments and obesity in old age. Our findings show that not being able to hear, irrespective of use of a hearing aid, was associated with obesity. The positive relation between hearing impairment and obesity observed in our study could be mediated by inflammation, which has previously been associated with both obesity[32] and hearing

impairment.[33] Similarly, all three groups of hearing impairment were associated with arthritis and bronchitis. Arthritis has previously been associated with hearing impairment[19, 28] suggesting the association could be explained by underlying pathological factors including inflammatory markers. Second, we have explored the impact of hearing aids, including the ability to hear with or without a hearing aid. Finally, this is one of few population-based studies examining sensory impairments in community-dwelling older adults >60 years in the UK.

Limitations of this study

The study's major strength is that it is a large representative cohort study of older men in Britain with a high response rate making the findings largely generalizable to older British men.

This study also has some limitations. First, since the study is cross-sectional we do not know the directionality of the associations observed and causality cannot be established from our findings. Second, the study was restricted to men, predominantly of white British ethnic origin, and generalisation of findings to women and non-white ethnic groups may be limited. Previous studies have demonstrated that men have a greater risk of hearing impairment compared to women,[4, 23] which potentially could be explained by greater occupational noise exposure in men.[21] Third, self-reported hearing and vision impairment rather than objective measures were used. Nevertheless, self-reported hearing impairment referring to television volume has been validated demonstrating an association between increased television volume and objectively measured hearing impairment.[10] Self-reported hearing impairment is also useful when examining quality of life since psychosocial aspects cannot be predicted effectively from objectively assessed hearing alone.[34] Self-reported vision impairment has also been validated and found to be comparable to objectively measured vision acuity.[11] It is likely that the single question used to assess vision impairment in our study has captured a limited group of participants with more severe vision impairment. The question could also have captured problems of recognition as vision impairment has been associated with poor cognitive function.[35] Finally, other aspects of hearing and vision impairment such as associated symptoms e.g. tinnitus, the underlying causes of the impairments, and the chronicity of the impairments were not examined.

Conclusions and implications of findings

In summary, our study demonstrates that older men who cannot hear and older men with poor vision have a high risk of ill-health, poor physical functioning and poor social interaction. Our findings suggest that sensory impairments need to be addressed in public health policies for older adults, in particular the burden of poor physical and social function in older adults with sensory impairments. Policies on hearing and vision impairment also need to focus more on the poor physical and social aspects associated with sensory impairments in older age.[36, 37] Sensory impaired older adults could further be targeted through interventions that involve local organisations helping older adults leading active and social lives.[38]

Future longitudinal studies are needed to confirm the causality and understand pathways underlying associations between sensory impairment and chronic conditions such as CHD and poor physical functioning including frailty. Longitudinal studies should also investigate whether the observed associations of not being able to hear with obesity, arthritis and bronchitis, respectively, could be explained by inflammatory markers.

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Conflict of interest
The authors declare that they have no competing interests.

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Author contributions
GW, SR, KW and LC conceived the study. LL prepared the data and OP developed the statistical model. AL did the statistical analysis with input from OP. AL wrote the paper with input from GW and SR. AL, GW, PW and SR provided input to the interpretation of the results, and KW, SI and LC critically revised the paper. All authors approved the final submitted version.

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Table 1. Prevalence of hearing impairment and vision impairment N (%) by age in a cross-sectional study of 3981 British men aged 63-85 years

	Age in years <70	≥70>75	≥75>80	≥80	Total
	1620 (41)	1123 (28)	814 (20)	424 (11)	3981 (100)
Hearing impairment					
Can hear	1277 (80)	822 (74)	502 (63)	250 (60)	2851 (73)
Can hear, use aid	114 (7)	117 (11)	158 (20)	93 (23)	482 (12)
Cannot hear, no aid	171 (11)	121 (11)	91 (11)	41 (10)	424 (11)
Cannot hear despite aid	44 (3)	45 (4)	49 (6)	30 (7)	168 (4)
Overall hearing impairment	329 (21)	283 (26)	298 (37)	164 (40)	1074 (27)
Overall use of hearing aid	158 (10)	162 (14)	207 (25)	123 (29)	650 (16)
Vision impairment					
Can see	1565 (98)	1071 (97)	764 (95)	400 (96)	3800 (97)
Poor vision	38 (2)	32 (3)	39 (5)	15 (4)	124 (3)

Table 2. Prevalence and associations for hearing impairment in a cross-sectional study of 3981 British men aged 63-85 years

	Could hear		Could hear, used aid			Could not hear, no aid			Could not hear, used aid		
				Age-adjusted	Adjusted		Age-adjusted	Adjusted		Age-adjusted	Adjusted
Social class	N (%)	OR	N (%)	OR (95% CI)	OR (95% CI)	N (%)	OR (95% CI)	OR (95% CI)	N (%)	OR (95% CI)	OR (95% CI)
Manual social class	1317 (48)	1.00	245 (53)	1.26 (1.03-1.54)	1.20 (0.97-1.48)	263 (63)	1.90 (1.54-2.36)	1.73 (1.38-2.18)	98 (60)	1.72 (1.24-2.38)	1.60 (1.14-2.26)
Lifestyle factors											
Physical inactivity	971 (36)	1.00	196 (44)	1.19 (0.97-1.47)	1.24 (0.99-1.54)	157 (41)	1.21 (0.97-1.51)	1.13 (0.90-1.42)	87 (54)	1.83 (1.32-2.52)	1.69 (1.20-2.37)
Current smoker	284 (10)	1.00	33 (7)	0.72 (0.49-1.05)	0.64 (0.42-0.98)	54 (13)	1.34 (0.98-1.83)	1.32 (0.94-1.87)	15 (9)	0.95 (0.55-1.64)	0.93 (0.53-1.65)
Never smoked	870 (31)	1.00	131 (27)	0.97 (0.77-1.20)	1.00 (0.79-1.27)	123 (29)	0.95 (0.76-1.19)	1.13 (0.88-1.44)	37 (22)	0.71 (0.49-1.04)	0.78 (0.51-1.17)
Obese (BMI ≥ 30)	445 (16)	1.00	61 (13)	0.94 (0.70-1.26)	0.87 (0.63-1.19)	85 (21)	1.41 (1.09-1.83)	1.38 (1.04-1.83)	42 (26)	2.12 (1.46-3.08)	1.83 (1.23-2.72)
Overall health											
Fair/poor health	731 (26)	1.00	132 (28)	0.99 (0.79-1.24)	0.91 (0.70-1.18)	152 (37)	1.63 (1.31-2.02)	1.56 (1.21-2.01)	80 (48)	2.41 (1.75-3.31)	1.90 (1.31-2.75)
Chronic conditions											
CHD	611 (21)	1.00	113 (23)	0.99 (0.79-1.26)	0.98 (0.77-1.26)	91 (21)	0.98 (0.76-1.26)	0.91 (0.69-1.20)	61 (36)	1.89 (1.36-2.63)	1.68 (1.18-2.39)
Breathlessness	418 (15)	1.00	93 (19)	1.21 (0.93-1.55)	1.13 (0.85-1.52)	88 (21)	1.49 (1.15-1.93)	1.24 (0.92-1.69)	55 (33)	2.51 (1.78-3.54)	1.87 (1.26-2.77)
Chest pain	553 (19)	1.00	106 (22)	1.12 (0.88-1.43)	1.14 (0.88-1.47)	107 (25)	1.39 (1.10-1.77)	1.35 (1.04-1.76)	60 (36)	2.22 (1.60-3.10)	1.91 (1.34-2.73)
Stroke	196 (7)	1.00	60 (12)	1.56 (1.15-2.16)	1.32 (0.92-1.88)	34 (8)	1.14 (0.78-1.67)	1.17 (0.77-1.77)	26 (15)	2.08 (1.33-3.26)	1.81 (1.11-2.94)
Arthritis	880 (31)	1.00	200 (41)	1.47 (1.20-1.79)	1.43 (1.15-1.78)	162 (38)	1.37 (1.11-1.69)	1.41 (1.12-1.78)	74 (44)	1.64 (1.20-2.26)	1.35 (0.96-1.91)
Bronchitis	340 (12)	1.00	75 (16)	1.34 (1.02-1.77)	1.36 (1.01-1.83)	71 (17)	1.48 (1.12-1.96)	1.45 (1.07-1.97)	32 (19)	1.72 (1.15-2.57)	1.75 (1.15-2.66)
Depression	220 (8)	1.00	39 (8)	1.26 (0.87-1.81)	1.12 (0.75-1.68)	41 (10)	1.32 (0.93-1.88)	1.47 (1.01-2.13)	17 (10)	1.58 (0.93-2.67)	1.33 (0.74-2.38)
Diabetes	281 (10)	1.00	45 (9)	0.96 (0.68-1.34)	0.92 (0.64-1.34)	41 (9)	0.98 (0.70-1.39)	0.90 (0.61-1.32)	19 (11)	1.18 (0.72-1.94)	0.92 (0.53-1.59)
Physical functioning											
Fall in past 12 months	280 (10)	1.00	68 (14)	1.31 (0.98-1.75)	1.28 (0.92-1.76)	49 (12)	1.17 (0.85-1.62)	1.15 (0.80-1.66)	28 (17)	1.62 (1.05-2.48)	1.48 (0.93-2.37)
Disability	774 (27)	1.00	169 (35)	1.25 (1.02-1.54)	1.21 (0.95-1.55)	164 (39)	1.66 (1.34-2.06)	1.66 (1.29-2.13)	74 (44)	1.87 (1.36-2.57)	1.34 (0.92-1.94)
Walking mobility	565 (20)	1.00	123 (26)	1.19 (0.94-1.49)	1.15 (0.88-1.51)	122 (29)	1.60 (1.27-2.02)	1.58 (1.20-2.09)	62 (37)	2.08 (1.49-2.89)	1.54 (1.04-2.27)
Balance difficulty	292 (10)	1.00	73 (15)	1.23 (0.93-1.63)	1.14 (0.83-1.58)	66 (16)	1.56 (1.16-2.09)	1.33 (0.94-1.88)	36 (21)	1.95 (1.31-2.90)	1.65 (1.07-2.55)
ADL difficulty	392 (14)	1.00	84 (18)	1.16 (0.89-1.51)	1.17 (0.86-1.58)	92 (22)	1.70 (1.31-2.19)	1.56 (1.16-2.11)	52 (32)	2.48 (1.75-3.52)	1.88 (1.26-2.82)
IADL difficulty	326 (12)	1.00	77 (17)	1.25 (0.95-1.65)	1.18 (0.86-1.63)	81 (19)	1.77 (1.35-2.32)	1.71 (1.24-2.35)	68 (41)	4.66 (3.33-6.53)	4.25 (2.84-6.34)
Quality of life											
Pain/discomfort	1265 (44)	1.00	232 (48)	1.18 (0.97-1.44)	1.18 (0.95-1.47)	230 (54)	1.49 (1.21-1.83)	1.49 (1.19-1.87)	114 (68)	2.68 (1.92-3.75)	2.46 (1.71-3.55)
Mobility problem	711 (25)	1.00	145 (30)	1.14 (0.92-1.42)	1.14 (0.89-1.47)	149 (35)	1.60 (1.29-1.99)	1.53 (1.18-1.98)	83 (49)	2.65 (1.93-3.64)	2.10 (1.45-3.04)
Anxiety/depression	449 (16)	1.00	72 (15)	0.98 (0.74-1.29)	0.97 (0.72-1.30)	84 (20)	1.33 (1.03-1.73)	1.38 (1.04-1.84)	41 (24)	1.79 (1.24-2.59)	1.47 (0.98-2.21)

Social interaction												
Low engagement	663 (24)	1.00	134 (28)	1.10 (0.88-1.38)	0.94 (0.73-1.21)	122 (29)	1.31 (1.04-1.65)	1.15 (0.89-1.48)	47 (29)	1.15 (1.03-1.06)	1.03 (0.70-1.50)	
Social isolation	504 (18)	1.00	113 (23)	1.33 (1.05-1.68)	1.38 (1.06-1.80)	98 (23)	1.38 (1.08-1.77)	1.33 (1.00-1.76)	72 (43)	3.29 (2.38-4.54)	2.48 (1.71-3.60)	

Table 3. Prevalence and associations for vision impairment in a cross-sectional study of 3981 British men aged 63-85 years

	Could see		Poor vision		
				Age-adjusted	Adjusted
Social class	N (%)	OR	N (%)	OR (95% CI)	OR (95% CI)
Manual social class	1840 (50)	1.00	80 (65)	1.89 (1.30-2.75)	1.49 (0.99-2.23)
Lifestyle factors					
Physical inactivity	1368 (38)	1.00	53 (50)	1.52 (1.03-2.25)	1.52 (1.01-2.28)
Current smoker	366 (10)	1.00	18 (15)	1.65 (0.99-2.75)	1.36 (0.75-2.45)
Never smoked	1124 (30)	1.00	34 (27)	0.94 (0.63-1.40)	1.18 (0.76-1.84)
Obese (BMI ≥ 30)	619 (17)	1.00	16 (13)	0.83 (0.48-1.42)	0.79 (0.44-1.41)
Overall health					
Fair/poor health	1038 (28)	1.00	61 (51)	2.61 (1.81-3.76)	2.09 (1.35-3.25)
Chronic conditions					
CHD	840 (22)	1.00	37 (30)	1.39 (0.93-2.07)	1.26 (0.81-1.97)
Breathlessness	620 (16)	1.00	37 (30)	2.06 (1.38-3.06)	1.53 (0.94-2.50)
Chest pain	791 (21)	1.00	37 (30)	1.58 (1.07-2.35)	1.30 (0.83-2.04)
Stroke	304 (8)	1.00	16 (13)	1.56 (0.91-2.68)	1.52 (0.84-2.76)
Arthritis	1271 (33)	1.00	47 (38)	1.17 (0.81-1.69)	0.96 (0.63-1.46)
Bronchitis	501 (13)	1.00	18 (15)	1.10 (0.66-1.84)	0.88 (0.48-1.59)
Depression	301 (8)	1.00	15 (12)	1.72 (0.99-3.00)	1.63 (0.87-3.05)
Diabetes	367 (10)	1.00	17 (14)	1.49 (0.89-2.52)	1.41 (0.77-2.57)
Physical functioning					
Fall in past 12 months	401 (11)	1.00	23 (19)	1.82 (1.14-2.90)	1.47 (0.84-2.57)
Disability	1131 (30)	1.00	57 (46)	1.90 (1.32-2.73)	1.38 (0.88-2.16)
Walking mobility	834 (22)	1.00	45 (36)	1.91 (1.31-2.78)	1.38 (0.86-2.23)
Balance difficulty	436 (11)	1.00	38 (31)	3.17 (2.12-4.75)	2.52 (1.54-4.12)
ADL difficulty	592 (16)	1.00	36 (31)	1.06 (1.04-1.07)	1.80 (1.10-2.96)
IADL difficulty	518 (14)	1.00	45 (39)	3.68 (2.49-5.44)	3.63 (2.21-5.96)
Quality of life					
Pain and discomfort	1784 (47)	1.00	61 (49)	1.09 (0.76-1.56)	0.98 (0.65-1.46)
Mobility problem	1044 (27)	1.00	53 (43)	1.87 (1.30-2.70)	1.44 (0.92-2.26)
Anxiety or depression	620 (16)	1.00	30 (24)	1.66 (1.09-2.53)	1.66 (1.04-2.64)
Social interaction					
Low engagement	918 (24)	1.00	48 (41)	2.05 (1.40-3.00)	1.77 (1.15-2.73)
Social isolation	742 (20)	1.00	49 (40)	2.60 (1.80-3.77)	2.64 (1.70-4.09)