# Perceived discrimination, visual impairment and emotional wellbeing in older adults: a prospective cohort study

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**Key words:** discrimination; visual impairment; eyesight; depression; wellbeing; prospective cohort study

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## Key points

**Question:** How prevalent is perceived discrimination among older people with visual impairment, and to what extent does it affect emotional wellbeing?

**Findings:** In this longitudinal study of 7,677 older adults (≥50y), 52.1% of those with poor eyesight reported discrimination vs. 43.8% of those with good eyesight. People with poor eyesight reporting discrimination were more likely to be depressed, lonely, or dissatisfied with life, and quality of life was lower than those not reporting discrimination.

**Meaning: This study suggests o**lder adults with impaired vision are at increased risk of discrimination, which if experienced, can adversely impact upon wellbeing.

Tweet Revision: Study suggests older adults with impaired vision are at increased risk of discrimination, which might adversely affect well being.

## Abstract

**Importance:** A substantial proportion of individuals with visual impairment report experiences of discrimination. However, evidence comparing perceived discrimination among people with visual impairment to the general population is lacking. In addition, poorer mental health and wellbeing have been detected in this population, but the impact of discrimination on wellbeing in those with visual impairment is unknown.

**Objective:** To investigate perceived discrimination among people with visual impairment and its association with wellbeing in a population-based sample of older adults.

**Design and setting:** Longitudinal observational study using the English Longitudinal Study of Ageing, a representative sample of older men and women in England.

**Participants:** 7,677 participants aged ≥50 years (mean[SD] 66.71[9.17] years; 52.4% female).

**Exposure:** Self-rated eyesight, categorized as “poor” (ratings of fair, poor or blind) or “good” (good, very good or excellent) (items not previously validated for this population).

**Main Outcomes and Measures:** Experiences of perceived discrimination were reported in 2010/11. Depressive symptoms, life satisfaction, quality of life and loneliness were assessed in 2010/11 and 2016/17. We used logistic regression to analyse (i) differences in perceived discrimination between participants reporting poor vs. good eyesight, and (ii) cross-sectional and prospective associations between perceived discrimination and wellbeing in those with poor eyesight.

**Results:** Participants with poor eyesight had increased odds of reporting perceived discrimination relative to those with good eyesight (OR=1.41, 95%CI 1.23;1.63, *p*<.001). Cross-sectionally, participants who reported poor eyesight and discrimination had increased odds of depressive symptoms (OR=2.14, 95%CI 1.57;2.92, *p*<.001) and loneliness (OR=2.17, 95%CI 1.61;2.92, *p*<.001) and lower quality of life (*B*=-4.06, 95%CI -5.29;-2.84, *p*<.001) and life satisfaction (*B*=-2.37, 95%CI -3.28;-1.46, *p*<.001) relative to those with poor eyesight who did not report discrimination. Prospectively, perceived discrimination was associated with increased risk of depressive symptoms among participants reporting poor eyesight at six-year follow-up (OR=1.72, 95%CI 1.08;2.76, *p*=.02).

**Conclusions and Relevance:** These findings suggest older adults with impaired vision are at increased risk of perceived discrimination. Those who reported experiencing discrimination had higher levels of depressive symptoms and loneliness and lower quality of life and life satisfaction. Action to address discrimination could help mitigate the increased risk of poor wellbeing in this population.

## Introduction

Visual impairment (defined as presenting visual acuity worse than 6/12 (1)) is estimated to affect almost 2 million people in the UK (2). Approximately 10% of those aged ≥65 report some sight loss (3). The prevalence of visual impairment is expected to rise due to population ageing and increased diabetes (2–5). This poses concern in relation to the financial consequences of sight loss, estimated at £28.1 billion annually, and the disease burden involved (2). People with visual impairment commonly experience difficulties with activities of daily living (3) and most require practical support (6).

These difficulties may be compounded by discrimination. Charity- and government-commissioned research suggests discrimination is experienced by a significant proportion of those with visual impairment in the UK (6–9). In a survey of >1,200 individuals with registered visual impairment, 35% reported experiencing negative attitudes from the public and 47% perceived they had been treated unfairly due to their sight loss (6). Observational data found those with sight loss were twice as likely as those with another impairment to have experienced discrimination (7,9).

A growing body of literature suggests discrimination is a determinant of mental health and wellbeing (10–19). For example, a meta-analysis of 110 studies found discrimination was associated with depression, psychiatric distress and reduced mental wellbeing (19). However, the existing evidence is dominated by studies on racism or experiences of discrimination in general (16).

There is evidence that individuals with visual impairment have poorer mental health than their impairment-free counterparts (6,15). In healthcare settings, an association between visual impairment and depression has been consistently reported (20–22). Greater prevalence of depressive symptoms in those with visual impairment has also been reported (7,9,23,24). In a cross-sectional study of 13,900 older adults in Britain, those with visual impairment were found to be three times more likely to experience depression than those with good vision (24), with similar rates reported in later population-based studies (7,9,23). Most of the evidence linking depression and visual impairment has been cross-sectional (20–24). However, recent evidence suggests vision loss may also be a predictor of new-onset depression (25).

Visual impairment has also been linked with poorer outcomes in other domains of wellbeing. Heightened levels of loneliness in those with visual impairment compared with those with good sight has been reported in Dutch and US samples (26–28). However, no significant increase was reported in a German study (29). In the UK, no study has assessed loneliness specifically but several surveys indicate social exclusion and reduced social contact may be experienced following sight loss (6,7,9,30).

Associations between visual impairment and lower life satisfaction have been reported (7,31–33), with UK data suggesting those with sight loss were three times more likely to be dissatisfied than those with no impairment (7). A link between visual impairment and reduced quality of life (QOL) has been documented by qualitative studies (34). Quantitative studies have also found evidence of an association cross-sectionally (30,33,35,36), and longitudinal evidence suggests improvements in vision may lead to a corresponding increase in QOL (37).

Taken together, several reports suggest that many individuals with visual impairment experience discrimination (6–9) and poorer wellbeing. However, evidence comparing the prevalence of discrimination among people with visual impairment to the general population is lacking. The impact of discrimination on wellbeing in those with visual impairment is unknown. Our study, therefore, set out to investigate this issue in a community sample of older English adults.

## Method

### Study population

Data were from the English Longitudinal Study of Ageing (ELSA), a longitudinal study of adults aged ≥50 (38). Participants are followed up every two years. The present analyses were not planned prior to data collection. The present study uses data from Wave 5 (collected 2010/11; the only wave that assessed discrimination) and Wave 8 (2016/17). Of the 9,090 participants interviewed in Wave 5, 8,107 (93%) answered the perceived discrimination questions. We excluded 430 participants (5.3%) with missing data on eyesight or covariates, leaving a final sample of 7,677 participants. Ethical approval was obtained from the National Research Ethics Service. All participants gave full written informed consent.

### Measures

Self-rated eyesight

The measure of visual impairment was a single-item rating: “*Is your eyesight (using glasses or corrective lenses; if you use them) excellent/very good/good/fair/or poor?*” Spontaneous responses of legally or registered blind were recorded. We dichotomised responses, defining visual impairment as blindness or fair or poor self-rated eyesight. Participants were also asked “*How good is your eyesight for seeing things up close, like reading ordinary newspaper print (excellent/very good/good/fair/or poor)?*” Response options were categorised as above. Hereafter, we refer to fair/poor/blind eyesight as “poor eyesight” and good/very good/excellent eyesight as “good eyesight”. We coded participants who reported being blind as having poor self-rated eyesight up close. Two participants had missing data for eyesight up close, so we imputed these values with their response to the rating of overall eyesight. To our knowledge, these items have not been validated, although they have been used in other publications of ELSA data (e.g. (39,40)).

Participants also reported whether or not they had ever been diagnosed with glaucoma, diabetic eye disease, macular degeneration, or cataracts. We considered those who reported any of these as having a history of eye disease.

Perceived discrimination

Items on discrimination were based on measures used in other studies (41–43). Participants were asked about the frequency of five discriminatory experiences: “*(1) you are treated with less respect or courtesy; (2) you receive poorer service than other people in restaurants and stores; (3) people act as if they think you are not clever; (4) you are threatened or harassed; (5) you receive poorer service or treatment than other people from doctors or hospitals (almost every day/at least once a week/a few times a month/a few times a year/less than once a year/never).*” Because data were skewed, with most participants reporting never experiencing discrimination, we dichotomised responses to indicate whether or not participants had experienced discrimination in the past year (a few times or more a year vs. less than once a year or never), with the exception of the fifth item which was dichotomised to indicate whether or not respondents had ever experienced discrimination from doctors or hospitals (never vs. all other options) (44).

Emotional wellbeing

Our primary outcome for analyses of wellbeing was depressive symptoms. Secondary outcomes were QOL, life satisfaction and loneliness.

Depressive symptoms were assessed with an eight‐item version of the Center for Epidemiologic Studies Depression Scale (45), widely validated for use in older adults (46). This asks about feelings over the last week (e.g. “*Over the last week have you felt sad?*”), with binary response options (1=yes, 0=no). Positively framed items were reverse scored. Data were dichotomised using an established cut‐off, with scores ≥4 indicating significant symptomatology (46).

QOL was assessed with the CASP-19 (47), a scale designed to measure QOL in older people. Items cover several domains of QOL including control, autonomy self-realisation and pleasure. Respondents are asked how often each statement applies to them (often=0 to never=3). Positively-worded items were reverse scored. A higher score indicates higher QOL (range: 0–57).

Life satisfaction was assessed with the Satisfaction With Life Scale (48), which asks respondents to rate the extent to which they agree with five statements (e.g. “*In most ways my life is close to my ideal”*) on a scale from 0 (strongly disagree) to 6 (strongly agree). Responses were summed to produce a total score (range: 0-30), with higher scores indicating greater life satisfaction.

Loneliness was measured using the three-item Revised UCLA Loneliness Scale (49). An example item was: “*How often do you feel you lack companionship?*” with response options ranging from hardly ever or never (scored 1) to often (scored 3). Total scores ranged from 3 to 9, with higher scores indicating greater loneliness. They were dichotomised at ≥6 versus <6 to indicate high vs. low loneliness (50).

Covariates

Information on age, sex, ethnicity (white vs. non-white), marital status (married vs. single/separated/divorced/widowed) and household non-pension wealth (an indicator of socioeconomic status in this population (51)) was recorded. Objectively measured body mass index (BMI) (collected in Wave 6 because BMI was not assessed in Wave 5) was also included in a sensitivity analysis. Trained research nurses measured weight to the nearest 0.1 kg using portable electronic scales, and height to the nearest millimetre using a portable stadiometer. Nurses recorded any factors that might have compromised measurement reliability (e.g. participant was stooped/unwilling to remove shoes), and these cases were excluded. BMI was calculated weight in kilograms divided by height in metres squared.

### Statistical analysis

All analyses were conducted using SPSS v.24. Data were weighted to correct for sampling probabilities and for differential non-response and to calibrate back to the 2011 National Census population distributions for age and sex. For cross-sectional analyses, the weights accounted for the differential probability of being included in Wave 5 and for non-response to the self-completion questionnaire that measured discrimination. For prospective analyses, we applied a longitudinal weight that accounted for non-response at wave 8 based on the sample who participated in wave 4.

Our primary outcome was perceived discrimination in any of five discriminatory situations. Secondary outcomes were perceptions of discrimination in each of the five situations. Logistic regression was used to examine associations between poor eyesight and perceived discrimination controlling for covariates. Additionally, these models were repeated analysing the odds of reporting perceived discrimination in (i) participants with poor eyesight who reported a history of eye disease and (ii) participants with poor eyesight with no history of eye disease, relative to the group with good eyesight, adjusting for covariates.

In those reporting poor eyesight, we examined differences in depressive symptoms, QOL, life satisfaction and loneliness between those who reported perceived discrimination and those who did not, both cross-sectionally and prospectively over six-year follow-up. Categorical outcomes were analysed using logistic regression and continuous outcomes were analysed using linear regression. All models controlled for age, sex, ethnicity, marital status and wealth, and prospective analyses also adjusted for baseline status/score on the outcome of interest.

We performed a sensitivity analysis in which models comparing the groups reporting poor vs. good eyesight were repeated with additional adjustment for BMI, because weight status is known to be associated with conditions associated with visual impairment (e.g. diabetes (52)) and perceived discrimination (53). BMI was not included as a covariate in the primary analyses because data were not available in the same wave as discrimination was and we wanted to maximise the sample size.

## Results

### Sample characteristics

Of the 7,677 participants in our sample, 913 (11.9%) reported poor overall eyesight and 658 (8.6%) reported poor eyesight up close. Sample characteristics are summarised in Table 1. On average, participants who reported poor eyesight were significantly older than those with good eyesight (70 vs. 66y) and a greater proportion were female, non-white, unmarried and from the lowest wealth quintiles.

### Self-rated eyesight and perceived discrimination

Associations between eyesight and discrimination are shown in Table 2. Discrimination was more commonly reported by participants with poor eyesight (52.1%) than those with good eyesight (43.8%). After adjustment for covariates, participants with poor eyesight had 1.41 times higher odds of reporting any discrimination than those with good eyesight (95%CI 1.23;1.63, *p*<.001). The most common form of discrimination was being treated with less respect or courtesy (36.3% of sample) and the least common was being threatened or harassed (9.9%). Poor eyesight was associated with increased odds of reporting discrimination in each of the five domains, with ORs ranging from 1.24 (95%CI 1.03;1.51, *p*=.03) for receiving poorer service in restaurants and stores to 1.41 (95%CI 1.18;1.69, *p*<.001) for receiving poorer service or treatment in medical settings (Table 2).

As for overall ratings of eyesight, participants who reported poor eyesight for seeing things up close had significantly higher odds of perceived discrimination overall (OR=1.45, 95%CI 1.24;1.70, *p*<.001) and in all five domains (OR range 1.25-1.72) (Table 2). Reports of being treated as if they were not clever and being threatened or harassed were more common among the group with poor eyesight up close (25.6% and 12.4%, respectively) than in the group reporting poor overall eyesight (23.0% and 9.9%, respectively).

Of the 913 participants who reported poor overall eyesight, 527 (57.7%) reported a history of eye disease. Relative to those with good eyesight, odds of reporting discrimination in any domain were 1.66 times higher (95%CI 1.30;2.12, *p*<.001) among participants with poor eyesight but no diagnosed eye disease and 1.39 times higher among those with poor eyesight who had a history of eye disease (95%CI 1.11;1.74, *p*=.004).

### Perceived discrimination and wellbeing among individuals with poor eyesight

Associations between discrimination and wellbeing in those reporting poor eyesight are summarised in Table 3. Cross-sectionally, participants who reported poor eyesight and discrimination had significantly increased odds of depressive symptoms (OR=2.14, 95%CI 1.57;2.92, *p*<.001) and loneliness (OR=2.17, 95%CI 1.61;2.92, *p*<.001) and lower QOL (*B*=-4.06, 95%CI -5.29;-2.84, *p*<.001) and life satisfaction (*B*=-2.37, 95%CI -3.28;-1.46, *p*<.001) relative to those with poor eyesight who did not report discrimination. Prospectively, discrimination was associated with increased risk of depressive symptoms among participants reporting poor eyesight at follow-up (OR=1.72, 95%CI 1.08;2.76, *p*=.02). Perceived discrimination was not significantly associated with other outcomes prospectively.

### Sensitivity analysis

In a subsample of participants whose BMI was measured two years after baseline (*n*=5,931), additional adjustment for BMI revealed no notable differences in associations between (i) eyesight and discrimination, or (ii) discrimination and wellbeing among the group with poor eyesight (data not shown).

## Discussion

In this population-based sample of older adults in England, participants with poor eyesight were 40% more likely to report perceived discrimination relative to those who rated their eyesight as good. Participants who reported poor eyesight and had experienced discrimination were more likely to report depressive symptoms both cross-sectionally and prospectively over six-year follow-up than those with poor eyesight who did not report discrimination. They were also more likely to be lonely and reported poorer QOL and life satisfaction in cross-sectional analyses, although prospective associations were not significant.

More than half (52.1%) of the sample who reported poor eyesight experienced discrimination in their day-to-day life. Over a third felt they were treated with less respect than other people, one in four felt people acted as if they were not clever, one in five reported receiving poorer treatment than other people from doctors or hospitals, one in six felt they received poorer service than other people in restaurants and shops, and one in ten reported being threatened or harassed. These findings are in line with previous reports in which 47% of people with visual impairment reported perceived discrimination, 35% reported negative attitudes from members of the public, and 14% reported unfair treatment from health workers (6). Importantly, we found that prevalence of perceived discrimination in each domain was significantly higher among people with poor eyesight than in a control group with good eyesight, despite relatively high prevalence of reports of discrimination among this control group (43.8%). Results also showed the association between poor eyesight and discrimination was not limited to participants with a history of eye disease, with associations at least as strong among participants with poor eyesight but no diagnosed eye disease.

Among participants with poor eyesight, discrimination was associated with poorer wellbeing. In cross-sectional and prospective analyses, we found individuals with poor eyesight who had experienced discrimination were twice as likely to have depressive symptoms above threshold. Previous studies have reported an association between visual impairment and depression (7,9,20–24), with some evidence suggesting a causal relationship whereby vision loss predicts the onset of depression (25). Our results demonstrating a longitudinal relationship between discrimination and increased depressive symptoms among individuals with poor vision point to a potential role for perceived discrimination in the onset and maintenance of depression in this population group.

As well as having a higher rate of depressive symptoms, people with poor vision who had experienced perceived discrimination were twice as likely to be lonely, and reported poorer QOL and life satisfaction. This suggests higher levels of discrimination may contribute to previously reported associations between visual impairment and increased loneliness, social exclusion and reduced social contact (6,7,9,26–28,30), lower QOL (30,33) and life dissatisfaction (7,31–33). While these associations were significant in cross-sectional analyses, no prospective associations were observed with the onset of loneliness or decline in QOL or life satisfaction over six-year follow-up. It seems plausible that the impact of discrimination on these outcomes had taken effect by the time of the baseline assessment, so little change was evident over and above the cross-sectional results.

Strengths of this study include the large, representative sample, prospective design and assessment of wellbeing using a range of measures. However, there were also limitations. A potential limitation is that poor eyesight was self-reported and these data have not been compared directly with objective measures. However, similar self-reported ratings of eyesight have been validated (54). Further research is needed to validate our findings using an objective measure of visual acuity. Perceived discrimination was determined by self-reports of past experiences, hence may be subject to recall bias. Recall bias may be a particular concern among participants at the older end of the age spectrum, who are also at increased risk of visual impairment (55), which may have led to underestimation of the prevalence of discrimination in the group with poor eyesight. The discrimination questions asked about five situations, but there may be others relevant to visual impairment that were not assessed. Prospective analyses were restricted to participants with data at follow-up. Consistent with retention in other studies (56), the analysed sample was younger and wealthier than the total ELSA sample, so results may not be population-representative.

In conclusion, these results support that older adults with impaired vision are at increased risk of discrimination across a range of domains, relative to those with good vision. In addition, those who experience discrimination report higher levels of depressive symptoms and loneliness and lower QOL and life satisfaction. Action to address discrimination against people with visual impairment could help mitigate the increased risk of poor wellbeing in this population group. Health practitioners might consider querying patients with visual impairment about their wellbeing to identify those who might benefit from additional support.

## References

1. World Health Organization. Blindness and vision impairment [Internet]. 2018 [cited 2019 Feb 3]. Available from: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment

2. Pezzullo L, Streatfeild J, Simkiss P, Shickle D. The economic impact of sight loss and blindness in the UK adult population. BMC Health Serv Res. 2018 30;18(1):63.

3. RNIB. People with sight loss in later life: RNIB Evidence-based review. 2015.

4. Minassian D, Reidy A. Future Sight Loss UK 2: An epidemiological and economic model for sight loss in the decade 2010-2020. EpiVision and RNIB; 2009.

5. Office for National Statistics. 2014-based National Population Projections: Principle projections. 2015.

6. Slade J, Edwards R. My Voice 2015: The views and experiences of blind and partially sighted people in the UK. London: RNIB; 2015.

7. McManus S, Lord C. Circumstances for people with sight loss: secondary analysis of Understanding Society and the Life Opportunities Survey. NatCen report for RNIB; 2012.

8. Williams B, Copestake P, Eversley J, Stafford B. Experiences and expectations of disabled people. Office for Disability Issues; 2008.

9. Flynn K, Lord C. Living with sight loss: Updating the national picture. RNIB and NatCn Social Research; 2015.

10. Goto JB, Couto PFM, Bastos JL. Revisão sistemática dos estudos epidemiológicos sobre discriminação interpessoal e saúde mental. Cad Saúde Pública. 2013 Mar;29(3):445–59.

11. Pascoe EA, Smart Richman L. Perceived discrimination and health: A meta-analytic review. Psychol Bull. 2009;135(4):531–54.

12. Paradies Y. A systematic review of empirical research on self-reported racism and health. Int J Epidemiol. 2006 Aug 1;35(4):888–901.

13. Williams DR, Neighbors HW, Jackson JS. Racial/Ethnic Discrimination and Health: Findings From Community Studies. Am J Public Health. 2003 Feb 1;93(2):200–8.

14. Ory M, Kinney Hoffman M, Hawkins M, Sanner B, Mockenhaupt R. Challenging aging stereotypes: Strategies for creating a more active society. Am J Prev Med. 2003 Oct;25(3, Supplement 2):164–71.

15. Emerson E, Madden R, Robertson J, Graham H, Hatton C, Llewellyn G. Intellectual and physical disability, social mobility, social inclusion and health: background paper for the Marmot Review [Internet]. Lancaster, UK: Center for Disability Research (CeDR); 2009 [cited 2016 Sep 27]. Available from: http://eprints.lancs.ac.uk/26403/1/Disability\_Social\_Mobility\_Social\_Inclusion.pdf

16. Meyer IH. Prejudice, Social Stress, and Mental Health in Lesbian, Gay, and Bisexual Populations: Conceptual Issues and Research Evidence. Psychol Bull. 2003 Sep;129(5):674–97.

17. Newcomb ME, Mustanski B. Internalized homophobia and internalizing mental health problems: A meta-analytic review. Clin Psychol Rev. 2010 Dec;30(8):1019–29.

18. McDonald P. Workplace Sexual Harassment 30 Years on: A Review of the Literature. Int J Manag Rev. 2012 Mar 1;14(1):1–17.

19. Pascoe EA, Smart Richman L. Perceived discrimination and health: a meta-analytic review. Psychol Bull. 2009 Jul;135(4):531–54.

20. Rovner BW, Shmuely-Dulitzki Y. Screening for depression in low-vision elderly. Int J Geriatr Psychiatry. 1997 Sep;12(9):955–9.

21. Goldstein JE, Massof RW, Deremeik JT, Braudway S, Jackson ML, Kehler KB, et al. Baseline Traits of Low Vision Patients Served by Private Outpatient Clinical Centers in the United States. Arch Ophthalmol. 2012 Aug 1;130(8):1028–37.

22. van der Aa HPA, Comijs HC, Penninx BWJH, van Rens GHMB, van Nispen RMA. Major depressive and anxiety disorders in visually impaired older adults. Invest Ophthalmol Vis Sci. 2015 Jan 20;56(2):849–54.

23. Zimdars A, Nazroo J, Gjonça E. The circumstances of older people in England with self-reported visual impairment: A secondary analysis of the English Longitudinal Study of Ageing (ELSA) - Anna Zimdars, James Nazroo, Edlira Gjonça, 2012. Br J Vis Impair. 2012;30(1):22–30.

24. Evans JR, Fletcher AE, Wormald RPL. Depression and anxiety in visually impaired older people. Ophthalmology. 2007 Feb;114(2):283–8.

25. Choi HG, Lee MJ, Lee S-M. Visual impairment and risk of depression: A longitudinal follow-up study using a national sample cohort. Sci Rep. 2018 Feb 1;8(1):2083.

26. Verstraten PFJ, Brinkmann WLJH, Stevens NL, Schouten JSAG. Loneliness, adaptation to vision impairment, social support and depression among visually impaired elderly. Int Congr Ser. 2005 Sep 1;1282:317–21.

27. Alma MA, Van der Mei SF, Feitsma WN, Groothoff JW, Van Tilburg TG, Suurmeijer TPBM. Loneliness and self-management abilities in the visually impaired elderly. J Aging Health. 2011 Aug;23(5):843–61.

28. Perissinotto CM, Stijacic Cenzer I, Covinsky KE. Loneliness in older persons: a predictor of functional decline and death. Arch Intern Med. 2012 Jul 23;172(14):1078–83.

29. Wahl H-W, Heyl V, Drapaniotis PM, Hörmann K, Jonas JB, Plinkert PK, et al. Severe Vision and Hearing Impairment and Successful Aging: A Multidimensional View. The Gerontologist. 2013 Dec 1;53(6):950–62.

30. Liljas AEM, Wannamethee SG, Whincup PH, Papacosta O, Walters K, Iliffe S, et al. 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. J Public Health Oxf Engl. 2016;38(2):e21-28.

31. Liu Z, Wu D, Huang J, Qian D, Chen F, Xu J, et al. Visual impairment, but not hearing impairment, is independently associated with lower subjective well-being among individuals over 95 years of age: A population-based study. Arch Gerontol Geriatr. 2016 Jan 1;62:30–5.

32. Crews JE, Chou C-F, Zhang X, Zack MM, Saaddine JB. Health-related quality of life among people aged ≥65 years with self-reported visual impairment: findings from the 2006-2010 behavioral risk factor surveillance system. Ophthalmic Epidemiol. 2014 Oct;21(5):287–96.

33. Chia E-M, Wang JJ, Rochtchina E, Smith W, Cumming RR, Mitchell P. Impact of bilateral visual impairment on health-related quality of life: the Blue Mountains Eye Study. Invest Ophthalmol Vis Sci. 2004 Jan;45(1):71–6.

34. Senra H, Barbosa F, Ferreira P, Vieira CR, Perrin PB, Rogers H, et al. Psychologic adjustment to irreversible vision loss in adults: a systematic review. Ophthalmology. 2015 Apr;122(4):851–61.

35. Lamoureux E, Pesudovs K. Vision-Specific Quality-of-Life Research: A Need to Improve the Quality. Am J Ophthalmol. 2011 Feb;151(2):195-197.e2.

36. Rees G, Tee HW, Marella M, Fenwick E, Dirani M, Lamoureux EL. Vision-Specific Distress and Depressive Symptoms in People with Vision Impairment. Invest Ophthalmol Vis Sci. 2010 Jun 1;51(6):2891–6.

37. Matthews K, Nazroo J, Whillans J. The consequences of self-reported vision change in later-life: evidence from the English Longitudinal Study of Ageing. Public Health. 2017 Jan 1;142:7–14.

38. Steptoe A, Breeze E, Banks J, Nazroo J. Cohort profile: the English Longitudinal Study of Ageing. Int J Epidemiol. 2013 Dec;42(6):1640–8.

39. Davies-Kershaw HR, Hackett RA, Cadar D, Herbert A, Orrell M, Steptoe A. Vision Impairment and Risk of Dementia: Findings from the English Longitudinal Study of Ageing. J Am Geriatr Soc. 2018 Sep 1;66(9):1823–9.

40. Smith L, Timmis MA, Pardhan S, Latham K, Johnstone J, Hamer M. Physical inactivity in relation to self-rated eyesight: cross-sectional analysis from the English Longitudinal Study of Ageing. BMJ Open Ophthalmol. 2017;1(1):e000046.

41. Yuan ASV. Perceived Age Discrimination and Mental Health. Soc Forces. 2007 Sep 1;86(1):291–311.

42. Luo Y, Xu J, Granberg E, Wentworth WM. A Longitudinal Study of Social Status, Perceived Discrimination, and Physical and Emotional Health Among Older Adults. Res Aging. 2012 May 1;34(3):275–301.

43. Smith J, Ryan L, Sonnega A, Weir D, The HRS Psychosocial Working Group. Psychosocial and Lifestyle Questionnaire 2006 - 2016. Ann Arbor, MI: Survey Research Center, Institute for Social Research; 2017.

44. Rippon I, Kneale D, Oliveira C de, Demakakos P, Steptoe A. Perceived age discrimination in older adults. Age Ageing. 2014 May 1;43(3):379–86.

45. Radloff LS. The CES-D scale. Appl Psychol Meas. 1977;1(3):385–401.

46. Steffick DE. Documentation of affective functioning measures in the Health and Retirement Study. HRS Documentation Report DR-005; 2000.

47. Hyde M, Wiggins RD, Higgs P, Blane DB. A measure of quality of life in early old age: the theory, development and properties of a needs satisfaction model (CASP-19). Aging Ment Health. 2003;7(3):186–194.

48. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. J Assess. 1985;49(1):71–75.

49. Russell DW. UCLA Loneliness Scale (Version 3): reliability, validity, and factor structure. J Pers Assess. 1996 Feb;66(1):20–40.

50. Steptoe A, Shankar A, Demakakos P, Wardle J. Social isolation, loneliness, and all-cause mortality in older men and women. Proc Natl Acad Sci U S A. 2013 Apr 9;110(15):5797–801.

51. Banks J, Karlsen S, Oldfield Z. Socio-economic position. 2003 [cited 2014 Mar 4]; Available from: http://discovery.ucl.ac.uk/15366/1/15366.pdf

52. Mokdad A, Ford E, Bowman B, Dietz W, Vinicor F, Bales V, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA. 2003 Jan 1;289(1):76–9.

53. Jackson SE, Steptoe A, Beeken RJ, Croker H, Wardle J. Perceived weight discrimination in England: a population-based study of adults aged ⩾50 years. Int J Obes. 2015 May;39(5):858–64.

54. Coren S, Hakstian AR. Validation of a Self-Report Inventory for the Measurement of Visual Acuity. Int J Epidemiol. 1989 Jun 1;18(2):451–6.

55. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. Br J Ophthalmol. 2012 May 1;96(5):614–8.

56. Mendes de Leon C. Aging and the Elapse of Time: A Comment on the Analysis of Change. J Gerontol B Psychol Sci Soc Sci. 2007 May 1;62(3):S198–202.

## Declarations

### Ethics approval

Ethical approval was obtained from the National Research Ethics Service and all participants gave full written informed consent.

### Access to data

SEJ had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

### Competing interests

None.

### Funding

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### Authors’ contributions

SEJ, LS and AS conceived of the design of the current study. SEJ performed the data analysis. SEJ and RAH drafted the paper. All authors provided critical revisions and approved the final version of the paper for submission.

### Availability of data and materials

The raw data are available from the UK Data Service.

## Tables

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 1** Sample characteristics at baseline in relation to self-rated eyesight | | | | | | | | | | | | | | | | | | |
|  | |  |  | | **Self-rated eyesight overall** | | | | | |  | | **Self-rated eyesight up close** | | | | | |
|  | |  |  | | **Good**  **(*n*=6,764)1** | | **Poor**  **(*n*=913)** | | ***p*** | |  | | **Good**  **(*n*=6,996)** | | **Poor**  **(*n*=681)** | | ***p*** | |
| Age (years), mean (SD) | | | | 66.24 (8.94) | | 69.95 (10.08) | | <.001 | |  | | 66.37 (8.99) | | 69.95 (10.24) | | <.001 | |
| Sex | | | |  | |  | |  | |  | |  | |  | |  | |
|  | Men | | | 48.3 | | 42.8 | | .001 | |  | | 47.9 | | 44.7 | | .10 | |
|  | Women | | | 51.7 | | 57.2 | | - | |  | | 52.1 | | 55.3 | | - | |
| Ethnicity | | | |  | |  | |  | |  | |  | |  | |  | |
|  | White | | | 96.5 | | 94.3 | | .007 | |  | | 96.3 | | 95.6 | | .31 | |
|  | Non-white | | | 3.5 | | 5.7 | | - | |  | | 3.7 | | 4.4 | | - | |
| Marital status | | | |  | |  | |  | |  | |  | |  | |  | |
|  | Married | | | 69.1 | | 54.8 | | <.001 | |  | | 68.6 | | 54.5 | | <.001 | |
|  | Unmarried | | | 30.9 | | 45.2 | | - | |  | | 31.4 | | 45.5 | | - | |
| Wealth quintile | | | |  | |  | |  | |  | |  | |  | |  | |
|  | 1 (poorest) | | | 16.4 | | 35.4 | | <.001 | |  | | 17.4 | | 32.5 | | <.001 | |
|  | 2 | | | 19.7 | | 22.4 | | - | |  | | 19.8 | | 22.7 | | - | |
|  | 3 | | | 20.8 | | 17.3 | | - | |  | | 20.6 | | 18.4 | | - | |
|  | 4 | | | 21.2 | | 12.9 | | - | |  | | 20.9 | | 12.6 | | - | |
|  | 5 (richest) | | | 21.9 | | 12.1 | | - | |  | | 21.3 | | 13.7 | | - | |
| 1 Unweighted sample sizes.  All figures are weighted for sampling probabilities and differential non-response.  Values are percentages unless otherwise stated.  SD = standard deviation. | | | | | | | | | | | | | | | | | | |

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| **Table 2** Associations between self-rated eyesight and perceived discrimination | | | | | | | | | | | |
|  | |  |  | **Self-rated eyesight overall** | | | |  | **Self-rated eyesight up close** | | |
|  | |  |  | **Good**  **(*n*=6,764)1** | | **Poor**  **(*n*=913)** | ***p*** |  | **Good**  **(*n*=6,996)** | **Poor**  **(*n*=681)** | ***p*** |
| Discrimination in any domain | | | | |  |  |  |  |  |  |  |
|  | % (SE) | | | 43.8 (0.6) | | 52.1 (1.6) |  |  | 44.0 (0.6) | 53.0 (1.8) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | | 1.41 [1.23; 1.63] | <.001 |  | 1.00 (Ref) | 1.45 [1.24; 1.70] | <.001 |
| Less courtesy | | | |  | |  |  |  |  |  |  |
|  | % (SE) | | | 31.0 (0.5) | | 36.3 (1.5) |  |  | 31.1 (0.5) | 36.5 (1.7) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | | 1.28 [1.10; 1.48] | .001 |  | 1.00 (Ref) | 1.25 [1.06; 1.48] | .009 |
| Service setting | | | |  | |  |  |  |  |  |  |
|  | % (SE) | | | 14.1 (0.4) | | 16.9 (1.1) |  |  | 14.0 (0.4) | 18.3 (1.3) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | | 1.24 [1.03; 1.51] | .03 |  | 1.00 (Ref) | 1.42 [1.15; 1.75] | .001 |
| Not clever | | | |  | |  |  |  |  |  |  |
|  | % (SE) | | | 18.1 (0.5) | | 23.0 (1.2) |  |  | 18.0 (0.4) | 25.6 (1.4) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | | 1.32 [1.12; 1.56] | .001 |  | 1.00 (Ref) | 1.56 [1.30; 1.87] | <.001 |
| Threatened/harassed | | | |  | |  |  |  |  |  |  |
|  | % (SE) | | | 7.9 (0.3) | | 9.9 (0.9) |  |  | 7.7 (0.3) | 12.4 (1.0) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | | 1.32 [1.03; 1.68] | .03 |  | 1.00 (Ref) | 1.72 [1.34; 2.20] | <.001 |
| Medical setting | | | |  | |  |  |  |  |  |  |
|  | % (SE) | | | 16.3 (0.4) | | 20.4 (1.2) |  |  | 16.4 (0.4) | 20.9 (1.4) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | | 1.41 [1.18; 1.69] | <.001 |  | 1.00 (Ref) | 1.38 [1.13; 1.68] | .001 |
| 1 Unweighted sample sizes.  All figures are weighted for sampling probabilities and differential non-response and adjusted for age, sex, ethnicity, marital status and wealth.  SE = standard error, OR = odds ratio, CI = confidence interval. | | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 3** Cross-sectional and prospective associations between perceived discrimination and emotional wellbeing outcomes among participants reporting poor eyesight (in ratings of overall eyesight) | | | | | | | | | | |
|  | |  |  | **Cross-sectional** | | |  | **Prospective** | | |
|  | |  |  | **No perceived discrimination (*n*=444)** | **Perceived discrimination  (*n*=469)** | ***p*** |  | **No perceived discrimination (*n*=247)** | **Perceived discrimination (*n*=316)** | ***p*** |
| Depressive symptoms above threshold | | | |  |  |  |  |  |  |  |
|  | % (SE) | | | 22.6 (2.0) | 36.2 (1.9) |  |  | 20.4 (2.6) | 31.2 (2.2) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | 2.14 [1.57; 2.92] | <.001 |  | 1.00 (Ref) | 1.72 [1.08; 2.76] | .02 |
| Quality of life | | | |  |  |  |  |  |  |  |
|  | Mean score (SE) | | | 37.46 (0.43) | 33.58 (0.41) |  |  | 36.76 (0.51) | 36.17 (0.42) |  |
|  | Coeff. [95%CI] | | | Ref | -4.06 [-5.29; -2.84] | <.001 |  | Ref | -0.11 [-1.56; 1.35] | .88 |
| Life satisfaction | | | |  |  |  |  |  |  |  |
|  | Mean score (SE) | | | 19.21 (0.32) | 16.95 (0.31) |  |  | 18.64 (0.38) | 18.20 (0.32) |  |
|  | Coeff. [95%CI] | | | Ref | -2.37 [-3.28; -1.46] | <.001 |  | Ref | -0.53 [-1.57; 0.52] | .32 |
| High loneliness | | | |  |  |  |  |  |  |  |
|  | % (SE) | | | 27.0 (2.1) | 41.2 (2.0) |  |  | 27.8 (2.8) | 33.6 (2.4) |  |
|  | OR [95%CI] | | | 1.00 (Ref) | 2.17 [1.61; 2.92] | <.001 |  | 1.00 (Ref) | 1.38 [0.82; 2.34] | .23 |
| 1 Unweighted sample sizes.  All figures are weighted for sampling probabilities and differential non-response and adjusted for age, sex, ethnicity, marital status and wealth. Prospective figures are additionally adjusted for baseline status/score.  SE = standard error, OR = odds ratio, CI = confidence interval, Coeff = coefficient.  Possible scores on the quality of life scale range from 0-57, and on life satisfaction scale range from 0-30. | | | | | | | | | | |