HHS Public Access

Author manuscript

Ophthalmic Epidemiol. Author manuscript; available in PMC 2016 June 28.

Published in final edited form as:

Ophthalmic Epidemiol. 2014 October ; 21(5): 287–296. doi:10.3109/09286586.2014.926556.

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

John E. Crews, **Chiu-Fang Chou**, **Xinzhi Zhang**, **Matthew M. Zack**, and **Jinan B. Saaddine**

National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA, USA

Abstract

Purpose—To examine the association between health-related quality of life (HRQoL) and visual impairment among people aged ≥65 years.

Methods—We used cross-sectional data from the 2006–2010 Behavioral Risk Factor Surveillance System to examine six HRQoL measures: self-reported health, physically unhealthy days, mentally unhealthy days, activity limitation days, life satisfaction, and disability. Visual impairment was categorized as no, a little, and moderate/severe. We examined the association between self-reported visual impairment and HRQoL using logistic regression accounting for the survey's complex design.

Results—People with self-reported moderate/severe visual impairment had more frequent (≥14) physically unhealthy days, mentally unhealthy days, and activity limitation days in the last 30 days compared to those reporting a little or no visual impairment. After controlling for all covariates (age, sex, marital status, race/ethnicity, education, income, diabetes, heart disease, stroke, heart attack, body mass index, leisure time activity, smoking, and medical care cost concerns) and comparing to those with no self-reported visual impairment, people reporting a little visual impairment were more likely to have fair/poor health (odds ratio, OR, 1.2, 95% confidence interval, CI, 1.1–1.3), life dissatisfaction (OR 1.6, 95% CI 1.3–2.0), and disability (OR 1.5, 95% CI 1.3–1.6), and those with self-reported moderate/severe visual impairment had more fair/poor health (OR 1.8, 95% CI 1.6–2.0), life dissatisfaction (OR 2.3, 95% CI 1.8–2.9), and disability (OR 2.0, 95% CI 1.8–2.2). They also had more frequent physically unhealthy days (OR 1.9, 95% CI 1.7–2.1), mentally unhealthy days (OR 1.8, 95% CI 1.5–2.1), and activity limitations days (OR 1.9, 95% CI 1.6–2.2).

Conclusion—Poor HRQoL is strongly associated with the severity of self-reported visual impairment among people aged ≥65 years.

Correspondence: John E. Crews, DPA, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA, USA. Tel: +1 770 488 1116. Jcrews@cdc.gov.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Keywords

Aging; Behavioral Risk Factor Surveillance System; health related quality of life; vision impairment

INTRODUCTION

In 2010, an estimated 5.4 million people aged ≥65 years in the US reported visual impairment, the highest prevalence among all age groups.[1] This number is likely to increase as the population ages.[2,3] Visual impairment is associated with increased risk of multiple chronic conditions,[4] depression,[5,6] falls,[7] and mortality,[8] as well as poorer quality of life and poorer vision-related quality of life.[9–19] A recent study by Prevent Blindness estimated the total economic burden of vision problems in the US to be $139 billion.[20]

The Centers for Disease Control and Prevention (CDC) through its Behavioral Risk Factor Surveillance System (BRFSS) developed a standard set of health-related quality of life (HRQoL) questions addressing subjective measures of a person's health and health perceptions.[21–23] Measuring HRQoL has two functions important to this investigation: (1) "The construct of HRQoL broadens the traditional notion of health needs to meet the expressed physical and mental health needs of the population", and (2) "HRQoL questions about perceived physical and mental health and function have become an important component of health surveillance and are generally considered valid indicators of service needs and intervention outcomes" (p. 6).[24] A recent Institute of Medicine report, Living Well with Chronic Illness: A Call for Public Health Action, asserted, "Although there is ample evidence of the effectiveness of widely disseminated wellness or lifestyle programs at community sites, there is inadequate evaluation of their impact on the health-related quality of life and health outcomes of individuals living with chronic illness" (p. 15).[25] The report recommended that chronic disease prevention programs measure both HRQoL and functional status.[25]

The BRFSS HRQoL measures have been employed to characterize chronic health conditions,[26–31] disability,[32] and caregiving[33] and to show the effects of eye diseases.[9] However, studies examining severity of visual impairment and HRQoL are lacking. In this study, we examined the 2006–2010 BRFSS to assess the association between severity of self-reported visual impairment and HRQoL outcomes in a group with the highest prevalence of visual impairment, people aged ≥65 years. This study demonstrates the association between increased self-reported visual impairment and poorer HRQoL using the CDC's six measures.

MATERIALS AND METHODS

We used BRFSS for this study. The BRFSS is a state-based, random-digit-dialed telephone survey of the non-institutionalized civilian population aged ≥18 years. Nationally, approximately 350,000 people are sampled each year. The BRFSS can produce local, state, and national estimates on important health-related information by sociodemographic characteristics for chronic conditions, health behaviors, and access to health care. The

BRFSS is de-identified publicly available data, exempt from institutional review board approval. Details on survey methods, questionnaires, data, and relevant reports appear at http://www.cdc.gov/brfss. The BRFSS questionnaire consists of three sections: core questions, optional modules, and state-added questions. An optional nine-question Visual Impairment and Access to Eye Care Module (Vision Module) has been implemented since 2005. We analyzed responses of adults aged ≥65 years from 22 states (Alabama, Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Indiana, Iowa, Kansas, Maryland, Massachusetts, Missouri, Nebraska, New Mexico, New York, North Carolina, Ohio, Tennessee, Texas, West Virginia, and Wyoming) participating in the 2006–2010 BRFSS surveys where the Vision Module was available. Our sample included 60,807 respondents aged ≥65 years. Sample sizes by state ranged from 1179 (Maryland) to 9024 (Alabama). Median states' response rates, the percentage of persons who completed the interview among all eligible persons among states for BRFSS during that period, ranged from 50.6–54.6%; median state cooperation rates, the percentage of persons who completed the interview among all eligible persons who were contacted, ranged from 75.2–79.7%.[34]

Health-related Quality of Life

We used six questions to measure HRQoL including self-rated health, physically unhealthy days, mentally unhealthy days, activity limitation days, life satisfaction, and disability. Four questions were derived from the original version of the Medical Outcomes Study, 36-Item Short-Form Survey Instrument (SF-36),[21,23,35] which has demonstrated validity and reliability for population health surveillance.[22,36] The self-rated health question asks: "Would you say that in general your health is excellent, very good, good, fair, or poor?" We dichotomized responses to this question into fair or poor health and good to excellent health. Three questions asked about self-assessed health referenced the past 30 days: "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" and "During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?". Responses to these questions were dichotomized into <14 days (infrequent) and ≥14 (frequent) unhealthy days in each domain. This approach is consistent with multiple investigations of these HRQoL measures.[28,29,37] The 14-day cutoff value was used to dichotomize mentally unhealthy days as frequent mental distress (≥14 days) versus infrequent mental distress (<14 days) because this criterion is often used as a marker for clinical depression and anxiety disorders in clinical practice and research.[21,28–31,38] Physically unhealthy days and activity limitation days were also dichotomized at 14 days to be consistent with the cutoff point used for mentally unhealthy days and in line with previous studies.[28–31] We dichotomized the responses to the life satisfaction question, "In general, how satisfied are you with your life?" into: satisfied (including very satisfied and satisfied) and dissatisfied (including dissatisfied and very dissatisfied). We defined disability by responses to two questions: "Are you limited in any way in any activities because of physical, mental, or emotional problems?" and "Do you now have any health problem that requires you to use special equipment, such as a cane, a

wheelchair, a special bed, or a special telephone?" We classified those responding yes to either question as having a disability.

Visual Impairment

Self-reported visual impairment was assessed using two questions from the Vision Module: "How much difficulty, if any, do you have in recognizing a friend across the street?" and "How much difficulty, if any, do you have reading print in newspapers, magazines, recipes, menus, or numbers on the telephone?". No visual impairment was defined as a response of no difficulty to both the distance (recognize friend across the street) and near (read newspaper print) questions; a little visual impairment was defined as a response of "a little difficulty" to either question; and moderate/severe visual impairment was defined as a response of "moderate difficulty," "extreme difficulty," or "unable to do because of your eyesight" to either question. Moderate difficulty, severe difficulty, and unable to do were collapsed into one category to create a sufficient sample size for the analysis. Three categories of visual impairment allow us to create a severity scale.

Other Covariates

We included five demographic factors as possible confounders based on previous studies[39,40] in our multivariate models: age (65–74 years, 75–84 years, and ≥85 years), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), education (<high school, high school or equivalent, or >high school), and annual household income (<$35,000 or ≥$35,000).

We included four chronic conditions reported in the BRFSS, including self-reported diagnosed diabetes (yes or no), heart disease (yes or no), heart attack (yes or no), and stroke (yes or no). The question stem asks: "Have you EVER been told by a doctor or other health professional that you have …". We also included three measures related to health behaviors: smoking (current smoker, former smoker, and never smoked), leisure-time physical activity, and estimated body mass index (BMI) calculated as the reported weight in kilograms divided by the reported height in meters squared. We categorized BMI as: normal/underweight (BMI <25 kg/m^2), overweight (BMI 25 to <30 kg/m^2), and obese (BMI ≥30 kg/m^2). We included two measures of access to health care: regular healthcare provider ("Do you have one person you think of as your personal doctor or health care provider?") and cost of medical care as a concern ("Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?"). To control for possible temporal trends, we included a year dummy variable into the model. We also controlled for state to control for possible differences across states.

Statistical Analysis

We used cross tabulations to test for differences in background characteristics and quality of life among people with any severity of self-reported visual impairment. Adjusted odds ratios and 95% confidence intervals (CIs) from multiple logistic regressions were used to assess the association between severity of self-reported visual impairment and each HRQoL outcome. All models were based on the complete case analysis and completed cases were 34,924. We adjusted all analyses for demographic variables (age, sex, marital status, race/

ethnicity/education, and household income), chronic conditions (diabetes, heart disease, stroke, and heart attack), BMI, health behaviors (physical activity and smoking), access to care (regular health care provider, medical care cost as problem), year, and state.

All analyses were conducted using Stata 12.0 (StataCorp LP, College Station, TX, US) survey procedures to account for the complex sampling design of BRFSS by weighting estimates for individual selection probabilities, nonresponse, and post-stratification.[41] Some states used the module for more than one year and others for only 1 year; therefore, we re-weighted those states with multiple years data. The multiple years of data were adjusted to represent an average individual year population for each state. This technique prevents overrepresentation of respondents in particular states for more than 1 year. We considered p values <0.05 statistically significant.

RESULTS

Among our study population, 54% were aged 65–74 years, 58% were women, 7.4% were non-Hispanic black, and 6.0% were Hispanic (Table 1). Compared to those reporting no visual impairment, more women, non-Hispanic blacks, Hispanics, those with less education, and those with annual household incomes below $35,000 reported moderate/severe visual impairment. Increased severity of self-reported visual impairment was consistently associated with greater prevalence of four comorbid chronic conditions (diabetes, heart disease, stroke, and heart attack). The proportions of people reporting a little difficulty and moderate/severe difficulty in our sample were 21.0% and 15.3%, respectively.

Increased severity of self-reported visual impairment was also consistently associated with worse HRQoL (Table 2, all p<0.0001). Although only 23.5% of people reporting no visual impairment had fair/poor health, 29.5% of those self-reporting a little visual impairment, and 43.0% of those self-reporting moderate/severe visual impairment noted fair/poor health. Similarly, 14.5% of those reporting no visual impairment had frequent (≥14) physically unhealthy days in the last 30 days compared to 18.3% and 28.3% for those self-reporting a little and moderate/severe visual impairment, respectively. Those with no self-reported visual impairment had fewer frequent mentally unhealthy days (4.8%) and fewer frequent activity limitation days (7.3%) compared to those reporting a little visual impairment (7.3% and 9.7%, respectively) and those self-reporting moderate/severe visual impairment (11.0% and 15.7%, respectively). Life dissatisfaction and disability status mirror the patterns seen in fair/poor health, physical unhealthy days, mentally unhealthy days, and activity limitation days. Among people with self-reported moderate/severe visual impairment, 8.4% indicated dissatisfaction with their lives, compared to 4.2% of those self-reporting a little visual impairment and 2.4% of those with no visual impairment. Over half of the people with self-reported moderate/severe visual impairment had a disability, compared to two-fifths of those self-reporting a little visual impairment, and less than a third of those reporting no visual impairment.

Severity of self-reported visual impairment was associated with poorer HRQoL outcomes after controlling for all variables (Table 3). Self-reported moderate/severe and a little visual impairment were associated with greater fair/poor health (odds ratio, OR, 1.8 and 1.2,

respectively) than those reporting no visual impairment. Self-reported moderate/severe and a little visual impairment were also associated with greater life dissatisfaction (OR 2.2 and 1.5, respectively). Moreover, self-reported moderate/severe and a little visual impairment were associated with increased disability (OR 2.0 and 1.5, respectively). Severity of self-reported visual impairment was also associated with increased frequent physically unhealthy days, frequent mentally unhealthy days, and frequent activity limitations days. After adjusting for other potentially confounding variables, compared to people reporting no visual impairment, those reporting moderate/severe visual impairment had 1.9 times more frequent physically unhealthy days, 1.8 times more frequent mentally unhealthy days, and 1.9 times more frequent activity limitation days (all $p<0.001$). Compared with those reporting no visual impairment, those self-reporting a little visual impairment had 1.3 times more frequent physically unhealthy days, 1.3 times more frequent mentally unhealthy days in the past 30 days (all $p<0.001$), but no significantly increased number of frequent activity limitation days.

DISCUSSION

People with self-reported moderate/severe visual impairment were about twice as likely as people reporting no visual impairment to have poorer self-reported health, life dissatisfaction, and disability. People reporting a little visual impairment also had greater odds of poorer health, life dissatisfaction, and disability. Moreover, people with self-reported moderate/severe visual impairment were about twice as likely to indicate frequent (≥14 days) physically unhealthy days, mentally unhealthy days, and activity limitation days. Our findings are generally consistent with previous quality of life, vision-related quality of life,[9–15] and HRQoL studies,[16–19] and consistent across the six measures for those with more severely impaired vision.

Two conceptual problems often temper quality of life and vision investigations. The first problem has to do with the definition of quality of life,[42] and the second has to do with the selection of eye disease or function. Quality of life research, as Snoek notes, has moved from measures of necessities for food and shelter to measures of “fulfillment and personal happiness” reflecting social priorities and changing outcomes in medicine.[43] The World Health Organization quality of life instrument, for example, defines quality of life as “an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.”[44,45] This instrument has been employed to gauge quality of life among people with visual impairment.[46,47] The particular effects of visual impairment, however, have led to the development of vision-specific quality of life measures. Although the Visual Function Index (VF-14)[48] and the National Eye Institute’s (NEI) Visual Function Questionnaire (VFQ-25)[49,50] are notable examples, at least 22 vision-specific instruments are available to measure activity performance and the impact of visual impairment.[51] The VF-14, originally designed for cataract patients, measures a person’s ability to perform various activities requiring vision, including near tasks and distance tasks, and it has been employed in many vision studies.[52–54] The NEI’s VFQ-25 captures the capacity to perform vision-related activities including near and distance tasks, health, and social participation as well as subjective measures of well-being. This instrument has been widely employed,[55–57] and

several questions from the VFQ-25 have been integrated into national surveys.[58] In contrast to these measures, CDC's HRQoL questions address "an individual's or group's perceived physical and mental health over time."[24] Therefore, quality of life measures range from general wellbeing, to task performance, to global physical and mental health. Each concept, arguably, measures important characteristics.

The second dilemma facing investigators is whether to report quality of life by eye disease or visual function.[59] Given the variety of self-reported vision questions in surveys, the lack of measured visual fields and acuity, and lack of clinical diagnosis in large population-based surveys, the selection of vision variables will largely be defined by the available questions in a particular survey.

Several studies have examined quality of life associated with glaucoma,[60–64] macular degeneration,[12,52,56,65] and cataract.[51,53,66] Lee and colleagues showed that decreases in HRQoL were independently and strongly associated with the presence of visual symptoms ("trouble seeing" and "blurred vision"[16]),a finding generally consistent with more global measures of visual impairment.[11,17–19,45,46]

A previous examination of the BRFSS Vision Module and HRQoL showed the presence of one or more self-reported eye disease was associated with poorer HRQoL,[9] but compared to that study, our findings show larger adjusted odds ratios for fair/poor health, life dissatisfaction, and disability among people reporting moderate/severe visual impairment than people reporting one or more age-related eye diseases.[9] Visual function is often not compromised in the early stages of many eye diseases; therefore, eye disease may not be a good proxy to assess HRQoL. Lee and co-authors observe, "merely having a condition may not be as important to HRQoL as having a noticeable physical difficulty or symptom".[16] Nevertheless, important decisions regarding measures of quality of life and vision (disease or function) will continue to temper the results of quality of life inquiry.

Our findings also reveal the importance of multiple chronic conditions among people with visual impairment. The BRFSS survey includes four chronic conditions, heart disease, heart attack, diabetes, and stroke, the last two may contribute directly to vision loss. Those reporting these four chronic conditions consistently report poorer HRQoL outcomes. After controlling for these major chronic conditions, however, visual impairment was still associated with poorer HRQoL; therefore, addressing visual impairment remains very important for improving HRQoL.

From a public health point of view, addressing the six CDC HRQoL measures may identify potential pathways to improve overall HRQoL especially among those reporting the most severe visual impairment. For example, ample evidence exists demonstrating that improved access to eye care results in positive health outcomes.[67,68] Refractive error remains a substantial problem for older people, but Medicare does not pay for spectacles, and those reporting more severe visual impairment indicate greater concerns for health care costs. A study regarding access to medical care for people with visual impairment reported the same pattern in usual source of care and financial barriers to obtaining care.[69] While removing impediments to access to eye care and health care lead to positive health outcomes, further

research could identify whether additional gains in HRQoL may occur by addressing health promotion and health behaviors targeting those with visual impairment. Our findings show that people with moderate/severe self-reported visual impairment had higher prevalence of chronic conditions, obesity, current smoking, and lack of leisure-time physical activity. Altering health promotion interventions and promoting health behaviors to include people with vision problems might lead to better HRQoL outcomes. Health promotion materials in large print or electronic formats might improve participation. Similarly, efforts to improve health behaviors, like being physically active, might include improved availability of sidewalks and better illumination to promote walking.[70] These avenues have not been rigorously investigated and require additional attention, but the sum of tailored interventions might lead to improved self-reported health, fewer physically unhealthy days, fewer mentally unhealthy days, and improved life satisfaction.

This study demonstrates the association between increased self-reported visual impairment and poorer HRQoL using CDC's six measures. To our knowledge, no other study has done so. The findings here are consistent with other studies using different measures of quality of life and visual function, and they identify potential health and public health interventions to improve HRQoL. While population-based for 22 states, this study is limited because the state samples may not be representative of the national population, and because states that conducted the module multiple times received more representation than states that conducted it fewer times. Furthermore, because the BRFSS samples only non-institutionalized populations, this study may underestimate poor HRQoL associated with visual impairment, given the high prevalence of visual impairment among nursing home residents.[71,72] Moreover, because BRFSS data are cross-sectional, causal inferences cannot be made even though visual impairment is more likely to precede changes in HRQoL than the reverse. BRFSS data were self-reported, and the accuracy of responses may be affected by recall bias, social desirability, or other factors. In particular, the BRFSS self-reported visual impairment questions have not been correlated to measured visual impairment, and self-reported vision is not the same as measured vision.[73,74] Finally, the broad construction of the BRFSS disability question ("limited in any way in any activity") tends to yield a high positive response among older people.

Poor HRQoL is strongly associated with the severity of self-reported visual impairment among people aged ≥65 years who participated in the BRFSS. Those reporting a little visual impairment report diminished HRQoL, while those reporting moderate/severe visual impairment show a strong, consistent association with poor HRQoL.

ACKNOWLEDGMENTS

Disclaimer: The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Financial support was provided by the Centers for Disease Control and Prevention.

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TABLE 1

Characteristics of study sample aged 65 years and older by visual impairment status in 22 US States[a], Behavioral Risk Factor Surveillance System, 2006–2010.

				Visual impairment status						
		Total		No difficulty		Little difficulty		Moderate/severe difficulty		
Characteristic	***n***	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	***p* Value[b]**
All		100.0		63.7	62.9–64.0	21.0	20.4–21.7	15.3	14.8–15.9	
Age group (years)										<0.001
65–74	33,198	53.5	52.7–54.3	55.4	54.4–56.4	51.8	50.2–53.5	48.1	46.1–50.1	
75–84	21,685	37.5	36.8–38.3	36.9	35.9–37.9	38.5	36.9–40.1	38.8	36.9–40.7	
85 or older	5924	9.0	8.5–9.4	7.7	7.2–8.3	9.6	8.6–10.8	13.1	11.7–14.7	
Sex										<0.001
Female	39,802	58.0	57.2–58.8	56.4	55.4–57.4	60.2	58.5–61.9	61.2	59.2–63.2	
Marital status										<0.001
Married	27,572	58.3	57.5–59.0	60.5	59.5–61.4	56.5	54.8–58.1	51.5	49.5–53.5	
Never married/divorced /widowed/separated	33,075	41.7	41.0–42.5	39.5	38.6–40.5	43.5	41.9–45.2	48.5	46.5–50.5	
Race/ethnicity										<0.001
Non–Hispanic white	52,257	83.6	83.0–84.3	85.2	84.3–86.0	83	81.6–84.3	78.1	76.2–79.9	
Non–Hispanic black	4422	7.4	6.9–7.8	6.5	6.0–7.1	8.0	7.2–9.0	10.0	8.9–11.2	
Hispanic	1971	6.0	5.5–6.5	5.5	5.0–6.1	6.0	5.1–7.1	7.8	6.5–9.2	
Other	1393	3.0	2.7–3.3	2.8	2.5–3.2	2.9	2.4–3.5	4.1	3.1–5.4	
Educational level										<0.001
<High school	9388	14.7	14.2–15.2	13.1	12.5–13.7	15.2	14.0–16.5	20.8	19.2–22.6	
High school graduate	22,673	34.7	33.9–35.4	34.3	33.4–35.2	34.5	33.0–36.0	36.3	34.4–38.2	
>High school	28,571	50.6	49.9–51.4	52.6	51.6–53.6	50.3	48.6–51.9	42.8	40.9–44.9	
Annual household										<0.001
Income										
<$35,000	28,992	55.2	54.3–56.1	51.7	50.5–52.8	57.4	55.5–59.3	66.9	64.9–69.0	
Diabetes										<0.001
Yes	11,621	18.8	18.2–19.4	17.2	16.4–17.9	20.0	18.6–21.4	24.0	22.5–25.6	

		Total		Visual impairment status						
				No difficulty		Little difficulty		Moderate/severe difficulty		
Characteristic	***n***	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	***p* Value**[b]
Heart Disease										<0.001
Yes	5966	13.7	13.2–14.2	12.7	12.1–13.3	13.8	12.7–15.0	17.2	15.9–18.5	
Stroke										<0.001
Yes	5054	8.3	7.9–8.7	7.4	6.8–7.9	8.3	7.5–9.2	12.2	11.1–13.5	
Heart attack										<0.001
Yes	5971	13.4	12.9–13.9	12.4	11.8–13.0	13.7	12.7–14.8	16.9	15.6–18.2	
Body mass index (kg/m^2)										<0.001
Normal (<25)	21,965	37.6	36.8–38.4	37.7	36.8–38.7	37.7	36.0–39.4	37.0	35.0–39.1	
Overweight (25–<30)	22,833	40.3	39.5–41.1	41.7	40.7–42.8	38.4	36.8–40.0	36.9	34.9–38.9	
Obese (≥30)	13,868	22.1	21.5–22.7	20.5	19.8–21.3	23.9	22.5–25.4	26.1	24.4–27.9	
Leisure–time physical activity									<0.001	
Yes	40,023	67.7	66.9–68.4	70.7	69.7–71.5	65.3	63.7–66.9	58.6	56.6–60.5	
Smoking status										0.002
Current smoker	5650	9.0	8.5–9.5	8.6	8.0–9.3	8.9	7.9–10.0	10.6	9.6–11.8	
Former smoker	24,697	43.1	42.3–43.8	42.9	41.9–43.9	42.2	40.6–43.9	44.8	42.8–46.8	
Never smoked	30,117	48	47.2–48.8	48.5	47.5–49.5	48.9	47.2–50.6	44.6	42.6–46.6	
Had a regular health care provider								0.147		
Yes	59,660	94.4	94.0–94.8	94.5	94.0–94.9	94.9	94.1–95.5	93.6	92.2–94.7	
Medical care cost issues										<0.001
Yes	2619	4.4	4.1,4.8	3.3	2.9,3.8	4.9	4.3,5.6	8.3	7.3,9.5	

CI, confidence interval

[a] 22 states used the Behavioral Risk Factor Surveillance System vision module at least once in the years 2006–2010: Alabama, Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Indiana, Iowa, Kansas, Maryland, Massachusetts, Missouri, Nebraska, New Mexico, New York, North Carolina, Ohio, Tennessee, Texas, West Virginia, Wyoming

[b] *p* Value is derived from chi–square Wald test of the null hypothesis within a covariate.

TABLE 2

Health-related quality of life among those aged 65 years and older by visual impairment status in 22 States[a], Behavioral Risk Factor Surveillance System, 2006–2010.

				Visual impairment status						
		Total		No difficulty		Little difficulty		Moderate/ severe difficulty		
Health-related quality of life measure	***n***	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	***p* Value[b]**
Life dissatisfaction										<0.0001
Yes	2396	3.7	3.4–3.9	2.4	2.1–2.6	4.2	3.6–4.8	8.4	7.3–9.5	
No	57,837	96.3	96.1–96.6	97.6	97.4–97.9	95.8	95.2–96.4	91.6	90.5–92.7	
Disability										<0.0001
Yes	22,946	37	36.2–37.8	31.6	30.7–32.6	41.2	39.5–42.9	53.6	51.6–55.7	
No	37,855	63	62.2–63.8	68.4	67.4–69.3	58.8	57.2–60.5	46.4	44.1–48.4	
Self-reported health										<0.0001
Excellent/very good/good	43,248	72.3	71.6–73.0	76.5	75.7–77.4	70.5	69.0–72.0	57	55.0–59.0	
Fair/poor	17,049	27.7	27.0–28.4	23.5	22.6–24.4	29.5	28.0–31.0	43	41.1–45.0	
Physically unhealthy day										<0.0001
0–13 days	47,669	82.6	82.0–83.2	85.5	84.7–86.2	81.7	80.4–83.0	71.7	69.8–73.4	
14–30 days	10,650	17.4	16.8–18.0	14.5	13.8–15.3	18.3	17.0–19.6	28.3	26.6–30.2	
Mentally unhealthy day										<0.0001
0–13 days	55,229	93.7	93.4–94.1	95.2	94.7–95.6	92.7	91.8–93.5	89	87.8–90.1	
14–30 days	4008	6.3	5.9–6.6	4.8	4.4–5.3	7.3	6.5–8.2	11	9.9–12.2	
Activity limitation day										<0.0001
0–13 days	54,850	90.9	90.5–91.4	92.7	92.2–93.2	90.3	89.3–91.3	84.3	82.9–85.6	
14–30 days	5428	9.1	8.6–9.5	7.3	6.8–7.8	9.7	8.7–10.7	15.7	14.4–17.1	

CI, confidence interval

[a]A total of 22 states used the Behavioral Risk Factor Surveillance System vision module at least once in the years 2006–2010: Alabama, Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Indiana, Iowa, Kansas, Maryland, Massachusetts, Missouri, Nebraska, New Mexico, New York, North Carolina, Ohio, Tennessee, Texas, West Virginia, Wyoming

[b]*p* Value is derived from chi–square Wald test of the null hypothesis within a covariate.

TABLE 3

Health-related quality of life among those aged 65 years or older by visual impairment status after adjustment for potentially confounding variables in 22 States[a], Behavioral Risk Factor Surveillance System, 2006–2010[b].

	Fair/poor health		Life dissatisfaction		Disability		Frequent physically unhealthy days		Frequent mentally unhealthy days		Frequent activity limitation days	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Visual impairment status												
No difficulty	1.0		1.0		1.0		1.0		1.0		1.0	
Little difficulty	1.2	1.1–1.3	1.5	1.4–1.9	1.5	1.3–1.6	1.3	1.1–1.4	1.3	1.1–1.5	1.1	1.00–1.28
Moderate/severe difficulty	1.8	1.6–2.0	2.2	1.8–2.8	2.0	1.8–2.2	1.9	1.7–2.1	1.8	1.5–2.1	1.9	1.6–2.2
Age group (years)												
65–74	1.0		1.0		1.0		1.0		1.0		1.0	
75–84	1.3	1.2–1.4	0.8	0.6–0.9	1.4	1.3–1.5	1.2	1.1–1.3	0.7	0.6–0.8	1.0	0.9–1.2
85 or older	1.4	1.2–1.7	0.6	0.4–0.8	2.3	2.0–2.6	1.1	0.9–1.3	0.4	0.4–0.6	1.0	0.8–1.3
Sex												
Male	1.0		1.0		1.0		1.0		1.0		1.0	
Female	1.0	0.9–1.0	0.8	0.7–1.0	1.1	1.0–1.2	1.2	1.0–1.3	1.4	1.2–1.7	1.2	1.0–1.3
Race/ethnicity												
Non-Hispanic white	1.0		1.0		1.0		1.0		1.0		1.0	
Non-Hispanic black	1.2	1.1–1.5	0.8	0.6–1.2	0.8	0.7–0.9	0.8	0.6–0.9	0.9	0.7–1.2	0.8	0.6–1.0
Hispanic	1.3	1.0–1.7	1.0	0.67–1.7	0.9	0.7–1.1	1.0	0.7–1.3	1.1	0.7–1.7	0.8	0.5–1.2
Other	1.2	0.9–1.6	0.7	0.4–1.2	1.2	0.9–1.5	1.2	0.8–1.6	1.1	0.7–1.6	0.8	0.6–1.2
Marital status												
Married	1.0		1.0		1.0		1.0		1.0		1.0	
Never married/divorced/ widowed/separated	1.0	1.0–1.1	2.0	1.6–2.4	1.2	1.1–1.3	1.0	0.9–1.1	1.3	1.1–1.5	1.0	0.9–1.2
Educational level												
< High school	2.2	1.9–2.5	1.1	0.8–1.4	0.8	0.7–0.9	1.5	1.3–1.7	1.5	1.2–1.8	1.3	1.1–1.6
High school graduate	1.4	1.3–1.5	0.9	0.8–1.2	0.6	0.7–0.9	1.1	1.0–1.2	1.19	0.9–1.3	1.00	0.9–1.2
> High school	1.0		1.0		1.0		1.0		1.0		1.0	
Annual household income												

	Fair/poor health		Life dissatisfaction		Disability		Frequent physically unhealthy days		Frequent mentally unhealthy days		Frequent activity limitation days	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
≥$35,000	1.0		1.0		1.0		1.0		1.0		1.0	
<$35,000	1.8	1.6–2.0	1.6	1.3–2.1	1.3	1.2–1.4	1.5	1.3–1.7	1.4	1.2–1.7	1.3	1.1–1.5
Diagnosed diabetes												
No	1.0		1.0		1.0		1.0		1.0		1.0	
Yes	2.4	2.2–2.7	1.4	1.1–1.7	1.3	1.2–1.5	1.6	1.4–1.7	1.2	1.0–1.5	1.4	1.2–1.6
Heart disease												
No	1.0		1.0		1.0		1.0		1.0		1.0	
Yes	2.4	2.1–2.7	1.5	1.2–2.0	1.9	1.7–2.1	1.9	1.6–2.2	1.4	1.1–1.7	1.8	1.5–2.2
Stroke												
No	1.0		1.0		1.0		1.0		1.0		1.0	
Yes	1.9	1.6–2.2	1.5	1.1–1.9	2.00	1.7–2.3	1.5	1.3–1.7	1.5	1.2–1.9	1.6	1.3–1.9
Heart attack												
No	1.0		1.0		1.0		1.0		1.0		1.0	
Yes	1.8	1.6–2.1	1.0	0.7–1.3	1.3	1.2–1.5	1.4	1.2–1.6	1.0	0.8.0–1.2	1.3	1.1–1.6
Smoking status												
Never smoked	1.0		1.0		1.0		1.0		1.0		1.0	
Current smoker	1.5	1.3–1.8	1.5	1.2–2.0	1.5	1.3–1.7	1.3	1.1–1.5	1.7	1.4–2.1	1.6	1.3–1.9
Former smoker	1.3	1.1–1.4	1.1	0.9–1.4	1.3	1.2–1.5	1.2	1.1–1.4	1.3	1.1–1.5	1.4	1.2–1.6
Physical activity												
No	1.0		1.0		1.0		1.0		1.0		1.0	
Yes	0.5	0.4–0.5	0.4	0.4–0.5	0.5	0.4–0.5	0.4	0.4–0.4	0.6	0.5–0.7	0.3	0.3–0.4
Body mass index (kg/m^2)												
Normal (<25)	1.0		1.0		1.0		1.0		1.0		1.0	
Overweight (25–<30)	0.8	0.8–0.9	0.8	0.6–1.0	1.1	1.0–1.2	0.8	0.7–0.9	0.8	0.7–0.9	0.7	0.6–0.9
Obese (≥30)	1.2	1.1–1.3	1.1	0.8–1.4	2.0	1.8–2.2	1.1	0.9–1.2	1.0	0.9–1.3	1.1	0.9–1.3
Has a regular healthcare provider												
No	1.0		1.0		1.0		1.0		1.0		1.0	
Yes	1.4	1.2–1.7	1.0	0.766–1.4	1.7	1.5–2.1	1.3	1.1–1.7	0.9	0.7–1.3	1.4	1.0–1.8

	Fair/poor health		Life dissatisfaction		Disability		Frequent physically unhealthy days		Frequent mentally unhealthy days		Frequent activity limitation days	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Medical care cost issue												
No	1.0		1.0		1.0		1.0		1.0		1.0	
Yes	1.9	1.6–2.4	3.0	2.3–4.0	1.9	1.6–2.3	1.8	1.5–2.2	2.4	1.9–3.0	1.9	1.5–2.4

CI, confidence interval; OR, odd ratio

[a] A total of 22 states used the Behavioral Risk Factor Surveillance System vision module at least once in the years 2006—2010: Alabama, Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Indiana, Iowa, Kansas, Maryland, Massachusetts, Missouri, Nebraska, New Mexico, New York, North Carolina, Ohio, Tennessee, Texas, West Virginia, Wyoming

[b] All models were adjusted for all covariates. There were no significant differences in the year and state variables in the logistic regression models.