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## Visual Impairment and Eye Care Among North Carolina Adults: Results from the New Vision Module Questions in the 2006 BRFSS Survey

by

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### ABSTRACT

**Objectives:** Eye health and use of eye care have not previously been measured among North Carolina adults. In 2006, questions from the newly developed vision module were included in North Carolina's BRFSS (Behavioral Risk Factor Surveillance System) survey. In this study, we present data related to impaired vision, eye-care insurance, and recent eye exams.

**Methods:** BRFSS survey results on visual impairment and vision care were available for 11,312 adult respondents age 40 and older. Impaired vision was defined as having at least some difficulty with near or far vision, even with corrective glasses or contact lenses if usually worn. A recent eye exam was defined as having an eye examination by a doctor or eye care provider in the past 12 months.

**Results:** Among adults age 40 and older, the statewide prevalence of impaired vision was 31.6 percent. The prevalence of impaired vision was highest among Americans Indians (39.3%) followed by African Americans (37.4%), whites (30.5%), other minorities (26.4%), and Hispanics (24.5%). Among those with a high risk for eye disease, 41.4 percent of diabetics had visual impairment. Overall, an estimated 41.9 percent of North Carolina adults do not have eye care insurance, and 36.3 percent have not had a recent eye exam. Among the two most common reasons for not having a recent eye exam, 52.1 percent of adults cited "no problem or reason to go," and 24.5 percent indicated cost or lack of eye-care insurance.

**Conclusions:** These new BRFSS vision module questions will serve as an important tool for monitoring eye health and use of eye care among North Carolina adults.



NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES

## Background

The first year in which the BRFSS (Behavioral Risk Factor Surveillance System) survey data were collected on visual impairment and access to eye care for North Carolina adults was 2006. The CDC (Centers for Disease Control and Prevention) contacted the North Carolina BRFSS Program in 2005 to request inclusion of the new BRFSS vision module in the state's upcoming 2006 survey. The module consisted of 10 questions. Due to limited space in the questionnaire, the NC BRFSS could only accept five questions from the module; the five questions asked were selected by the CDC. The vision module questions pertain only to those ages 40 and older.

We present here the results from these five questions by selected demographic characteristics and by selected risk groups, known to have an elevated risk for eye disease.

## Methods

The BRFSS survey is a state-based health survey, administered with support from the CDC. One adult (18+ year olds) is randomly selected for participation from households with land-line telephones. In 2006, the NC BRFSS survey lab completed 15,648 telephone interviews.

This study follows the methodology and format outlined by CDC researchers in the very first publication of results from the BRFSS vision module: "Visual Impairment and Eye Care Among Older Adults—Five States, 2005"<sup>1</sup> (referred to hereafter as the *Five-State Study*). Comparison of results between this study and the *Five-State Study* are discussed in the Discussion section of this report.

Visual impairment or low vision<sup>‡</sup> was defined as respondents who reported having "a little difficulty," "moderate difficulty," "extreme difficulty," or "unable to do because of eyesight" to the ques-

tion, "How much difficulty, if any, do you have in recognizing a friend across the street?" or to the question, "How much difficulty, if any, do you have reading print in newspaper, magazine, recipe, menu, or numbers on the telephone?" Not having eye-care insurance and not having a recent eye exam (i.e., no eye exam in the past 12 months or never visiting an eye-care professional) were also examined. For those with no recent eye exam, we analyzed the results for the two most commonly cited reasons: (1) no reason or problem to go, and (2) cost or lack of eye-care insurance.

These five study measures were cross-tabulated with respondent gender, age, race, education, employment status, and household income (Table 1). In addition, we cross-tabulated these measures with those who have an elevated risk for eye disease (Table 2), including respondents with doctor-diagnosed diabetes,<sup>2</sup> those with a history of cardiovascular disease (coronary heart disease, stroke, or heart attack),<sup>3</sup> daily or occasional smokers,<sup>4</sup> and those with obesity,<sup>5</sup> i.e., body mass index greater than or equal to 30.

A total of 11,312 adult respondents (age 40 and older) were available for analysis. Percentages and their corresponding 95 percent confidence intervals were calculated for each study measure, using statistical software (SAS) to account for the complex design of the BRFSS survey. Only weighted percentages are presented in this report.

## Results

As shown at the bottom of Table 1, 31.6 percent of respondents met the definition for visual impairment. No statistically significant difference in the rates of visual impairment was observed by gender or by age (i.e., all of the confidence intervals overlap). Visual impairment did, however, vary significantly by race/ethnicity, education, employment status, and household income. African Americans had a significantly higher rate of visual impairment (37.4%) than whites (30.5%), other minorities (26.4%), and Hispanics (24.5%). American Indians had the highest rate of visual impairment, but this difference was not statistically significant due to the

<sup>‡</sup> As defined on the NIH SeniorHealth website (<http://nihseniorhealth.gov/lowvision/>), "Low vision is a visual impairment, not correctable by standard glasses, contact lenses, medicine, or surgery, that interferes with a person's ability to perform everyday activities [such as reading or driving]."

**Table 1. Prevalence of visual impairment, no eye-care insurance, and no recent eye exam by selected demographic characteristics: 2006 NC BRFSS Survey**

| Demographics             | Visually impaired<br>% (95% C.I.) | No eye-care<br>insurance<br>% (95% C.I.) | No recent<br>eye exam <sup>+</sup><br>% (95% C.I.) | Reason for no recent eye exam                  |                                |
|--------------------------|-----------------------------------|--|--|--|--------------------------------|
|                          |                                   |  |  | No problem/<br>No reason to go<br>% (95% C.I.) | Cost/Insurance<br>% (95% C.I.) |
| <b>Gender</b>            |                                   |  |  |  |                                |
| Male                     | 30.0 (28.2-31.8)                  | 41.4 (39.5-43.3)                         | 40.4 (38.5-42.3)                                   | 58.2 (55.1-61.2)                               | 19.4 (16.9-21.8)               |
| Female                   | 33.0 (31.7-34.4)                  | 42.3 (40.9-43.8)                         | 32.7 (31.3-34.0)                                   | 45.6 (43.0-48.1)                               | 30.0 (27.7-32.3)               |
| <b>Age</b>               |                                   |  |  |  |                                |
| 40-49 yrs.               | 32.4 (30.2-34.5)                  | 36.8 (34.6-39.1)                         | 43.5 (41.3-45.8)                                   | 52.8 (49.3-56.3)                               | 25.1 (22.2-28.0)               |
| 50-59 yrs.               | 32.8 (30.7-35.0)                  | 39.9 (37.7-42.1)                         | 41.6 (39.4-43.8)                                   | 47.0 (43.6-50.5)                               | 29.0 (25.9-32.1)               |
| 60-69 yrs.               | 28.9 (26.8-31.1)                  | 48.0 (45.6-50.4)                         | 32.3 (30.1-34.5)                                   | 54.3 (50.1-58.5)                               | 21.0 (17.6-24.5)               |
| 70-79 yrs.               | 29.6 (27.1-32.1)                  | 49.6 (46.8-52.3)                         | 21.3 (19.0-23.6)                                   | 60.3 (54.3-66.2)                               | 15.9 (11.1-20.6)               |
| 80+ yrs.                 | 34.9 (31.1-38.7)                  | 44.0 (40.0-48.1)                         | 16.6 (13.6-19.5)                                   | 65.2 (56.1-74.3)                               | 6.9 (1.7-12.0)                 |
| <b>Race/Ethnicity</b>    |                                   |  |  |  |                                |
| White                    | 30.5 (29.3-31.7)                  | 42.7 (41.4-44.0)                         | 36.1 (34.9-37.4)                                   | 53.5 (51.3-55.7)                               | 23.3 (21.4-25.1)               |
| African American         | 37.4 (34.4-40.4)                  | 34.5 (31.7-37.3)                         | 32.3 (29.5-35.1)                                   | 45.0 (39.8-50.2)                               | 27.9 (23.3-32.6)               |
| American Indian          | 39.3 (30.3-48.4)                  | 45.7 (36.3-55.2)                         | 45.9 (36.6-55.1)                                   | 43.7 (30.4-57.1)                               | 32.7 (20.4-45.0)               |
| Other minorities         | 26.4 (20.2-32.7)                  | 55.0 (47.8-62.2)                         | 50.6 (43.3-57.8)                                   | 51.7 (40.8-62.7)                               | 30.6 (20.8-40.4)               |
| Hispanic                 | 24.5 (18.5-30.6)                  | 58.6 (51.4-65.7)                         | 51.5 (44.1-58.8)                                   | 49.9 (39.2-60.7)                               | 28.0 (18.8-37.2)               |
| <b>Education</b>         |                                   |  |  |  |                                |
| Less Than H.S.           | 39.0 (36.0-42.0)                  | 53.4 (50.3-56.5)                         | 41.7 (38.6-44.8)                                   | 41.9 (37.0-46.8)                               | 35.1 (30.6-39.6)               |
| H.S.                     | 33.0 (31.0-35.0)                  | 44.5 (42.3-46.6)                         | 38.3 (36.1-40.4)                                   | 49.2 (45.6-52.8)                               | 26.3 (23.2-29.4)               |
| Some Post-H.S.           | 32.1 (29.8-34.4)                  | 39.4 (37.1-41.7)                         | 35.4 (33.1-37.8)                                   | 50.7 (46.7-54.8)                               | 25.7 (22.2-29.3)               |
| College Grad             | 26.5 (24.6-28.4)                  | 36.1 (34.1-38.1)                         | 32.5 (30.5-34.5)                                   | 62.3 (58.7-66.0)                               | 15.4 (12.6-18.2)               |
| <b>Employment Status</b> |                                   |  |  |  |                                |
| Employed for wages       | 30.0 (28.3-31.7)                  | 33.0 (31.3-34.8)                         | 40.5 (38.6-42.3)                                   | 54.5 (51.6-57.5)                               | 20.7 (18.4-23.1)               |
| Self-employed            | 26.5 (22.7-30.4)                  | 55.0 (50.6-59.4)                         | 45.0 (40.7-49.4)                                   | 61.2 (54.6-67.8)                               | 15.9 (11.3-20.5)               |
| Other                    | 34.1 (30.5-37.8)                  | 53.7 (49.9-57.6)                         | 40.8 (37.0-44.6)                                   | 35.8 (30.2-41.4)                               | 45.7 (39.9-51.5)               |
| Retired                  | 29.0 (27.3-30.7)                  | 47.6 (45.7-49.5)                         | 23.4 (21.7-25.0)                                   | 61.5 (57.5-65.4)                               | 14.8 (11.7-17.8)               |
| Unable to work           | 52.9 (49.1-56.7)                  | 47.7 (43.8-51.6)                         | 42.8 (39.0-46.6)                                   | 26.7 (21.7-31.8)                               | 51.7 (45.8-57.6)               |
| <b>Household Income</b>  |                                   |  |  |  |                                |
| <\$15,000                | 46.6 (43.2-50.1)                  | 56.7 (53.4-60.1)                         | 43.0 (39.5-46.4)                                   | 30.1 (25.1-35.0)                               | 49.9 (44.3-55.5)               |
| \$15,000-24,999          | 39.2 (36.2-42.1)                  | 55.5 (52.4-58.6)                         | 41.1 (38.0-44.1)                                   | 43.4 (38.4-48.4)                               | 35.5 (30.8-40.1)               |
| \$25,000-34,999          | 33.9 (30.7-37.2)                  | 44.9 (41.5-48.3)                         | 38.1 (34.7-41.4)                                   | 47.7 (42.0-53.5)                               | 32.1 (26.7-37.5)               |
| \$35,000-49,999          | 29.3 (26.4-32.2)                  | 39.1 (36.1-42.2)                         | 35.2 (32.2-38.3)                                   | 56.5 (51.1-61.8)                               | 20.3 (16.0-24.7)               |
| \$50,000+                | 25.8 (23.9-27.6)                  | 31.0 (29.1-32.9)                         | 34.9 (32.9-36.9)                                   | 62.8 (59.5-66.1)                               | 11.4 (9.0-13.7)                |
| <b>Total</b>             | 31.6 (30.5-32.7)                  | 41.9 (40.8-43.1)                         | 36.3 (35.1-37.4)                                   | 52.1 (50.1-54.1)                               | 24.5 (22.8-26.2)               |

<sup>+</sup> Had eye exam more than 12 months ago or never.

Notes: C.I. = Confidence Interval. Hispanics are included both in the Hispanic ethnicity row and in the racial category which they report.

small number of American Indian survey respondents. Those with less than a high school education had a significantly higher rate of visual impairment than those with higher levels of education, and low income groups had a significantly higher rate of visual impairment than high income groups. With respect to employment status, more than half of persons (52.9%) who reported being unable to work had visual impairment—the highest percentage of any demographic group.

Not having eye-care insurance varied most by household income: 56.7 percent of those with

annual household incomes of less than \$15,000 dollars had no eye-care insurance, compared to 31.0 percent of those with incomes in the highest group. Thirty-three percent of those employed for wages did not have eye-care insurance, compared to 55 percent of those who were self-employed. Those retired or unable to work also had high rates of no eye-care insurance. By age, the highest rate of no insurance was found among 70 to 79 year olds—almost 50 percent. By race and ethnicity, Hispanics had the highest rate of no eye-care insurance (58.6%), and African Americans had the lowest (34.5%).

**Table 2. Prevalence of visual impairment, no eye-care insurance, and no recent eye exam by selected risk conditions for eye disease: 2006 NC BRFSS Survey.**

| Risk for Eye Disease              | Visually impaired<br>% (95% C.I.) | No eye-care insurance<br>% (95% C.I.) | No recent eye exam <sup>+</sup><br>% (95% C.I.) | Reason for no recent eye exam                  |                                |
|-----------------------------------|-----------------------------------|---------------------------------------|---|--|--------------------------------|
|                                   |                                   |                                       |   | No problem/<br>No reason to go<br>% (95% C.I.) | Cost/Insurance<br>% (95% C.I.) |
| Doctor-diagnosed diabetes         | 41.4 (38.4-44.4)                  | 40.3 (37.3-43.2)                      | 22.4 (19.7-25.1)                                | 25.5 (19.5-31.4)                               | 42.7 (36.8-48.6)               |
| History of cardiovascular disease | 39.5 (36.7-42.4)                  | 46.6 (43.7-49.6)                      | 31.0 (28.1-33.8)                                | 36.1 (30.9-41.3)                               | 38.5 (33.0-44.0)               |
| Current smoker                    | 35.5 (32.7-38.2)                  | 45.9 (43.0-48.7)                      | 47.4 (44.6-50.2)                                | 44.0 (39.9-48.0)                               | 33.6 (29.8-37.3)               |
| Obesity                           | 35.4 (33.3-37.6)                  | 41.7 (39.5-43.9)                      | 36.9 (34.7-39.1)                                | 46.4 (42.6-50.3)                               | 30.1 (26.7-33.4)               |

<sup>+</sup> Had eye exam more than 12 months ago or never.

Note: C.I. = Confidence Interval

The percentage of respondents not having a recent eye exam (past 12 months) decreased with increasing age, education, and household income. Overall, a little more than one-third of North Carolina adults, ages 40 and older, have not had an eye exam in the past 12 months.

Males were significantly more likely than females to cite “no reason or problem to go” as the principal reason for not having a recent eye exam. This reason was also chosen most often among the oldest age group, 80+ year olds: of the 16.6 percent with no recent eye exam, more than 65 percent said they had no reason to go.

Among the risk groups shown in Table 2, visual impairment ranged from 41.4 percent among persons with diabetes to 35.4 percent among obese persons. The report of not having eye-care insurance was highest among those with a history of cardiovascular disease. Smokers were most at risk for not having a recent eye exam. And among diabetics who reported not having an eye exam in past 12 months, almost 43 percent cited “cost” as the main reason.

## Discussion

Visual impairment or low vision, defined as persons who report having at least “a little difficulty” with either their near vision (i.e., reading newsprint) or far vision (i.e., recognizing a friend across the street), was present among a substantial proportion of North Carolina adults in 2006: the estimated prevalence was 31.6 percent. This prevalence

rate approximates that of self-reported disability (31.7%; 2006 NC BRFSS) or hypertension (29.2%; 2005 NC BRFSS) in the state.

Though the prevalence of visual impairment in North Carolina cannot be compared directly with the results from the *Five-State Study*, the difference between the two sets of estimates is instructive. In the 2005 *Five-State Study*, where low vision was defined as any difficulty watching television (changed to reading difficulties in the 2006 revision of the module) or recognizing a friend across the street, the state prevalence of low vision ranged from 14.3 percent in Iowa to 20.5 percent in Ohio, both substantially lower than North Carolina’s reported prevalence of 31.6 percent. The differences here suggest that reading problems (asked about in the 2006 NC BRFSS) are more common in the general population and represent a different risk group for low vision than those who report having difficulty watching television. It also suggests that assessment of visual impairment or low vision via survey is highly sensitive to the content of questions and the survey definition of low vision.

Furthermore, research in low vision using optometric measurement tells us that estimates derived from survey assessments of low vision are likely to over-estimate the true prevalence. For example, in a recent article published in the *Journal of the American Medical Association*, researchers found (using data from the 1999-2002 National Health and Nutrition Examination Survey) that, when visual impairment was defined “as presenting distance

visual acuity of 20/50 or worse in the better-seeing eye,” the weighted prevalence of low vision in the United States was 6.4 percent for persons ages 12 and older.<sup>6</sup> By including respondents who report having only “a little difficulty” in the definition of low vision, as in the *Five-State Study*, our BRFSS survey estimate may capture some of those who are at risk for low vision, but do not show a marked clinical manifestation. When we re-calculated the prevalence of visual impairment in North Carolina, leaving out those who reported having only “a little difficulty” with either their near or far vision, the prevalence of impaired vision in the state fell to 11.5 percent.

Not having eye-care insurance is prevalent among many North Carolinians. More than 40 percent of the adult population (age 40+) had no eye-care insurance in 2006. Even higher estimates of no eye-care insurance were observed in the *Five-State Study*: 51.8 percent in Iowa, 50.5 percent in Louisiana, 46.2 percent in Ohio, 55.0 percent in Tennessee, and 52.5 percent in Texas. Not only is not having eye-care insurance prevalent in the general population, it is also prevalent among those at high risk for eye disease. For example, based on our weighted results, out of an estimated 203,000 visually-impaired, diabetic adults in North Carolina, 82,000 (40%) had no eye-care insurance in 2006. It’s clear that improving eye-care insurance coverage is a pressing public health issue—one which has often been left out of the national debate on health care.

Another important issue in eye health is the fact that many adults do not seek eye care until a vision problem becomes obvious, and by that time (especially if the problem was allowed to persist), the window for effective treatment may be reduced. Some eye diseases, such as AMD (age-related macular degeneration), tend to be asymptomatic in the early stages. The later an eye problem is diagnosed, the more difficult it becomes to treat.<sup>7</sup> In this study, as in the *Five-State Study*, the majority of respondents cited “no reason to go” as the main reason for not having an eye exam in the past year. Certainly, the message needs to get out to all older

adults of the importance of regular eye care, as recommended by Healthy Vision2010 ([www.healthyvision2010.nei.nih.gov](http://www.healthyvision2010.nei.nih.gov)) or by the American Academy of Ophthalmology ([www.aao.org/education/guidelines/ppp/camee.cfm](http://www.aao.org/education/guidelines/ppp/camee.cfm)).

## Conclusion

The new BRFSS vision module\* is an essential tool for monitoring the eye health of adult North Carolinians. Underlining the importance of this, there is widespread agreement in the research literature that the prevalence of visual disabilities will increase markedly in the United States during the next 20 years, as the population continues to age.

\* Note: The BRFSS vision module in its entirety is scheduled for inclusion in the 2008 NC BRFSS questionnaire.

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