



Introduction

For adults, glaucoma, cataracts, age-related macular degeneration and diabetic retinopathy are serious threats to vision. Eye disease and visual impairment are among the ten most common causes of disability. These conditions can affect a person's ability to work and to care for themselves. They also may result in reduced quality of life and increased risk of premature death. Cataracts can be treated, most often with excellent outcomes; however, the treatments for many other eye diseases are often not as promising especially if discovered late in the disease process. That is why early detection and prevention are so important.

Behaviors such as smoking or poor diet can impact eye health, as well as overall health. Injuries, too, can result in vision problems. Adopting healthy eating habits, not smoking and taking safety precautions can help keep your eyes healthy. Vision screening among adults aged 65 years and older ranks among the top ten most effective clinical preventive services that can be offered in medical settings.¹

The annual cost of adult vision problems in the U.S. is more than \$51 billion.² Rates of vision loss and blindness are expected to increase dramatically in the next three decades as the population ages and demographics change.³ With these increases, the cost will also rise. Community-based organizations, local health departments and other partners can play a critical role in preventing new cases of eye disease and the visual impairment that often follows.

Data Collection

The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing telephone-based surveillance system developed by the Centers for Disease Control and Prevention (CDC) and administered by the New York State Department of Health. The BRFSS is designed to provide information on behaviors, risk factors, diseases and conditions, and utilization of preventive services related to the leading causes of chronic and infectious diseases, disability, injury, and death among the non-institutionalized, civilian adult population aged 18 years and older.

In 2006, the Visual Impairment and Access to Eye Care module was included in the survey to assess prevalence of self-reported visual impairment, eye disease, eye injury, and lack of eye care insurance and eye examination among persons aged 40 years and older. The module has ten questions and was first used in 2005 by five states.⁴ One question about diabetic retinopathy was asked in the Diabetes module.

VISION IMPAIRMENT AND ACCESS TO EYE CARE

Copies may be obtained by contacting:

BRFSS Coordinator
New York State Department of Health
Bureau of Chronic Disease,
Epidemiology and Surveillance
Empire State Plaza, Rm. 565,
Corning Tower
Albany, NY 12237-0679

or by phone or electronic mail:
(518) 473-0673

or BRFSS@health.state.ny.us or
www.health.state.ny.us

Results

Information was obtained from 4,258 adults, although the number of respondents answering each question varied. The results are shown in Figure 1, Table 1, Table 2, and briefly highlighted. Data are presented with confidence intervals to show the precision of the estimates and better understand variation among demographic groups. T-tests were used to test for statistically significant differences in proportions between groups.

Number of New York adults with distance vision impairment and eye disease – The number of people aged 40 years and older living in New York with distance vision impairment or who have at least one of the age-related eye diseases was estimated by multiplying the number of state residents in this age group⁵ by the weighted prevalence estimate. The results are shown in Figure 1.

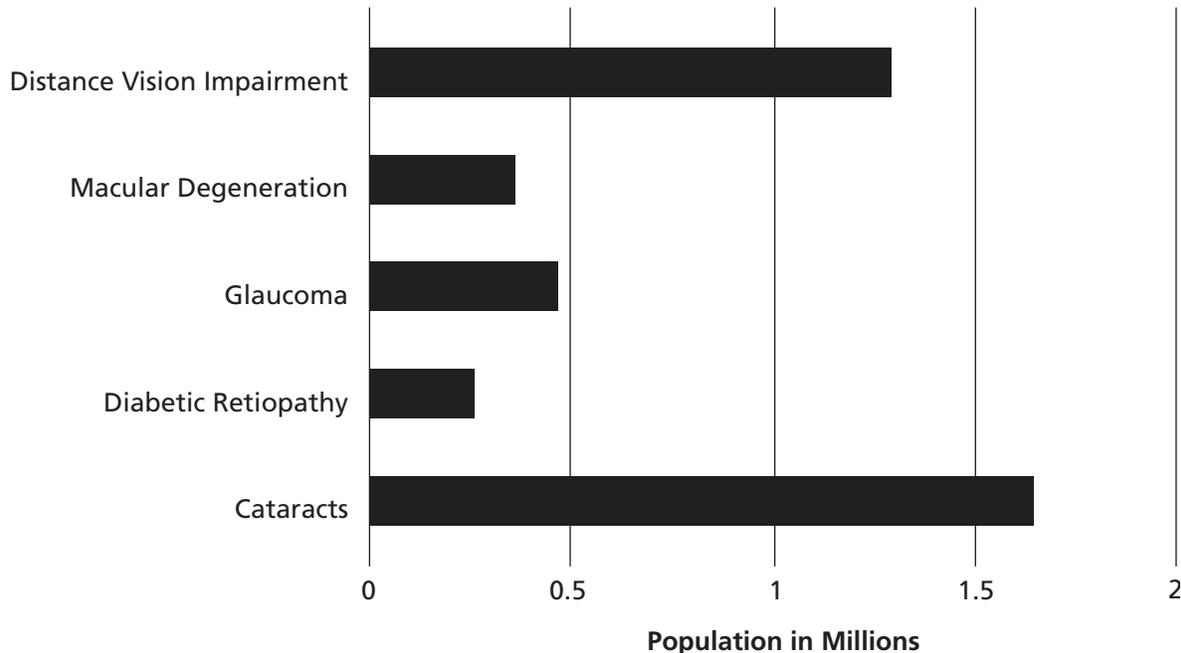
Distance Vision Impairment – Respondents were classified as having distance vision impairment if they said they had at least some difficulty recognizing a friend across the street. The prevalence of distance vision impairment was 14.9% overall and was significantly higher in older age groups, females, non-Hispanic blacks and Hispanics, those with less than high school educations, and those with annual household incomes lower than \$25,000.

Cataracts – A cataract is a clouding of the lens in the eye that affects vision. A cataract can occur at any age but is more likely with advancing age. There are many different types of cataracts. Sometimes, just one eye is affected (e.g., traumatic cataract). Other times, such as in age-related cataract, both eyes have cataracts. Overall, the prevalence of cataracts was 19.0% and increased sharply with age, ranging from 2.7% in those aged 40-49 years to 62.0% among those at least 80 years of age. Among those aged 60-69 years, the prevalence was 23.0%, 54.4% among those aged 70-79 years, and 62.0% among those aged 80 years and older. The prevalence of cataracts was significantly higher in females, both white and black non-Hispanics, those with high school educations or less, and those with annual household incomes lower than \$35,000.

Glaucoma – Glaucoma is a disease that causes degeneration of the cells of the optic nerve which carries visual information to the brain, often causing vision loss. More than one in 20 (5.3%) respondents have been told by health care professionals that they have glaucoma. The reported prevalence rose steadily with age, affecting 13.9% of people aged 80 years and older. The prevalence was significantly higher among non-Hispanic blacks, those with high school educations or less, and those with annual household incomes less than \$50,000.

Figure 1

Estimated number of adults aged 40 years and older with distance vision impairment or an age-related eye disease: New York State Behavioral Risk Factor Surveillance System, 2006



Macular degeneration – Age-related macular degeneration (AMD) is the leading contributor of irreversible vision loss among older adults. AMD is caused by a breakdown of the central retinal tissue leading to leakage of blood or serum and a subsequent loss of central vision. Those affected often lose their ability to read, see facial details, watch television, and drive. Peripheral vision, however, remains intact so individuals with AMD are still able to move about on their own. The proportion of respondents who have been told by health care professionals that they have macular degeneration was 4.1%. A significantly higher prevalence was reported by those aged 70 years and older and by females.

Diabetic retinopathy – Diabetic retinopathy is a complication of diabetes that occurs when retinal blood vessels break, leak or become blocked, thus impairing vision. The proportion of respondents who have been told by their doctors that diabetes has affected their eyes or that they have retinopathy was 2.9%. Prevalence varied across demographic groups, with a significantly higher proportion found among those aged 60 and older, Hispanics and non-Hispanic blacks, those with less than high school educations, and those with lower incomes.

Workplace eye injury – Injuries can damage the eye, sometimes causing vision loss. Most eye injuries are preventable. According to the National Institute for Occupational Safety and Health, each day about 2000 U.S. workers have job-related eye injuries that require medical treatment.⁷ The majority of these injuries result from small particles or objects striking or abrading the eye. History of workplace eye injury was reported by 7.4% of respondents. Females and non-Hispanic blacks were significantly less likely to report histories of eye injury.

Insurance coverage for eye care – For eligible adults, Medicare and Medicaid provide some reimbursement for eye care services. Private health insurance may also cover selected eye care services. Otherwise, people can purchase supplementary vision insurance, which typically includes a wellness benefit designed to cover routine, preventive eye care such as eye exams, eyewear, and other services at a reduced cost. About one-third (32.8%) of respondents reported not having any health insurance coverage

for eye care; this proportion rose to 42.3% among those aged 70 years or older. While everyone in this older age group is eligible for Medicare, some of them may not be aware of the eye care benefits available to them, or may view their Medicare benefits as limited. The groups less likely to report having eye care insurance were non-Hispanic blacks and Hispanics, those with less than high school educations, and those with annual household incomes under \$25,000.

Recent dilated eye examination – A dilated eye exam can detect vision problems and eye diseases earlier in the disease process. Every one should receive a comprehensive eye exam through dilated pupils regularly as recommended by their doctor. People with special risks such as diabetes, previous eye trauma, surgery, or a family history of glaucoma may need eye exams more frequently. Overall, 48.1% of respondents reported that they had not had dilated eye examinations in the past year. There was a significant gradient by age, with lower proportions reporting no exam in the older age groups.

Recent visit to eye care professionals – Although many vision problems are initially asymptomatic, regular eye examinations can help to delay or limit their progression. An eye care professional can identify risk factors, find early signs of eye disease, prescribe effective treatment and, ultimately, save vision. Despite these benefits, 37.2% of respondents had not visited an eye care professional in the last year. The proportion not visiting an eye care professional decreased in older age groups, declining from 46.6% in respondents aged 40-49 years to 16.5% in those aged 80 years and older. Nearly half (47.5%) of the respondents who had not visited an eye care professional reported they had no reason to go, with a significantly higher proportion among the following groups: those aged 70-79 years, females, those in the 'other' race category, and those with more than \$50,000 in annual household income. Cost or lack of insurance was cited as the reason that 18.9% had not visited an eye care professional. A significantly lower proportion giving this reason was found among respondents aged 70-79 years, males, non-Hispanics, those with more than high school educations, and those with annual household incomes of at least \$50,000.

Table 1
Prevalence of distance vision impairment, age-related eye diseases, or workplace eye injury history among persons aged ≥40 years by selected demographic characteristics: New York State Behavioral Risk Factor Surveillance System, 2006

Characteristic	Distance vision impairment ^a		Cataract ^c		Glaucoma ^d		Macular degeneration ^e		Diabetic retinopathy ^f		Workplace eye injury ^g	
	%	95% CI ^b	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Total	14.9	13.6 16.3	19.0	17.7 20.3	5.3	4.5 6.1	4.1	3.5 4.8	2.9	2.4 3.7	7.4	6.4 8.5
Age (yrs)												
40-49 (Reference)	10.4	8.4 12.9	2.7	1.8 4.0	2.0	1.2 3.4	2.4	1.6 3.7	1.2	0.6 2.5	8.5	6.6 10.9
50-59	15.3*	12.9 17.9	8.9*	7.0 11.2	2.8	1.9 4.1	2.6	1.8 3.9	2.5	1.6 4.0	8.4	6.7 10.6
60-69	15.3*	12.6 18.4	23.0*	19.8 26.5	7.4*	5.3 10.2	3.5	2.2 5.3	5.5*	3.7 8.1	6.8	5.0 9.2
70-79	17.5*	14.4 21.0	54.4*	50.2 58.6	11.5*	9.1 14.4	6.8*	5.0 9.3	4.1*	2.6 6.3	5.8	3.9 8.6
80+	30.0*	24.2 36.5	62.0*	55.3 68.2	13.9*	10.4 18.4	14.2*	10.7 18.7	4.3*	2.5 7.3	2.1*	0.9 4.7
Sex												
Male (Reference)	12.5	10.7 14.6	15.8	13.9 17.9	4.8	3.7 6.1	3.0	2.2 4.1	3.4	2.4 4.7	12.5	10.7 14.5
Female	17.0*	15.3 18.8	21.7*	20.0 23.5	5.7	4.7 6.9	5.0*	4.2 6.0	2.6	1.9 3.4	3.0*	2.1 4.2
Race/Ethnicity												
White, non-Hispanic (Reference)	12.9	11.8 14.2	20.9	19.5 22.3	4.7	4.0 5.5	4.0	3.3 4.8	1.9	1.5 2.5	7.9	6.8 9.1
Black, non-Hispanic	21.7*	16.7 27.8	16.5	12.5 21.6	9.7*	6.5 14.2	4.3	2.6 7.3	5.7*	3.4 9.3	4.5*	2.4 8.0
Other	13.2	8.1 20.8	14.6*	10.0 20.8	3.2	1.2 7.8	5.7	3.1 10.2	4.6	2.3 9.1	8.5	4.9 14.3
Hispanic	19.9*	15.2 25.5	13.3*	9.4 18.6	5.9	3.5 10.0	3.2	1.7 6.0	5.1*	2.8 9.2	6.7	3.4 12.5
Education												
< High school (Reference)	24.6	19.3 30.7	24.9	20.1 30.4	8.7	5.8 12.7	3.1	1.7 5.5	8.0	5.2 12.1	9.3	5.6 14.9
High school graduate	18.1*	15.7 20.8	23.5	21.0 26.3	6.0	4.7 7.7	5.3	4.0 7.0	2.8*	1.9 4.1	9.0	7.1 11.2
More than high school	11.7*	10.3 13.2	15.7*	14.2 17.2	4.3*	3.5 5.3	3.6	2.9 4.5	2.1*	1.5 2.9	6.2	5.2 7.4
Annual household income												
< \$15,000 (Reference)	26.9	21.7 32.8	28.7	23.7 34.3	8.6	6.0 12.3	4.4	2.7 7.2	8.7	5.7 13.0	10.4	6.1 17.2
\$15,000 - \$24,999	22.6	18.5 27.4	30.9	26.5 35.6	6.4	4.6 8.8	6.1	4.2 8.7	4.5*	2.8 7.1	7.2	4.9 10.4
\$25,000 - \$34,999	14.7*	11.0 19.5	24.6	20.2 29.7	6.8	4.2 10.8	5.7	3.6 8.8	5.0	2.8 8.6	7.7	5.2 11.3
\$35,000 - \$49,999	14.9*	11.7 18.8	16.2*	12.9 20.2	6.1	4.3 8.6	4.4	2.7 7.1	1.9*	0.7 4.8	7.8	5.5 10.9
≥ \$50,000	9.5*	7.9 11.3	10.6*	9.2 12.3	3.2*	2.4 4.4	2.5	1.8 3.5	1.2*	0.7 1.9	7.6	6.2 9.4

a Respondents were classified as having distance vision impairment if they answered "a little difficulty," "moderate difficulty," "extreme difficulty," or "unable to do because of eyesight" to Q1.

b % = weighted percentage; CI = confidence interval

c Respondents were classified as having cataracts if they answered 'yes' or 'yes, but had been removed' to Q3.

d Respondents were classified as having glaucoma if they answered 'yes' to Q4.

e Respondents were classified as having macular degeneration if they answered 'yes' to Q5.

f Respondents were classified as having diabetic retinopathy if they answered 'yes' to Q6.

g Respondents were classified as having had a workplace eye injury if they answered 'yes' to Q7.

* Significantly different (p < 0.05) from the first subcategory (reference group).

Table 2

Prevalence of no eye care insurance, no dilated eye examination, and no visit to an eye care professional among persons aged ≥40 years by selected demographic characteristics: New York State Behavioral Risk Factor Surveillance System, 2006

Characteristic	No eye care insurance ^a		No dilated eye examination ^c		No visit to an eye care professional ^d		Reason for no eye care visit ^e			
	%	95% CI ^b	%	95% CI	%	95% CI	No reason to go	Cost/insurance		
Total	32.8	31.1 34.6	48.1	46.2 50.0	37.2	35.4 39.1	47.5	44.4 50.7	18.9	16.5 21.6
Age (yrs)										
40-49 (Reference)	28.0	24.7 31.5	62.6	59.0 66.1	46.6	43.0 50.3	47.3	42.0 52.6	20.5	16.4 25.4
50-59	30.0	27.0 33.3	48.8*	45.3 52.4	38.8*	35.5 42.2	43.6	38.3 49.1	22.2	18.1 26.9
60-69	37.3*	33.4 41.4	44.7*	40.6 48.8	36.9*	33.0 41.0	48.2	41.4 55.1	17.6	12.7 23.9
70-79	40.2*	36.1 44.5	27.8*	24.3 31.6	20.7*	17.6 24.1	61.3*	52.7 69.2	7.8*	4.3 13.7
80+	42.3*	36.1 48.8	24.9*	19.8 30.8	16.5*	12.6 21.4	51.1	36.8 65.1	0	N/A N/A
Sex										
Male (Reference)	33.4	30.5 36.3	50.1	47.0 53.2	39.1	36.1 42.1	55.4	50.5 60.2	13.7	10.6 17.6
Female	32.4	30.2 34.6	46.5	44.1 48.8	35.6	33.4 37.9	40.2*	36.5 44.0	23.8*	20.3 27.6
Race/Ethnicity										
White, non-Hispanic (Reference)	34.0	32.3 35.8	47.9	46.0 49.8	37.1	35.3 38.9	47.9	44.8 51.0	17.6	15.4 20.0
Black, non-Hispanic	20.1*	15.0 26.5	46.0	39.4 52.7	35.2	29.0 41.9	41.7	30.8 53.4	19.1	11.5 30.0
Other	28.1	20.3 37.4	48.2	39.3 57.3	38.9	30.7 47.7	65.0*	51.4 76.5	14.0	6.6 27.4
Hispanic	42.4*	35.2 50.0	51.7	44.2 59.1	38.3	31.2 45.8	37.9	26.3 51.1	30.1*	19.4 43.6
Education										
< High school (Reference)	46.6	39.6 53.8	49.4	42.2 56.5	37.8	31.2 45.0	43.2	31.9 55.3	28.8	18.8 41.6
High school	35.6*	32.5 38.9	47.9	44.5 51.3	37.5	34.3 40.9	45.2	39.6 50.8	20.7	16.6 25.6
More than high school	29.0*	26.9 31.1	48.1	45.7 50.4	37.0	34.8 39.3	49.5	45.6 53.3	16.2*	13.5 19.4
Annual household income										
< \$15,000 (Reference)	49.3	42.7 55.9	50.2	43.6 56.7	38.3	32.0 45.0	37.1	26.9 48.5	34.4	23.4 47.2
\$15,000 - \$24,999	44.6	39.2 50.0	48.7	43.2 54.2	37.0	31.8 42.5	43.7	34.6 53.3	28.7	21.4 37.4
\$25,000 - \$34,999	37.0*	31.1 43.3	44.7	38.7 50.9	38.1	32.5 44.0	46.4	37.6 55.4	21.0	14.9 28.8
\$35,000 - \$49,999	32.8*	28.0 38.0	47.0	41.7 52.4	40.1	35.0 45.4	38.9	31.2 47.2	27.7	20.0 37.0
≥ \$50,000	23.1*	21.0 25.4	50.2	47.4 53.0	37.0	34.3 39.8	54.3*	49.6 58.8	9.6*	7.4 12.3

a Respondents who had no health insurance coverage for eye care

b % = weighted percentage; CI = confidence interval

c Respondents who had not had a dilated eye examination in the preceding 12 months

d Respondents who had not visited an eye care professional in the preceding 12 months

e Respondents were asked the main reason they had not visited an eye-care professional in the preceding 12 months.

The two most common reasons were 'no reason to go' and 'cost/coinsurance.'

* Significantly different (p < 0.05) from the first subcategory (reference group).

Discussion

The 2006 BRFSS data provide the first population-based estimates for the number of New York adults whose distance vision is impaired, as well as the percent who report that doctors or other health care professionals have told them they have eye disease. About one in six adults has distance vision impairment, with the prevalence rising with age. These estimates are consistent with national data⁷ that highlight the disproportionate burden of vision loss and eye disease among older adults, especially those aged 80 years and older, and other demographic groups such as people with less education and lower income.

Early detection and timely treatment can help prevent visual impairment and disease progression to blindness. Annual dilated eye examinations are recommended for individuals with diabetes and people aged 65 years and older. Nearly half of adults interviewed did not have dilated eye examinations in the past year. Despite strong evidence for the benefits of having regular eye examinations, more than a third of New Yorkers have not visited eye care professionals in the past year. Moreover,

nearly 50% of those who had not visited eye care professionals during the preceding year said that they had no reason to go. Approximately one in five cited cost or lack of eye care insurance as the cause.

These data can be used to raise public awareness about vision impairment and age related eye diseases. Public health strategies recommended to address vision problems are outlined in two recent reports.^{8,9} These recommendations stress the importance of coordinating public, private and non-profit resources in reaching population groups at increased risk for eye disease and vision loss. Efforts should seek to integrate and coordinate timely screening, diagnosis, and treatment programs in communities; ensure continuity between medical treatment and supportive care for eye conditions associated with aging; and conduct ongoing surveillance about the magnitude of visual impairment, using better methods for identifying people affected and the extent of their vision loss.

Appendix A. 2006 BRFSS Vision-Related Questions

IMPAIRMENTS

Q1 How much difficulty, if any, do you have in recognizing a friend across the street?

1. No difficulty 2. A little difficulty 3. Moderate difficulty 4. Extreme difficulty
5. Unable to do because of eyesight 6. Unable to do for other reasons

Q2 How much difficulty, if any, do you have reading print in newspaper, magazine, recipe, menu, or numbers on the telephone?

1. No difficulty 2. A little difficulty 3. Moderate difficulty 4. Extreme difficulty
5. Unable to do because of eyesight 6. Unable to do for other reasons

EYE DISEASES AND INJURIES

Q3 Have you been told by an eye doctor or other health professional that you now have cataracts?

1. Yes 2. Yes, and had been removed 3. No 4. Don't know/ Not sure 5. Not applicable (Blind) 6. Refused

Q4 Have you ever been told by an eye doctor or other health care professional that you had glaucoma?

1. Yes 2. No 3. Don't know/ Not sure 4. Not Applicable (Blind) 5. Refused

Q5 Have you ever been told by an eye doctor or other health care professional that you had macular degeneration?

1. Yes 2. No 3. Don't know/ Not sure 4. Not Applicable (Blind) 5. Refused

Q6 Has a doctor ever told you that diabetes has affected your eyes or that you had retinopathy?*

1. Yes 2. No 3. Don't know / Not sure 4. Not Applicable (Blind) 5. Refused

Q7 Have you ever had an eye injury that occurred at your workplace while you were doing your work?

1. Yes 2. No 3. Don't know/ Not sure 4. Refused

ACCESS TO AND USE OF HEALTH CARE

Q8 When was the last time you had your eyes examined by any doctor or eye care provider?

1. Within the past month (anytime less than 1 month ago) 2. Within the past year (1 month but less than 12 months ago) 3. Within the past 2 years (1 year but less than 2 years ago) 4. 2 or more years ago 5. Never

Q9 What is the main reason you have not visited an eye care professional in the past 12 months?

1. Cost / insurance 2. Do not have / know an eye doctor 3. Cannot get to the office/clinic (too far away, no transportation) 4. Could not get an appointment 5. No reason to go (no problem) 6. Have not thought of it 7. Other

Q10 When was the last time you had an eye exam in which the pupils were dilated? This would have made you temporarily sensitive to bright light.

1. Within the past month (anytime less than 1 month ago) 2. Within the past year (1 month but less than 12 months ago) 3. Within the past 2 years (1 year but less than 2 years ago) 4. 2 or more years ago 5. Never

Q11 Do you have any kind of health insurance coverage for eye care?

1. Yes 2. No 3. Don't know/ Not sure 4. Not Applicable (Blind) 5. Refused

*This question was included in the Diabetes module and administered only to people with diabetes.

References

1. Maciosek MV, Edwards NM, Coffield AB, Flottemesch TJ, Goodman MJ, Solberg LI. Priorities among effective clinical preventive services: Methods. *American Journal of Preventive Medicine*. 2006;31(1):52-61.
2. Rein DB, Zhang P, Wirth KE, Lee PP, Hoerger TJ, McCall N, Klein R, Tielsch JM, Vijan S, Saaddine J. The Economic Burden of Major Adult Visual Disorders in the United States. *Archives of Ophthalmology*. 2006 Dec;124(12):1754-60.
3. The Eye Disease Prevalence Research Group. Causes and prevalence of visual impairment among adults in the United States. *Archives of Ophthalmology* 2004;122:477-485.
4. Bailey RN, Indian RW, Zhang X, Geiss LS, Duenas MR, Saaddine JB; Centers for Disease Control and Prevention. Visual Impairment and Eye Care Among Older Adults – Five States, 2005. *Morbidity and Mortality Weekly Report*, December 15, 2006 / 55(49);1321-1325.
5. 2005 American Community Survey. <http://factfinder.census.gov>
6. National Institute for Occupational Safety and Health. <http://www.cdc.gov/niosh/topics/eye/>
7. Vision Problems in the U.S. Prevalence of Adult Vision Impairment and Age-Related Eye Disease in America. Prevent Blindness America. 2002. <http://www.preventblindness.org/vpus/vp.html>
8. Improving the Nation's Vision Health: A Coordinated Public Health Approach. Centers for Disease Control and Prevention, 2006. <http://www.cdc.gov/diabetes/pubs/vision.htm>
9. A Plan for the Development of State Based Vision Preservation Programs: Summary of a Retreat on Public Health Vision Preservation. Prevent Blindness America and the National Association of Chronic Disease Directors, October 2005. http://www.chronicdisease.org/files/public/A_Plan_forthe_Development_of_StateBased_Vision_Preservation_Programs.pdf

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