

North Carolina's Older Population and Vision Loss: A Briefing



VisionServe Alliance

LEADING TO A BETTER WORLD
FOR PEOPLE WITH VISION LOSS
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September 30, 2022

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Suggested Citation: VisionServe Alliance (2022). *North Carolina's Older Population and Vision Loss: A Briefing*, St. Louis.

Contents

Executive Summary	4
North Carolina's Older Population and Vision Loss: A Briefing	5
Purpose	5
Introduction	5
Vision Impairment in North Carolina	7
Demographic Characteristics	7
Table 1. Prevalence of Vision Impairment by Age, Sex, and Race/Ethnicity among People Aged 65 Years and Older, North Carolina, BRFSS	8
Geographic Distribution	8
Figure 1. County Level Estimated Prevalence of Vision Impairment and Blindness by County, North Carolina, American Community Survey, 2019.	9
Chronic Conditions	9
Figure 2. Chronic Conditions among People with and without Vision Impairment, North Carolina, 2019, BRFSS	10
Health-Related Quality of Life	10
Figure 3. Health-Related Quality of Life among People Aged ≥65 Years, with and without Vision Impairment, North Carolina, 2019, BRFSS	11
Disability Status	11
Figure 4. Disability Status among People Age ≥65 Years with and without Vision Impairment, North Carolina, 2019, BRFSS	12
Social Determinants of Health and Health Equity	12
Discussion	13
Conclusion	13
References	14
Acknowledgements	15
Appendix A: Methods	16
Appendix B: BRFSS and ACS Tables	18
Appendix B, Table 1. Prevalence of Visual Impairment by Age and Race/Ethnicity in People Aged 65 and Older, BRFSS, United States and North Carolina, 2019	18
Appendix B, Table 2. Prevalence of Vision Impairment among People Age ≥65 Years by County, North Carolina, American Community Survey, 2019	19
Appendix B, Table 3. Social, Economic, and Health Characteristics of People Age ≥65 Years United States and North Carolina, 2019, BRFSS	25
Appendix C: Tabular Representations of Figures 1-4	28

Figure 1. Estimated Prevalence of Vision Impairment among People Aged ≥ 65 Years by County, North Carolina, American Community Survey, 2019.....	28
Figure 2. Chronic Conditions among People Aged ≥ 65 Years with and without Vision Impairment, North Carolina, 2019, BRFSS.....	28
Figure 3. Health-Related Quality of Life among People Aged ≥ 65 Years with and without Vision Impairment, North Carolina, 2019, BRFSS.....	29
Figure 4. Disability Status among People Aged ≥ 65 Years, with and without Vision Impairment, North Carolina, 2019, BRFSS.....	29
Appendix D: Vision Rehabilitation Resources	30

Executive Summary

This briefing is designed to assist policy makers and service providers better understand the characteristics and circumstances of older people with vision impairment in North Carolina. Data from the Behavioral Risk Factor Surveillance System and the Census provide considerable insight into the population of people experiencing vision loss. An estimated 8.7% of older people in North Carolina report severe vision impairment or blindness. Men and women experience about the same prevalence of vision impairment (8.4% and 8.9% respectively), but women with vision impairment comprise 57% of the older population, and the prevalence increases with age. African Americans and Hispanics report much higher prevalence of vision impairment than whites. Vision impairment is not evenly distributed across the state. The prevalence of vision impairment among people aged 65 years and older by county ranges from 3.1% to 13.8%.

Older people with vision impairment have lower levels of education and are poorer than older people without vision loss. Twenty-six percent of older people with vision impairment have not graduated from high school, and 40% have annual incomes below \$20,000. In addition, older people with vision impairment report higher prevalence of chronic conditions, particularly stroke, arthritis, diabetes, kidney disease, and depression. Not surprisingly, then, 52% of older people with vision impairment in North Carolina compared to 24% among older people without vision impairment report fair or poor health. Moreover, 40% of older people with vision impairment report 14 or more days of poor physical health in the past 30 days compared to 16% of those without vision impairment. Similarly, 22% of people with vision impairment report 14 or more days of poor mental health compared to 8% of those without vision loss. This disparity in quality of life is repeated in activity limitation days, where 27% of people with vision impairment report 14 or more days of activity limitation compared to 23% among those without vision impairment.

Upstream factors including poverty and less education have the potential to contribute to higher prevalence of chronic conditions and poorer health-related quality of life. These factors may lead to increased disability, including increased difficulty walking, dressing/bathing, and doing errands.

Data from state and national surveys provide quantitative information regarding health, chronic conditions, and quality of life factors associated with vision impairment in North Carolina. These data, when informed by the personal experiences of people who have lost vision, serve to define policy decisions and interventions to preserve the independence, dignity, and autonomy of older people with vision impairment. By aligning aging services, public health initiatives, transportation resources, and vision rehabilitation programs to meet the needs of older people with vision impairment, there is potential to improve health, quality of life, and function.

North Carolina's Older Population and Vision Loss: A Briefing

Purpose

This briefing provides estimates of the prevalence of vision impairment among older people in the state of North Carolina at the state and county level. Using state and national data systems, this report describes self-reported health, prevalence of chronic conditions, and quality of life among older people with and without vision impairment. The findings show that an estimated 8.7% of older people in the state report vision impairment, and they report substantial health and social disparities compared to older people without vision impairment, differences that potentially compromise function and quality of life. By better understanding the circumstances of older people with vision impairment in North Carolina, policy makers and providers can tailor services in aging, public health, transportation, and vision rehabilitation to preserve the dignity, independence, and quality of life of older people.

Introduction

Vision impairment and blindness often have profound effects upon older people and those who care for and about them. Vision impairment can make common activities difficult or impossible; for example, climbing stairs, crossing a street, driving, using public transportation, preparing meals, and performing household activities may be compromised. Older people experiencing vision impairment may have difficulty managing accounts, paying bills, and identifying prescribed medications. Falls or fear of falling may further compromise their independence. Vision impairment is often isolating, keeping people at home when they prefer to be with family and friends. Many older people with vision loss do not interact with others who are going through the same experience, creating further isolation and depression.

An estimated 8.7% of older people in North Carolina report vision impairment or blindness. Those most at risk for vision impairment are African Americans, Hispanics, those who report less education and those who experience poverty. Older people with vision impairment are also more likely to have age-related chronic conditions compared to older people without vision impairment. As North Carolina's population continues to age, the number of people experiencing vision impairment will likely increase.

While the circumstances and risk factors associated with aging and vision loss are serious, much can be done to ameliorate the effects of vision impairment. For example, improved access and utilization of vision and eye health, as well as the availability of comprehensive vision rehabilitation services, promoting independence and autonomy, are effective strategies often enabling older people in North Carolina to live independently and remain in their community.

National Perspective

A recent study estimated that 12.5 million people over the age of 40 years in the United States experienced vision impairment. Of those, 1.02 million were blind (visual acuity 20/200 or worse), 3.22 million had vision impairment (visual acuity of 20/40 to less than 20/200), and 8.2 million had uncorrected refractive error. By 2050, the population of people with vision impairment is expected to increase by 118%. The greatest increases will be among women, older people, African Americans, and Hispanics.¹

In addition to representing a large and growing population, older people with vision impairment generally have a greater likelihood of reporting other medical conditions, such as, diabetes, stroke, hypertension, heart disease, and hearing impairment than people without vision impairment.² They are twice as likely to fall as people without vision impairment.³ Moreover, people with vision impairment are more likely to report oral health problems.⁴ Perhaps because of these circumstances, older people with vision impairment are more likely to report higher levels of depression,⁵ poor quality of life (QOL),⁶ and overall poorer health than people without vision impairment.²

Vision impairment is not evenly distributed across the United States.¹ States with higher proportions of older people and racial/ethnic minorities tend to have higher prevalence of vision problems.¹

Additional research shows that people with vision impairment are less likely to access routine medical care, and they are less likely to have access to and utilize eye care.⁷

Responding to this complex set of circumstances requires thoughtful, innovative, well-integrated strategies by multiple entities to address the varied health and rehabilitation needs of older people with vision impairment. Among those entities are eye care providers, the aging network, public health, transportation, and housing, as well as comprehensive vision rehabilitation services.

Vision Rehabilitation Programs

A central component of supports for older people with vision impairment is a network of public and private agencies providing vision rehabilitation services addressing communication, activities of daily living, personal care, self-advocacy, travel and mobility skills, diabetes, and medication management, as well as access to assistive technology (e.g., smart phones, tablets, and computers). Services often include counseling, information, and referrals to community resources and supports. Vision rehabilitation services generally include low vision evaluations and the provision of adapted vision devices. Moreover, older people with vision impairment benefit from peer support groups where older people share common experiences and exchange information about successful management strategies. These services are often provided in the client's home or in an agency setting. The sum of vision rehabilitation services improves independence, self-esteem, health, and quality of life.

Despite the best effort of these agencies, only about 3% of older people with vision impairment nationally receive vision rehabilitation services ([see healthypeople.gov](http://www.healthypeople.gov)

[here](#)). This gap between need and response represents a major public health and public policy concern recently addressed by a National Academies of Science, Engineering, and Medicine (NASEM, formerly the Institute of Medicine) seminal report *Making Eye Health A Population Health Imperative: Vision for Tomorrow*.⁸ The NASEM report asserted, “Vision rehabilitation is essential to maximizing the independence, function, participation, safety, and overall QOL of people with chronic vision impairment. Yet there are numerous barriers to high quality and universally accessible vision rehabilitation services” (p. 414).⁸ A goal of Healthy People 2030 is to increase access to vision rehabilitation services by only 10%, to 3.3% over a ten year period ([see Healthy People 2030 here](#)).

This report examines data from the 2019 Behavioral Risk Factor Surveillance System (BRFSS) and the 2019 American Community Survey to characterize older people with vision impairment at the population level in North Carolina. See **Appendix A** for methods.

Vision Impairment in North Carolina

[Demographic Characteristics](#)

An analysis of 2019 Behavioral Risk Factor Surveillance System data reveals that 8.7% of people 65 years of age and older report vision impairment in response to the question, “Are you blind or do you have serious difficulty seeing, even when wearing glasses?” (See Appendix A.)

While 8.9% of older women over age 65 years report vision impairment, 8.4% of men do so. Women, however, comprise 57% of the older population of people with vision impairment. In North Carolina, vision impairment varies among racial/ethnic populations: 7.6% of whites report vision impairment compared to 13.5% among African Americans and 23.6% among Hispanics. (See Table 1.)

Table 1. Prevalence of Vision Impairment by Age, Sex, and Race/Ethnicity among People Aged 65 Years and Older, North Carolina, BRFSS

Characteristic	Prevalence
North Carolina Prevalence	8.7%
Sex	
Male	8.4%
Female	8.9%
Age	
65-74 Years	7.3%
75-79 Years	13.1%
80 + Years	8.7%
Race/Ethnicity¹	
White non-Hispanic	7.6%
Black non-Hispanic	13.5%
Hispanic	23.6%

Data Source: 2019 Behavioral Risk Factor Surveillance System, Centers for Disease Control and Prevention, Atlanta, GA

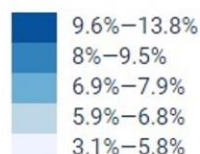
Geographic Distribution

Vision impairment is not evenly distributed across the United States or within states. Figure 1 shows the prevalence of vision impairment among people aged 65 years and older by county in North Carolina. Five categories of prevalence are presented, ranging from 3.1% to 13.8%. Higher prevalence of vision impairments tends to occur in more rural counties where resources and care providers may be scarce. Jones County (13.8%), Scotland County (13.7%), Swain County (13.0%), Greene County (12.2%) and Hertford County (12.1%) report the highest prevalence of vision impairment among older people, while Dare County (3.1%), Clay County (3.1%), Davie (4.0%), Lincoln County (4.3%) and Watauga County (4.4%) report the lowest prevalence. The prevalence of vision impairment by county is presented in Appendix B, Table 2.

Figure 1. County Level Estimated Prevalence of Vision Impairment and Blindness by County, North Carolina, American Community Survey, 2019.

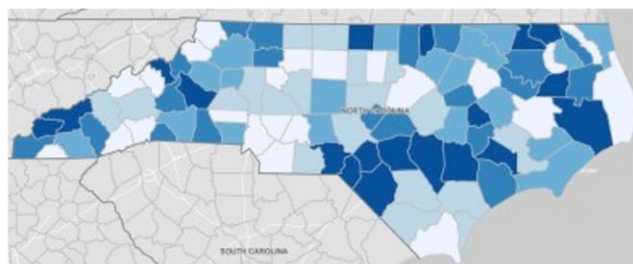
North Carolina

**Percent with a disability
—Total civilian... in 2019**



Geos:
100

19
20
19
19
23



Note: See Appendix C for tabular representation of Figure 1.

Chronic Conditions

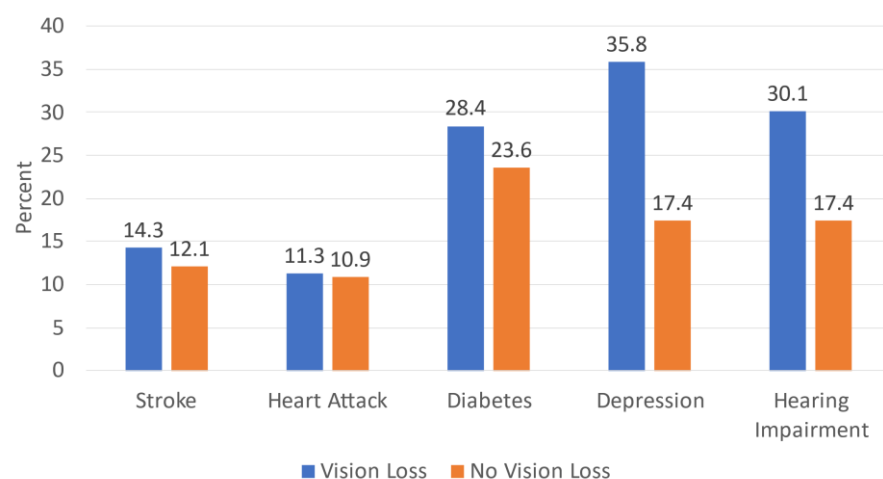
Older people with vision impairment in North Carolina are more likely to experience age-related chronic health conditions compared to people without vision impairment. See Figure 2. For example, 14% of people with vision impairment report having had a stroke compared to 12% among those without vision impairment. A stroke often compromises vision, but the effects of vision impairment from stroke are often unrecognized and under-appreciated. Diabetes is a known cause of vision impairment, and North Carolina data show that 28% of older people with vision impairment report diabetes compared to 24% of those without vision impairment. Because vision impairment often leads to compromised daily activities, older people with vision impairment more frequently report depression: 36% compared to 17% among older people without vision impairment. Moreover, people with vision impairment report more frequent hearing problems, with 30% reporting hearing impairment compared to 17% of people without vision impairment. Dual sensory impairment often has a compounding effect that leads to complex healthcare and rehabilitation needs. Vision and hearing are often addressed independently instead of in combination where interventions could be more effective.

Because vision is frequently required to recognize obstacles and trip hazards, 40% of older people with vision impairment in North Carolina report falling, compared to 28% of older people without vision impairment.⁹ Addressing falls risk among those with vision impairment could prevent complications of broken hip and functional decline.

In addition to heart attack, stroke, diabetes, and depression, the BRFSS asks about seven additional chronic conditions (asthma, cancer, COPD, arthritis, kidney disease, high cholesterol, and hypertension). In all cases, older people with vision impairment are more likely to report having these chronic conditions (Appendix B, Table 3).

The sum of all these factors means that older people with vision impairment are at greater risk for losing independence.

Figure 2. Chronic Conditions among People with and without Vision Impairment, North Carolina, 2019, BRFSS



Note: See Appendix C for tabular representation of Figure 2.

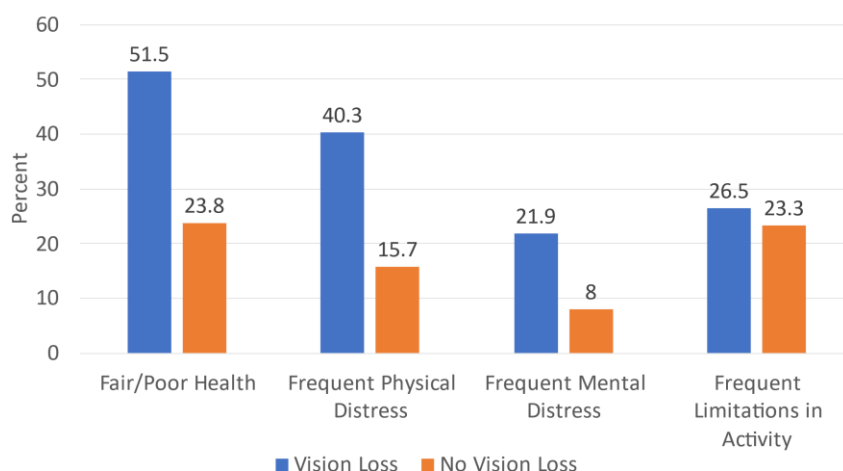
Health-Related Quality of Life

BRFSS data show that older people with vision impairment compared to people without vision impairment are more likely to report poorer health-related quality of life. Four questions address health, physical distress, mental distress, and activity limitation in the Behavioral Risk Factor Surveillance System. This survey asks about self-reported health (excellent, very good, good, fair, and poor), how many days in the last 30 did the respondent report “health not good,” “mental health not good,” and “limitations in physical activity.” Figure 3 below illustrates the percent of people reporting 14 or more days out of the last 30 in which they experienced poor health, poor mental health, and activity limitations.

While 52% of people with vision impairment report fair or poor health, only 24% of older people without vision impairment report the same health status. Similarly, 40% of people with vision impairment report 14 or more days of physical health not good compared to 16% of those without vision impairment. Great differences are also found in frequent days of poor mental health; 22% of older people with vision impairment report frequent mentally unhealthy days compared to 8% among those without vision impairment. Not surprisingly, then, 27% of older people with vision impairment report frequent (14 or more) days of activity limitation compared to 23% among those without vision impairment.

Poorer health-related quality of life for older people with vision impairment in North Carolina likely results from many factors, including the effects of chronic conditions and the lack of vision rehabilitation services.

Figure 3. Health-Related Quality of Life among People Aged ≥ 65 Years, with and without Vision Impairment, North Carolina, 2019, BRFSS



Note: See Appendix C for tabular representation of Figure 3.

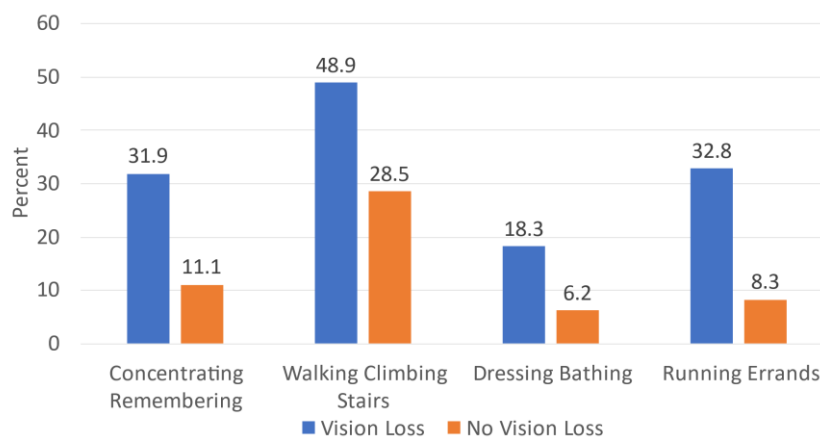
Disability Status

For many older people with vision impairment, multiple factors converge to threaten independence and quality of life. This report demonstrates that some groups are at greater risk of vision impairment than others, particularly African Americans and Hispanics, and those who are poorer and have less education. These upstream demographic factors may contribute to older people with vision impairment reporting higher prevalence of chronic conditions, including higher rates of diabetes, stroke, hearing impairment, and depression. These chronic health conditions in turn contribute to older people with vision impairment reporting poorer overall health and poorer health-related quality of life, including more frequent physically unhealthy days, more frequent mentally unhealthy days, and more frequent days of activity limitation. The convergence of these factors results in older people with vision impairment reporting greater disabilities, including limitations in cognitive function, walking and mobility, running errands, and dressing/bathing.

For older people, the effects of upstream factors appear to have dramatic effects on measures of disability. See Figure 4. While 32% of older people with vision impairment report difficulty concentrating and remembering, 11% of people without vision impairment report problems with cognition. Substantial declines in cognitive function

have been reported among people with vision impairment.¹⁰ Other measures of disability may represent the effects of the lack of vision rehabilitation services. Older people with vision impairment are about twice as likely to report difficulty walking and climbing stairs (49% compared to 29%) compared to people without vision impairment. That limitation could be attributed to a lack of orientation and mobility training or a lack of low vision services and low vision aids. More dramatically, older people with vision impairment are four times more likely to report difficulty running errands (33% compared to 8%). That measure may reflect the combined effects of the lack of vision rehabilitation services that address travel skills and low vision services.

Figure 4. Disability Status among People Age ≥65 Years with and without Vision Impairment, North Carolina, 2019, BRFSS



Note: See Appendix C for tabular representation of Figure 4.

Social Determinants of Health and Health Equity

Health inequities are shown to be related to social determinants of health based on sex, socio-economic status, race, ethnicity, and specific health conditions.¹¹ Overall, people with vision impairment, as this report demonstrates, are disadvantaged in multiple domains of poorer health, decreased quality of life, and increased disability. See Appendix B, Table 2.

One social determinant of health is defined by educational level which often predicts career and economic well-being. Among older people with vision impairment, 26% did not complete high school compared to 13% of people without vision impairment.

In addition, older people with vision impairment are much more likely to experience poverty and lower incomes than people without vision impairment. For example, 14% of older people with vision impairment report annual incomes of less than \$10,000

compared to 2% of older people without vision impairment. Sixteen percent of older people with vision impairment report annual incomes between \$10,000 and less than \$15,000, compared to 7% of people without vision impairment. Lower socio-economic status has also been shown to represent a substantial barrier to access to care for those with vision loss—those with the most need for care.

While people with or without vision impairment are likely to have health insurance and a regular doctor, more people with vision impairment report having to delay health care because of cost, 21% compared to 5% of people without vision impairment.

Discussion

The experience of vision impairment for older people is complex and multidimensional. This report estimates the population and distribution of older people with vision impairment in North Carolina, and it characterizes the population in terms of health, chronic conditions, health-related quality of life, and disability status—variables available from the Behavioral Risk Factor Surveillance System and the American Community Survey. These findings reveal that upstream circumstances related to poverty and poorer education reveal the potential of downstream outcomes in poorer overall health and quality of life as well as increased disability.

While this briefing provides considerable insight into health, chronic conditions, and quality of life factors at the population level, the report does not tell the personal stories of older people who have lost vision. It does not chronicle the isolation or struggle to find eye care or vision rehabilitation services. It does not describe the positive effects of vision rehabilitation or the power that older people feel when participating with peers to share their stories or solve common problems. That gap will be filled by others.

Conclusion

About 8.7% of people aged 65 years and older respond yes to the question “Are you blind or do you have severe difficulty seeing even when wearing glasses.” African Americans, Hispanics, and people who are poorer and less educated report higher prevalence of vision impairment. People who are older and visually impaired report higher prevalence of chronic conditions, poorer overall health, and poorer health-related quality of life. These factors appear associated with higher prevalence of disability indicators. These findings reveal that people with vision impairment are disadvantaged in multiple ways that place them at greater risk for compromised independence and autonomy. The findings in this report are designed to inform policy makers and providers about the circumstances of older people with vision impairment so that decisions and programs can be designed to better support older people with vision loss.

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Acknowledgements

VisionServe Alliance gratefully acknowledges [North Carolina Department of Health and Human Services, Division of Services for the Blind](#), for their support of and participation in the development of this report.

Appendix A: Methods

The Behavioral Risk Factor Surveillance System conducted by the U.S. Centers for Disease Control and Prevention (CDC) gathers health and health behavior data in each of the states and territories. Conducted since 1984, the BRFSS represents the world's largest telephone survey, sampling over 440,000 people annually. For additional details, [see BRFSS here](#). Data are collected from January to December using standard methods, and data are made publicly available about five months after data collection is completed. In 2013 the BRFSS added a standard set of disability questions to the core. The vision question asks, "Are you blind or do you have serious difficulty seeing even while wearing glasses?" This question serves as the case definition of vision impairment for this study, and is the same question used by the American Community Survey in the Census data.

Using BRFSS data, it is possible to construct a profile of each state addressing demographic characteristics (age, sex, race/ethnicity, and education), reported chronic conditions (heart attack, coronary heart disease, stroke, COPD, diabetes, and arthritis), health-related quality of life (HRQoL), disability, and factors related to Social Determinants of Health among people with and without vision impairment. An analysis of these factors identifies the magnitude of within state disparities between people with and without vision impairment. Moreover, an analysis of aggregated national level BRFSS data allows for an understanding of how each state compares with national averages across these factors.

To account for the complex sampling weights used in the 2019 BRFSS survey, all analysis was run in SAS callable SUDAAN. To be included in the analysis subjects must be at least 65 years old and respond to both the vision impairment and age question. The response rate was 97.4%. The final sample size is 145,322. This includes 135,566 subjects without vision impairment and 9,756 subjects with vision impairment.

The American Community Survey (ACS) from the U.S. Census collects data on social, economic, and demographic characteristics, including housing, employment status, income/poverty, and level of education. In addition, the ACS collects data on race/ethnicity, sex, marital status, and living arrangements. Although the ACS does not collect information about health and health behaviors, it asks the same six disability questions as the BRFSS, including vision, hearing, cognition, walking, bathing, and doing errands. The function of the ACS is to provide information for decision makers to allocate federal resources. The granularity of the data makes it possible to construct county, state, and national profiles regarding social, economic, and demographic factors (see [more ACS information here](#)). The unique feature of the ACS is that the prevalence of vision impairment can be estimated at the county level, and maps can be constructed to illustrate the distribution of vision impairment within and across states.

The descriptive tables in the appendices show the estimated point prevalence as well as the 95% Confidence Interval (CI) for each variable. Ninety-five percent CI means that we are 95% certain that the true value resides within the estimated perimeters.

Confidence intervals for many of the variables are wide in large part because the sample size is small. By combining multiple years of data, the CI would likely be reduced. Caution should be exercised in interpreting these findings.

Most all large population-based surveys are limited because they rely on self-reported information from survey respondents. Multiple questions regarding vision have been employed in national surveys, and each question yields a different population estimate.¹ The American Community Survey, for example, asks the question “Are you blind or do you have serious difficulty seeing even when wearing glasses?” The narrow focus of this question yields a low prevalence of vision impairment—about 7.3% among older people in the US. Another large population-based survey, the National Health Interview Survey, asks “Do you have any trouble seeing, even when wearing glasses or contact lenses?” That question yields an estimated prevalence of 13.5% among older people.² There is no widely accepted gold standard vision question used in national surveys. However, the BRFSS and ACS are the only surveys that provide state and county level estimates.

This report was prepared by the VanNasdale Lab at The Ohio State University College of Optometry. Questions regarding the methods and findings for this study should be directed to John E. Crews, DPA (johncrews@bellsouth.net) or Dean VanNasdale, OD, PhD (vannasdale.1@osu.edu).

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Appendix B: BRFSS and ACS Tables

Appendix B, Table 1. Prevalence of Visual Impairment by Age and Race/Ethnicity in People Aged 65 and Older, BRFSS, United States and North Carolina, 2019

	United States		North Carolina	
	%	95% CI	%	95% CI
Age				
65+ years	7.3%	7.0- 7.6	8.7%	6.8- 11.1
65-74 years	6.3%	6.0- 6.7	7.3%	4.9- 10.6
75-79 years	7.4%	6.7- 8.1	13.1%	8.6- 19.3
80+ years	9.8%	9.2- 10.5	8.7%	5.3- 14.0
Sex				
Male	7.0%	6.6- 7.5	8.4%	5.6- 12.6
Female	7.5%	7.1- 7.9	8.9%	6.6- 12.1
Marital Status				
Married	5.7%	5.3- 6.1	7.6%	5.0- 11.3
Not Married/Separated	9.3%	8.8- 9.8	9.9%	7.3- 13.3
Education				
Did not graduate High School	15.4%	14.0- 17.0	15.8%	8.3- 27.9
Graduated High School	7.4%	6.9- 7.9	8.7%	5.5- 13.3
Attended College or Technical School	6.6%	6.1- 7.1	9.8%	6.8- 13.9
Graduated from College or Technical	4.0%	3.6- 4.4	2.9%	1.6- 5.2
Race/Ethnicity				
White only, non-Hispanic	6.1%	5.8- 6.4	7.6%	5.5- 10.4
Black only, non-Hispanic	10.5%	9.4- 11.7	13.5%	8.9- 20.1
American Indian or Alaskan Native only, non-Hispanic	14.2%	10.0- 19.8	17.2%	3.4- 55.2
Asian only, non-Hispanic	8.8%	6.0- 12.8	0.0%	.- .
Hispanic	13.9%	11.9- 16.2	23.6%	8.4- 51.1

Appendix B, Table 2. Prevalence of Vision Impairment among People Age ≥65 Years by County, North Carolina, American Community Survey, 2019

County	Percent
Alamance County, North Carolina	6.6
Alexander County, North Carolina	6.9
Alleghany County, North Carolina	8.7
Anson County, North Carolina	6.0
Ashe County, North Carolina	5.6
Avery County, North Carolina	9.5
Beaufort County, North Carolina	5.1
Bertie County, North Carolina	8.4
Bladen County, North Carolina	6.7
Brunswick County, North Carolina	4.5
Buncombe County, North Carolina	6.0
Burke County, North Carolina	10.7
Cabarrus County, North Carolina	5.8
Caldwell County, North Carolina	7.1
Camden County, North Carolina	5.8
Carteret County, North Carolina	7.1
Caswell County, North Carolina	10.6
Catawba County, North Carolina	6.0
Chatham County, North Carolina	6.8
Cherokee County, North Carolina	8.0
Chowan County, North Carolina	5.0
Clay County, North Carolina	3.1
Cleveland County, North Carolina	8.2
Columbus County, North Carolina	6.3
Craven County, North Carolina	6.6
Cumberland County, North Carolina	10.9
Currituck County, North Carolina	7.7
Dare County, North Carolina	3.1
Davidson County, North Carolina	6.6
Davie County, North Carolina	4.0
Duplin County, North Carolina	10.9
Durham County, North Carolina	6.6
Edgecombe County, North Carolina	5.7
Forsyth County, North Carolina	5.0
Franklin County, North Carolina	7.1
Gaston County, North Carolina	7.4
Gates County, North Carolina	10.7

Graham County, North Carolina	10.5
Granville County, North Carolina	9.5
Greene County, North Carolina	12.2
Guilford County, North Carolina	5.1
Halifax County, North Carolina	7.1
Harnett County, North Carolina	8.1
Haywood County, North Carolina	6.8
Henderson County, North Carolina	5.8
Hertford County, North Carolina	12.1
Hoke County, North Carolina	10.5
Hyde County, North Carolina	9.7
Iredell County, North Carolina	5.9
Jackson County, North Carolina	8.0
Johnston County, North Carolina	5.9
Jones County, North Carolina	13.8
Lee County, North Carolina	8.5
Lenoir County, North Carolina	9.2
Lincoln County, North Carolina	4.3
McDowell County, North Carolina	8.4
Macon County, North Carolina	7.8
Madison County, North Carolina	5.8
Martin County, North Carolina	9.1
Mecklenburg County, North Carolina	5.0
Mitchell County, North Carolina	10.0
Montgomery County, North Carolina	7.2
Moore County, North Carolina	6.2
Nash County, North Carolina	7.1
New Hanover County, North Carolina	6.3
Northampton County, North Carolina	7.7
Onslow County, North Carolina	8.6
Orange County, North Carolina	5.5
Pamlico County, North Carolina	7.8
Pasquotank County, North Carolina	8.2
Pender County, North Carolina	6.1
Perquimans County, North Carolina	7.3
Person County, North Carolina	7.7
Pitt County, North Carolina	7.1
Polk County, North Carolina	8.2
Randolph County, North Carolina	7.0
Richmond County, North Carolina	11.0
Robeson County, North Carolina	11.1

Rockingham County, North Carolina	6.0
Rowan County, North Carolina	6.8
Rutherford County, North Carolina	7.9
Sampson County, North Carolina	10.0
Scotland County, North Carolina	13.7
Stanly County, North Carolina	5.5
Stokes County, North Carolina	6.0
Surry County, North Carolina	9.0
Swain County, North Carolina	13.0
Transylvania County, North Carolina	4.7
Tyrrell County, North Carolina	8.5
Union County, North Carolina	5.3
Vance County, North Carolina	10.2
Wake County, North Carolina	5.7
Warren County, North Carolina	8.6
Washington County, North Carolina	11.2
Watauga County, North Carolina	4.4
Wayne County, North Carolina	7.9
Wilkes County, North Carolina	7.7
Wilson County, North Carolina	8.7
Yadkin County, North Carolina	8.2
Yancey County, North Carolina	5.8

Distribution of Population of People Aged ≥ 65 Years with Vision Impairment by County by Quintiles, North Carolina, American Community Survey, 2019.

County	Percent
5th Quintile	
Jones County, North Carolina	13.8
Scotland County, North Carolina	13.7
Swain County, North Carolina	13.0
Greene County, North Carolina	12.2
Hertford County, North Carolina	12.1
Washington County, North Carolina	11.2
Robeson County, North Carolina	11.1
Richmond County, North Carolina	11.0
Cumberland County, North Carolina	10.9
Duplin County, North Carolina	10.9
Burke County, North Carolina	10.7
Gates County, North Carolina	10.7

Caswell County, North Carolina	10.6
Graham County, North Carolina	10.5
Hoke County, North Carolina	10.5
Vance County, North Carolina	10.2
Mitchell County, North Carolina	10.0
Sampson County, North Carolina	10.0
Hyde County, North Carolina	9.7
4th Quintile	
Avery County, North Carolina	9.5
Granville County, North Carolina	9.5
Lenoir County, North Carolina	9.2
Martin County, North Carolina	9.1
Surry County, North Carolina	9.0
Alleghany County, North Carolina	8.7
Wilson County, North Carolina	8.7
Onslow County, North Carolina	8.6
Warren County, North Carolina	8.6
Lee County, North Carolina	8.5
Tyrrell County, North Carolina	8.5
Bertie County, North Carolina	8.4
McDowell County, North Carolina	8.4
Cleveland County, North Carolina	8.2
Pasquotank County, North Carolina	8.2
Polk County, North Carolina	8.2
Yadkin County, North Carolina	8.2
Harnett County, North Carolina	8.1
Cherokee County, North Carolina	8.0
Jackson County, North Carolina	8.0
3rd Quintile	
Rutherford County, North Carolina	7.9
Wayne County, North Carolina	7.9
Macon County, North Carolina	7.8
Pamlico County, North Carolina	7.8
Currituck County, North Carolina	7.7
Northampton County, North Carolina	7.7
Person County, North Carolina	7.7
Wilkes County, North Carolina	7.7
Gaston County, North Carolina	7.4
Perquimans County, North Carolina	7.3
Montgomery County, North Carolina	7.2
Caldwell County, North Carolina	7.1

Carteret County, North Carolina	7.1
Franklin County, North Carolina	7.1
Halifax County, North Carolina	7.1
Nash County, North Carolina	7.1
Pitt County, North Carolina	7.1
Randolph County, North Carolina	7.0
Alexander County, North Carolina	6.9
2nd Quintile	
Chatham County, North Carolina	6.8
Haywood County, North Carolina	6.8
Rowan County, North Carolina	6.8
Bladen County, North Carolina	6.7
Alamance County, North Carolina	6.6
Craven County, North Carolina	6.6
Davidson County, North Carolina	6.6
Durham County, North Carolina	6.6
Columbus County, North Carolina	6.3
New Hanover County, North Carolina	6.3
Moore County, North Carolina	6.2
Pender County, North Carolina	6.1
Anson County, North Carolina	6.0
Buncombe County, North Carolina	6.0
Catawba County, North Carolina	6.0
Rockingham County, North Carolina	6.0
Stokes County, North Carolina	6.0
Iredell County, North Carolina	5.9
Johnston County, North Carolina	5.9
1st Quintile	
Cabarrus County, North Carolina	5.8
Camden County, North Carolina	5.8
Henderson County, North Carolina	5.8
Madison County, North Carolina	5.8
Yancey County, North Carolina	5.8
Edgecombe County, North Carolina	5.7
Wake County, North Carolina	5.7
Ashe County, North Carolina	5.6
Orange County, North Carolina	5.5
Stanly County, North Carolina	5.5
Union County, North Carolina	5.3
Beaufort County, North Carolina	5.1
Guilford County, North Carolina	5.1

Chowan County, North Carolina	5.0
Forsyth County, North Carolina	5.0
Mecklenburg County, North Carolina	5.0
Transylvania County, North Carolina	4.7
Brunswick County, North Carolina	4.5
Watauga County, North Carolina	4.4
Lincoln County, North Carolina	4.3
Davie County, North Carolina	4.0
Clay County, North Carolina	3.1
Dare County, North Carolina	3.1

Appendix B, Table 3. Social, Economic, and Health Characteristics of People Age ≥65 Years United States and North Carolina, 2019, BRFSS

	United States				North Carolina			
	Vision Impairment N=9756		No Vision Impairment N=135566		Vision Impairment N=90		No Vision Impairment N=1084	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age Group								
65-74 years	51.3	49.1- 53.4	59.6	59.0- 60.1	50.5	37.8- 63.3	61.5	57.9- 64.9
75-79 years	19.6	17.9- 21.5	19.4	18.9- 19.8	30.1	20.0- 42.6	19.1	16.5- 22.0
80+ years	29.1	27.3- 31.0	21	20.6- 21.5	19.4	11.7- 30.3	19.4	16.6- 22.7
Sex								
Male	43.4	41.2- 45.6	45.1	44.5- 45.6	42.9	30.5- 56.4	44.4	40.9- 48.0
Female	56.6	54.4- 58.8	54.9	54.4- 55.5	57.1	43.6- 69.5	55.6	52.0- 59.1
Marital Status								
Married	42.9	40.7- 45.1	56.3	55.7- 56.8	45.7	33.0- 59.0	53.1	49.5- 56.7
Not Married/Separated	57.1	54.9- 59.3	43.7	43.2- 44.3	54.3	41.0- 67.0	46.9	43.3- 50.5
Education								
Did not graduate High School	28.7	26.4- 31.1	12.4	11.9- 12.8	25.7	14.3- 41.7	12.9	10.2- 16.3
Graduated High School	28.5	26.7- 30.3	28.2	27.7- 28.7	27.7	18.0- 40.1	27.6	24.5- 31.0
Attended College or Technical School	27.9	26.0- 29.8	31.1	30.6- 31.6	38.5	27.2- 51.2	33.5	30.1- 37.0
Graduated from College or Technical	15	13.7- 16.4	28.4	27.9- 28.8	8.2	4.3- 14.8	26	23.3- 28.8
Race/Ethnicity								
White only, non-Hispanic	65	62.5- 67.3	79	78.4- 79.6	67.9	55.7- 78.1	79.5	76.6- 82.2
Black only, non-Hispanic	12.8	11.5- 14.3	8.6	8.3- 9.0	26.1	17.0- 37.8	16	13.6- 18.8
American Indian or Alaskan Native only, non-Hispanic	1.9	1.3- 2.7	0.9	0.8- 1.0	2.3	0.4- 12.2	1.1	0.7- 1.7
Asian only, non-Hispanic	3	2.0- 4.4	2.4	2.1- 2.8	0	.- .	0.6	0.2- 1.8
Hispanic	15.3	13.1- 17.6	7.4	7.0- 7.9	3.6	1.2- 10.5	1.1	0.7- 1.8
Annual Income								
Less than \$10,000	10.6	9.1- 12.3	3.6	3.3- 3.9	13.6	6.0- 27.8	1.9	1.0- 3.5
\$10,000 to less than \$15,000	11.7	10.3- 13.3	5.4	5.1- 5.7	15.9	7.5- 30.5	6.8	4.9- 9.3
\$15,000 to less than \$20,000	14.8	13.2- 16.5	7.9	7.6- 8.3	10.2	4.5- 21.7	14.3	11.2- 18.2
\$20,000 to less than \$25,000	13.5	12.0- 15.2	10.7	10.3- 11.1	14.5	7.2- 27.0	10.3	8.0- 13.1
\$25,000 to less than \$35,000	14.4	12.8- 16.0	12.7	12.3- 13.1	18.7	9.7- 33.0	11.3	9.1- 14.1

\$35,000 to less than \$50,000	12.8	11.4- 14.5	15.9	15.4- 16.3	8.4	3.9- 17.3	15.8	12.9- 19.3
\$50,000 to less than \$75,000	9.8	8.5- 11.2	16.5	16.1- 17.0	9.8	3.9- 22.3	15	12.5- 18.0
\$75,000 or more	12.4	10.7- 14.3	27.3	26.7- 27.8	9	3.4- 21.6	24.5	21.2- 28.1
Health Behaviors								
BMI								
Underweight	2.6	2.1- 3.3	1.8	1.7- 2.0	3.1	0.9- 9.9	1.8	1.0- 3.2
Normal weight	27.3	25.5- 29.2	30.5	30.0- 31.1	24.7	15.9- 36.4	30.3	26.9- 33.9
Overweight	37.2	35.0- 39.5	38.6	38.1- 39.2	37.3	24.6- 52.0	36.8	33.3- 40.3
Obese	32.9	30.8- 35.1	29	28.5- 29.6	34.9	24.1- 47.5	31.2	27.8- 34.7
Physical Exercise	53.6	51.4- 55.8	70.2	69.7- 70.7	57.6	44.6- 69.6	73	69.7- 76.1
Smoking Status								
Current smoker	13.4	12.0- 14.9	8.8	8.4- 9.1	10.9	5.8- 19.7	10.4	8.2- 13.1
Former smoker	40.8	38.6- 43.0	39.8	39.2- 40.3	50.8	37.9- 63.6	38.5	35.0- 42.0
Never smoked	45.8	43.6- 48.0	51.5	50.9- 52.0	38.3	26.6- 51.5	51.2	47.5- 54.8
Health Care Access								
Have Health Insurance	96	95.0- 96.8	98.1	97.9- 98.2	98	93.2- 99.5	99.4	98.6- 99.8
Have Personal Doctor	92.4	91.0- 93.6	93.8	93.5- 94.1	88.1	69.1- 96.0	95.2	93.1- 96.7
Could not see doctor because of cost.	11.5	10.2- 12.9	4.2	4.0- 4.5	20.9	10.8- 36.5	5	3.7- 6.7
Health Related Quality of Life								
Adults with fair/poor health status	51.4	49.2- 53.6	23.3	22.8- 23.8	51.5	38.7- 64.1	23.8	20.8- 27.1
14 or more days during past 30 when physical health not good.	35.6	33.5- 37.8	15.9	15.5- 16.4	40.3	27.2- 55.1	15.7	12.9- 18.9
14 or more days during past 30 when mental health not good.	17.9	16.3- 19.6	7.3	7.0- 7.6	21.9	11.3- 38.1	8	6.2- 10.2
14 or more days of activity limitation.	34.3	31.8- 36.9	18.9	18.3- 19.5	26.5	14.9- 42.6	23.3	18.7- 28.6
Chronic Conditions								
High Blood Pressure	68.6	66.5- 70.7	59.7	59.1- 60.2	67.8	55.3- 78.2	63.2	59.6- 66.6
High Cholesterol	56.6	54.4- 58.8	50.5	49.9- 51.1	53.3	40.1- 66.0	54.5	50.8- 58.1
Myocardial Infarction	17.2	15.8- 18.7	10.2	9.9- 10.6	11.3	5.9- 20.7	10.9	8.9- 13.3
Angina or coronary heart disease	18.2	16.4- 20.0	10.1	9.8- 10.5	16.1	8.8- 27.6	11	9.0- 13.5
Stroke	16.9	15.3- 18.6	7.3	7.0- 7.6	14.3	5.6- 31.9	12.1	9.7- 15.1
Asthma	18.2	16.6- 20.1	11.8	11.4- 12.1	14.4	8.0- 24.5	10.1	8.2- 12.4

Cancer	32.7	30.7- 34.7	31.8	31.3- 32.4	29.3	19.6- 41.3	34	30.7- 37.5
COPD	22.9	21.3- 24.7	12.2	11.8- 12.5	21.4	13.5- 32.1	13.9	11.5- 16.7
Arthritis	61.3	59.1- 63.4	49.5	48.9- 50.1	60.5	46.6- 72.9	51.7	48.1- 55.3
Depression	26.9	25.0- 29.0	13.9	13.5- 14.3	35.8	23.7- 50.1	17.4	14.9- 20.3
Kidney disease	13.6	12.1- 15.3	6.4	6.1- 6.7	14.8	7.5- 26.9	6.1	4.5- 8.2
Diabetes	36.4	34.2- 38.6	22.1	21.6- 22.6	28.4	19.2- 39.9	23.6	20.6- 26.9
Disability Status								
Serious difficulty concentrating, remembering, or making decisions	29.3	27.3- 31.4	8.2	7.9- 8.5	31.9	20.3- 46.4	11.1	8.9- 13.7
Serious difficulty walking or climbing stairs	56.9	54.7- 59.0	25.4	24.9- 25.9	48.9	36.3- 61.7	28.5	25.3- 32.0
Difficulty dressing or bathing	19.1	17.4- 20.8	5	4.8- 5.3	18.3	10.6- 29.7	6.2	4.6- 8.2
Difficulty doing errands alone	35.3	33.3- 37.5	7.7	7.4- 8.0	32.8	22.4- 45.3	8.3	6.6- 10.5
Deaf or do you have serious difficulty hearing	33.3	31.3- 35.3	15	14.6- 15.4	30.1	20.2- 42.1	17.4	15.0- 20.2

Appendix C: Tabular Representations of Figures 1-4

Figure 1. Estimated Prevalence of Vision Impairment among People Aged ≥65 Years by County, North Carolina, American Community Survey, 2019

Quintile	Number of Counties	Counties Included (total = 100) (listed from high to low in each quintile)
9.6 – 13.8%	19	Jones, Scotland, Swain, Greene, Hertford, Washington, Robeson, Richmond, Dublin, Cumberland, Gates, Burke, Caswell, Hoke, Graham, Vance, Sampson, Mitchell, Hyde
8 – 9.5%	20	Granville, Avery, Lenoir, Martin, Surry, Wilson, Alleghany, Warren, Onslow, Tyrrell, Lee, McDowell, Bertie, Yadkin, Polk, Pasquotank, Cleveland, Harnett, Jackson, Cherokee
6.9 – 7.9%	19	Wayne, Rutherford, Pamlico, Macon, Wilkes, Person, Northampton, Currituck, Gaston, Perquimans, Montgomery, Pitt, Nash, Halifax, Franklin, Carteret, Caldwell, Randolph, Alexander
5.9 – 6.8%	19	Rowan, Haywood, Chatham, Bladen, Durham, Davidson, Craven, Alamance, New Hanover, Columbus, Moore, Pender, Stokes, Rockingham, Catawba, Buncombe, Anson, Johnston, Iredell
3.1 – 5.8%	23	Yancey, Madison, Henderson, Camden, Cabarrus, Wake, Edgecombe, Ashe, Stanly, Orange, Union, Guilford, Beaufort, Mecklenburg, Forsyth, Chowan, Transylvania, Brunswick, Watauga, Lincoln, Davie, Dare, Clay

Figure 2. Chronic Conditions among People Aged ≥65 Years with and without Vision Impairment, North Carolina, 2019, BRFSS

Chronic Condition	Vision Impairment	No Vision Impairment
Stroke	14.3%	12.1%
Heart Attack	11.3%	10.9%
Diabetes	28.4%	23.6%
Depression	35.8%	17.4%
Hearing Impairment	30.1%	17.4%

Figure 3. Health-Related Quality of Life among People Aged ≥65 Years with and without Vision Impairment, North Carolina, 2019, BRFSS

Health-Related Quality of Life	Vision Impairment	No Vision Impairment
Fair/Poor Health	51.5%	23.8%
Frequent Physical Distress	40.3%	15.7%
Frequent Mental Distress	21.9%	8.0%
Frequent Limitations in Activity	26.5%	23.3%

Figure 4. Disability Status among People Aged ≥65 Years, with and without Vision Impairment, North Carolina, 2019, BRFSS

Disability Status	Vision Impairment	No Vision Impairment
Concentrating, Remembering	31.9%	11.1%
Walking, Climbing Stairs	48.9%	28.5%
Dressing, Bathing	18.3%	6.2%
Running Errands	32.8%	8.3%

Appendix D: Vision Rehabilitation Resources

For information about vision rehabilitation services for older individuals, visit [North Carolina Division of Services for the Blind](#).