NORC at the University of Chicago

**FINAL REPORT**
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# The Prevent Blindness Children's Vision Health Map:
## Data Summary and Methods

**Presented by:**
John Wittenborn
David Rein
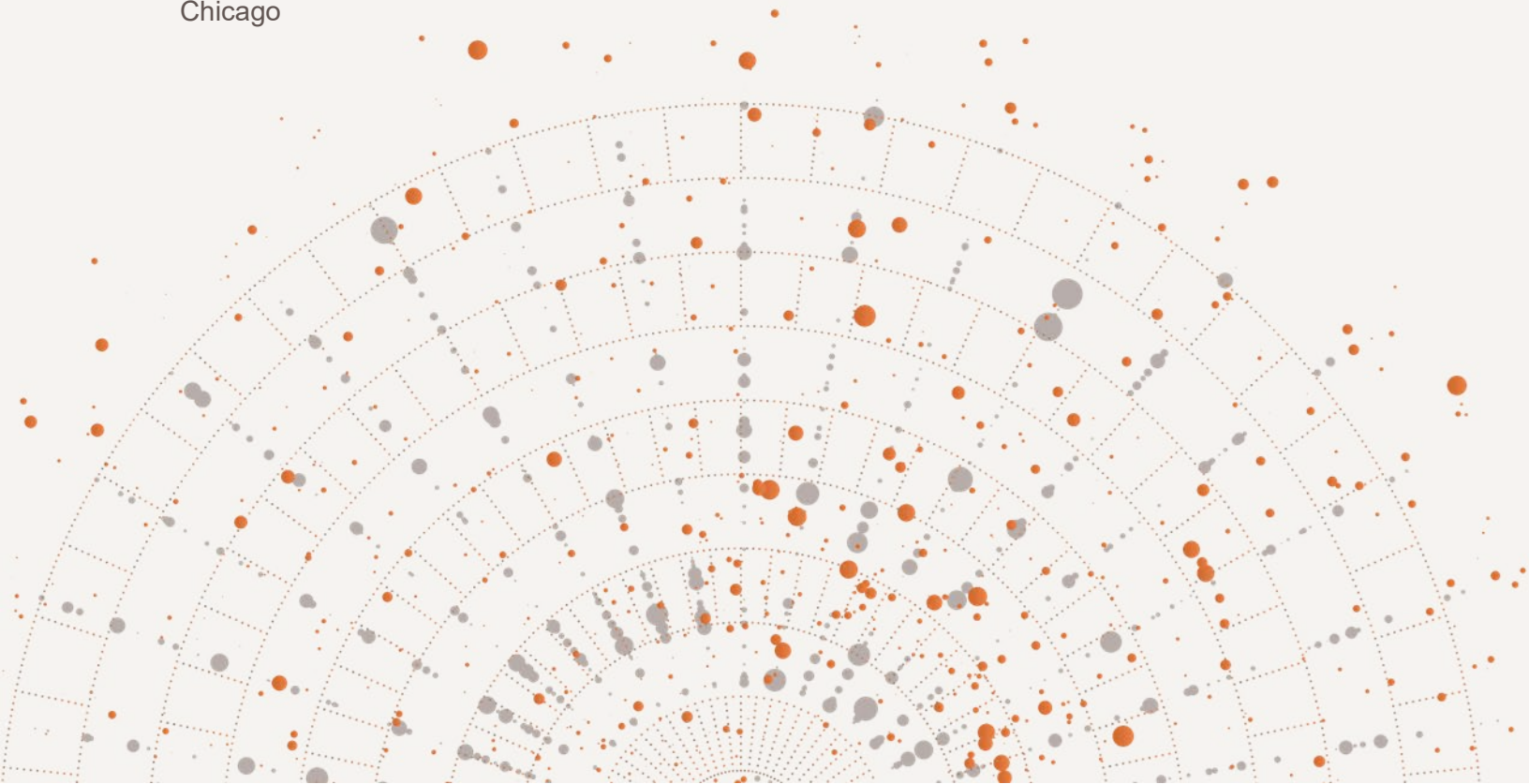NORC at the University of Chicago

**Presented to:**
Prevent Blindness

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# Executive Summary

Over 600,000 children in the United States are living with uncorrectable visual acuity loss or blindness, and millions more experience vision problems from uncorrected acuity problems that could be easily resolved with glasses or contact lenses. In this report, we describe the case definitions, methods, and data sources used to create the Prevent Blindness **Children's Vision Health Map**, the first ever online interactive system specifically designed to explore state and county-level geographic variations in common children's vision problems. This report includes tables of national and state-level outcome measures and explores correlations between the vision and eye health outcome measures and county-level characteristics available on the interactive map.

**National Facts About Children's Vision Loss, Medicaid Diagnosed Amblyopia & Strabismus, and Medicaid Eyeglass Provision**

| | |
|---|---|
| **Vision Loss** | Over 600,000 children in the US have uncorrectable visual acuity loss, representing one out of every 122 children, including one out of every 137 children aged 0-11 and one out of every 102 children aged 12-17. This includes over 45,500 who are blind. There are 25% more girls with vision loss than boys. Non-Hispanic Black children have the highest rates of vision loss and blindness. One out of every 89 black children have vision loss, and one out of every 1,000 are permanently blind. |
| **Amblyopia & Strabismus Diagnoses** | Over 760,000 children enrolled in Medicaid/CHIP were diagnosed with either amblyopia or strabismus in 2019, representing one out of every 45 children enrolled. Over 360,000 were diagnosed with amblyopia and 486,000 with strabismus. Diagnosis rates were highest among non-Hispanic whites, Asian, and American Indian/Alaskan Native children, and lowest among non-Hispanic black children and children of other races. |
| **Eyeglasses** | Over 4 million children in Medicaid/CHIP received at least one pair of covered eyeglasses in 2019, representing one out of every 8.5 children with Medicaid. All state Medicaid programs are required to cover eyeglasses for children, but the proportion of children who received glasses from Medicaid ranged from 3% to 20%. |
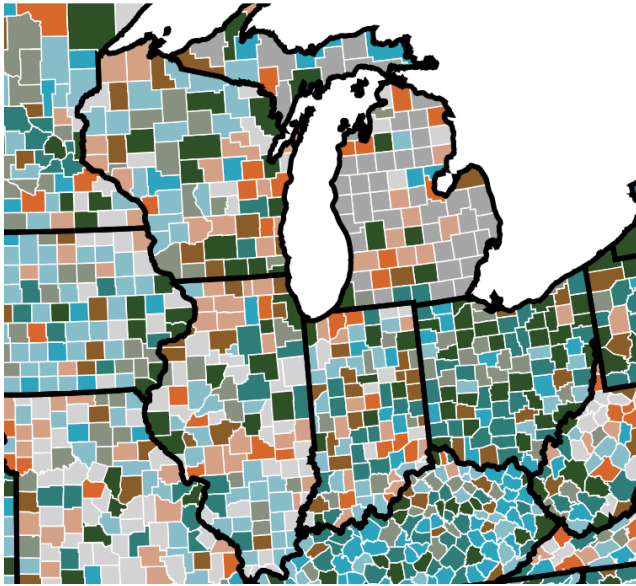
The goal of the Prevent Blindness Children's Vision Health Map is to provide high quality data and inform decision making about children's vision health at the national, state, and county levels. Users can select different visual health indicators, add filters, or explore relationships between vision health and community-level characteristics including state child vision screening requirements, education scores, health & disability measures, socioeconomic determinants of health, and eyecare providers per capita. All vision and eye health data in the tool were taken from the publicly accessible Vision and Eye Health Surveillance System (VEHSS), operated by the US Centers for Disease Control and Prevention.

**preventblindness.org/childrens-vision-map**

**Vision and Eye Health Indicators Available in the Children's Vision Health Map**

| Vision and Eye Health Variables | National Rate | Population | Data Source* |
|---|---|---|---|
| **Vision Loss** | | | |
| Blindness (≤20/40) | 0.06% (0.03%-0.09%) | US population, ages 0-17 | **VEHSS** |
| Visual Acuity Loss (≤20/40) | 0.82% (0.53%-1.12%) | | **VEHSS** |
| **Amblyopia and Strabismus** | | | |
| Amblyopia | 1.06% | Medicaid/CHIP enrollees ages 0-17 | **VEHSS** |
| Strabismus | 1.43% | | **VEHSS** |
| Amblyopia or Strabismus | 2.24% | | **VEHSS** |
| **Eyeglasses** | | | |
| Provision of Eyeglasses | 11.71% | Medicaid/CHIP enrollees ages 0-17 | **VEHSS** |

*VEHSS: CDC's Vision and Eye Health Surveillance System

**Community-level Relationship Variables Available in the Children's Vision Health Map**

| Relationship Variable | National | Population | Data Source* |
|---|---|---|---|
| **States with Child Vision Screening Requirements As of 2024** | | | |
| Preschool-age | 32 states | | National Center for Children's Vision and Eye Health |
| School-Age | 40 states | | |
| Any Screening | 41 states | | |
| **Education** | | | |
| Math scores | Normalized to 0 | Grades 3-8 | Educational Opportunity Project |
| Reading scores | | | |
| **Health & Disability** | | | |
| % with a Cognitive Disability | 4.82% | Ages 5-17 | ACS |
| % with Hearing Loss | 0.22% | Ages 0-17 | SoundCheckMap.org |
| **Socioeconomic** | | | |
| % under Poverty Line | 16.7% | Ages 0-17 | ACS |
| Income Inequality (GINI Index) | 4.88 | Ages 18+ | |
| **Eyecare Providers per 10,000 per Capita** | | | |
| Ophthalmologists | 1.1 | All ages | National Plan and Provider Enumeration System (NPPES) |
| Optometrists | 2.8 | | |
| Pediatric Ophthalmologists | 0.0 | | |
| Pediatric Optometrists | 0.1 | | |
| Any Eyecare Providers | 3.9 | | |

*ACS: American Community Survey

https://preventblindness.org/the-childrens-vision-map/
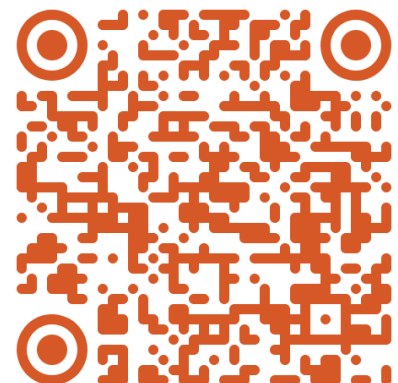
# Introduction

In this report, we present data from the Centers for Disease Control and Prevention's **Vision and Eye Health Surveillance System (VEHSS)** on children's vision and eye care, including:

- Vision loss and blindness prevalence among all children in the United States
- Amblyopia and strabismus diagnosis rates among children in Medicaid
- Eyeglasses provision among children in Medicaid

These data are summarized on the new interactive Prevent Blindness **Children's Vision Health Map**. Readers can visit the online map to explore data for their state or county, including the base layer outcome measures from VEHSS, and add community level associations to explore relationships between children's vision health and community characteristics in their area.

Vision loss and blindness are highly disabling and costly conditions which can affect education outcomes, lifetime productivity and quality of life. In 2017, vision problems cost the US economy over $139 billion, including productivity losses, care and nursing costs, medical costs and other direct expenditures such as federally funded assistance programs.[1] This is in addition to the cost of transfer payment programs such as Social Security Disability Insurance payments.

Detecting and potentially averting vision problems early in life could achieve substantial savings to the US economy and federal government. Identifying eye conditions and refractive errors while also making sure children have appropriate eyeglasses is vital for assuring children's educational achievement. Data from multiple studies, summarized in a systematic review, indicate that uncorrected hyperopia (also known as far sightedness) is associated with worse academic performance.[2] However, this impact can be modified with appropriate case identification and treatment. Studies have shown that providing free screening, eye exams, and eyeglasses to students improved student achievement as measured by standardized test scores.[3, 4]

Vision problems in children can also negatively impact child well-being and socialization. A systematic review of quality of life among children with myopia or strabismus found reduced quality of life among children with these conditions, and further found that surgical correction among children with strabismus improves quality of life.[5]  A study of adolescents from the United Kingdom found that students with vision problems experienced substantial problems with self-esteem and social inclusion as compared to their peers with no problems.[6] Another study from the US found that children with amblyopia have lower self-perception of their

scholastic, social, and athletic competence as compared to a matched control sample without vision problems.[7]

Early detection may be even more important for identifying eye conditions such as amblyopia or strabismus, which if identified early, can typically be easily treated, with sight fully restored. However, the efficacy of treatment for restoring sight decreases dramatically after age 7, and lost vision is often not recoverable if treatment is delayed until late childhood or adulthood.[8]

As of 2024, **41 states** and the District of Columbia had legislation mandating some form of children's vision screening, including 32 states with pre-school age vision screening and 40 with school-age requirements. However, not all children in states with mandates receive screening because requirements vary substantially from state-to-state, including different frequencies of screening and methodologies.

In addition to children's vision screening in schools and public preschools or childcare programs, Medicaid and State Children's Health Insurance Programs (CHIP) are a primary mechanism to both identify and address vision and eye health problems in children. As of 2019, over 40 million children in the United States were enrolled in Medicaid or CHIP, representing more than half of American children younger than age 18. Federal requirements mandate coverage of certain vision care services in Medicaid, including routine eyecare visits and eyeglasses. However, rates of amblyopia and strabismus diagnosis and provision of eyeglasses varies widely by state and demographic characteristics.

## Community-Level Characteristics

A growing body of evidence additionally shows high associations between eye and vision problems and community-level social determinants of health.[9-13] While more research is needed to understand causality in these relationships, multiple published studies have demonstrated the correlation between negative social determinants of health and worse visual outcomes. The Prevent Blindness Children's Vision Health Map includes an array of community-level characteristics that show positive or negative correlations with vision loss, amblyopia and strabismus diagnosis, and eyeglass provision, including:

- Child vision screening requirements: preschool-age, school-age
- Education measures: math scores[*], reading scores[*]
- Health & Disability measures: cognitive difficulties[±], hearing loss[c]
- Socioeconomic indicators: poverty rate[c], income inequality[a]
- Eyecare providers per capita: optometrists [a], ophthalmologists [a], and those specializing in pediatrics [a]

*\*: characteristics measured among children in grades 3-8*

*±: characteristic measured among children aged 5-17*

*c: characteristic measured among children aged 0-17*

*a: characteristic measured among adults aged 18+*

It is important to note that these characteristics are measured at the community level (state or county) and are measured among the entire population of children or adults in the community. These community-level relationship characteristics are *not* measured specifically among children with vision and eye problems. For example, the reading and math scores are scores for all children in each area; they are not the reading and math scores among children with vision or eye problems.

## Analyzing Correlations

We analyzed the correlation between **vision and eye outcomes** and each of the community characteristics available on the Prevent Blindness Children's Vision Health Map using Spearman's rank correlation coefficient. Spearman's correlation coefficient measures the strength and direction of association between two ranked variables. Correlation values range from -1 to 1, with positive values indicating that when one variable has a higher value the other tends to have a higher value as well, and negative values indicating an inverse relationship when one variable has a higher value the other variable tends to have a lower value. Correlation coefficients closer to -1 or 1 indicate a stronger correlation and value closer to 0 indicate a weaker relationship. As a general guide, a correlation with an absolute value less than 0.3 is considered a weak correlation, an absolute value between 0.3 to 0.5 is considered moderate correlation, and a correlation greater than 0.5 is considered a strong correlation. We do not report correlations with an absolute value less than 0.1.

These correlations can be used as a starting point in understanding which factors may be related to vision and eye health. However, we caution readers that correlation is not causality, and additional research is critically needed to understand the causal mechanisms between social determinants and vision health and between vision health and educational measures.

In the sections below, we describe the case definitions, methods, and data sources used to create the Children's Vision Health Map, including tables of national and state-level outcome measures, and exploration of correlations between the vision and eye health outcome measures and community-level characteristics.

**preventblindness.org/childrens-vision-map**

# Vision Loss and Blindness

We report the prevalence of children with vision problems based on uncorrectable visual acuity loss found in modeled estimates produced by the Centers for Disease Control's (CDC) **Vision and Eye Health Surveillance System (VEHSS)**. These estimates represent CDC's primary estimate of vision loss prevalence. VEHSS researchers used a statistical methodology called Bayesian meta-regression to combine information from multiple data sources to produce vision loss and blindness prevalence estimates among the entire US population in 2017.[14, 15]

## Case Definition

Vision loss in this report is defined based on the best-corrected visual acuity (BCVA) in the better-seeing eye, as measured using the methodology of the **National Health and Nutrition Examination Survey (NHANES)**. These estimates measure the best visual function obtainable with proper glasses or contact lenses, or use of an autorefractor which automatically identifies and applies the correct prescription lens.

### What is vision loss?

This report defines vision loss and blindness based on best corrected distance visual acuity in the better-seeing eye. Visual acuity is a method for assessing visual function using an eye chart with letters or shapes.

Best-corrected acuity is measured with the child wearing their optimal prescription glasses. Best-corrected visual acuity loss is also called "uncorrectable" or "permanent" vision loss, although sometimes this vision loss may be treatable if caused by treatable conditions including amblyopia, strabismus, or cataracts.

Presenting acuity is measured when wearing glasses or contact lenses that are usually worn, but that may be corrected with better glasses or contact lenses. Currently, there is no recent national data, nor any state or county-level data, on the prevalence of presenting visual acuity loss.

Best-corrected visual acuity excludes vision loss due to inadequate corrective glasses or contacts (uncorrected refractive error). It also does not capture vision problems caused by reduced visual field or contrast sensitivity. Because we use acuity in the better-seeing eye, this

## Case Definitions for Vision Loss and Blindness

- **Vision Loss:** Vision loss is defined as best corrected distance visual acuity 20/40 or worse in the better-seeing eye

- **Blindness:** Blindness is defined as best corrected distance visual acuity 20/200 or worse in the better-seeing eye

means that the vision loss is bilateral, and the other eye has the same or worse visual acuity. Therefore, the vision loss prevalence estimates reported here do not include cases of monocular vision loss, which is commonly associated with amblyopia and strabismus.

## Methods

The vision loss prevalence estimates are from the CDC's Vision and Eye Health Surveillance System's 'VEHSS Prevalence Estimates: Visual Acuity Loss'. The VEHSS Prevalence Estimates are generated using a statistical modeling approach called Bayesian meta-regression, which researchers used to combine information from multiple VEHSS data sources into a single summary estimate. See the **Data Sources** section of this report for more information on the data. Because our estimates of visual acuity loss and blindness were obtained from a statistical model, we report an uncertainty interval associated with each estimate.

Correlations between variables may be confounded by other variables that are also correlated with both variables and much more research is needed to understand the causes and effects of children's vision problems. Correlations in this report should be used to evaluate the possible relationship between vision indicators and other variables. If the correlation is high, that subject may warrant additional investigation.

## Highlighted National Summary Results

- One out of every 122 children in the US have uncorrectable vision loss. This includes one out of every 137 children aged 0-11 and one out of every 102 children aged 12-17.

**Over 600,000 children in the US have uncorrectable visual acuity loss, including over 45,500 who are blind**

- There are 25% more girls with vision loss than boys.
- Non-Hispanic Black children have the highest rates of vision loss and blindness. One out of every 89 black children have vision loss, and one out of every 1,000 are permanently blind.
- The 5 states with the highest prevalence of visual acuity loss among children were the District of Columbia, Mississippi, West Virginia, Arkansas, and Nevada.
- Among the community-level indicators included in the Prevent Blindness Children's Vision Health Map, vision loss is most closely correlated with the prevalence of children in poverty (+55%).
- Among the community-level indicators included in the Prevent Blindness Children's Vision Health Map, the prevalence of vision loss is most closely *inversely* correlated with math scores (-54%) and reading scores (-53%).

## Table 1.   National Prevalence of Vision Loss (Acuity ≤20/40) Among Children Age 0-17

| Vision Loss (≤20/40) | Number of Children | % of Children |
|---|---|---|
| **Total** | **601,972 (389,889-823,916)** | **0.82% (0.53%-1.12%)** |
| | | |
| **Age 0-11** | **355,463 (203,288-546,941)** | **0.73% (0.42%-1.13%)** |
| **Age 12-17** | **246,509 (186,199-296,913)** | **0.98% (0.74%-1.18%)** |
| | | |
| **Female** | **325,619 (208,361-459,831)** | **0.91% (0.58%-1.28%)** |
| **Male** | **276,353 (180,670-380,160)** | **0.73% (0.48%-1.01%)** |
| | | |
| **White, non-Hispanic** | **107,596 (64,843-156,387)** | **0.56% (0.34%-0.82%)** |
| **Black, non-Hispanic** | **56,401 (32,555-81,637)** | **1.13% (0.65%-1.63%)** |
| **Hispanic, any race** | **95,819 (52,110-144,012)** | **1.01% (0.55%-1.52%)** |
| **Other** | **16,537 (8,170-27,370)** | **0.40% (0.20%-0.67%)** |

**Table 2.  National Prevalence of Blindness (acuity ≤20/200) Among Children Age 0-17**

| Blindness (≤20/200) | Number of Children | % of Children |
|---|---|---|
| **Total** | **45,520 (22,069-66,208)** | **0.06% (0.03%-0.09%)** |
| | | |
| **Age 0-11** | **24,101 (9,680-43,562)** | **0.05% (0.02%-0.09%)** |
| **Age 12-17** | **21,419 (12,581-30,194)** | **0.09% (0.05%-0.12%)** |
| | | |
| **Female** | **23,276 (10,777-35,924)** | **0.06% (0.03%-0.10%)** |
| **Male** | **22,244 (11,292-33,876)** | **0.06% (0.03%-0.09%)** |
| | | |
| **White, non-Hispanic** | **8,436 (3,814-13,350)** | **0.04% (0.02%-0.07%)** |
| **Black, non-Hispanic** | **5,034 (2,504-8,514)** | **0.10% (0.05%-0.17%)** |
| **Hispanic, any race** | **7,416 (2,842-12,317)** | **0.08% (0.03%-0.13%)** |
| **Other** | **1,359 (409-2,451)** | **0.03% (0.01%-0.06%)** |

**Table 3.   34 States with Prevalence Rate of Children's Vision Loss Lower than National Average**

| Rank | State | Vision Loss (≤20/40) | Blind (≤20/200) |
|------|-------|----------------------|-----------------|
| | NATIONAL | 0.82% (0.53%-1.12%) | 0.06% (0.03%-0.09%) |
| 1 | Maine | 0.36% (0.19%-0.55%) | 0.03% (0.01%-0.04%) |
| 2 | Iowa | 0.47% (0.26%-0.71%) | 0.03% (0.01%-0.05%) |
| 3 | Hawaii | 0.48% (0.26%-0.73%) | 0.03% (0.02%-0.06%) |
| 4 | North Dakota | 0.48% (0.28%-0.75%) | 0.04% (0.02%-0.06%) |
| 5 | New Hampshire | 0.53% (0.30%-0.81%) | 0.04% (0.02%-0.07%) |
| 6 | Montana | 0.55% (0.29%-0.84%) | 0.04% (0.02%-0.06%) |
| 7 | South Dakota | 0.55% (0.30%-0.81%) | 0.04% (0.02%-0.07%) |
| 8 | Minnesota | 0.57% (0.34%-0.82%) | 0.04% (0.02%-0.07%) |
| 9 | Wisconsin | 0.58% (0.33%-0.85%) | 0.04% (0.02%-0.07%) |
| 10 | Connecticut | 0.59% (0.35%-0.84%) | 0.04% (0.02%-0.07%) |
| 11 | Utah | 0.59% (0.35%-0.90%) | 0.04% (0.02%-0.07%) |
| 12 | Wyoming | 0.62% (0.36%-0.91%) | 0.05% (0.02%-0.07%) |
| 13 | Alaska | 0.63% (0.36%-0.94%) | 0.05% (0.02%-0.07%) |
| 14 | Massachusetts | 0.64% (0.40%-0.94%) | 0.05% (0.02%-0.07%) |
| 15 | Maryland | 0.64% (0.40%-0.93%) | 0.05% (0.03%-0.08%) |
| 16 | New Jersey | 0.66% (0.38%-0.95%) | 0.05% (0.03%-0.08%) |
| 17 | Oregon | 0.67% (0.38%-0.97%) | 0.05% (0.02%-0.08%) |
| 18 | Vermont | 0.67% (0.33%-1.02%) | 0.05% (0.02%-0.08%) |
| 19 | Delaware | 0.68% (0.43%-0.99%) | 0.05% (0.03%-0.08%) |

| Rank | State | Vision Loss (≤20/40) | Blind (≤20/200) |
|------|-------|----------------------|-----------------|
| 20 | New York | 0.68% (0.40%-0.99%) | 0.05% (0.03%-0.08%) |
| 21 | Michigan | 0.70% (0.42%-1.03%) | 0.05% (0.03%-0.08%) |
| 22 | Washington | 0.70% (0.43%-1.05%) | 0.05% (0.03%-0.08%) |
| 23 | Illinois | 0.71% (0.45%-1.03%) | 0.05% (0.03%-0.09%) |
| 24 | Rhode Island | 0.71% (0.44%-1.06%) | 0.05% (0.03%-0.08%) |
| 25 | Colorado | 0.72% (0.42%-1.06%) | 0.05% (0.03%-0.08%) |
| 26 | Ohio | 0.72% (0.42%-1.09%) | 0.05% (0.03%-0.09%) |
| 27 | Virginia | 0.74% (0.43%-1.05%) | 0.06% (0.03%-0.09%) |
| 28 | Kansas | 0.76% (0.46%-1.16%) | 0.06% (0.03%-0.09%) |
| 29 | Nebraska | 0.76% (0.45%-1.11%) | 0.06% (0.03%-0.09%) |
| 30 | Indiana | 0.77% (0.45%-1.10%) | 0.06% (0.03%-0.09%) |
| 31 | Missouri | 0.77% (0.45%-1.11%) | 0.06% (0.03%-0.09%) |
| 32 | Pennsylvania | 0.77% (0.47%-1.11%) | 0.06% (0.03%-0.09%) |
| 33 | Idaho | 0.80% (0.44%-1.15%) | 0.06% (0.03%-0.10%) |
| 34 | California | 0.81% (0.46%-1.23%) | 0.06% (0.03%-0.10%) |

**Table 4.   17 States with Prevalence Rate of Children's Vision Loss Higher than National Average**

| Rank | State | Vision Loss (≤20/40) | Blind (≤20/200) |
|---|---|---|---|
| | NATIONAL | 0.82% (0.53%-1.12%) | 0.06% (0.03%-0.09%) |
| 35 | Arizona | 0.87% (0.53%-1.32%) | 0.06% (0.03%-0.10%) |
| 36 | North Carolina | 0.87% (0.52%-1.25%) | 0.07% (0.03%-0.10%) |
| 37 | Florida | 0.89% (0.55%-1.29%) | 0.07% (0.04%-0.11%) |
| 38 | Georgia | 0.93% (0.57%-1.31%) | 0.07% (0.04%-0.11%) |
| 39 | South Carolina | 1.00% (0.61%-1.44%) | 0.08% (0.04%-0.12%) |
| 40 | Tennessee | 1.00% (0.60%-1.43%) | 0.08% (0.04%-0.12%) |
| 41 | Texas | 1.03% (0.59%-1.53%) | 0.08% (0.04%-0.13%) |
| 42 | Alabama | 1.04% (0.61%-1.50%) | 0.08% (0.04%-0.13%) |
| 43 | Kentucky | 1.04% (0.62%-1.52%) | 0.08% (0.04%-0.13%) |
| 44 | Louisiana | 1.07% (0.66%-1.56%) | 0.08% (0.04%-0.13%) |
| 45 | Oklahoma | 1.11% (0.68%-1.61%) | 0.08% (0.04%-0.13%) |
| 46 | New Mexico | 1.13% (0.61%-1.69%) | 0.09% (0.04%-0.15%) |
| 47 | Nevada | 1.13% (0.67%-1.70%) | 0.08% (0.04%-0.13%) |
| 48 | Arkansas | 1.16% (0.69%-1.68%) | 0.09% (0.04%-0.14%) |
| 49 | West Virginia | 1.18% (0.65%-1.82%) | 0.09% (0.04%-0.15%) |
| 50 | Mississippi | 1.40% (0.86%-2.13%) | 0.11% (0.05%-0.18%) |
| 51 | District Of Columbia | 1.57% (0.83%-2.36%) | 0.12% (0.06%-0.19%) |

# Associations with Community-Level Characteristics

Among the community characteristics included in the Prevent Blindness Children's Vision Health Map, vision loss prevalence rate at the county level is most strongly correlated with the percentage of children living in poverty, higher levels of income inequality among all ages, and the prevalence rates of hearing difficulties in children.

Visual acuity loss is also weakly positively correlated with school and preschool vision screening, which may be an artifact of higher case finding from the school screening program translating into higher response rates to the self-reported vision difficulty question in the American Community Survey (ACS) and National Survey of Children's Health (NSCH), which are used as model inputs for generating estimates of regional differences in the visual acuity prevalence estimates. ACS and NSCH data are used to help the model predict visual acuity loss in children younger than age 11 and as a source of state and county level variation because this information is not available in examination-based visual acuity data sources. Alternatively, state adoption of school screening laws may have occurred in response to a recognized problem of vision problems in children.

Visual acuity loss was strongly negatively correlated with reading and math scores, and weakly negatively correlated with optometrists per capita. These relationships may warrant additional investigation.

**Table 5.   Community Characteristics Correlated with Visual Acuity Loss**

| Positively correlated characteristics | | Negatively correlated characteristics | |
|---|---|---|---|
| 1 | Poverty rate (0.55) | 1 | Reading score (-0.54) |
| 2 | Income inequality (0.32) | 2 | Math score (-0.53) |
| 3 | Hearing loss rate (0.31) | 3 | Optometrists per capita (-0.12) |
| 4 | School vision screening (0.28) | | |
| 5 | Preschool vision screening (0.28) | | |

# Diagnosed Amblyopia and Strabismus in Medicaid

We report the prevalence of children who are diagnosed with amblyopia, strabismus, or either amblyopia or strabismus and enrolled in Medicaid or State Children's Health Insurance Programs (CHIP) in 2019.[16] In 2019, over 35 million children were enrolled in Medicaid/CHIP, representing 51% of all children in the US. These data are based on analyses conducted by the Centers for Disease Control (CDC) Vision and Eye Health Surveillance System (VEHSS).

## Case Definition

Amblyopia and strabismus in this report are identified based on the presence of one or more diagnosis codes in Medicaid and CHIP-covered claims and encounters. Prevalence rates are calculated by dividing the number of children with diagnosis codes by the number of beneficiaries in Medicaid/CHIP.

### What are amblyopia and strabismus?

**Amblyopia**, also known as lazy eye, is a visual disorder that causes poor vision in one or both eyes and is usually caused by uncorrected refractive error. This may cause the brain to stop using visual signals. Amblyopia can usually be successfully treated with glasses, eye patches, and other treatments if caught early in childhood, before neural plasticity reduces with age.

**Strabismus** is a physical disorder that causes the eyes to be misaligned and point in different directions. Like amblyopia, strabismus can cause the brain to stop using visual signals from one or both eyes. Strabismus can often be successfully treated with glasses, eye patches, eye muscle exercise, or surgery. Like amblyopia, restoration of sight from strabismus is typically only successful if diagnosed and treated in early childhood.

It is important to note that the results in this report are restricted only to children covered by Medicaid/CHIP and represent the annual diagnosis rate of amblyopia and strabismus in 2019. The results do not reflect full population prevalence because they exclude 1) children not

### Case Definitions for Diagnosed Amblyopia and Strabismus

- **Amblyopia:** A diagnosis code on any Medicaid/CHIP claim during 2019 indicating amblyopia, including H53.0* and certain codes under H53.3
- **Strabismus:** A diagnosis code on any Medicaid/CHIP claim during 2019 indicating strabismus, including H49*, H50*, and certain codes under H53.3
- **Amblyopia or Strabismus:** Either of the above

covered by Medicaid/CHIP, 2) children who were not diagnosed or treated, and 3) children who were previously diagnosed but did not have a treatment claim for these conditions in 2019.

## Methods

The prevalence of diagnosed amblyopia and strabismus are from the VEHSS analysis of 2019 Medicaid and CHIP claims and encounter data. The VEHSS project calculated prevalence of diagnosed amblyopia, strabismus, or either amblyopia or strabismus in 2019 based on the presence of ICD-10 diagnosis codes on any patient claim during the year of observation. See the **Data Sources** section of this report for more information on the Medicaid and CHIP data. Diagnosed prevalence rates reported here were derived from actual patient counts obtained by analyzing Medicaid data. They therefore do not require estimates of uncertainty.

We analyzed the correlation between diagnoses of amblyopia or strabismus and each of the community characteristics available on the Prevent Blindness Children's Vision Health Map using Spearman's rank correlation coefficient. Spearman's correlation coefficient measures the strength and direction of association between two ranked variables. The correlation values are not an indicator of causation.

## Highlighted National Summary Results

- Over 760,000 children were diagnosed with either amblyopia or strabismus in Medicaid/CHIP in 2019, including over 360,000 with amblyopia and 486,000 with strabismus.

- One out of every 45 children in Medicaid/CHIP had an amblyopia or strabismus diagnosis in 2019. This includes one out of every 94 children with amblyopia and one out of every 70 with strabismus.

- Diagnosed prevalence of amblyopia or strabismus was highest among non-Hispanic whites, Asian, and American Indian/Alaskan Native children, and lowest among non-Hispanic black children and children of other races.

- The 5 states with the highest prevalence of amblyopia or strabismus among children were the District of Columbia, Mississippi, West Virginia, Arkansas, and Nevada.

**Table 6.   Prevalence of Diagnosed Amblyopia or Strabismus Among Children Aged 0-17 Enrolled in Medicaid/CHIP**

| Amblyopia or Strabismus | Number of Children Diagnosed in Medicaid | % of Children in Medicaid |
|---|---|---|
| **Total** | **762,300** | **2.24%** |
| | | |
| **Female** | **385,700** | **2.32%** |
| **Male** | **376,600** | **2.16%** |
| | | |
| **White, non-Hispanic** | **271,400** | **2.55%** |
| **Black, non-Hispanic** | **91,600** | **1.45%** |
| **Asian** | **24,500** | **2.39%** |
| **North American Native** | **9,500** | **2.34%** |
| **Other** | **5,200** | **1.86%** |
| **Hispanic, any race** | **193,900** | **2.17%** |
| **Unknown** | **166,100** | **2.57%** |

**Table 7.    Prevalence of Diagnosed Amblyopia Among Children Aged 0-17 Enrolled in Medicaid/CHIP**

| Amblyopia | Number of Children Diagnosed in Medicaid | % of Children in Medicaid |
|---|---|---|
| **Total** | **360,800** | **1.06%** |
| | | |
| **Female** | **179,900** | **1.08%** |
| **Male** | **181,000** | **1.04%** |
| | | |
| **White, non-Hispanic** | **118,100** | **1.11%** |
| **Black, non-Hispanic** | **39,800** | **0.63%** |
| **Asian** | **11,500** | **1.12%** |
| **North American Native** | **5,200** | **1.28%** |
| **Other** | **2,300** | **0.84%** |
| **Hispanic, any race** | **109,500** | **1.23%** |
| **Unknown** | **74,300** | **1.15%** |

**Table 8.   Prevalence of Diagnosed Strabismus Among Children Aged 0-17 Enrolled in Medicaid/CHIP**

| Strabismus | Number of Children Diagnosed in Medicaid | % of Children in Medicaid |
|---|---|---|
| **Total** | **485,900** | **1.43%** |
|  |  |  |
| **Female** | **247,900** | **1.49%** |
| **Male** | **237,900** | **1.36%** |
|  |  |  |
| **White, non-Hispanic** | **188,700** | **1.77%** |
| **Black, non-Hispanic** | **60,100** | **0.95%** |
| **Asian** | **15,400** | **1.50%** |
| **North American Native** | **5,400** | **1.33%** |
| **Other** | **3,300** | **1.19%** |
| **Hispanic, any race** | **103,100** | **1.16%** |
| **Unknown** | **109,900** | **1.70%** |

## Table 9.    23 States with Prevalence of Medicaid Diagnosed Amblyopia or Strabismus HIGHER than National Average

|  |  | Number of Children | % of Children |
|---|---|---|---|
|  | **National** | **762,300** | **2.24%** |
| 1 | **New York** | 84,500 | 4.41% |
| 2 | **Kansas** | 11,700 | 4.15% |
| 3 | **Maine** | 3,500 | 3.84% |
| 4 | **Ohio** | 41,900 | 3.59% |
| 5 | **New Mexico** | 10,500 | 3.50% |
| 6 | **Connecticut** | 10,600 | 3.35% |
| 7 | **Delaware** | 3,500 | 3.33% |
| 8 | **Massachusetts** | 19,400 | 3.31% |
| 9 | **Maryland** | 19,200 | 3.16% |
| 10 | **New Hampshire** | 3,000 | 3.15% |
| 11 | **Washington** | 23,400 | 2.93% |
| 12 | **Rhode Island** | 2,200 | 2.84% |
| 13 | **Iowa** | 9,400 | 2.77% |
| 14 | **Idaho** | 5,500 | 2.76% |
| 15 | **Arizona** | 22,500 | 2.74% |
| 16 | **Michigan** | 26,900 | 2.73% |
| 17 | **Oregon** | 10,800 | 2.60% |
| 18 | **Colorado** | 15,100 | 2.53% |
| 19 | **Montana** | 2,600 | 2.52% |
| 20 | **Texas** | 86,800 | 2.47% |
| 21 | **Arkansas** | 10,300 | 2.40% |
| 22 | **Pennsylvania** | 30,300 | 2.39% |
| 23 | **Oklahoma** | 12,500 | 2.37% |

*Data is not available for every state

**Table 10.  24 States with Prevalence of Medicaid Diagnosed Amblyopia or Strabismus LOWER than National Average**

| Rank | State | Number of Children | % of Children |
|---|---|---|---|
| | **National** | **762,300** | **2.24%** |
| 24 | **Kentucky** | **11,900** | **2.17%** |
| 25 | **Minnesota** | **9,800** | **2.17%** |
| 26 | **Virginia** | **15,000** | **2.17%** |
| 27 | **North Carolina** | **25,800** | **2.16%** |
| 28 | **Tennessee** | **16,300** | **2.13%** |
| 29 | **New Jersey** | **16,200** | **2.03%** |
| 30 | **Nebraska** | **3,500** | **2.03%** |
| 31 | **Wisconsin** | **9,700** | **1.90%** |
| 32 | **West Virginia** | **3,700** | **1.86%** |
| 33 | **Louisiana** | **12,800** | **1.81%** |
| 34 | **South Carolina** | **11,200** | **1.72%** |
| 35 | **South Dakota** | **1,300** | **1.72%** |
| 36 | **Nevada** | **5,400** | **1.62%** |
| 37 | **Georgia** | **21,100** | **1.60%** |
| 38 | **Missouri** | **9,600** | **1.59%** |
| 39 | **Hawaii** | **2,100** | **1.49%** |
| 40 | **Indiana** | **10,000** | **1.44%** |
| 41 | **Illinois** | **15,700** | **1.37%** |
| 42 | **Florida** | **29,000** | **1.36%** |

| Rank | State | Number of Children | % of Children |
|------|-------|--------------------|----------------|
| 43 | District Of Columbia | 1,100 | 1.29% |
| 44 | California | 57,600 | 1.28% |
| 45 | Mississippi | 5,200 | 1.27% |
| 46 | North Dakota | 500 | 1.17% |
| 47 | Wyoming | 30 | 0.67% |

*Data is not available for every state

# Associations with Community-Level Characteristics

Among the community characteristics included in the Prevent Blindness Children's Vision Health Map, Medicaid diagnosis rates of amblyopia or strabismus were correlated with higher rates of Medicaid eyeglasses provision, higher math and reading scores, the presence of vision screening programs, and higher rates of eyecare providers per capita. The positive correlation between amblyopia and strabismus diagnoses and school screening legislation and higher numbers of eyecare providers per capita may be indicative of these factors leading to higher rates of diagnosis.

Medicaid diagnosis of amblyopia and strabismus were negatively correlated with the prevalence of hearing loss and the percentage of children living in poverty. This indicates that areas with higher rates of these negative SDOH indicators generally also had lower rates of diagnosis of amblyopia and strabismus, which may indicate lower rates of case-finding in these areas.

All correlations between amblyopia or strabismus diagnosis and community-level characteristics were relatively weak.

**Table 11.  Community Characteristics Correlated with Amblyopia and Strabismus**

| | Positively correlated characteristics | | Negatively correlated characteristics |
|---|---|---|---|
| 1 | Medicaid eyeglasses provision (0.29) | 1 | Hearing loss prevalence (-0.22) |
| 2 | Math score (0.23) | 2 | Poverty rate (-0.12) |
| 3 | Reading score (0.20) | | |
| 4 | School vision screening (0.16) | | |
| 5 | Ophthalmologists per capita (0.13) | | |

# Provision of Eyeglasses in Medicaid

We report the prevalence of children who received prescription eyeglasses through Medicaid and State Children's Health Insurance Programs (CHIP) in 2019. These data are based on analyses conducted by the Centers for Disease Control (CDC) Vision and Eye health Surveillance System (VEHSS).

## Case Definition

Eyeglasses in this report are identified based on the presence of one or more procedure codes indicating reimbursement for eyeglasses in Medicaid and CHIP-covered claims and encounters. Prevalence rates are calculated by dividing the number of children with eyeglasses procedure codes by the number of beneficiaries in Medicaid/CHIP.

It is important to note that the results in this report are restricted only to children covered by Medicaid/CHIP and represent the annual rate of eyeglass provision. The results do not reflect full population prevalence because they exclude 1) children not covered by Medicaid/CHIP, 2) children who did not receive reimbursement from Medicaid/CHIP for their glasses, and 3) children who may already have eyeglasses and did not get new glasses in 2019.

This report does not include contact lenses or fittings, which are generally not covered by most Medicaid programs. Fewer than 50,000 children received contact lenses or had a covered contact lens fitting through Medicaid in 2019.

## How does Medicaid pay for eyeglasses?

All states are required to cover eyeglasses for children. However, coverage varies by state, and may differ between Fee for Service plans or different managed care programs, even within the same state. Some states cover eyeglasses annually, and potentially up to two pairs of glasses per year for children. States also differ in copayment amounts. Eyeglasses are free in many states, while some Medicaid managed care plans provide an annual allowance towards eyeglasses, such as $100. In some cases, beneficiaries could elect not to use their Medicaid eyeglass benefit, for example if they cannot find a provider that accepts the Medicaid reimbursement rate, or if they wish to obtain different eyeglasses than the type provided by Medicaid.

## Case Definitions for Eyeglasses

- **Eyeglasses:** A HCPCS code indicating Medicaid/CHIP reimbursement of eyeglasses in 2019.

## Methods

The prevalence of receiving eyeglasses is from the VEHSS analysis of 2019 Medicaid and CHIP claims and encounter data. The VEHSS project calculated prevalence of receiving one or more pairs of eyeglasses in 2019 based on the presence of CPT and HCPCS procedure codes on any patient claim or encounter record during the year of observation. See the **Data Sources** section for more information on the Medicaid and CHIP data.

We analyzed the correlation between receiving eyeglasses and each of the community characteristics available on the Prevent Blindness Children's Vision Health Map using Spearman's rank correlation coefficient. Spearman's correlation coefficient measures the strength and direction of association between two ranked variables. The correlation values are not an indicator of causation.

## Highlighted National Summary Results

- Nearly 4 million children in Medicaid/CHIP received at least one pair of covered eyeglasses in 2019.

- One out of every 8.5 children in Medicaid/CHIP received at least one pair of covered eyeglasses in 2019.

- Receipt of eyeglasses was highest among American Indian/Alaskan Native and Hispanic children, and lowest among children of other races and non-Hispanic blacks.

- Receipt of eyeglasses covered by Medicaid/CHIP ranged from 3% of children in Delaware to 20% in Kansas.

**Table 12. Prevalence of Receipt of Covered Eyeglasses Among Children Enrolled in Medicaid/CHIP**

| | Number of Children who Received Medicaid-covered Eyeglasses | % of Children in Medicaid |
|---|---|---|
| **Total** | **3,991,500** | **11.71%** |
| **Female** | **2,188,800** | **13.15%** |
| **Male** | **1,802,700** | **10.33%** |
| **White, non-Hispanic** | **1,266,800** | **11.88%** |
| **Black, non-Hispanic** | **664,100** | **10.50%** |
| **Asian** | **120,600** | **11.73%** |
| **North American Native** | **60,900** | **15.02%** |
| **Other** | **24,600** | **8.82%** |
| **Hispanic, any race** | **1,154,200** | **12.94%** |
| **Unknown** | **700,300** | **10.82%** |

**Table 13.  29 States with Rate of Medicaid-covered Eyeglasses HIGHER than National Average**

| Rank | State | Number of Children | % of Children |
|---|---|---|---|
| | National | 3,991,500 | 11.71% |
| 1 | Kansas | 56,400 | 19.93% |
| 2 | Oklahoma | 99,400 | 18.79% |
| 3 | Mississippi | 74,200 | 18.02% |
| 4 | Connecticut | 55,300 | 17.40% |
| 5 | Kentucky | 95,100 | 17.28% |
| 6 | Colorado | 98,700 | 16.53% |
| 7 | Arkansas | 70,500 | 16.47% |
| 8 | South Dakota | 12,100 | 15.86% |
| 9 | Louisiana | 108,600 | 15.36% |
| 10 | Nebraska | 26,600 | 15.26% |
| 11 | Rhode Island | 11,300 | 14.93% |
| 12 | Idaho | 29,600 | 14.82% |
| 13 | New Jersey | 112,000 | 14.11% |
| 14 | Arizona | 115,600 | 14.08% |
| 15 | Nevada | 45,600 | 13.75% |
| 16 | Montana | 14,100 | 13.73% |
| 17 | Ohio | 157,400 | 13.50% |
| 18 | Tennessee | 101,600 | 13.32% |
| 19 | Texas | 462,200 | 13.15% |
| 20 | Iowa | 44,400 | 13.14% |
| 21 | Pennsylvania | 165,600 | 13.07% |

| Rank | State | Number of Children | % of Children |
|------|-------|--------------------|---------------|
| 22 | **New Mexico** | 38,100 | 12.69% |
| 23 | **Oregon** | 51,400 | 12.36% |
| 24 | **Minnesota** | 55,500 | 12.28% |
| 25 | **North Carolina** | 146,600 | 12.26% |
| 26 | **Maryland** | 73,500 | 12.12% |
| 27 | **North Dakota** | 5,100 | 11.87% |
| 28 | **Indiana** | 82,600 | 11.81% |
| 29 | **Massachusetts** | 69,400 | 11.80% |

*Data is not available for every state

**Table 14.  18 States with Rate of Medicaid-covered Eyeglasses LOWER than National Average**

| Rank | State | Number of Children | % of Children |
|------|-------|--------------------|---------------|
| | **National** | **3,991,500** | **11.71%** |
| 30 | **South Carolina** | **75,900** | **11.70%** |
| 31 | **New York** | **215,000** | **11.21%** |
| 32 | **Washington** | **89,200** | **11.15%** |
| 33 | **West Virginia** | **22,200** | **11.09%** |
| 34 | **Maine** | **10,100** | **11.06%** |
| 35 | **Illinois** | **124,700** | **10.82%** |
| 36 | **Missouri** | **63,400** | **10.42%** |
| 37 | **Michigan** | **90,600** | **9.17%** |
| 38 | **Georgia** | **121,100** | **9.17%** |
| 39 | **Wyoming** | **460** | **8.85%** |
| 40 | **California** | **397,000** | **8.81%** |
| 41 | **Wisconsin** | **45,100** | **8.80%** |
| 42 | **Florida** | **185,500** | **8.70%** |
| 43 | **New Hampshire** | **8,000** | **8.54%** |
| 44 | **District Of Columbia** | **5,800** | **6.96%** |
| 45 | **Virginia** | **36,600** | **5.30%** |
| 46 | **Hawaii** | **5,500** | **3.87%** |
| 47 | **Delaware** | **3,100** | **2.98%** |

*Data is not available for every state

# Associations with Community-Level Characteristics

Among the community characteristics included in the Prevent Blindness Children's Vision Health Map, rates of Medicaid eyeglasses coverage were correlated with higher rates of hearing loss, the poverty rate, and school vision screening programs.

Rates of eyeglass provision were negatively correlated with ophthalmologists per capita, pediatric optometrists per capita, and pediatric ophthalmologists per capita.

Each of these correlations were fairly weak, likely due to wide differences in coverage of eyeglasses across states.

**Table 15.  Community Characteristics Correlated with Medicaid Provision of Eyeglasses**

| Positively correlated characteristics | | Negatively correlated characteristics | |
|---|---|---|---|
| 1 | Hearing loss prevalence (0.21) | 1 | Ophthalmologists per capita (-0.15) |
| 2 | Poverty rate (0.16) | 2 | Pediatric ophthalmologists per capita (-0.13) |
| 3 | School vision screening (0.14) | 3 | Pediatric optometrists per capita (-0.11) |

# Conclusion

The **Prevent Blindness Children's Vision Health Map** provides data-driven insights into the prevalence of common vision problems among children in the United States. The report highlights that over 600,000 children suffer from uncorrectable visual acuity loss or blindness, with additional millions experiencing vision issues that are treatable with corrective lenses. The data, derived from sources such as the Centers for Disease Control and Prevention's **Vision and Eye Health Surveillance System (VEHSS)**, reveals significant geographic disparities in the prevalence of these conditions and the provision of eyeglasses through Medicaid and CHIP. For instance, while Medicaid requires all states to cover eyeglasses for children enrolled in Medicaid, the proportion of enrolled children who receive glasses varies widely between states, from as low as 3% to as high as 20%.

These data can provide significant value to those seeking to develop vision health interventions or formulate policy to address vision health among children. Health policymakers can better allocate resources and implement targeted vision screening and treatment programs by identifying areas with higher prevalences of vision problems. Targeting may be particularly effective in states with significant socioeconomic challenges. Correlations between vision loss and community-level characteristics, such as poverty and education, underscore the need for integrated approaches that address health and social determinants of vision health. These insights are critical for ensuring that all children, regardless of background or location, have access to the vision care they need to thrive academically and socially.

The report also leaves several important questions unanswered, paving the way for future research. More research on the drivers and causes of differences in childhood visual outcomes can help direct resources and attention to the root causes of vision problems. A more granular accounting of vision promotion programs at the state, county, and municipal levels and research on their relative effectiveness can provide information to understand and promote promising practices of children's vision care. Additionally, understanding the barriers to accessing vision care, particularly in underserved communities, will be crucial for designing more effective policies and practices. Researchers are encouraged to explore these areas further to build on the findings of the Prevent Blindness Children's Vision Health Map and contribute to the development of comprehensive strategies for improving children's vision health nationwide.

# Data Sources

## Vision Loss

The vision loss prevalence estimates are from the CDC's **Vision and Eye Health Surveillance System's** 'VEHSS Prevalence Estimates: Visual Acuity Loss'. The VEHSS Prevalence Estimates are generated using a statistical modeling approach called Bayesian meta-regression, which researchers used to combine information from multiple VEHSS data sources into a single summary estimate.

The 'VEHSS Prevalence Estimates: Visual Acuity Loss' use measured visual acuity data from the National Health and Nutrition Examination Survey (NHANES) as the reference point dataset to create output based on the characteristics and performance of the NHANES vision exam. In addition to NHANES, the estimation model used population-based study data to provide additional evidence, and self-reported survey data to provide information on variation by state, county, and among under-represented population groups.

**Documentation**

A summary of the VEHSS Visual Acuity Loss estimates is available here: https://www.cdc.gov/vision-health-data/prevalence-estimates/vision-loss-prevalence.html

**Explore the Data**

All data included in the PUF file can be displayed and analyzed in the VEHSS Data Explorer interactive data visualization application. Select 'Vision Problems and Blindness' > 'Vision Loss and Blindness' > 'VEHSS Prevalence Estimate: Visual Acuity Loss' to explore the data: https://ddt-vehss.cdc.gov/

**Access the Data**

All vision loss data presented in this report and on the Prevent Blindness Children's Vision Health Map are from the VEHSS Prevalence Estimates public use file (PUF). This PUF is freely available for download from the CDC's VEHSS Data Portal, which allows users to query, visualize, and access PUFs via download or through direct application programming interface (API).
https://data.cdc.gov/Vision-Eye-Health/VEHSS-Composite-Prevalence-Estimates/qeru-k2y2/about_data

## Citations

- Flaxman AD, Wittenborn JS, Robalik T, Gulia R, Gerzoff RB, Lundeen EA, Saaddine J, Rein DB. Prevalence of visual acuity loss or blindness in the US. *JAMA Ophthalmology.* 2021;139(7):171-23.

- Lundeen EA, Flaxman AD, Wittenborn JS, et al. County-Level Variation in the Prevalence of Visual Acuity Loss or Blindness in the US. *JAMA Ophthalmology.* July 7, 2022: doi:10.1001/jamaophthalmol.2022.2405.

# Amblyopia, Strabismus, and Eyeglasses

Diagnosed prevalence of amblyopia and strabismus, and provision of eyeglasses measures included in the Prevent Blindness Children's Vision Health Map come from CDC's **Vision and Eye Health Surveillance System (VEHSS)** analysis of the Medicaid **Transformed Medicaid Statistical Information System (T-MSIS)** data from 2019. T-MSIS data are a set of de-identified person-level data files with information on enrollment, eligibility, service utilization, diagnoses, and payments in Medicaid and Children's Health Insurance Program (CHIP). Owned by the Centers for Medicare & Medicaid Services (CMS), Medicaid data cover everyone enrolled in Medicaid and CHIP from participating states within a given year.

Certain beneficiaries were excluded from the analysis, including beneficiaries 1) who are dually enrolled in Medicare, 2) without a valid gender variable, 3) do not have a valid care plan variable, 4) are only enrolled in single-service plans (i.e., a dental plan), 5) have missing enrollment information, or 5) are duplicates based on beneficiary, plan, and state ID's. Based on these exclusion criteria, 34,094,900 Medicaid/CHIP beneficiaries aged younger than 18 were included in the analysis.

Four states (Alabama, Alaska, Utah, and Vermont) were not included in the results because they were either not included in the T-MSIS base file, or because data quality issues preclude them from the analysis.

## Documentation

A summary of the VEHSS Medicaid data analysis is available here:
https://www.cdc.gov/vision-health-data/data-sources/medicaid.html

## Explore the Data

All vision loss data presented in this report and on the Prevent Blindness Children's Vision Health Map can be displayed and analyzed in the VEHSS Data Explorer interactive data visualization application. Filter the data sources to 'Medicaid' to explore all vision and eye

health indicators included in the VEHSS analysis of Medicaid data:
https://ddt-vehss.cdc.gov/

## Access the Data

All vision loss data presented in this report and on the Prevent Blindness Children's Vision Health Map are from the VEHSS Medicaid public use file (PUF). This PUF is freely available for download from the CDC's VEHSS Data Portal, which allows users to query, visualize, and access PUFs via download or through direct application programming interface (API).
https://data.cdc.gov/Vision-Eye-Health/Medicaid-Claims-MAX-Vision-and-Eye-Health-Surveill/bwx3-gx66/about_data

# Math and Reading Scores

The state and county-level Math Score and Reading Score data are from the Educational Opportunity Project at Stanford University. This project seeks to produce estimates of student performance that are comparable across states. The data are based on state testing from grades 3-8 by standardizing proficiency thresholds across different types of tests in different states.

## Documentation

A summary of the SEDA data and methods is available here:
https://edopportunity.org/methods/

## Explore the Data

The SEDA Educational Opportunity Explorer is an interactive online visualization application that can display the math score, reading score, and other data.
https://edopportunity.org/get-the-data/

## Access the Data

Public use files are available by request.

## Citation:

- Reardon, S. F., Ho, A. D., Shear, B. R., Fahle, E. M., Kalogrides, D., Saliba, J. (2024). Stanford Education Data Archive (Version 5.0). Retrieved from https://purl.stanford.edu/cs829jn7849

# Prevalence of Hearing Loss

The prevalence of hearing loss is based on data from NORC's SoundCheck project. SoundCheck uses statistical modelling approaches to combine examination, survey, and administrative claims-based data to produce comprehensive estimates of the prevalence of hearing loss at the national, state and county level.

## Documentation

Documentation is available through the SoundCheck 'National Indicator Report on Hearing Loss' report

https://norc-soundcheck.nyc3.digitaloceanspaces.com/soundcheckresources-pdfs/national-indicator-report-on-hearing-loss_final2024-compressed-(1).pdf

## Explore the Data

The soundcheckmap.org website contains an interactive map to display the hearing loss prevalence data.

https://soundcheckmap.org/

## Access the Data

Public use files can be downloaded from
https://soundcheckmap.org/map

## Citation

- Rein DB, Franco C, Reed NS, Herring-Nathan ER, Lamuda PA, Alfaro Hudak KM, Hu W, Hartzman AJ, White KR, Wittenborn JS. The prevalence of bilateral hearing loss in the United States in 2019: a small area estimation modelling approach for obtaining national, state, and county level estimates by demographic subgroup. Lancet Reg Health Am. 2024 Jan 24;30:100670. doi: 10.1016/j.lana.2023.100670.

# Prevalence of Cognitive Difficulties, Poverty Rate, and Income Inequality

The prevalence of cognitive disabilities cognitive difficulties, uninsured rate, poverty rate, low English-speaking proficiency are based on 2022 American Community Survey (ACS) data.

- **Cognitive difficulties** are based on household responses to the question: "Because of a physical, mental, or emotional problem, does the respondent have difficulty

remembering, concentrating, or making decisions?" for children aged 5-17 from table B18104 from 2022 ACS 5-year data.

- The **poverty rate** was calculated as the proportion of households in the location who reported annual household income below the poverty rate, sourced from table S1701 from 2022 ACS 5-year data.

- **Income inequality** is based on the GINI index, which is a coefficient value reported in table B19083 from 2022 ACS that summarizes the dispersion of household income, and ranges from 0 (perfect income equality) to 1 (perfect income inequality).

## Documentation

Documentation on the ACS data is available here: https://www.census.gov/programs-surveys/acs

## Access the Data

US Census estimates including ACS results for cognitive difficulties can be accessed from data.census.gov/

# Eyecare Providers Per Capita

The eyecare providers per capita were calculated by analyzing the National Provider Index (NPI) produced by the **National Plan and Provider Enumeration System (NPPES)**, part of the Centers for Medicare and Medicaid Services (CMS). The NPI contains the street address and provider type taxonomy codes for all healthcare providers who have registered to submit for reimbursement from CMS.

In our analysis, we used the provider type taxonomy codes to identify providers and categorize them into the following groups:

- Any eyecare provider
- Ophthalmologists
- Pediatric Ophthalmologists
- Optometrists
- Pediatric Optometrists

Of note, pediatric ophthalmologists are a subset of ophthalmologists, and pediatric optometrists are and subset of optometrists. Any eyecare provider is a subtotal variable where each provider is counted only once.

We then mapped provider place of service addresses to states and counties, and then divided by the resident population estimate for the location from the 2022 US Census population estimate. Rates are presented per 10,000 residents.

## Documentation

Documentation on the NPI is available here:

https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/NPI-What-You-Need-To-Know.pdf

## Access the Data

NPI data can be searched or downloaded here:
https://npiregistry.cms.hhs.gov/search

An interactive map of NPI data for eyecare providers is available at Prevent Blindness:
https://preventblindness.org/us-eyecare-provider-map/

# States with Child Vision Screening Legislation

The states with school screening legislation were compiled and provided by the National Center for Children's Vision and Eye Health at Prevent Blindness.

**Table 16. States with Child Vision Screening Legislation Indicated with a Solid Dot ●**

|  | 2024 Preschool-Age Requirement | 2024 School-Age Requirement | 2024 Any Requirement |
|---|---|---|---|
| **Alabama** | NO | NO | NO |
| **Alaska** | ● | ● | ● |
| **Arizona** | ● | ● | ● |
| **Arkansas** | ● | ● | ● |
| **California** | ● | ● | ● |
| **Colorado** | NO | ● | ● |
| **Connecticut** | ● | ● | ● |
| **Delaware** | ● | ● | ● |
| **District of Columbia** | ● | ● | ● |
| **Florida** | NO | ● | ● |

| | 2024 Preschool-Age Requirement | 2024 School-Age Requirement | 2024 Any Requirement |
|---|---|---|---|
| **Georgia** | ● | ● | ● |
| **Hawaii** | ● | ● | ● |
| **Idaho** | NO | NO | ● |
| **Illinois** | ● | ● | ● |
| **Indiana** | NO | ● | ● |
| **Iowa** | NO | ● | ● |
| **Kansas** | ● | ● | ● |
| **Kentucky** | ● | ● | ● |
| **Louisiana** | ● | ● | ● |
| **Maine** | ● | ● | ● |
| **Maryland** | ● | ● | ● |
| **Massachusetts** | ● | ● | ● |
| **Michigan** | ● | ● | ● |
| **Minnesota** | ● | NO | ● |
| **Mississippi** | ● | ● | ● |
| **Missouri** | NO | NO | NO |
| **Montana** | NO | NO | NO |
| **Nebraska** | ● | ● | ● |
| **Nevada** | NO | ● | NO |
| **New Hampshire** | NO | NO | NO |
| **New Jersey** | ● | ● | ● |
| **New Mexico** | ● | ● | ● |
| **New York** | ● | ● | ● |
| **North Carolina** | ● | ● | ● |

| | 2024 Preschool-Age Requirement | 2024 School-Age Requirement | 2024 Any Requirement |
|---|---|---|---|
| **North Dakota** | NO | NO | NO |
| **Ohio** | NO | ● | ● |
| **Oklahoma** | NO | ● | ● |
| **Oregon** | ● | ● | ● |
| **Pennsylvania** | NO | ● | ● |
| **Rhode Island** | ● | ● | ● |
| **South Carolina** | NO | NO | NO |
| **South Dakota** | NO | NO | NO |
| **Tennessee** | ● | ● | ● |
| **Texas** | ● | ● | ● |
| **Utah** | NO | ● | ● |
| **Vermont** | ● | ● | ● |
| **Virginia** | ● | ● | ● |
| **Washington** | ● | ● | ● |
| **West Virginia** | ● | ● | ● |
| **Wisconsin** | NO | NO | NO |
| **Wyoming** | NO | NO | NO |

# Find More Data on Vision Loss on the Vision and Eye Health Surveillance System (VEHSS)

The VEHSS website houses a large repository of information on the prevalence of vision and eye problems, including the VEHSS prevalence estimates reported here as well as prevalence estimates for over 200 vision and eye health indicators calculated across 12 individual datasets.

VEHSS Home Page: https://www.cdc.gov/vision-health-data
VEHSS Prevalence Estimates Summary
VEHSS Data Explorer

Find More Data on Vision Loss and Blindness

## Self-report Measures

VEHSS contains estimates of individuals who reported difficulties with their vision in federal surveys, including the American Community Survey (ACS), Behavioral Risk Factor Surveillance System (BRFSS), National Health Interview Survey (NHIS), and the National Survey of Children's Health (NSCH). These estimates represent people who perceive problems with their vision, and will include both correctable and uncorrectable vision problems, but exclude people who are not aware of, or bothered by their vision problems. A strength of these estimates is they are available by multiple person-level characteristics including diabetes, hypertension, smoking, income, education, and nursing home residence. A limitation of self-report measures is that they are sensitive to question wording and the data collection methods, and therefore different surveys can yield substantially different results even with similar or identical questions.

## Measured Acuity

VEHSS contains national prevalence estimates of measured, correctable and uncorrectable visual acuity deficits from NHANES. The original NHANES estimates are available on the VEHSS Data Explorer but are only available at the national level and were last collected in 2008. These data were used to help create the vision loss prevalence estimates in this report. The VEHSS Data Explorer also contains information on patients with measured vision impairment or blindness as measured by ophthalmologists and reported to the Intelligent Research in Sight (IRIS) Registry©. The IRIS Registry© data can be used to look at state and population differences but are only applicable to people who visited an ophthalmologist who participated in the IRIS Registry©.

## Vision Care

VEHSS contains information on using vision care services related to vision problems as coded in insurance claims information obtained from Medicare, Medicaid, commercial medical insurance (MarketScan), and managed vision care programs, as well as services included in ophthalmology electronic health records summarized by the IRIS Registry©. These estimates measure the proportion of patients who received at least one medical service coded with a diagnosis code for vision impairment or blindness.

# Find More Data on Amblyopia, Strabismus and other Eye Health Conditions

## Diagnosed Prevalence

VEHSS contains diagnosed prevalence of 17 eye health conditions and 79 subgroups, including amblyopia and strabismus, calculated from Medicaid/CHIP, Medicare, commercial medical insurance, managed vision care insurance, and the IRIS Registry.

Visit the **VEHSS Data Explorer** and select any included eye disorder:

- **Age-related Macular Degeneration (AMD)**
- **Cataract**
- **Diabetic Retinopathy**
- **Glaucoma**
- **Other Eye Disorders**, which includes:
  - Cancer and neoplasms of the eye
  - Cornea Disorders
  - Disorders of Optic Nerve and Visual Pathways
  - Infectious and Inflammatory Diseases
  - Injury, Burns and Surgical Complications of the Eye
  - Orbital and External Disease
  - Other Eye Disorders
  - Other Retinal Disorders
  - Retinal Detachment and Defects
  - Strabismus and Amblyopia

# Find More Data on Eyeglasses and other types of vision care

Visit the VEHSS Data Explorer and select "**Vision Care**".

## Eyeglasses or Contacts

VEHSS contains data on the proportion of patients receiving glasses or contacts per year in Medicaid, Medicare, commercial medical insurance (MarketScan), and managed vision care programs. These data are available at the national, state, and county (Medicare and Medicaid) level.

## Self-Reported Use of Glasses or Contacts

VEHSS also contains summary prevalence estimates of self-reported use of eyeglasses from the National Health Interview Survey (NHIS). Unlike the annual rates of receiving eyeglasses from claims data, this measure can be interpreted as a prevalence estimate of the overall use of eyeglasses.

## Other Vision Care Services

VEHSS also contains information on other vision care services in addition to glasses. Vision Care Services reported by VEHSS include:

- Eye Exams
- Eye Injury Prevention
- Glasses or Contacts
- Imaging or Diagnostic Tests
- Low Vision Aids
- Screening Services

# Using the Prevent Blindness Children's Vision Health Map

This Prevent Blindness Children's Vision Health Map provides a simple and intuitive way to explore the data presented in this report at the state or county level. This section demonstrates some of the key features and functionality of the map. Note that all of the outcome data included in the Children's Vision Health Map are also available on the VEHSS website. However, VEHSS does not include bivariate relationship mapping.

## Dropdown Menus

Use the dropdown menus on the left side of the map to make any changes in the selected geography, outcome measures, filters, indicators or relationships.

Note that you must click the 'Update Map' button to load a new map with your selections.
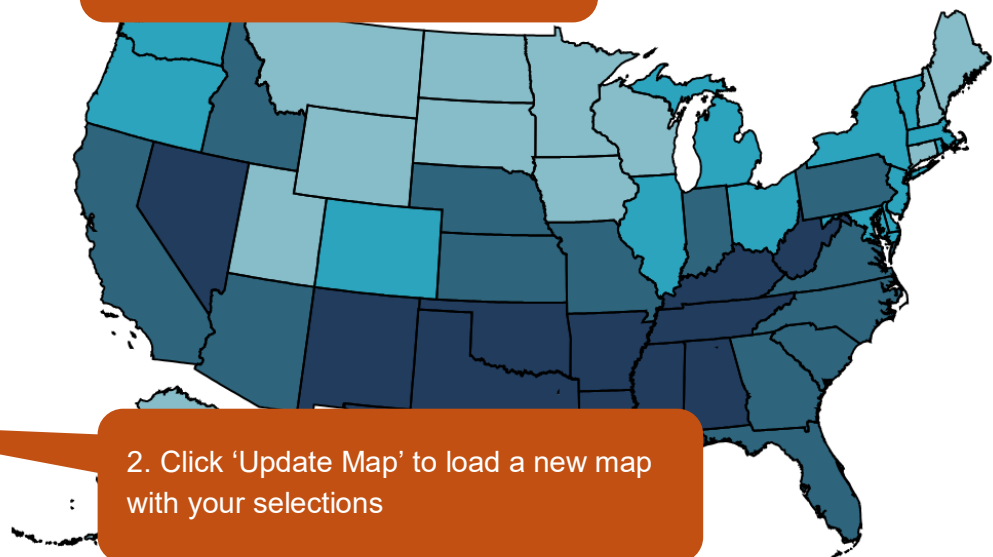
SELECT GEOGRAPHY



Use this dropdown menu, then click 'Update Map' to switch between State and County views

SELECT GEOGRAPHY

States

Counties

States

Nothing Selected

## Indicate States With Vision Screening Legislation

Use this dropdown, then click Update Map' to add dots that will indicate which states have child vision screening legislation in 2024.

INDICATE STATES WITH VISION
SCREENING LEGISLATION

2024 Preschool Screening Requir

Nothing Selected

2024 Preschool Screening Requirement

2024 School-Age Screening Requirement

2024 Any Screening Requirement

**Age Group**

Ages 0-17

Indicator Dots appear on states with selected type of screening legislation

# Filter By Subtopics

Use these dropdowns to change the "base layer" data shown on the map.
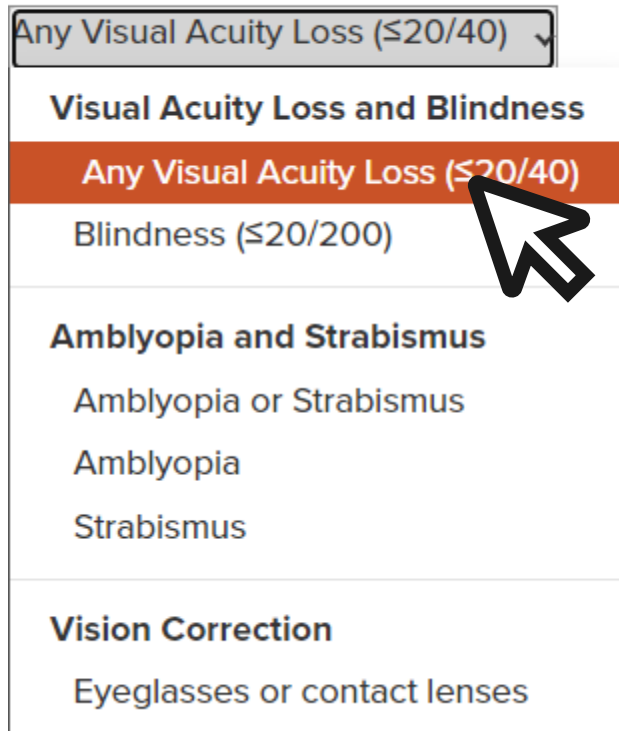
## Select Outcome Measure

The Outcome Measures are the main results of the Child Vision Health Map, including

- **Vision Loss and Blindness** which reports the prevalence of vision loss among all children in the United States,
- **Amblyopia and Strabismus** which reports diagnosis rates among children in Medicaid, and
- **Vision Correction**, which reports the proportion of children in Medicaid who received Medicaid-covered eyeglasses

FILTER BY SUBTOPICS

**Select Outcome**

Any Visual Acuity Loss (≤20/40)

**Visual Acuity Loss and Blindness**

Any Visual Acuity Loss (≤20/40)

Blindness (≤20/200)

**Amblyopia and Strabismus**

Amblyopia or Strabismus

Amblyopia

Strabismus

**Vision Correction**

Eyeglasses or contact lenses

## Age Group, Race/Ethnicity, Gender

Selecting values in these dropdowns will filter the demographic groups displayed in the base-layer Outcome Measures. For example, if the selected outcome measure is 'Any Visual Acuity Loss', then selecting Age 0-11, Hispanic, and Male, then clicking 'Update Map' will reload the map showing the prevalence rates of 'Any Visual Acuity Loss' among 0–11 year-old Hispanic boys.

**Age Group**

Ages 0-17                              ⌄

**Race/Ethnicity**

All Races and Ethnicities              ⌄

**Gender**

| All genders            ⌄ |
|---|
| **All genders** |
| Female |
| Male |

# Add Relationship

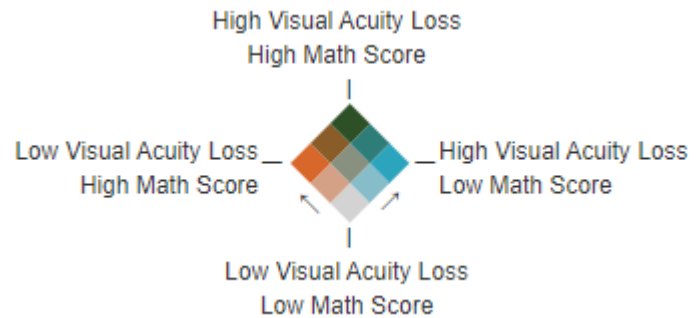## What are the relationship variables?

The relationship variables are community (state or county) level data for factors that may be correlated with the outcome measures. An important point is that these variables are NOT measured among the children affected by the outcome measure – these are community level indicators measured among the entire population of the area. For example, Math Scores are a measure of the math scores for all students in the state or county. They are NOT the math scores among children with vision or eye problems. Currently, such data does not exist. The intent of the relationship variables is to facilitate users' understanding of how community characteristics may be associated with vision and eye problems, diagnosis and treatment. The selection of these variables are based on expert opinion and published literature on social determinants of health and their associations with vision problems. Currently, there is little or no evidence on causal links between these variables and the vision and eye problems reported in this map.
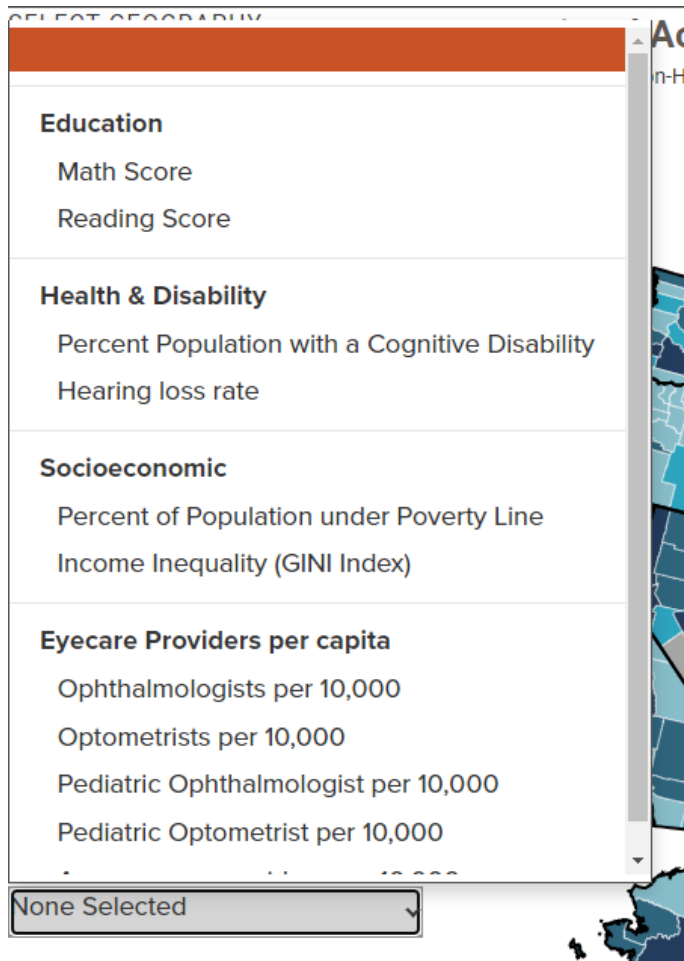
# Bivariate Map Mode

Selecting a relationship variable and clicking 'Update Map', will load the map in bivariate mode, which displays 2 variables each with its own color scale. The base layer is in blue, but the relationship variable is in orange. When both the base layer value and the relationship variable value are high, the blue and orange combine and turn green.

This image shows the bivariate map legend showing the combination of both color scales. In this example, the base layer is showing visual acuity loss in blue, where a darker blue indicates higher prevalence of visual acuity loss. The relationship variable selected is Math Scores shown in orange, where higher math scores are darker orange.

High Visual Acuity Loss
High Math Score

Low Visual Acuity Loss __　__ High Visual Acuity Loss
High Math Score　　　　　　Low Math Score

Low Visual Acuity Loss
Low Math Score

This image shows a small section of the map with these selections:

- The **blue (1)** counties in the west are areas with both high visual acuity loss prevalence and low math scores.
- The **orange (2)** counties in the east are areas where the prevalence of visual acuity loss is low and math scores are high.
- The **green (3)** county in the center has both high visual acuity loss and high math scores.
- The **light orange (4)**, **light blue (5)**, **teal (6)**, and **brown (7)** counties are areas where one or both variables are above or below average.
- The **dark gray (8)** counties in the center are average in both visual acuity loss and math scores.
- The **light gray (9)** county in the south has low visual acuity loss and low math scores.
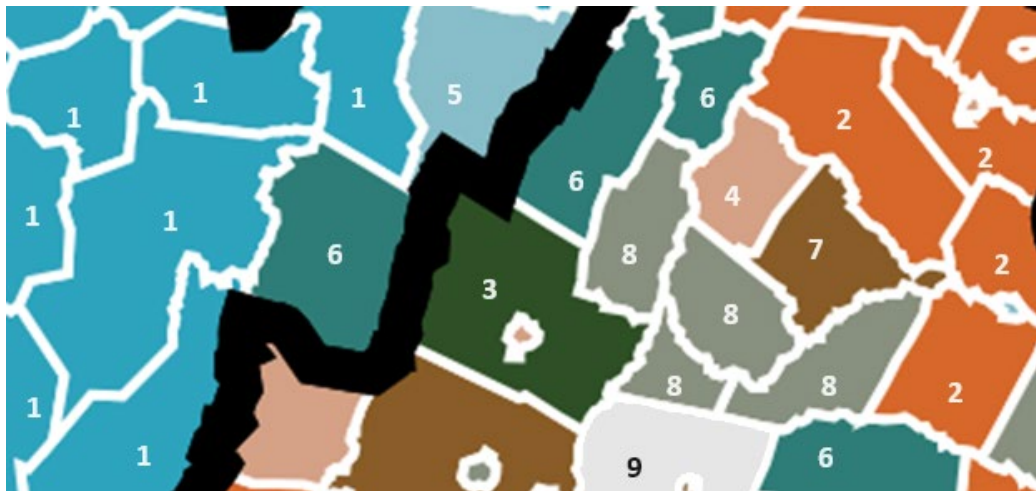
Note some colors on the map were changed for illustrative purposes.

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