

Vision trouble affects 43.2 million adults throughout the United States and poses an annual economic burden of \$145 billion (Wittenborn & Rein, 2014). 6.8 million individuals reported a vision disability in 2014, 620,386 of whom were Texans (U.S. Census Bureau, 2016a). The likelihood of having a vision disability increases with age. The following tables reflect vision disabilities reported by age group for the U.S., Texas, and the KCF counties of interest in 2014:

Visual Disabilities 2014						
	US		TX		Bexar	
Age	Number	%	Number	%	Number	%
Under 5	95,964	0.5	10,078	0.5	881	0.7
5 - 17	430,152	0.8	46,822	0.9	3,328	1.0
18 - 64	3,493,078	1.8	334,892	2.1	26,238	2.4
65 & over	2,813,964	6.7	228,594	8.3	16,814	9.0
Total	6,833,158	9.8	620,386	11.8	47,261	13.1

(U.S. Census Bureau, 2016a)

Visual Disabilities 2014						
	Bandera		Comal		Kendall	
Age	Number	%	Number	%	Number	%
Under 5	0	0.0	51	0.8	0	0.0
5 - 17	52	1.9	84	0.4	27	0.4
18 - 64	482	3.9	1,365	2.0	256	1.2
65 &	253	5.7	1,118	6.0	460	7.5
Total	787	11.5	2,618	9.2	743	9.1

(U.S. Census Bureau, 2016a)

Visual impairment refers to the consequence of functional loss of vision such as losing the ability to perform daily living activities or function independently. Definitions of levels of visual impairments are as follows (American Optometric Association [AOA], 2015):

- **Low vision:** best-corrected visual acuity in the better-seeing eye is:

- 20/30 to 20/60 -- mild vision loss
- 20/70 to 20/160 -- moderate low vision
- 20/200 to 20/400 -- severe low vision
- 20/500 to 20/1,000 -- profound low vision

- **Legal blindness:** best-corrected visual acuity less than 20/200 in the better-seeing eye or has a visual field extent less than 20 degrees in diameter (AOA, 2015)

- What a person with normal vision can see at 200 feet, a legally blind person can see at 20 ft.
- 1,355,248 people in the U.S. are estimated to be blind (Wittenborn & Rein, 2014)
- 71,731 Texans age 40 and older are estimated to be blind (Prevent Blindness America [PBA], 2012)

A wide variety of other conditions that result in visual impairment are described in greater detail below.

Retinal diseases involve the neural tissue that contains photoreceptor cells (rods and cones), located in the back of the eye. The retina converts light to electrical signals and then transmits the information via the optic nerve to the brain (National Eye Institute [NEI], 2015a):

- **Age-related Macular Degeneration (AMD):** Leading cause of vision loss in persons over 50 years of age with no known cure:
 - **Dry AMD:** the gradual break-down of cells in the macula (center of retina), resulting in blurring of the central vision of the affected eye
 - 90% of all AMD cases
 - Gradual onset

- **Wet AMD:** the growth of tiny blood vessels under the retina leak fluid or break, distorting vision and can form scar tissue
 - Rapid onset
 - Also known as Advanced AMD
- A “blind spot” in the center of the eye is characteristic of wet AMD; the spot can grow over time but does not usually completely black out the entire vision range
- Peripheral vision is typically maintained, but can become so severely blurred that it is difficult to distinguish details
- 2,176,985 people in the U.S. are estimated to have AMD (Wittenborn & Rein, 2014)
- 118,169 Texans have AMD (PBA, 2012)
- **Diabetic Retinopathy:** Damage to the blood vessels in the retina. There are four progressive stages (NEI, 2015b):
 - Mild Nonproliferative Retinopathy: microaneurysms occur
 - Moderate Nonproliferative Retinopathy: some blood vessels become blocked
 - Severe Nonproliferative Retinopathy: many more blood vessels become blocked triggering growth of new vessels
 - Proliferative Retinopathy: numerous newly grown blood vessels are abnormally fragile and may leak, causing severe vision loss or blindness
 - Treatment for the first three stages is unnecessary; control of diabetic issues such as blood sugar, blood pressure, and cholesterol have been shown to slow down progression of the disease
 - Proliferative retinopathy is treated with laser surgery
 - Between 40 to 45 percent of Americans diagnosed with diabetes have some stage of diabetic retinopathy
 - 8,084,767 people in the U.S. area estimated to have diabetic retinopathy (Wittenborn & Rein, 2014)
 - 607,054 Texans have diabetic retinopathy (PBA, 2012)

Corneal diseases affect the transparent tissue at the front of the eye that serves as both a protective physical barrier, by shielding the eye from the external environment, and as the main refractive element of the eye, directing incoming light onto the lens (NEI, 2013):

- **Refractive errors**
 - Myopia (nearsightedness) – incoming light rays focused in front of the retina
 - Hyperopia (farsightedness) – incoming light rays focused behind the retina
 - Astigmatism – light rays not focused on a single point
 - Over 2.3 million individuals in Texas are myopic (PBA, 2012)
 - 929,605 Texans are hyperopic (PBA, 2012)
- **Corneal Dystrophies:** conditions in which one or more parts of the cornea lose their normal clarity due to a buildup of cloudy material. There are over 20 corneal dystrophies that affect all parts of the cornea.
- **Keratoconus:** progressive thinning of the cornea that results in thin, bulging, conically shaped corneas that can cause severe visual impairment. This affects one in every 2,000 Americans.

(NEI, 2013)

Glaucoma is a group of diseases that cause a gradual degeneration of cells that make up the optic nerve (NEI, n.d.):

- Elevated pressure inside the eye is frequently, but not always, present
- Vision loss is gradual and usually unnoticed until significant, irreversible nerve damage occurs
- Peripheral and side vision is lost first, creating a “tunnel effect” where patients only see what is central in their vision. Gradually, this central vision also begins to deteriorate until little or no vision remains.
- Can be treated with medication and/or surgery to slow the progression of the disease
- Highest risk for African Americans over age 40; everyone over age 60, especially Mexican Americans

- 2,858,572 Americans are estimated to have glaucoma (Wittenborn & Rein, 2014)
- 184,720 Texans have glaucoma (PBA, 2012)

Cataract is the leading cause of blindness in the world according to the World Health Organization (2016). A clouding of the eye's naturally clear lens that interferes with vision, cataract is the result of build-up of proteins in the lens (NEI, 2009):

- Occur mostly in older persons
- Fuzzy or blurred vision is sometimes the first symptom
- Outpatient surgery is the only option for mild to severe cataract, and is usually performed by replacing the cataract affected lens with an artificial lens
- Medical costs and prescription drug services total \$10.7 billion a year for cataract treatment (PBA, 2013)
- 25,666,427 people in the U.S. are estimated to have cataracts (Wittenborn & Rein, 2014)
- 1,589,280 Texans have cataracts (PBA, 2012)

Vision Is a Continuum

A person with low vision has severely reduced visual acuity and/or has a significantly obstructed field of vision that cannot be corrected by glasses, medicine or surgery (Santa Rosa Low Vision Clinic, n.d.). Persons with visual impairments face a variety of challenges on a day-to-day basis. These difficulties often lead persons with visual impairments to suffer from loneliness, isolation, and depression. Even simple tasks such as preparing food may become extremely difficult.

The elderly have the highest risk for developing visual impairments, and suffer the most from the effects of vision loss due to the inability to adapt to a world of non-vision. In 2014, people 65 years and older made up 14.5% of the United States population; in Texas, they made up 11.5% of the population. Bandera (24.6%), Bexar (11.3%), Comal (17.4%), and Kendall (19.1%) counties all have percentages of elderly residents that meet or exceed the state average (U.S. Census Bureau, 2016b).

Early and frequent screening of older adults is imperative to minimize the impact of vision problems. The National Institute on Aging (2015) states that most vision problems among seniors can be treated or avoided if treated before the problem becomes too severe.

Low Vision Rehabilitation

Low vision exams may be necessary to assess a patient's level of usable vision. Provided by low vision specialists, these exams are conducted using specialized charts (versus the standard eye chart) as well as tests to measure contrast sensitivity, size, and location of blurry or distorted areas in the visual field, and other functions such as how well someone can see faces, street signs, newspaper print, stove dials, etc. (Low Vision Gateway, n.d.).

The goal of a low vision exam is to help maximize the use of remaining vision. Low vision doctors prescribe prescription eyewear, filters, microscopic - telescopic eyewear, magnifiers, adaptive equipment, closed circuit television systems, independent living devices, and provide training and counseling for patients (Santa Rosa Low Vision Clinic, n.d.).

While low vision exams are not currently covered under most vision insurance policies, including Medicare (Sharp Eyes Vision Center, 2011), there is some help available for Texans through the Texas Department of Rehabilitative Services. The Division for Blind Services of the Texas Department of Assistive and Rehabilitative Services (DBS) (2014) estimated that it will cost \$52,586,879 to assist 7,888 visually impaired individuals with vocational rehabilitation services in FY2015. Independent living services for older individuals are also available through DBS. In 2013, Texas spent \$3,156,127 assisting 2,681 seniors (55+) with services or training in alternative non-visual or low vision techniques including assistive technology (DBS, n.d.).

Accessible Media

It is especially important for seniors to access resources to help alleviate feelings of isolation. Certain adaptations, such as learning to read

Braille, are very difficult to attain. There are a limited number of services available to address this growing need:

- **U.S. Library of Congress National Library Service for the Blind and Physically Handicapped (NLS):** any U.S. citizen who is unable to read or use standard print materials, as a result of a temporary or permanent visual or physical limitation, may receive service. Playback equipment, books, magazines, and catalogs are sent directly to the subscriber by U.S. Postal Services as “Free Matter for the Blind” and are returned the same way. There is no cost to the individual for this service.

Efforts have been made to develop a means of delivering new digital technology that will replace cassettes, resulting in a portable digital talking book player that allows visually impaired readers to easily navigate through books. There are two types of digital players, a standard model and a more advanced one that has navigation and bookmarking capabilities. Readers are encouraged to use cassettes and digital readers to access the full range of the collection (NLS, 2014).

- **National Federation of the Blind** offers a free newspaper and magazine reading service (U.S. newspapers only) where qualified individuals call a toll-free number and can hear articles from national and local papers and magazines, including four Spanish language papers, read over the phone (National Federation of the Blind, 2015).
- **Owl Radio** in San Antonio provides daily radio broadcasts of newspapers, magazines and other information. Programming is transmitted to special radio receivers provided to qualified applicants over subcarriers provided by Texas Public Radio (Low Vision Resource Center, 2015).

REFERENCES

American Optometric Association (AOA). (2015). *Low vision*. Retrieved from <http://www.aoa.org/patients-and-public/caring-for-your-vision/low-vision?ss0=v>

- Low Vision Gateway. (n.d.). *The low vision examination*. Retrieved February 13, 2015, from http://www.lowvision.org/what_occurs_in_a_low_vision_exam.htm
- Low Vision Resource Center. (2015). *Owl Radio: Reading for those who cannot see*. Retrieved from <http://www.owlradio.org/>
- National Eye Institute (NEI). (n.d.). *Facts about glaucoma*. Retrieved February 2, 2016, from https://nei.nih.gov/health/glaucoma/glaucoma_facts
- National Eye Institute (NEI). (2009). *Facts about cataract*. Retrieved from https://nei.nih.gov/health/ataract/ataract_facts
- National Eye Institute (NEI). (2013). *Facts about the cornea and corneal disease*. Retrieved from <https://nei.nih.gov/health/cornealdisease/>
- National Eye Institute (NEI). (2015a). *Facts about age-related macular degeneration*. Retrieved from https://nei.nih.gov/health/maculardegen/armd_facts
- National Eye Institute (NEI). (2015b). *Facts about diabetic retinopathy*. Retrieved from <https://nei.nih.gov/health/diabetic/retinopathy>
- National Federation of the Blind. (2015). *NFB-NEWSLINE free service to those who cannot read regular newsprint!* Retrieved from <https://nfb.org/audio-newspaper-service>
- National Institute on Aging. (2015). *Aging and your eyes*. Retrieved from <https://www.nia.nih.gov/health/publication/aging-and-your-eyes>
- Prevent Blindness America (PBA). (2012). *Vision problems in the U.S. Report (2012 Edition)*. Retrieved from <http://www.visionproblemsus.org/>
- Prevent Blindness America (PBA). (2013). *Cost of vision problems: The Economic burden of vision loss and eye disorders in the United States*. Retrieved from http://www.preventblindness.org/sites/default/files/national/documents/Economic%20Burden%20of%20Vision%20Final%20Report_130611.pdf
- Santa Rosa Low Vision Clinic. (n.d.). *What is low vision?* Retrieved February 2, 2016, from <http://www.lowvisionclinic.net/home/whatislowvision.html>
- Sharp Eyes Vision Center. (2011). *Low vision*. Retrieved from <http://www.sharpeyesvisioncenter.com/low-vision.html>
- Texas Department of Assistive and Rehabilitation Services, Division for Blind Services (DBS). (n.d.). *Quicktables: Independent living services for older individuals who are blind: expenditures, performance, and FTEs*. Retrieved February 13, 2015, from <https://rsa.ed.gov/quick-tables.cfm>
- Texas Department of Assistive and Rehabilitation Services, Division for Blind Services (DBS). (2014). *State plan for fiscal year 2015: annual estimates*. Retrieved from <https://rsa.ed.gov/view.cfm?rsaform=VR-State-Plan&state=TX&grant=H126A140065>
- U.S. Census. (2016a). *Disability characteristics: 2010-2014 American community survey 5-year estimates: Table S1810*. Retrieved from http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_5YR_S1810&prodType=table
- U.S. Census Bureau. (2016b). *State and county QuickFacts*. Retrieved from <http://quickfacts.census.gov/qfd/states/48000.html>
- U.S. Library of Congress National Library Service for the Blind and Physically Handicapped (NLS). (2014). *NLS: That all may read: Frequently asked questions*. Retrieved from <http://www.loc.gov/nls/faq.html>
- World Health Organization (WHO). (2016). *Prevention of blindness and visual impairment: Priority eye diseases: Cataract*. Retrieved from <http://www.who.int/blindness/causes/priority/en/index1.html>
- Wittenborn, J. & Rein, D. (2014). *The Future of vision: Forecasting the prevalence and cost of vision problems*. Retrieved from <http://forecasting.preventblindness.org/>