

On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.



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Disclosures

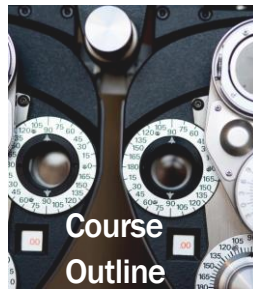
I have no disclosures or conflicts of interests



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- 01 Epidemiology

- 02 Ocular Effects of Diabetes

- 03 Categories of Vision Impairment and Prevalence

- 04 Management Options

- 05 Summary





PRE-DIABETES STATISTICS

- Total:** 88 million people aged 18 years or older have prediabetes (34.5% of the adult US population)
- 65 years or older:** 24.2 million people aged 65 years or older have prediabetes



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Characteristic	Prediabetes* 2018 Estimates Number in millions (95% CI)	Prediabetes* 2013–2016 Estimates Percentage (95% CI)	Prediabetes Awareness, ^b 2013–2016 Estimates Percentage (95% CI)
Total	88.0 (82.2–93.8)	34.5 (32.2–36.9)	15.3 (12.8–18.3)
Age in years			
18–44	28.7 (25.3–32.1)	24.3 (21.4–27.4)	8.8 (5.9–13.0)
45–64	35.1 (31.0–37.3)	41.7 (39.1–44.4)	16.0 (12.8–19.8)
≥65	24.2 (22.0–26.4)	46.6 (42.3–51.0)	22.6 (17.2–29.1)
Sex			
Men	40.9 (37.6–44.3)	38.0 (34.5–41.2)	11.4 (8.5–15.2)
Women	47.1 (42.9–51.3)	31.2 (28.6–34.0)	19.8 (15.9–24.5)

Note: CI = confidence interval. Data are crude estimates.
 *Prediabetes was defined as fasting plasma glucose values of 100 to 125 mg/dL or A1C values of 5.7% to 6.4%.
^bPrediabetes awareness was based on self-report and estimated only among adults with prediabetes.
 Data sources: 2013–2016 National Health and Nutrition Examination Survey; 2018 US Census Bureau data.



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DIABETES STATISTICS

- Total:** 34.1 million people have diabetes (10.5% of the US population)
- Diagnosed:** 26.9 million people, including 26.8 million adults
- Undiagnosed:** 7.3 million people (21.4% are undiagnosed)



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Prevalence: Diabetes

Characteristic	Diagnosed diabetes Number in Millions (95% CI)	Undiagnosed diabetes Number in Millions (95% CI)	Total diabetes Number in Millions (95% CI)
Total	26.8 (24.4–29.1)	7.3 (6.3–8.4)	34.1 (31.6–36.6)
Age in years			
18–44	3.6 (3.0–4.1)	1.4 (0.8–1.9)	4.9 (4.0–5.8)
45–64	11.7 (10.3–13.1)	3.1 (2.3–3.9)	14.8 (13.4–16.3)
≥65	11.5 (10.1–12.8)	2.9 (2.1–3.6)	14.3 (12.7–15.9)
Sex			
Men	14.0 (12.4–15.6)	3.9 (2.8–5.0)	17.9 (16.2–19.6)
Women	12.8 (11.4–14.1)	3.4 (2.7–4.1)	16.2 (14.8–17.6)

Note: CI = confidence interval. Estimated numbers for 2018 were derived from percentages for 2013–2016 applied to July 1, 2018 US resident population estimates from the US Census Bureau.
 Diagnosed diabetes was based on self-report. Undiagnosed diabetes was based on fasting plasma glucose and A1C levels among people self-reporting no diabetes. Numbers for subgroups may not add up to the total because of rounding.
 Data sources: 2013–2016 National Health and Nutrition Examination Survey; 2018 US Census Bureau data.

Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2020. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services, 2020.



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Characteristic	Population Estimates, 2018* Number in thousands (95% CI)	Incidence Estimates, 2017-2018 Rate per 1,000 (95% CI)
Total	1,483 (1,289-1,677)	6.9 (5.8-8.3)^a
Age in years		
10-44	452 (343-561)	4.3 (3.2-5.5) ^a
45-64	706 (571-840)	9.9 (7.6-12.8) ^a
≥65	326 (253-398)	8.8 (6.5-11.9) ^a
Sex		
Men	45 (614-875)	7.3 (5.8-8.3) ^a
Women	38 (601-876)	6.6 (5.1-8.4) ^a
Race/ethnicity		
White, non-Hispanic	786 (666-906)	5.4 (4.6-6.3)
Black, non-Hispanic	213 (148-279)	7.9 (5.9-10.8)
Asian, non-Hispanic	97 (58-137)	7.2 (4.8-10.8)
Hispanic	334 (204-464)	9.0 (6.1-13.3)

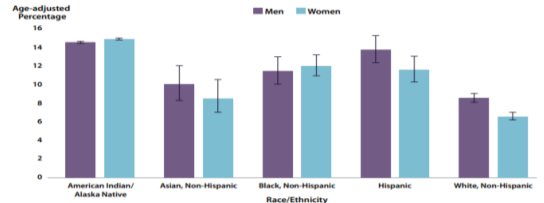
CI = confidence interval.
 *Population estimates for 2018 were derived from rates for 2017-2018 applied to July 1, 2018 US resident population estimates from the US Census Bureau (See Detailed Methods).
^a Rates were calculated using 2018 data only.
 Data sources: 2017-2018 National Health Interview Survey and 2018 US Census Bureau data.

In 2018, there were 1.5 million NEW CASES of diabetes in the US



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Age-adjusted est. prevalence of Diagnosed Diabetes by race/ethnicity



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TYPE 1	<ul style="list-style-type: none"> •Autoimmune β - cell destruction •Pancreas stops making insulin •Insulin deficiency
TYPE 2	<ul style="list-style-type: none"> •Progressive loss of β - cell insulin secretion •Insulin resistance
GESTATIONAL	<ul style="list-style-type: none"> •Diabetes diagnosed in 2nd or 3rd trimester of pregnancy •No overt diabetes diagnosis before pregnancy



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Type 1

- The incidence of type 1 diabetes continues to increase in U.S.
- Steeper increases observed in Black and Hispanic youths
- Since 2011, the incidence of type 1 diabetes has significantly increased among Asians and Pacific Islanders
- There are no known prevention interventions for type 1 diabetes




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TYPE 2

- approximately 90-95% of diabetics have type 2 diabetes
- The incidence of type 2 diabetes among adolescents has increased at a higher rate than that of type 1 diabetes, especially among racial/ethnic minority youths




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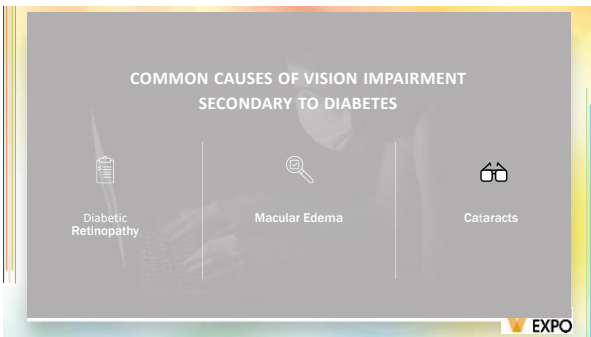
Gestational Diabetes

- From 1 in 50 to 1 in 20 pregnant women has gestational diabetes.
- More common in Native American, Alaskan Native, Hispanic, Asian, and Black women according to the CDC



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COMMON CAUSES OF VISION IMPAIRMENT SECONDARY TO DIABETES


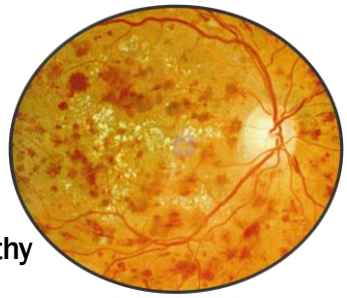


- Diabetic Retinopathy
- Macular Edema
- Cataracts



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Diabetic Retinopathy



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How Many Diabetics Have Diabetic Retinopathy?

- 77.3% in type 1 diabetes patients¹
- AND
- 25.1% in type 2 diabetes patients



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DIABETIC RETINOPATHY STATISTICS

- Diabetes with Diabetic Retinopathy is one of the leading causes of visual impairment and blindness worldwide.
- 828, 000 African-Americans have diabetic retinopathy
- 1.2 Million Hispanics/Latinos currently have diabetic retinopathy



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- **Disparities in Diabetic Retinopathy Screening Rates within Minority Populations: Differences in Reported Screening Rates among African American and Hispanic Patients**, published in the December 30, 2015⁴

Compared with Hispanic patients, African American patients were screened 50% less often in the previous year, despite reporting similar barriers to screening, similar awareness that diabetes may lead to diabetic retinopathy, and the same likelihood of receiving physician recommendation for diabetic retinopathy screening.

"Our findings of a large discrepancy in diabetic retinopathy screening rates among safety-net minority communities may have important implications for consequent risk of blindness," the researchers wrote. "Different approaches to encourage diabetic retinopathy screening may be necessary in different minority populations."

Diabetic Retinopathy



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Diabetic Retinopathy

The researchers found that most patients were aware of diabetic retinopathy as a potential complication of diabetes, and more than 75% reported that a physician had recommended diabetic retinopathy screening. However, only 55% reported screening in the previous year.

- Patients in each population also reported similar types of barriers to diabetic retinopathy screening. The exceptions were that more Hispanic patients felt that being "upset" or "depressed" was a barrier, and more African American patients reported "fear of screening" or "not being comfortable ..."



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Diabetic Retinopathy Pathophysiology

The specific etiology of diabetic retinopathy is unclear and likely, the result of many interplaying factors²:

- Due primarily to hyperglycemia leads to activation of alternative pathways of glucose metabolism
- Diabetes and subsequent hyperglycemia results in the formation of advanced glycation end products (AGEs)
- Results in the activation of cytokines and growth factors and vascular endothelial dysfunction which leads to ischemia secondary to microvascular occlusions, leads to IRMA and Neovascularization



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Diabetic Retinopathy Pathophysiology

- Oxidative stress happens as a result of increased levels of reactive oxygen species leading to cell and tissue damage
- Now recognized that low levels of oxidants can modify cell-signaling proteins and that these modifications have functional consequences
- When oxidized, cellular Protein Kinase C (PKC) activity is stimulated.



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Diabetic Retinopathy Pathophysiology

- PKC is involved in signal transduction
- Activation of PKC leads to basement membrane alterations along with vascular changes like:
 - increased vascular permeability
 - release of angiogenic growth factors
 - vascular stasis
 - capillary occlusion
- These changes are seen in small retinal vessels in Diabetic Retinopathy



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Classification

Early Treatment Diabetic Retinopathy study (ETDRS) classification of diabetic retinopathy⁴:

Nonproliferative Diabetic Retinopathy:

- **No retinopathy**: No retinal lesions
- **Very mild NPDR**: Microaneurysms only
- **Mild NPDR**: A few microaneurysms, retinal hemorrhage & hard exudates
- **Moderate NPDR**: Retinal hemorrhages in 1-3 quadrant + cotton wool spots
- **Severe NPDR**: fulfilling one rule of 4-2-1 rule.
 - Severe hemorrhages in all 4 quadrants
 - Venous beading in 2 or more quadrants
 - Moderate IRMA in 1 or more quadrants
- **Very Severe NPDR**: fulfilling two or more rules of 4-2-1 rule

International Clinical Diabetic Retinopathy Disease Severity Scale⁵:

- **No apparent retinopathy**: No abnormality
- **Mild NPDR**: Microaneurysms only
- **Moderate NPDR**: More than just microaneurysms and less than severe disease
- **Severe NPDR**: No signs of PDR and any of the following:
 - 20 intraretinal hemorrhages in each of the 4 quadrants
 - Venous beading in ≥2 quadrants
 - Prominent IRMA ≥1 quadrant
- **PDR**: One or more of the following:
 - Neovascularization
 - Vitreous or pre-retinal hemorrhage



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Diabetic Retinopathy Classification

Early Treatment Diabetic Retinopathy study (ETDRS) classification of diabetic retinopathy⁴:

Proliferative Diabetic Retinopathy:

- **Mild to moderate PDR**-NVD or NVE insufficient to meet high-risk characteristics
- **High risk PDR**-NVD greater than ETDRS standard photograph 10A (about 1/3 disc area)
- Any NVD with vitreous hemorrhage
- NVE greater than 1/2 disc area with vitreous hemorrhage

International Clinical Diabetic Retinopathy Disease Severity Scale⁶:

- **PDR**- One or more of the following:
 - Neovascularization
 - Vitreous or pre-retinal hemorrhage



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Treatments for Diabetic Retinopathy

Management of Non-Proliferative Diabetic Retinopathy⁴:

- Very mild NPDR: follow-up every yearly
- Mild to moderate NPDR: follow-up 6-12 months
- Severe to Very Severe NPDR: Close follow-up within 2-4 months
- Intravitreal anti-VEGF agents have been approved to treat moderate and severe NPDR to improve diabetic retinopathy including:
 - Lucentis and Eylea
 - Eylea: DR, DME
 - off-label Avastin



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Treatments for Diabetic Retinopathy

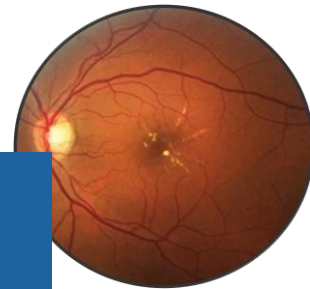
Treatment of Proliferative Diabetic Retinopathy⁶:

- Intravitreal anti-VEGF agents improve PDR
 - Studies show that Lucentis is non-inferior to PRP in PDR without DME and superior when DME is present
 - Other anti-VEGF options are Eylea and Avastin
- PRP is another option
 - Non-high-risk PDR without DME - careful 2-4 months follow-up and immediate pan-retinal photocoagulation if high-risk PDR occurs
 - High risk PDR Scatter PRP-Nasal and inferior quadrants first
 - **Some physicians perform PRP in all PDR cases.**
 - High-risk PDR in which complete photocoagulation is not possible- alternatives like cryopexy or vitrectomy should be considered
 - High-risk PDR without macular edema- pan-retinal photocoagulation should be initiated
 - PDR with CSME- combined intravitreal anti-VEGF injections and PRP sessions should be considered



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Macular
Edema



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How Many Diabetics Have Diabetic Macular Edema?

- Diabetic macular edema (DME) is one of the leading causes of vision loss worldwide
- It affects over 75,000 Americans yearly, and nearly 100 million people worldwide
- The prevalence of DME is higher in individuals with type 1 diabetes than those with type 2 diabetes



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Diabetic Macular Edema (DME)-It can be classified into the following groups:⁶

- Focal exudative and diffuse exudative maculopathy
- Ischemic and non- ischemic maculopathy
- Tractional and non-tractional maculopathy
- Center involving macular edema and non-center involving macular edema

• Further classified into:

Mild DME: The retinal thickening or hard exudates located far from the center of the fovea

Moderate DME: Retinal thickening or hard exudates approaching the center of the macula but not involving the center

Severe DME: Hard exudate and thickening involving the center of the fovea

OCT (optical coherence tomography) classification of diabetic macular edema:

- Sponge-like thickening of retinal layers
- Large cystoid spaces
- Serous detachment of the retina
- Tractional detachment of the fovea
- Taut posterior hyaloid membrane.



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DME is deemed Clinically Significant if:

ETDRS classification of Clinically significant macular edema (CSME)⁶:

- Retinal edema within 500 μm of the center of the fovea
 - Hard exudates within 500 μm of the center of the fovea if associated with adjacent retinal thickening (which may be outside the 500 μm limit)
 - Retinal edema one disc area (1500 μm) or larger any part of which is within one disc diameter of the center of the fovea
- Only ONE of these features must be present in order for diabetic macular edema to be deemed as Clinically Significant



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Macular Edema Pathophysiology

Diabetes can lead to macular edema in a multifactorial manner. Understanding the pathophysiology of diabetic macular edema is secondary to the disruption of the Blood-Retinal Barrier (BRB)

- Two major compartments: an outer and inner barrier.
- Animal models show permeability of both compartments is disrupted after the onset of diabetes.
- Disruption of this barrier results in the accumulation of fluid leading to macular edema
 - Involves various inflammatory markers upregulated by AGEs, and hyperglycemia
 - AGEs are osmotically active, and they may be responsible for fluid accumulation in the macula
 - Diabetes results in vasoconstriction, which upregulates VEGF expression
 - VEGF results in macular edema and results in vasculogenesis, which results in further retinal damage.^{10,11,12}



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Macular Edema Pathophysiology

- Diabetic retinopathy also affect the Muller cells
- Functions⁶
- Müller cells function in:
 - maintaining the structural integrity of the retina
 - regulation of the BRB
 - retinal blood flow
 - uptake and recycling of various neurotransmitters, retinoic acid compounds and ions (such as potassium K)
 - regulation of metabolism and supply of nutrients to the retina
- In diabetes, there is downregulation of potassium k channel causing continued potassium uptake leading to swelling of Muller cells, which leads to Muller cell dysfunction



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Treatments for Macular Edema

- The Early Treatment Diabetic Retinopathy Study (EDTRS) provides the guidelines for treatment via laser photocoagulation
- Leaking Microaneurysms are directly treated, while a combination of focal laser photocoagulation and scatter laser photocoagulation are described as the treatment for DME
- Macular laser photocoagulation is a major treatment modality for clinically significant macular edema, but it is not curative, and many cases are refractive to the laser therapies
- Current first-line therapy is anti-VEGF therapy
- Other treatment modalities include subthreshold micropulse photocoagulation diode and intravitreal steroid injections



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Other Retinal Exam Findings

- Microaneurysms: Clinically identified as tiny, round, red dots with a sharp regular margin
 - Microaneurysms with a diameter of less than 30 μm may not be detectable clinically
 - Microaneurysms are differentiated from dot hemorrhages by FFA
 - Dot hemorrhages are clinically larger and may have an irregular margin.
- **Dot and Blot Hemorrhages**
- **Hard exudates**
- **Cotton wool spots/soft exudates**
- **IRMA (Intraretinal microvascular abnormalities)**



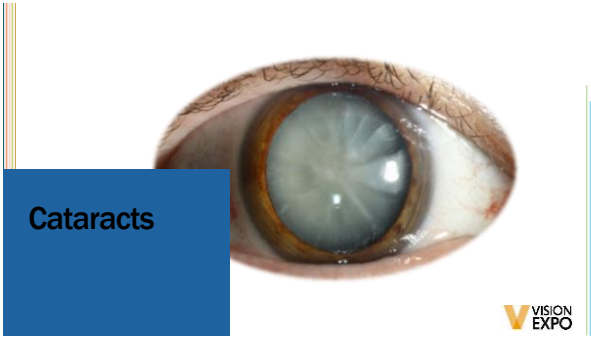
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Other Retinal Exam Findings

- **Venous changes:**
 - Dilatation
 - Looping
 - Beading
 - Sausage-like segmentation
- **Arterial changes:**
 - Peripheral narrowing
 - Silver-wiring
 - Obliteration
- **Neovascularization:**
 - Neovascularization at the disc (NVD): neovascularization at or within one disc diameter of the optic disc
 - Neovascularization elsewhere (NVE): away from one disc diameter of the optic disc
 - Neovascularization of his-a marker of poor prognosis and is associated with the propensity to develop neovascular glaucoma



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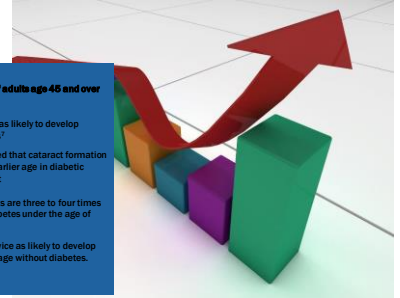
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How Many Diabetics Have Cataracts?

According to the CDC **32.3 percent of adults age 45 and over living with diabetes have cataracts**

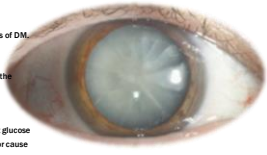
- People with diabetes may be twice as likely to develop cataracts as those without diabetes*
- Several clinical studies have reported that cataract formation occurs more frequently and at an earlier age in diabetic patients than in nondiabetic patient
- Some studies indicate that cataracts are three to four times more prevalent in patients with diabetes under the age of 65*
- People over 65 with diabetes are twice as likely to develop cataracts than people of the same age without diabetes.



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Cataract Formation Pathophysiology

- Diabetes can cause cataracts for several reasons and different types of mechanisms have been proposed for the pathogenesis of cataract in cases of DM.
- high blood sugar over a long period can damage blood vessels increasing the likelihood of getting a cataract
- People who had the most difficulty controlling blood sugar had the highest glucose levels in the aqueous humor and high glucose levels in the aqueous humor cause the lens to swell
- enzymes in the lens which convert glucose to sorbitol, which can swell the lens and contribute to blurred vision. sorbitol-is a central part of the mechanism of cataract development



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Cataract Formation Pathophysiology

- Osmotic stress as a result of extensive swelling of the cortical lens fibers is another compounding mechanism in the rapid development of cataracts, especially in young patients with type 1
- Another recently proposed mechanism is an Autoimmune hypothesis in acute bilateral type 1 diabetic cataracts.
 - authors reported that insulin autoantibodies became positive within three months of beginning insulin treatment, and that this period coincided with cataract formation*



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Treatment of Cataracts

- Cataract surgery in diabetic patients yields better results since the introduction of phacoemulsification
- Different options are available during surgery that can lead to better surgical results and improved postoperative retinopathy evaluation.
- As anterior capsular phimosis is more common in diabetic eyes, capsulorhexis size should be larger than normal but smaller than the intracapsular lens (IOL) optic diameter, in order to prevent anterior IOL displacement and posterior capsular opacification (PCO)
- However, a large diameter optic is also important for the postoperative diagnosis and treatment of peripheral retinal pathology
- Progression of retinopathy after cataract surgery is another problem in diabetic patients. The duration and complexity of cataract surgery are the main risk factors for progression of retinopathy. It is therefore important to reduce the time and complexity of the surgery.
- Poor pupillary dilatation can be seen in diabetic patients as the result of damage to pupillary parasympathetic supply and elevated prostaglandin levels
- The effects of DM on the ocular surface include neurogenic effects and impaired corneal stem cell and epithelial cell division, which lead to corneal epithelial defects, abrasions, which may heal slowly
- It has also been shown that corneal endothelial cell loss is higher in people with diabetes than in nondiabetics this means that routine evaluation of diabetic patients using specular microscopy is recommended surgeons should take greater care in order to reduce endothelial stress during surgery.
- The Wisconsin Epidemiologic Study of Diabetic Retinopathy investigated the incidence of cataract and factors associated with a higher risk of cataract surgery. They found 5.2% of patients suffering from type 1 diabetes and 04.2% of those with type 2 diabetes had a 10-year cumulative incidence of cataract surgery. For type 1 diabetes, they found some risk factors, including age, severity of diabetic retinopathy (DR), and proteinuria; for type 2 diabetes, risk factors included age and use of insulin!



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Vision Loss and Diabetes

Vision Loss and Diabetic Retinopathy

- **Advanced Diabetic Eye Disease**
- End-stage vision-threatening complication of diabetic retinopathy in patients in whom the treatment is inadequate or unsuccessful
- It may present as pre-retinal or intragel hemorrhage, tractional retinal detachment, or rubeosis iridis.

Vision Loss and Macular Edema

- The worse the initial presenting severity of the edema the more likely that vision will deteriorate in the future
- 25% to 30% of eyes with clinically significant macular edema will experience some degree of visual loss within three years of diagnosis



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Vision Loss and Diabetes

Vision Loss and Cataracts

- The main signs and symptoms of a cataract include:
 - cloudy or blurred vision
 - reduced intensity of colors
 - sensitivity to glare from lights, which can make driving at night difficult
 - seeing a halo of light around lights
 - vision changes that require a change in eyeglass prescription



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Vision Loss and Diabetes

- Treatments can also cause vision loss:
 - Laser photocoagulation is associated with: subretinal fibrosis and scarring, decreased visual acuity and paracentral scotoma, as well as choroidal neovascular membranes.
 - Intravitreal injections are associated with an increased risk of endophthalmitis, hemorrhage, an increased frequency of cataracts, increased intraocular pressure and retinal tears.
 - Vitrectomy is associated with significant risks including vitreous hemorrhage
- Cataract surgery:
- The presence of clinically significant macular edema (CSME) at the time of surgery was found to be a predictor of poor final BCVA in cases of uncomplicated phacemulsification
 - severity of DR at the time of surgery. As the severity of retinopathy increased, the risk of macular ischemia or edema also increased
 - Studies show the development of PCO was significantly higher in diabetic patients 18 mos. after surgery, even though it was similar to the control group for the first 24 mos.



Low Vision Statistics

Totals

Approximately 12 million people 40 years and over in the United States have vision impairment. Including 3 million who are blind, 3 million who have vision impairment after correction, and 6 million who have vision impairment due to uncorrected refractive error*.



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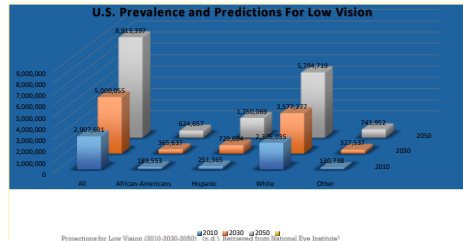
Low Vision Statistics

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Epidemiology

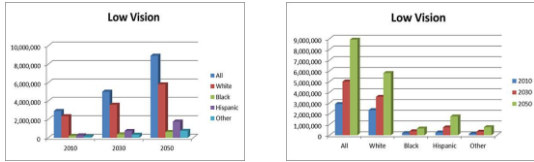


Table 1.20 Civilians Ages 18 to 64 Years Living in the Community for the United States and States - Vision Disability, 2018

State	Total	Female	Vision		Total	Female	Vision	
			Count	%			Count	%
US	197,399,406	103,512,700	8,879,933	4.5	8,711,411	4,318,114	4.9	
AL	5,178,443	2,514,454	282,999	5.5	282,999	141,499	5.5	
AK	745,500	372,750	10,000	1.3	10,000	5,000	1.3	
AZ	7,127,992	3,563,996	602,000	8.4	602,000	301,000	8.4	
CA	34,217,475	17,108,737	2,541,000	7.4	2,541,000	1,270,500	7.4	
CO	7,448,547	3,724,273	180,000	2.4	180,000	90,000	2.4	
CT	3,582,100	1,791,050	120,000	3.4	120,000	60,000	3.4	
DC	692,453	346,226	10,000	1.4	10,000	5,000	1.4	
DE	988,100	494,050	40,000	4.0	40,000	20,000	4.0	
FL	21,485,100	10,742,550	1,400,000	6.5	1,400,000	700,000	6.5	
GA	10,400,100	5,200,050	600,000	5.8	600,000	300,000	5.8	
HI	1,000,000	500,000	10,000	1.0	10,000	5,000	1.0	
IA	3,174,550	1,587,275	100,000	3.1	100,000	50,000	3.1	
IL	12,819,441	6,409,720	1,000,000	7.8	1,000,000	500,000	7.8	
IN	6,471,433	3,235,716	200,000	3.1	200,000	100,000	3.1	
KS	3,666,876	1,833,438	100,000	2.7	100,000	50,000	2.7	
KY	4,707,449	2,353,724	300,000	6.4	300,000	150,000	6.4	
LA	4,500,000	2,250,000	400,000	8.9	400,000	200,000	8.9	
MA	7,301,037	3,650,518	300,000	4.1	300,000	150,000	4.1	
MD	5,892,682	2,946,341	200,000	3.4	200,000	100,000	3.4	
ME	1,344,100	672,050	50,000	3.7	50,000	25,000	3.7	
MI	10,263,000	5,131,500	800,000	7.8	800,000	400,000	7.8	
MN	5,437,100	2,718,550	100,000	1.8	100,000	50,000	1.8	
MO	6,395,000	3,197,500	150,000	2.3	150,000	75,000	2.3	
MS	2,754,100	1,377,050	100,000	3.6	100,000	50,000	3.6	
MT	1,042,100	521,050	10,000	1.0	10,000	5,000	1.0	



Vision Dis

Quick Statistics

Employment with disability **37.8%**

Employment without disability **80.0%**

- In 2018, the employment rate of working-age people with disabilities in the US was 37.8 percent.
- In 2018, the employment rate of working-age people without disabilities in the US was 80.0 percent.
- The gap between the employment rates of working-age people with and without disabilities was 42.2 percentage points.
- Among the six types of disabilities identified in the ACS, the highest employment rate was for people with a "Hearing Disability," 53.6 percent. The lowest employment rate was for people with a "Self-Care Disability," 16.2 percent.

Erickson, W., Lee, C., & von Schrader, S. (2020). 2018 Disability Status Report United States. Ithaca, NY: Cornell University Yang-Tsun Institute on Employment and Disability (YI).



Employment of non-institutionalized working-age people (ages 21 to 64) by disability status in the United States in 2018



Visual Disabi

Erickson, W., Lee, C., & von Schrader, S. (2020). 2018 Disability Status Report United States. Ithaca, NY: Cornell University Yang-Tsun Institute on Employment and Disability (YI).



Categories of Vision Impairment

Category	Worse than	Equal to or better than
Mild or no visual impairment		6/18 3/10 (0.3) 20/70
Moderate visual impairment	6/18 3/10 (0.3) 20/70	6/60 1/10 (0.1) 20/200
Severe visual impairment	6/60 1/10 (0.1) 20/200	3/60 1/20 (0.05) 20/400
Blindness	3/60 1/20 (0.05) 20/400	1/60* 1/50 (0.02) 5/300 (0.1/200)
Blindness	1/60* 1/50 (0.02) 5/300 (0.1/200)	Light perception
Blindness	No light perception	No light perception
9	Undetermined or unspecified	Undetermined or unspecified



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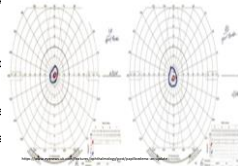
World Health Organization:
Distance vision impairment:
 •Mild –visual acuity worse than 6/12 to 6/18(20/70)
 •Moderate –visual acuity worse than 6/18 (20/70) to 6/60 (20/200)
 •Severe –visual acuity worse than 6/60 (20/200) to 3/60 (20/400)
 •Blindness –visual acuity worse than 3/60 (20/400)
Near vision impairment:
 •Near visual acuity worse than N6 (20/40) or M.08 at 40cm.



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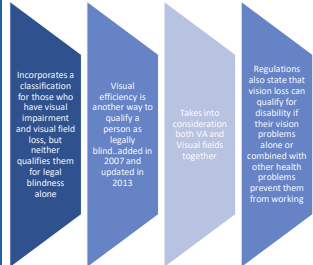
Social Security and Supplemental security (SSI)

- Social Security Act added and amendment in 1954 that included disability insurance
- In 2007, clarifications was provided on how visual acuity and visual fields could be tested as well as visual efficiency
- 2012 change to help with determining a combined measurement of visual acuity using logMAR in conjunction with Visual fields. Went into effect in 2013
- Statutory Blindness: central VA of 20/200 or worse with corrective lens
- OR eyes with visual field constriction of 20 degrees or less in the widest diameter(Goldmann III4c) or HVF(30-2 or 24-2, size III target) shall be considered to have a central acuity of 20/200 or less



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Social Security: Visual Efficiency



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Management Options for Low Vision Patients

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Portable "CCTV" Electronic Magnifiers



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- Useful to a broad patient base
- PivotCam™—a rotating camera for more viewing options
- 3 hours of continuous use
- Magnifies 2x-24x
- Weighs 10.5 ounces
- Saves a maximum of 80 images
- Near, Intermediate and Distance Viewing
- Adjustable Reading Line
- compatible with computers
 - Send images via USB for saving on computer



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Smartphones

- Voice activated dialing
- Contrast, brightness, color options
- Adjustable font size
- Tactile and tonal feedback
- Text to speech
- Speech to text
- Screen magnification
- Accessibility features built-in
- No need for 3rd party software
- Accessibility options under settings



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Smartphones (iPhone and android)

iPhone features⁵²

- Siri
- Zoom
- Voice Over
- Multitasking gestures
- Large text/Icons
- White on black/High contrast
- Speak auto text
- Touch Accommodations

Android features⁵³

- Screen reader (Talkback)
- Talkback braille keyboard
- Select to Speak: If you want spoken feedback only at certain times.
- Hover Zoom/Magnification gestures
- Hand wave to answer/end calls
- Voice Access
- Switch Access
- Speak Passwords
- Color Correction: for color blindness



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Accessibility and technology in healthcare are necessary now more than ever.



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Seeing AI

- Available in 70 countries and many languages
- available on IOS 10 or later
- Narrates the world around you
 - Reads short text
 - Documents
 - Currency identification
 - Product identification
 - Face recognition
 - Scene description



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Wearable Technology

Headborne Devices



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- Innovative assistive technology
- Class-1 medical device with FDA¹³
- Combo of Samsung's VR headset and smartphone
- Intended for patients with AMD, Glaucoma, DR, RP
- Mag up to 14X
- FOV of 70 degrees
 - Realistic
- Customizable control setting
- Patented "bubble View" technology
- Stream and save YouTube videos
- Take and save photos in your photo gallery
- Read with ease with OCR
- Use smart voice commands with Amazon Alexa
- **Grant by National Eye Institute**


IrisVision



V VISION EXPO

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Orcam MyEYE



- Named one of Time top 100 inventions of 2019¹³
- Device magnetically attaches to glasses
 - can be attached to **any** pair of **eyeglasses**
- head unit with a camera and a base
- serves as a sight substitution device
 - Read text
 - Recognize faces
- provides audio information
- The image is interpreted and identified and then spoken back to the patient through a speaker in the head unit.
- Can read multiple languages.
- Effective color detection

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Additional Advanced Technologies

- Amazon Echo and Google Home: provide great benefit to people who are blind or visually impaired
 - Hands-free
 - Voiced controlled
 - News, weather, music, shopping, other information
 - Can help control home devices: lights, doorbells, thermostats

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Take Away

Key Points and Additional Resources

Diabetes is an Epidemic

- Numbers are expected to continue to increase

Support and funding may be available through local services and national services such as Guide Dogs for the Blind

Social Security Administration

- If someone is considered to have Statutory blindness they are eligible for benefits:
 - Free mailing
 - Free library services
 - Free telephone directory assistance
- Still leaves out some people who may need benefits

Video demonstrations available to Daily activities and smartphone use are available

Hadley.edu

We need to convert doctor thinking toward implementing basic low vision and knowing when to refer

All optometrists are trained to do low vision at a basic level. Start with apps and smartphone accessibility implementation can be cost free for provider and patient.

Other services:

ARIA Service: Free in Airports and Federal Buildings

V VISION EXPO

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