

# The Complications of Diabetes: Eyes



## The Diabetes Epidemic

Every day, nearly 4,400 people in the U.S. develop diabetes.<sup>1</sup> In 2011, approximately 4 million people diagnosed with diabetes reported having some form of visual impairment.<sup>2</sup> (See Figure 1) That number is projected to rise to 6.6 million by 2025.<sup>3</sup>

Diabetes is one of the most prevalent chronic diseases our nation faces, affecting nearly 26 million Americans, with 7 million of those undiagnosed.<sup>1</sup> Prediabetes, which often progresses to type 2 diabetes within 10 years if preventive action is not taken, affects another 79 million Americans.<sup>1</sup> Over the past 30 years, the percentage of Americans diagnosed with diabetes has more than doubled.<sup>1</sup> If current trends continue, experts predict that 1 in 3 U.S. adults will have diabetes by 2050.<sup>1</sup>

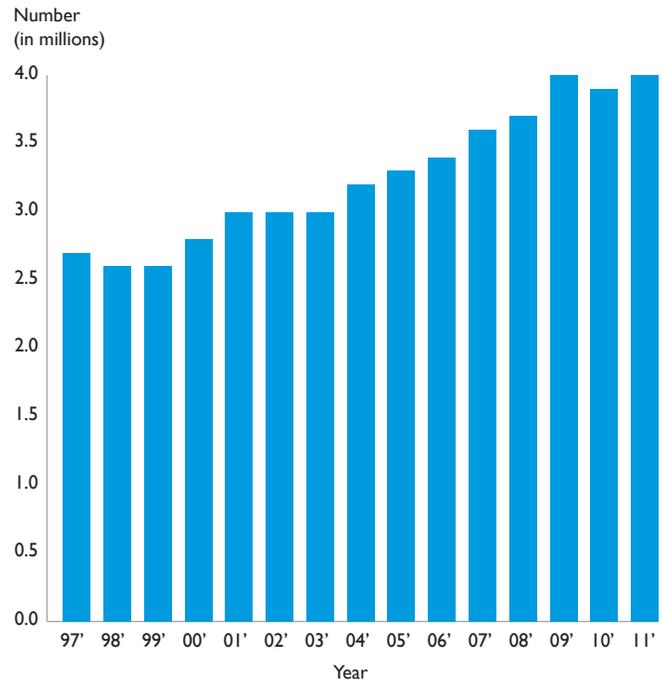


Figure 1. Number of U.S. Adults Aged 18 Years or Older with Diagnosed Diabetes Reporting Visual Impairment 1997–2011.<sup>2</sup>

## Diabetes: A Gateway Disease Affecting Eye Health and Vision

As a gateway disease, diabetes can lead to many other conditions. The longer people live with diabetes—whether diagnosed or undiagnosed—the more likely it is they will suffer from its life-altering complications. People with diabetes are at greater risk of developing some form of diabetic eye disease, a group of eye problems that includes diabetic retinopathy, glaucoma, and cataracts.<sup>4</sup>

## How Diabetes Damages the Eyes

Diabetes damages the eyes and impairs vision over time by causing the lens of the eye, which is responsible for focusing light on the retina, to swell, resulting in vision changes and, ultimately, formation of cataracts (permanent clouding of the internal lens causing vision loss). High blood glucose, high blood pressure and elevated cholesterol can eventually damage the small blood vessels of the retina leading to diabetic retinopathy, and may also affect circulation to the optic nerve, increasing the risk of glaucoma.<sup>5</sup> Diabetic eye disease is a serious complication of diabetes. There are no warning signs, and delays in treatment or failure to seek treatment can lead to blindness. In fact, diabetes is the leading cause of new cases of blindness among adults—with 10,000 to 24,000 new cases every year in the US.<sup>6</sup>

<sup>1</sup> Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.  
<sup>2</sup> Diabetes Data & Trends. (2012). Centers for Disease Control and Prevention. <http://www.cdc.gov/diabetes/statistics/visual/fig1.htm>.  
<sup>3</sup> Institute for Alternative Futures. United States' Diabetes Crisis: Today and Future Trends. Available at: [http://www.altfutures.org/pubs/diabetes2025/US\\_Diabetes2025\\_Overall\\_BriefingPaper\\_2011.pdf](http://www.altfutures.org/pubs/diabetes2025/US_Diabetes2025_Overall_BriefingPaper_2011.pdf). Accessed March 20, 2013.  
<sup>4</sup> American Diabetes Association. Living with diabetes: eye complications. 2012. <http://www.diabetes.org/living-with-diabetes/complications/eye-complications/>  
<sup>5</sup> Vision problems in the U.S.: prevalence of adult vision impairment and age-related eye disease in america. 2008. Prevent Blindness America. [http://www.preventblindness.net/site/DocServer/VPUS\\_2008\\_update.pdf?docID=1561](http://www.preventblindness.net/site/DocServer/VPUS_2008_update.pdf?docID=1561)

## Diabetic Retinopathy

The growing prevalence of diabetes in the U.S. has resulted in a significant increase in the number of adults suffering from diabetic retinopathy—which rose 89% between 2000 and 2010.<sup>7</sup> Diabetic retinopathy develops when high blood glucose levels cause the small blood vessels of the retina to leak, resulting in fluid leakage (retinal edema) and insufficient blood and oxygen supply to the retina. A common and frequent complication of diabetes, diabetic retinopathy is the leading cause of blindness among adults aged 20 to 74 years. Approximately 7.7 million adults aged 40 and over suffer from diabetic retinopathy and, if the trend continues, about 13 million Americans aged 40 and over will have visual impairment or develop blindness from diabetes by 2050.<sup>7</sup>

In fact, the majority of people with diabetes will develop diabetic retinopathy at some point in their lives, and the disease can actually begin to develop as early as 9 years prior to an individual being diagnosed with type 2 diabetes.<sup>8</sup> Estimates indicate that 20 years after diabetes diagnosis, over 90% of patients with type 1 diabetes and more than 60% of those with type 2 diabetes will have some degree of retinopathy.<sup>9</sup> Hispanic Americans have higher rates of the disease, as shown in Figure 2.<sup>10</sup>

## Glaucoma and Cataracts

While glaucoma and cataracts often occur in people without diabetes, people with diabetes are 40% more likely to be diagnosed with glaucoma and 60% more likely to develop cataracts.<sup>8</sup> Glaucoma is the result of elevated internal eye pressure and poor optic nerve circulation, which causes progressive damage to the optic nerve, resulting in irreversible loss of peripheral vision and, ultimately, central vision as well.<sup>5</sup> A cataract is a clouding of a portion of the clear lens of the eye (the lens being approximately the size of an M&M), which subsequently obscures vision.<sup>5</sup> In both conditions, vision is lost progressively over time as the condition worsens.<sup>5</sup> This gradual worsening means that the conditions are relatively asymptomatic in their early most treatable stages. Unlike cataracts, which can be successfully removed, vision that is lost to glaucoma is never regained. The risk of glaucoma among people with diabetes increases with age and duration of the disease.<sup>5</sup> Cataracts progress faster and develop at a younger age in people with diabetes.<sup>5</sup>

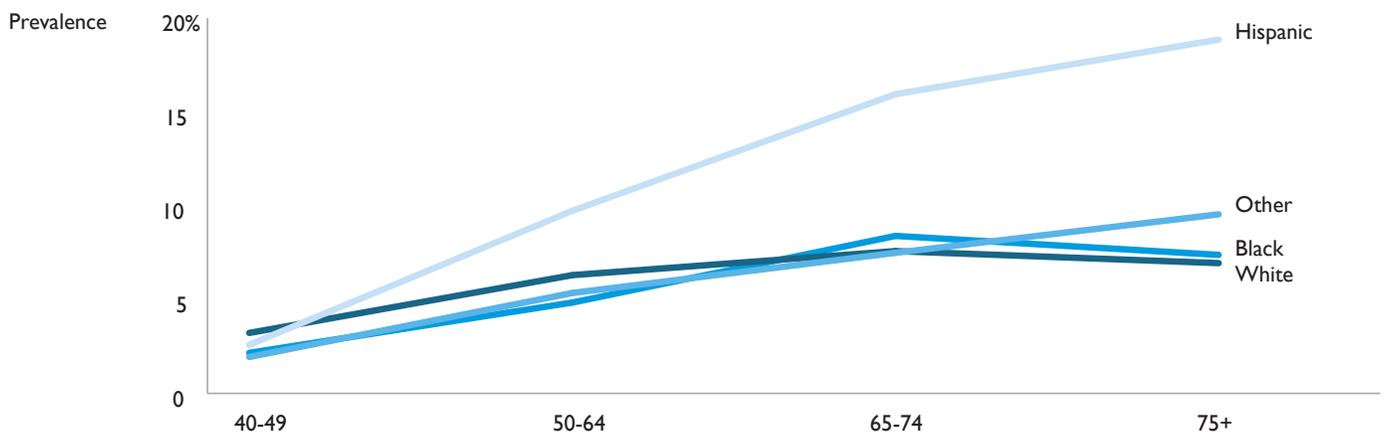


Figure 2. 2010 U.S. Prevalence Rates for Diabetic Retinopathy by Race and Age.<sup>10</sup>

6 Fowler, M.J. (2008). Microvascular and macrovascular complications of diabetes. *Clinical Diabetes*, 26, 77–82. <http://clinicaldiabetesjournals.org/content/26/2/77.full> and <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2701130/>

7 Diabetes epidemic brings spike in related eye disease. 20 June 2012. USA Today. <http://www.usatoday.com/news/health/story/2012-06-20/diabetes-eye-disease/55702602/1>

8 Living with diabetes. (2012). American Diabetes Association. <http://www.diabetes.org/living-with-diabetes/complications/eye-complications/>

9 Garg and Davis. (2009). Diabetic retinopathy screening update. *Clinical Diabetes*, 27, 140–145.

10 Diabetic Retinopathy: 2010 U.S. age-specific prevalence rates for diabetic retinopathy by age, and race/ethnicity. National Eye Institute. <http://www.nei.nih.gov/eyedata/diabetic.asp#1>

11 Majority of Americans lack awareness of diabetic eye disease. (2011). American Optometric Association. <http://www.aoa.org/x20583.xml>

12 Facts about diabetic retinopathy. National Eye Institute. <http://www.nei.nih.gov/health/diabetic/retinopathy.asp>

## Preventive Measures

Because diabetic eye disease rarely has early warning signs, 12,000 to 24,000 people with diabetes annually experience severe or total vision loss.<sup>11</sup>

There is no cure for blindness caused by diabetes-related eye complications.<sup>12</sup> However, early detection can help slow and even reverse the progression of eye diseases. Therefore, it is essential that all newly-diagnosed individuals with type 2 diabetes receive a comprehensive eye examination from an optometrist or ophthalmologist within three months of diagnosis. Additionally, people with diabetes should receive annual dilated eye exams.<sup>12</sup> Early detection of diabetic retinopathy enables the use of treatment modalities that have been proven to decrease the risk of severe vision loss by more than 90%.<sup>8</sup> Improvement of patients' metabolic control (blood glucose, blood pressure and blood lipids) can help save sight. Treating sight-threatening diabetic retinopathy with laser therapy can reduce rates of severe vision loss by an estimated 50% to 75%, depending on the severity of the condition.<sup>8</sup> Comprehensive eye exams can help about 65% of adults with diabetes and poor vision through appropriate eyeglasses.<sup>1</sup>

Ultimately, the best way to prevent developing eye complications from diabetes is to have your eyes examined annually, and control blood glucose levels and blood pressure.<sup>13</sup> Intensive blood glucose control can reduce the risk of progression of diabetic retinopathy by 54% and the risk of diabetic macular (central retinal) edema by 23%.<sup>12,13</sup> In addition, healthy lifestyle behaviors, such as a nutritious, low-to-moderate carbohydrate diet and frequent physical activity lower the risk of development and/or progression of retinopathy, glaucoma and cataracts.<sup>14</sup>

## Tracking Eye-Related Diabetes Management: Quality Improvement Measures

Quality measurement of diabetes care is critical to improving diabetes management. The National Committee for Quality Assurance (NCQA) created the Health Effectiveness Data and Information Set (HEDIS), which provides 76 health-related performance measures across 5 domains of care.<sup>15</sup> Several HEDIS measures track eye-related care.<sup>15</sup> These measures provide health plans with valuable information, including rates of and trends in diabetes-related service use. For example, in 2003 the HEDIS measure on eye examinations indicated retinal eye exam rates had remained relatively constant over a 4-year period (Figure 3).<sup>16</sup> However, Figure 3 also shows that the rate of eye examinations actually began to drop in 2001, with a 2.9% decrease in eye examinations between 2002 and 2003, highlighting an area that may potentially need attention. Therefore, these measures are critical to monitor, evaluate, and apply innovative, community-wide strategies to improve prevention and care for diabetes-related eye complications.

### Percentage of Patients With Type 1 and Type 2 Diabetes, Ages 18-75

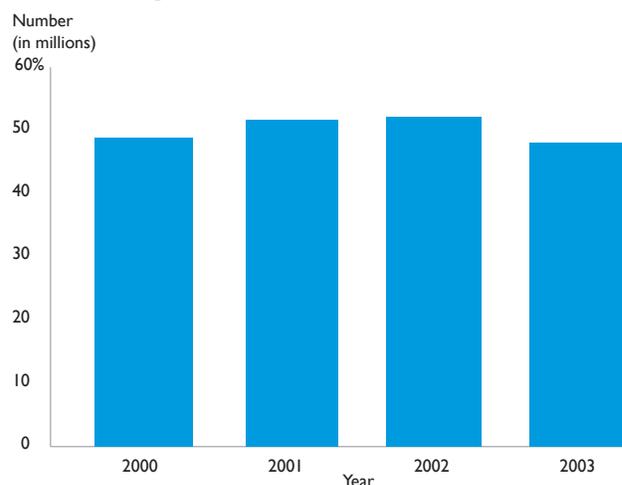


Figure 3. Eye examination rates from HEDIS Eye Examination Measure.<sup>16</sup>

For more information on other diabetes-related complications and potential solutions to the diabetes epidemic, please see additional briefing papers on the Diabetes Advocacy Alliance™ website at [www.diabetesadvocacyalliance.org](http://www.diabetesadvocacyalliance.org).

<sup>13</sup> National Institute of Diabetes and Digestive and Kidney Diseases. Prevent diabetes problems: keep your eyes healthy. 2008. [http://diabetes.niddk.nih.gov/dm/pubs/complications\\_eyes/index.aspx](http://diabetes.niddk.nih.gov/dm/pubs/complications_eyes/index.aspx)  
<sup>14</sup> Diabetes public health resource: Take charge of your diabetes. (2011). Centers for Disease Control and Prevention. <http://www.cdc.gov/diabetes/pubs/tcyl/eye.htm>  
<sup>15</sup> HEDIS and Quality Compass. (2012). National Committee for Quality Assurance. <http://www.ncqa.org/HEDISQualityMeasurement/WhatIsHEDIS.aspx>  
<sup>16</sup> What is the current state of quality of care in diabetes? National Committee for Quality Assurance. [http://www.qualityprofiles.org/leadership\\_series/diabetes/diabetes\\_current\\_state.asp](http://www.qualityprofiles.org/leadership_series/diabetes/diabetes_current_state.asp)