DIABETES BURDEN IN VIRGINIA





Diabetes in Virginia

Introduction:

Diabetes mellitus is a group of chronic diseases characterized by elevated blood glucose levels resulting from defects in insulin secretion, insulin action, or both. Insulin a hormone, produced by the pancreas, helps the body metabolize glucose. It acts as the "key" that opens the "door" to cells and allows the glucose to move into the cells. Without insulin, or its ineffectiveness in the body, glucose builds up in the bloodstream leading to serious complications.

Diabetes is one of the most common chronic diseases in the United States and the seventh leading cause of death in both Virginia and the United States. However, diabetes may be prevented and controlled by engaging in lifestyle changes, self-management practices and, if necessary, medication.

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Key Diabetes Facts:

Prevalence & Incidence

- More than 30.3 million Americans are living with diabetes, and 84.1 million are living with prediabetes, a serious health condition that increases a person's risk of type 2 diabetes and other chronic diseases.¹
- In Virginia, 631,194 people have diabetes²--that is 9.6% or nearly one in every ten Virginians (Figure 1). The rate of new cases of diabetes is 7.3 per 1,000 people.³
- One out of every three Virginians is estimated to have prediabetes. Most of these individuals are undiagnosed.⁴
- The Eastern Shore of Virginia has the highest prevalence of diabetes, estimated at 20.8% of the population (Table 6).

Figure 1. Prevalence of Diagnosed Diabetes in the United States and Virginia, 1994-2015



Source: Centers for Disease Control and Prevention. National Center for Health Statistics; Division of Health Interview Statistics; Data from the National Health Interview Survey. Accessed at CDC on May 11, 2017. *In 2011 there was a major change in survey methods.

Morbidity & Mortality

- Diabetes is the leading cause of kidney failure, lower-limb amputations, and adult-onset blindness in the United States.¹
- Adults with diabetes are nearly twice as likely to die from heart disease or stroke as compared to people without diabetes-and at a younger age.¹
- Diabetes was the seventh leading cause of death in the United States and Virginia in 2015^5 (Table 9).
- There were 1,635 deaths in Virginia attributable to diabetes in 2013⁶

Health Care Utilization & Cost

- The US spent \$245 billion in diabetes-related expenses in 2012, including \$176 billion in direct medical costs and \$69 billion in indirect costs. This accounts for more than 20% of health care spending in 2014.¹
- In Virginia, the total cost of diabetes was \$11.0 billion in 2013, consisting of approximately \$4.6 billion in direct medical costs and \$6.4 billion in indirect costs.⁶
- People with diabetes have 3.5 times the medical expenses (Avg. \$15,000 per person per year) as compared to people without diabetes (Figure 11).

BACKGROUND

Types of Diabetes

There are several types of diabetes, each with a different cause, demographic, and risk factors.⁷

- Prediabetes is a condition where blood glucose levels are higher than normal characterized by an A1C of 5.7% 6.4%. If left untreated, 15-30% of people with prediabetes will develop type 2 diabetes within five years.² Type 2 diabetes can be prevented or delayed through lifestyle changes such as weight loss, increased physical activity and a healthier eating pattern.
- Type 1 diabetes is an autoimmune disease that occurs when the body's immune system attacks and destroys its pancreatic beta cells, which produce insulin. The body loses its ability to make insulin and use blood glucose. People with type 1 diabetes need to take insulin every day to stay alive. Type 1 diabetes often develops in children, teens and young adults but may occur at any time. Type 1 diabetes accounts for 5% of all diabetes cases and it is not preventable through lifestyle change. Risk factors include family history and genetics.
- **Type 2 diabetes** results from the body becoming both resistant to the action of insulin and unable to produce a sufficient amount of insulin to metabolize glucose. Type 2 diabetes can occur at any age, even during childhood. About 90-95% of diabetes cases are type 2. Type 2 diabetes can be prevented or delayed through lifestyle change (moderate weight loss, physical activity, healthier eating patterns). Risk factors include age, ethnicity, obesity, physical inactivity, family history and previous gestational diabetes. Testing for type 2 diabetes in asymptomatic people should be considered in adults of any age who are overweight or obese and who have one or more additional risk factors for diabetes.
- Gestational diabetes develops in some women during pregnancy. Complications such as preeclampsia (pregnancy-induced high blood pressure), birth-related trauma, and birth defects may result when blood glucose levels are poorly controlled. Typically, gestational diabetes resolves after pregnancy. Gestational diabetes is a risk factor for type 2 diabetes. Women with gestational diabetes have a 35-60% chance of developing type 2 diabetes 10 to 20 years following their pregnancy.
- Monogenic forms of diabetes are rare forms of diabetes resulting from mutations in a single gene. Monogenic forms of diabetes account for about 1 to 5 percent of all cases of diabetes in young people. In most cases of monogenic diabetes, the gene mutation is inherited; in the remaining cases the gene mutation develops spontaneously. Most mutations in monogenic diabetes reduce the body's ability to produce insulin, Neonatal diabetes mellitus (NDM) and maturity-onset diabetes of the young (MODY) are the two main forms of monogenic diabetes. MODY is much more common than NDM. When hyperglycemia is first detected in adulthood, type 2 is often diagnosed instead of monogenic diabetes. Genetic testing can diagnose most forms of monogenic diabetes.
- Diseases of the exocrine pancreas (e.g. cystic fibrosis)
- **Drug- or chemical-induced diabetes** is a result of medications or chemicals destroying the insulin producing beta cells.
- **Post-transplantation diabetes** is a frequent and serious complication after an organ transplant. The cause is multifactorial and includes the immunosuppressive treatment regimen used in transplant, ethnicity, older age and body mass index.

Prediabetes: Prevention or Delay of Onset of Type 2 Diabetes

- Over the past 25 years, evidence-based research has unequivocally demonstrated that intensive lifestyle change can prevent or delay the onset of type 2 diabetes.^{8 9 10 11}
- These large-scale studies using intensive lifestyle change programs implemented a core set of goals:
 - Weight loss of at least 5-7% and the goal of maintaining maximal weight loss.
 - Healthy eating patterns (See <u>American Diabetes Association</u> dietary recommendations).
 - Engagement in regular physical activity of at least 150 minutes per week.
 - Ongoing support and increased frequency of visits with diabetes and lifestyle health professionals.
- Intensive lifestyle change programs have been delivered in real world settings such as in, Diabetes Self-Management Education Programs, YMCAs, local health departments, and virtual programs that include a human component.¹²

To learn more about Diabetes Prevention in Virginia, go to <u>Preventing Diabetes in</u> <u>Virginia State Plan</u>

Risk Factors for Diabetes

Table 1. Risk Factors for Type 2 Diabetes

- First degree relative with diabetes
- African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, Native Hawaiian, or Pacific Islander decent
- Age: older than 45 years
- History of gestational diabetes
- Overweight (BMI <u>></u> 25 kg/m², <u>></u> 23 kg/m2 in Asian Americans)
- Physical activity less than three times a week
- Hypertension (high blood pressure)
- Low levels of HDL cholesterol and high level of triglycerides
- History of heart disease or stroke
- Polycystic ovary Syndrome (PCOS)
- Acanthosis nigricans--dark, think, velvety skin around neck and armpits

Source: NIDDK. Diabetes\Diabetes Overview\Risk Factors for Type 2 Diabetes

Type 1 Diabetes--there is no current known way to prevent or alter risk factors for type 1 diabetes, an autoimmune disease.

Type 2 diabetes results from a shared group of inherent and behavioral risk factors (Table 1):

- Inherent risk factors: Risk factors that the individual has limited or no control over, including age, ethnicity and genetic predisposition as well as poverty and stress.
- Behavioral risk factors: While there are risk factors we cannot control, behavior is one we can control and it is responsible for a significant proportion of type 2 diabetes. These behaviors can include an unhealthy diet including excess calories and being sedentary.
- Medical risk factors: Inherent and behavioral risk factors may result in medical conditions, which increase the risk of type 2 diabetes and diabetes complications. These can include obesity, high blood cholesterol, elevated blood glucose and high blood pressure.

Table 2. Age Adjusted Percent of Adults with Diabetes in Virginia and US with Risk Factors forDiabetes, 2015

Risk Factor	Percent of Adults with Diabetes in VA with Risk Factor	Percent of Adults with Diabetes in US with Risk Factor
Smoking	21.6%	20.8%
Overweight & Obesity	78.7%	86.5%
Physical Inactivity	40.3%	36.4%
Hypertension	65.1%	59%
High Cholesterol	52.8%	58%

Source: Centers for Disease Control, BRFSS

• Compared to the United States, Virginia has a higher percent of people with diabetes who smoke, are physically inactive and have hypertension.

Warning Signs and Symptoms of Diabetes

Diabetes warning signs and symptoms may vary from person to person. Symptoms of type 1 diabetes usually develop over a short period of time.

Symptoms include:

- Increased thirst
- Frequent urination
- Unexplained weight loss
- Fruity or sweet smelling breath
- Constant hunger
- Extreme fatigue.

Sometimes type 2 diabetes may develop without any warning signs. Up to 25% of US adults who have type 2 diabetes don't know that they have it.

Symptoms include:

- Frequent urination
- Excessive thirst
- Constant hunger even though you've eaten
- Extreme fatigue

- Blurry vision
- Headaches
- Cuts/bruises that are slow to heal
- Weight loss even though you are eating more
- Tingling, pain, or numbness in hands/feet

Diagnostic Tests for Diabetes

A health care professional can diagnose diabetes, prediabetes, and gestational diabetes through blood tests (Table 3). The blood tests show if your blood glucose level is too high. Health care professionals most often use the fasting plasma glucose (FPG) test or the A1C test to diagnose diabetes.

- Anyone who has symptoms of diabetes should be tested.
- People with risk factors should be screened yearly by their health care professional.
- Pregnant women, under the care of their health care professional, are regularly screened between 24 and 28 weeks of pregnancy using a two-hour oral glucose tolerance test to determine if they have gestational diabetes.

Table 3. A1c, Fasting Plasma Glucose and Two-Hour Oral Glucose Tolerance Test DiagnosticValues for Prediabetes and Diabetes

	Normal	Prediabetes	Diabetes
A1C	< 5.7	5.7 – 6.4%	<u>></u> 6.5%
Fasting Plasma Glucose	< 100 mg/dL	100 – 125 mg/dL	≥ 126 mg/dL
Two–Hour Oral Glucose Tolerance Test	NA	140 – 199 mg/dL	≥ 200 mg/dL

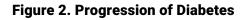
ADA Standards of Medical Care in Diabetes. Diabetes Care 2016; 39(suppl. 1): S13-S22.

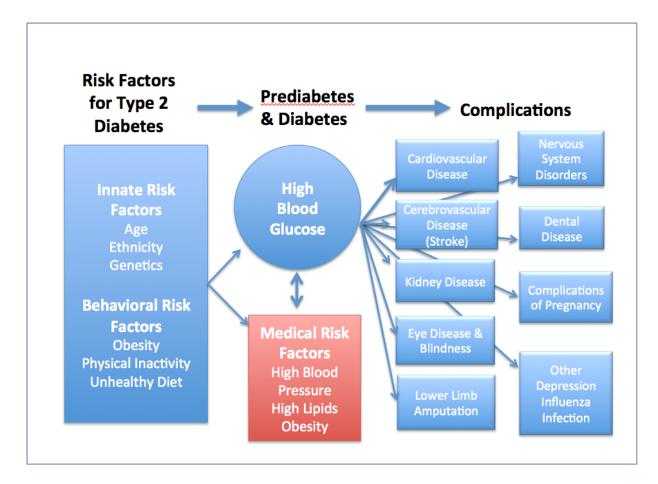
Notes: Not for diagnosis of GDM. If results from one test are not convincingly indicative of the diagnosis, then a repeat test should be done on a different day.

Progression of Diabetes

- When blood glucose levels increase to a level above normal (A1C > 5.7%) but not high enough to be diagnosed as type 2 diabetes (A1C < 6.4%), prediabetes is diagnosable. People with prediabetes have an increased risk of developing type 2 diabetes; however type 2 diabetes can be prevented or delayed with moderate weight loss, physical activity and lifestyle changes. Type 2 diabetes is 90- 95% of all diabetes cases.
- Diabetes is diagnosed when blood glucose and hemoglobin A1C are elevated, specifically, an A1C <u>></u> 6.5%.
- In type 2 diabetes, blood glucose levels can be slightly elevated for years without warning signs and symptoms yet still cause damage.

• Once diabetes is diagnosed, it doesn't go away with weight loss or other treatment modalities (i.e. medications). If the blood glucose returns to normal ranges, diabetes is considered "well controlled".





Complications of Diabetes

Diabetes alone can present major challenges and threats to health due to risks related to high blood glucose levels including diabetic ketoacidosis and hyperosmolar hyperglycemic nonketotic syndrome as well as susceptibility to other conditions such as depression, pneumonia, and influenza. In addition, activities of daily living may be negatively impacted (Table 8).

Diabetes is a major risk factor for cardiovascular disease, hypertension and cerebrovascular disease (stroke).^{13,14} Some of the increased susceptibility could be due to the long-term effects of inadequate control of blood glucose levels on the tissues or due to other cell damage related to diabetes. In addition, blood vessels in people with diabetes are more susceptible to other well-established risk factors such as high cholesterol and high blood pressure. More than 90 percent of patients have one or more of these additional risk factors. Being overweight, having

a sedentary lifestyle and poor blood glucose control also contribute to the increased chance of high blood pressure and abnormalities in high cholesterol.¹⁵

Other complications of diabetes include:

- <u>Vision Impairment and Blindness</u>: Diabetes is a leading cause of adult-onset blindness, mainly caused by diabetic retinopathy, among adults aged 20-74. People with diabetes are also more likely develop glaucoma and cataracts compared to people without diabetes¹⁶.
- <u>Kidney disease (Nephropathy)</u>: One in four adults with uncontrolled diabetes have kidney disease.¹⁷ Diabetes is listed as the primary cause of kidney failure in 44% of all new cases in the US in 2011¹⁶ which may result in the need for dialysis or transplant.
- <u>Nervous system disease (Neuropathy)</u>: Nerve damage is a frequent result of diabetes, including impaired sensation or pain in the extremities, digestive problems, erectile dysfunction, and other nerve problems.
- <u>Lower limb amputation</u>: More than 60% of non-traumatic amputations of the lower limbs are a direct result of diabetes.¹⁶
- <u>Periodontal disease</u>: Periodontal disease is a frequent complication, resulting in gum disease and loss of teeth; smoking exacerbates this situation.
- <u>Complications of pregnancy</u>: Poorly controlled diabetes prior to conception and during the first trimester can cause major birth defects and spontaneous abortions in a significant number of pregnancies. Note that if diabetes is well controlled these risks are reduced and a healthy outcome is very attainable.

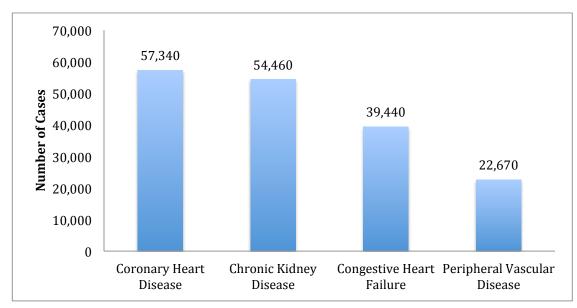


Figure 3. Estimated Number of Disease Cases* Attributable to Diabetes in Medicare Beneficiaries with Diabetes, Aged 65+, Virginia, 2013

Source: <u>CDC. Diabetes State Burden Toolkit</u>. Data Source: 2013 Medicare Master Beneficiary Summary File *Case is defined as a person being diagnosed with specific health condition

Condition	Age-Adjusted Rate (per 100)	Estimated Cases (in thousands)	Estimated Cases Attributable to Diabetes (in thousands)
Limitations of Instrumental Activities of Daily Living	14.9	89.3	47.8
Mobility Limitations	34.5	215.4	117.3
Coronary Heart Disease	16.4	118.8	66.3
Hypertension	64.4	454.5	177.3
Vision Impairment or Blindness	14.8	81.7	48.5

Table 4. Prevalence of Self-Reported Health Conditions and Limitations in Adults with
Diabetes, aged 18 years or older, Virginia, 2013

Source: <u>CDC. Diabetes State Burden Toolkit</u>. Data source: 2013 Behavioral Risk Surveillance System.

- For every 100 adults with diabetes in Virginia, 14.9 experience limitations in important activities of daily living. Throughout the state, this amounts to 893,000 people. If diabetes were eliminated, 478,000 of these cases would be eliminated.
- Compared to the national average, Virginians who have diabetes have higher rates of hypertension and severe vision impairment or blindness.

Prevention of Complications of Diabetes

Research studies have shown that control of blood glucose, blood pressure, and blood cholesterol levels helps prevent complication in people with type 1 and type 2 diabetes.¹⁸ Lifestyle management and psychosocial care are the cornerstones of diabetes management. It is the position of the American Diabetes Association that people with diabetes should receive referrals for diabetes self-management education (DSME) and diabetes self-management support (DSMS), medical nutrition therapy, and psychosocial/emotional health concerns, when necessary. People with diabetes should receive preventive care services, smoking cessation counseling, and ophthalmology, dental, and podiatry referrals. People with diabetes should be screened for complications and comorbidities.¹⁹

Most of the complications of diabetes can be prevented through good blood glucose control in the early stages of diabetes. If complications have already occurred, further harm can be prevented through:

- Glucose control Improved control of blood glucose can reduce the risk of microvascular complications in both type 1 and type 2 diabetes. These complications include those involving the eyes, kidneys and nervous system.
- Blood pressure control Reduction in high blood pressure decreases the risk of cardiovascular and cerebrovascular disease as well as the microvascular complications. Monitoring and medical management of high blood pressure is important.
- Control of blood cholesterol Control of LDL and HDL cholesterol and triglycerides can
 reduce the cardiovascular complications of diabetes significantly. Improved diet and
 use of medications will help control blood cholesterol and reduce the risk of
 cardiovascular complications.
- **Care of feet** The care of feet is very important since persons with diabetes are often diagnosed with neuropathy and unable to sense pain from cuts or injuries to their feet.

Not feeling a foot injury may lead to an infection if not treated in time. Daily foot checks are recommended.

 Kidney Protection – Monitoring blood pressure and taking blood pressure medications as prescribed, quit smoking, and limiting salt intake may reduce the risk of kidney damage.

Table 5. Percent of Adults with Diabetes in Virginia who Engage in Preventive and Self-Management Diabetes Practices in 2015.

Preventive and Management Behavior	Percent of Adults with Diabetes in Virginia
Check blood sugars at least once per day	52.9%
Have A1c checked by health professional at least twice/year	69.4%
Check feet for sores or irritations at least daily	63.3%
Have feet checked by health professional annually	72.7%
Saw health professional for diabetes in last year	85.5%
Had an eye exam in which pupils were dilated	64.9%
Have ever taken a course or class in how to manage their diabetes	53.7%

Source: CDC. Behavioral Risk Factor Surveillance Survey, 2015

- More than 45% of Virginians with diabetes have never taken a class on how to better manage their diabetes.
- 73.6% of people who have less than a high school education have never taken a class as compared to 36.7% of people with more than a high school education.

Diabetes Prevention Programs and Diabetes Self-Management Education and Support Programs

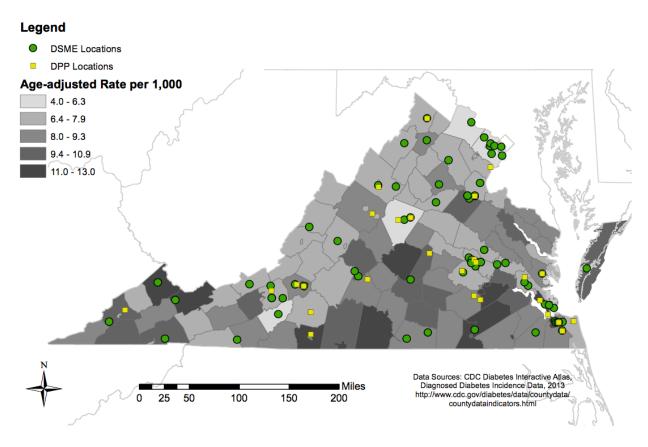
- Lifestyle management is an integral component of prevention and treatment of diabetes. **Prevention Programs**
 - People with prediabetes can prevent or delay type 2 diabetes by changing their lifestyle. Diabetes prevention programs (DPP) are available throughout Virginia (Figure 4) to educate and support people with prediabetes so that they can prevent or at least delay the onset of type 2 diabetes.
 - DPP programs are effective. Participants in community programs reduced the incidence of diabetes by 41% through healthier eating patterns, regular physical activity and moderate weight loss. They also experienced reductions in blood glucose, blood pressure and cholesterol levels.²⁰
 - Medicare will cover DPPs starting April 2018. Many employers and insurances cover DPP programs as well.

Diabetes Self-Management Education and Support (DSMES) Programs

- Diabetes Self-Management Education and Support (DSMES) is a standard component of diabetes care. People with diabetes are educated and support is provided around seven self-care behaviors: healthy eating, being active, monitoring, taking medication, problem solving, healthy coping and reducing risks.
- Referrals to a DSMES program are recommended for preventing acute complications and reducing the risk of long-term complications.⁷
- The four critical times to assess, provide, adjust and refer for DSMES are⁷:

- Upon diagnosis
- o Annual assessment of education, nutrition, emotional issues
- o When new complicating factors influence self-management
- When transitions in care occur
- Engaging adults with type 2 diabetes in DSMES results in improvements in A1C by as much as 1%.
- DSMES also has a positive effect on other clinical, psychosocial, and behavior aspects
 of diabetes and is reported to reduce the onset and/or advancement of diabetes
 complications.²¹
- DSMES programs exist throughout Virginia (Figure 4)
- DSMES programs are covered by Medicare and health insurance.

Figure 4. Diabetes Self-Management & Education (DSME) and Diabetes Prevention Programs in Virginia (2017) by Age-Adjusted Diabetes Rates (2015), Map of Virginia Counties



Source: MAP INFORMATION Data Sources: CDC Diabetes Interactive Atlas, Diagnosed Diabetes Incidence Data, 2012 http://cdc.gov/diabetes/atlas/countydata/atlas.html Coordinate Systems: NAD1983Virginia Lambert Virginia Geographic Information Network, 2013 Virginia Department of Health, 2014 DPP location: CDC Registry of Recognized Programs https://nccd.cdc.gov/DDT_DPRP/ State.aspx?STATE=VA LINK to map on VDH site

PREVALENCE

Useful Terms for Section

Prevalence: The percent or proportion of the specified population that has an existing disease at a given point in time.

Incidence: A measure of the frequency with which new cases of illness, or other health conditions occur expressed explicitly per a time frame.

Age-Adjusted: A statistical process applied to rates of disease, death, injuries or other health outcomes that allows communities with different age structures to be compared.

Prevalence of Diabetes in Virginia

- 631,194 Virginians have diabetes; 1 of 4 do not know they have diabetes.
- 2.1 million or 30% of Virginians have prediabetes; 90% of them do not know they have it.
- Virginia's prevalence of diabetes (9.7%) is slightly higher than the national average (9.4%) in 2015.
- Nearly one quarter of the 65+ population are living with diabetes in Virginia. Prevalence of diabetes increases dramatically with every 10-year age group (Figure 5).

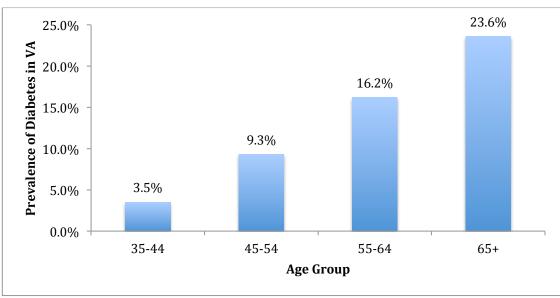


Figure 5. Prevalence of Diabetes in Virginia by Age Group

Source: VDH, Division of Policy and Evaluation, Behavioral Risk Factor Surveillance Survey, 2014. Weighted percent are weighted to population characteristics. Does not include people with prediabetes or gestational diabetes.

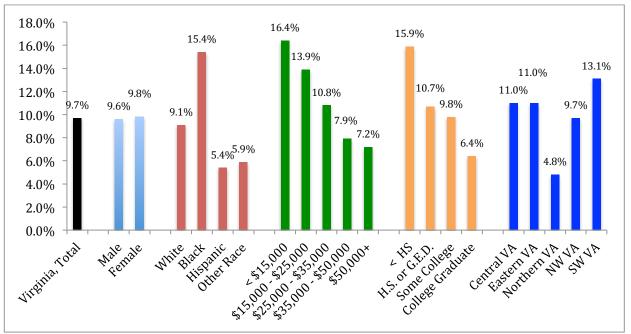


Figure 6. Prevalence of Diabetes in Virginia by socio-demographics, 2014

Source: VDH, Division of Policy and Evaluation, Behavioral Risk Factor Surveillance Survey, 2014. Weighted percent's are weighted to population characteristics. Does not include people with prediabetes or gestational diabetes.

- Gender: Women have slightly higher rates of diabetes than men.
- **Race:** An important determinant, with Blacks having three times the amount of diabetes compared to Hispanics and other race/ethnicity groups.
- **Income:** An important factor with those in poverty having more than double the prevalence as people in the higher income range. The impact of income may be driven by education level.
- Education level: A key factor, with those who have not graduated from high school having more than twice the prevalence of diabetes compared to those who graduated from college.
- **Region: The** Southern and Eastern parts of Virginia have the highest prevalence of diabetes. Most (73%) health district's prevalence of diabetes exceeds the state prevalence of 9.6%

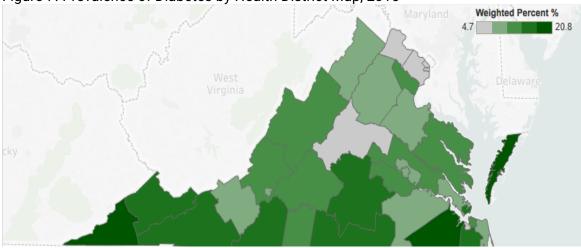


Figure 7. Prevalence of Diabetes by Health District Map, 2015

Source: VDH, Data Portal. Chronic Disease. Chronic Disease Prevalence, Diabetes, 2015 Link to map

Planning District	Prevalence of Diabetes
Alexandria	NA
Allegany	13.7%
Central Shenandoah	13.0%
Central Virginia	14.0%
Chesapeake	15.0%
Chesterfield	11.5%
Chickahominy	13.9%
Crater	10.3%
Cumberland Plateau	15.5%
Eastern Shore	20.8%
Fairfax	6.3%
Hampton	17.3%
Henrico	8.5%
Lenoswisco	19.1%
Lord Fairfax	10.1%
Loudon	NA
Mount Rogers	14.4%
New River	8.7%
Norfolk	11.8%
Peninsula	8.3%
Piedmont	15.2%
Pittsylvannia/Danville	11.4%
Portsmouth	NA
Prince William	11.2%
Rappahannock	10.2%
Rappahannock/Rapidan	10.1%
Richmond City	10.3%
Roanoke City	9.9%
Southside	16.3%
Thomas Jefferson	4.7%
Three Rivers	11.4%
Virginia Beach	9.3%
West Piedmont	16.2%
West Tidewater	18.0%

Table 6. Prevalence of Diabetes by Health District, Virginia 2015

Prevalence
NA-6.3%
8.3 -10.5%
11.2 - 14.0%
14.4 - 17.3%
18.0 - 20.8%

MORBIDITY

Useful Terms for Section

Morbidity: A term used to describe having a disease or health condition. **Activities of daily living:** Routine activities that people tend do every day without needing assistance. There are six basic ADLs: eating, bathing, dressing, toileting, transferring (walking) and continence.

Rate: An expression used to measure the relative frequency that an event occurs among a defined population per unit of time.

Attributable: Regarded as being caused by. Example, heart disease attributable to diabetes would be the number of heart disease diagnoses due specifically to diabetes.

Morbidity of Diabetes in Virginia

- People with diabetes suffer from poorer physical and mental health. Virginians who have diabetes have lower levels of poor mental and physical health as compared to the national average.
- In 2012, for every 100,000 adults in Virginian with diabetes, 145.2 people began treatment for end-stage renal disease (dialysis or kidney transplant) and listed diabetes as the primary cause of their kidney failure.²²
- Hospitalizations related to diabetes vary by health district with the highest hospitalization rates in the Eastern Shore (North Hampton), Southern Virginia, Allegany, and dense pockets in cities (Petersburg City. Covington City) (Figure 8)

Health Indicator or Disability	Age-Adjusted Percentage
Poor Mental Health at least 1 day in past 30 days	39.3%
Poor Physical Health at least 1 day in past 30 days	51.7%
Poor Physical or Mental Health, at least 1 day in past 30 days	63%
Poor Physical and Mental Health, at least 1 day in past 30 days	28.1%
Inability to do Usual Activities at least 1 day in past 30 days	29.6%
Fair or Poor General Health	36%

Table 7. Health Status and Disability among Adults with Diabetes in Virginia, 2015

Source :CDC. US Diabetes Surveillance System

Condition	Age-Adjusted Rate (per 1000)	Total Events	Estimated Cases attributable to Diabetes
Myocardial Infarction	6.1	5,857	1,580
Stroke	7.0	7,084	NA
Congestive Heart Failure	1.05	10,663	4,870
Diabetic Ketoacidosis	16.1	4,260	NA
Hyperosmolar Hyperglycemic Nonketotic Syndrome	1.6	768	NA
Hypoglycemia	2.2	1,573	NA
Lower Extremity Amputations	3.8	3,001	2,540

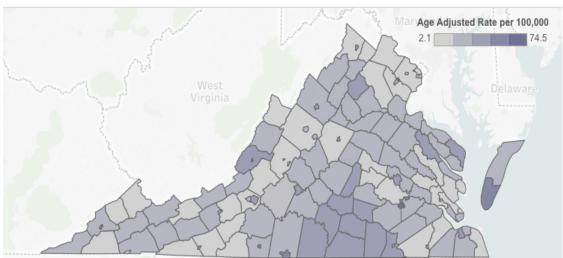
Table 8. Hospitalizations for Diabetes-Associated Conditions* in Adults with Diabetes, Virginia, 2014

* First listed diagnosis

Source: <u>CDC, Diabetes State Burden Toolkit</u>. Data source: Healthcare Cost and Utilization Project, Inpatient Database, 2014

- For every 1000 adults with diabetes in Virginia, 6.1 myocardial infarctions (MI) or 5,857 total MI events occurred in 2014. If diabetes was not present, 1,580 of those events would not have occurred.
- Compared to the national average, Virginia's hospitalizations for diabetes-associated conditions are mildly higher for myocardial infarctions, stroke, congestive heart failure, hyperosmolar hyperglycemic nonketotic syndrome, and amputations.

Figure 8. Map of Rate of Hospitalizations due to Diabetes in Virginia Health Districts, 2012



Source: VDH, Data Portal. Chronic Disease. Chronic Disease Hospitalization, Diabetes, 2012 Link to map

MORTALITY

Useful Terms for Section Mortality: The relative frequency of deaths. Attributable deaths: The number of deaths due to a specific disease Crude death rate: the total number of deaths to residents in a specified geographic area (country, state, county, etc.) divided by the total population for the same geographic area (for a specified time period, usually a calendar year) and multiplied by 100,000. Age-adjusted death rate: rates that would have existed if the population under study had the same age distribution as the "standard" population.

Mortality due to Diabetes in Virginia

- In 2015, there were 2,044 death certificates in Virginia listing diabetes as an underlying cause of death (Table 9).
- Because diabetes is also a contributing cause of death to cardiovascular, cerebrovascular disease, and other medical conditions, there were 6,820 diabetes attributable deaths in Virginia in 2013 (Figure 9).
- A high proportion of these deaths were among people with diabetes who were age 45-64 years (Figure 9).
- Highland County has the highest death rate due to diabetes in Virginia (79.3 per 100,000 people). Sussex County (60 per 100,000), Bland County (56.9 per 100,000), and Bath County (56.4 per 100,000) also have high death rates due to diabetes (Figure 10).

UNITED STATES				VIRGINIA				
YEAR	RANK	DEATHS	CRUDE DEATH RATE	AGE-ADJ DEATH RATE	RANK	DEATHS	CRUDE DEATH RATE	AGE-ADJ DEATH RATE
2005	6 th	75,119	25.3	24.9	6 th	1,642	21.7	22.9
2006	6 th	72,449	24.2	23.6	6 th	1,632	21.4	22.1
2007	7 ^{tn}	71,382	23.7	22.8	7 ^{tn}	1,507	19.5	19.9
2008	7 ^{tn}	70,553	23.2	22.0	8 th	1,534	19.7	19.8
2009	7 ^{tn}	68,705	22.4	21.0	7 ^{tn}	1,560	19.8	19.5
2010	7 ^{tn}	69,071	22.4	20.8	8 th	1,530	19.1	18.8
2011	7 ^{tn}	73,831	23.7	21.6	7 ^{tn}	1,634	20.3	19.5
2012	7 ^{tn}	73,932	23.6	21.2	7 ^{tn}	1,603	19.6	18.6
2013	7 th	75,578	23.9	21.2	7 th	1,626	19.7	18.4
2014	7 ^{tn}	76,488	24.0	20.9	7 ^{tn}	1,683	20.2	18.5
2015	7 th	79,535	24.7	21.3	7 th	2,044	24.4	21.9

Table 9. Ten-year Trend in Deaths due to Diabetes in the United States and Virginia, 2005-2015

Death rates are per 100,000 people. Source: CDC WONDER. Accessed May 11, 2017

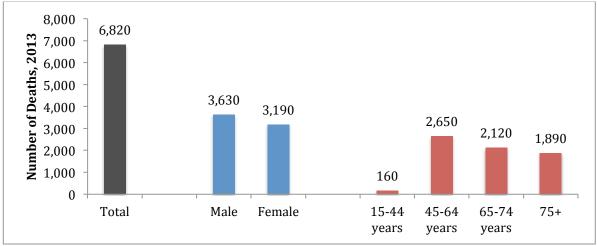
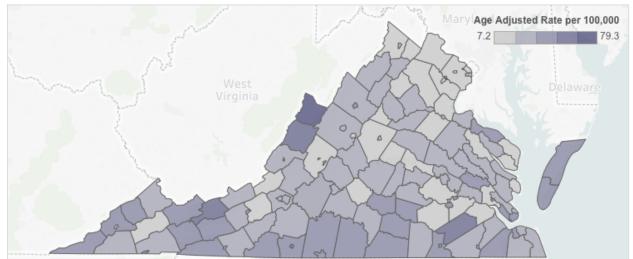


Figure 9. Number of Diabetes Attributable Deaths in Persons, Aged 15 Years or Older by Gender and Age Group, Virginia, 2013

Source: <u>CDC, Diabetes State Burden Toolkit</u>. Data Sources: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999-2013 from CDC WONDER Online Database, 2013 United States Renal Data System.





Source: VDH, Data Portal. Chronic Disease. Chronic Disease Deaths, Diabetes, 2012 Link to map

Health Care Costs

Useful Terms for Section

Direct costs: are costs associated with medical services such as physician visits, hospitalizations, prescription drugs and other services. **Indirect costs**: reflect the labor and household productivity losses that arise when diabetes causes missed workdays (i.e., absenteeism costs), on-the-job productivity losses (i.e., presenteeism costs), household productivity losses, disability that prevents people from working, or early mortality. **Per capita:** By or for each person.

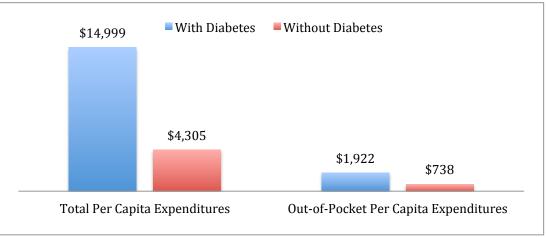
Out of pocket expenses: Costs of health care that are not covered by health insurance. They include deductibles, co-insurance and all the costs for services, medications and devices that are not covered.

Costs attributable to diabetes: Costs, either direct or indirect, that are due specifically to the disease condition of diabetes.

Health Care Costs of Diabetes in Virginia

- Direct per person medical costs in Virginia are similar to the national average.
- Total indirect costs of diabetes in Virginia are approximately 10% higher than nationwide indirect costs primarily due to increased morbidity costs.
- As compared to the national average, Virginia employers' direct and indirect costs were slightly lower in the workforce who were < 64 years and slightly higher in the +65 year old workforce.

Figure 11. Per Capita Health Care and Out-of-Pocket Expenses for People with and without Diabetes, US, 2013



Source: Shakiba P, Frost A., "Per Capita health Care Spending on DM: 2009-2013". Health Care Cost Institute Issue Brief # 10, May 2015. Accessed May 12, 2017 at http://www.healthcostinstitute.org/files/HCCl%20Diabetes%20Issue%20Brief%205-7-15.pdf

• People with diabetes have 3.5 times the medical expenses as compared to people without diabetes; after adjusting for age and sex, average medical expenditures for people with diabetes are 2.3 times higher than for people without diabetes.¹

Payer	Estimated Cost Per Person with	Total Cost in Virginia	
	Diabetes	(\$, in Millions)	
Medicare	\$5,036	1,374.4	
Medicaid	\$3,981	429.7	
Private	\$3,689	1,279.4	
Employers	\$9,328	2,398.7	

Table 10. Annual Direct Medical Costs Attributable to Diabetes in Virginia, by Payer, 2013

Source: <u>CDC State Burden of Diabetes Toolkit</u>. Data Sources: 2008 and 2013 National Health Expenditure Accounts, 2008 State Health Expenditure Accounts, 2008 and 2015 Current Population Survey, 2013 Behavioral Risk Factor Surveillance Survey, 2008-2013 Medical Expenditure Panel Survey.

• Employers in Virginia bear 2.4 times the costs of diabetes because they incur medical costs and indirect costs due to absenteeism and presenteeism.

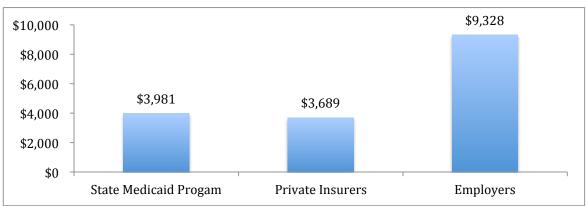
Table 11. Annual Indirect Costs Attributable to Diabetes, Virginia, 2013 dollars.

Category	Cost Per Person with Diabetes	Total Cost in Virginia (\$, in Millions)
Morbidity	\$5,774	3,709.5
Work Absenteeism	\$297	190.6
Presenteeism	\$1,724	1,107.6
Household Productivity Loss	\$280	180.1
Inability to Work	\$3,473	2,23.1
Mortality	\$4,235	2,720.4
Total (Morbidity + Mortality)	\$10,009	6,429.9

Note: Presenteeism cost is the cost of on the job productivity losses. Inability to work costs arise when people are disabled and unable to work. Source: <u>CDC State Burden of Diabetes Toolkit</u>. See reference ²³ for data sources.

• In 2013, the total cost of diabetes in Virginia to insurance payers was estimated to be \$2,398.7 million by employers; \$1,374.4 million by Medicare; \$1,279.4 million by private insurers and \$429.7 million by the State Medicaid Program.

Figure 12. Annual, Per Person Diabetes Attributable Medical Costs Incurred in 2013 by the Type of Payer, Virginia



Source: <u>CDC Diabetes State Burden Toolkit</u>. Medicaid covers children, individuals with disabilities, older adults and some parents, and pregnant women with low income (families income < 133%, elderly & disabled 80%, working parents 30% of Federal poverty level. Fifty percent of Medicaid enrollees are children.

Sex	Age Group (Years)	Estimated Cost Per Person (\$)	Estimated Total Cost (\$, in Millions)
	18-74	9,328	2,398.7
Total	18-64	9,771	2,197.9
	65-74	6,235	200.8
	18-74	9,977	1,409.1
Male	18-64	10,421	1,272.4
	65-74	7,145	136.7
	18-74	8,537	989.6
Female	18-64	8,999	925.5
	65-74	4,902	64.1

Table 12. Estimated Annual Diabetes-Attributable Costs by Age and Gender Incurred byEmployers in Virginia, 2013 dollars

Note: The annual cost from the employer perspective consists of direct medical costs (from private insurance perspective) and indirect (absenteeism and presenteeism) costs.

Source: <u>CDC. Diabetes State Burden Toolkit</u>. See references 20 for data sources.

• In Virginia, women have a higher prevalence of diabetes but they incur a lower total cost.

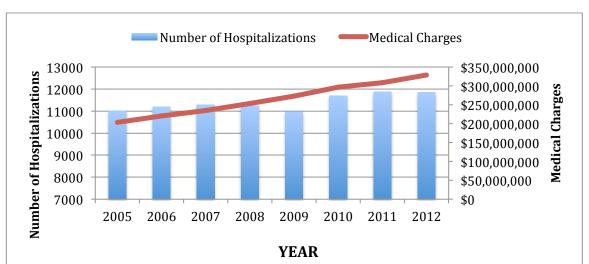


Figure 13. Number of Hospitalizations and Medical Charges in Virginia Attributable to Diabetes, from 2005 to 2012

Source: VDH, Data Portal. Chronic Disease Overview, Diabetes from 2005 to 2012

 Medical charges related to those hospitalizations have increased at a greater rate than the number of hospitalizations indicating that medical charges for diabetes in Virginia are rising.

Glossary

A1C is a blood test that provides information about a person's average levels of blood glucose over the past two to three months. The A1c test is the primary test used to measure an individual's blood glucose control.

Blood glucose: The main sugar found in the blood and the body's main source of energy.

Body Mass Index (BMI) is a calculation based on a person's weight and height. Healthcare professionals use BMI as a screening tool to classify overweight and obesity in adults. Overweight and obesity (BMI \geq 25 kg/m² or \geq 23 kg/m² among Asian Americans) have been positively associated with increased risk for type 2 diabetes and other diseases.

Chronic Kidney Disease(CKD): Any condition that causes reduced kidney function over a period of time. CKD is present when a patient's glomerular filtration rate remains below 60 milliliters per minute for more than 3 months. CKD may develop over many years and lead to end-stage renal disease.

Diabetes Prevention Program: An evidence-based lifestyle change program, which has been demonstrated to delay or prevent the development of type 2 diabetes among people at high risk.

Diabetic ketoacidosis (DKA): An emergency condition in which extremely high blood glucose levels, along with a severe lack of insulin, result in the breakdown of body fat for energy and an accumulation of ketones in the blood and urine. Signs of DKA are nausea and vomiting, stomach pain, fruity breath odor, and rapid breathing. Untreated DKA can lead to coma and death.

Diabetes Self-Management Education Programs: Accredited programs that provide the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards.

Diabetic retinopathy: Causes vision damage to the small blood vessels in the retina. Loss of vision may result.

End-Stage Kidney Disease (ESRD): Total and permanent kidney failure. When the kidneys fail, the body retains fluid. Harmful wastes build up. A person with ESRD requires dialysis treatment to replace the work of the failed kidneys.

Fasting plasma glucose is a blood test that measures a person's blood glucose level after a person has fasted (not eaten) for at least eight-hours.

Federally qualified health center (FQHC): Health centers that provide health care to underserved populations and offer a sliding scale. They are eligible to receive funding from the Public Health Service and enhanced reimbursement from Medicare and Medicaid and well as other benefits.

Hyperglycemic Hyperosmolar Syndrome: An emergency condition in which one's blood glucose level is very high and ketones are not present in the blood or urine. If not treated, it can lead to coma or death. **Insulin:** is a hormone that allows blood glucose to enter cells, where it can be used for energy. When the body doesn't have enough insulin or can't use it effectively, blood glucose builds up in the blood.

Macrovascular disease: Disease of the large blood vessels such as atherosclerosis, coronary heart disease, stroke, and peripheral vascular disease.

Microvascular disease: Disease of the smallest blood vessels, such as those found in the eyes, nerves, and kidneys.

Nephropathy: Disease of the kidneys causing damage that allows protein to leak out of the kidneys into the urine. Damaged kidneys can no longer remove wastes and extra fluid from the bloodstream.

Neuropathy: Disease of the nervous system that causes muscle weakness, pain, and numbness. The most common form of neuropathy in people with diabetes is peripheral neuropathy, which affects the legs and feet.

Periodontal disease: Disease of the gums in the mouth.

Peripheral vascular disease: A condition in which the large blood vessels of the legs are narrowed or blocked by fatty deposits, decreasing blood flow to the legs and feet. It is marked chiefly by cramping pain, weakness, numbness, and tingling in the legs and it increases the chances of amputation, heart attack, and stroke.

Two-hour glucose tolerance test is a blood test that measures a person's blood glucose level over a twohour period after drinking a glucose solution. Prior to the test, patients have fasted for eight-hours. It is used to diagnose gestational diabetes.

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