

Diabetes in Virginia

Diabetes Mellitus is an increasingly common disease which results in significant rates of chronic and acute symptoms. Diabetes is a major public health challenge because the disease, itself, compromises health, but also because it increases the risk of developing other serious acute and chronic diseases such as cardiovascular disease, hypertension, kidney disease and other serious medical problems.

Key Diabetes Facts:

- Diabetes Mellitus (diabetes or DM) lowers life expectancy by up to 15 years, increases the risk of heart disease by 2 to 4 times and is the leading cause of kidney failure, lower limb amputations and adult-onset blindness (Healthy People U.S.).
- Diabetes represents a significant cause of disability in the U.S. and in Virginia, with an estimated 10.4% of the population or 637,837 Virginians living with diabetes and its resulting disability, which takes many forms.
- In 2010, 1,527 Virginians died as a result of diabetes, which was the eight eighth leading cause of death in the Commonwealth; the 2010 age adjusted death rate per 100,000 people for diabetes in Virginia was 18.8, compared with 20.8 for the U.S.
- Death rates from diabetes have declined slightly across the U.S. over the past decade and have dropped from the 6th to the 7th leading cause of death; in Virginia, diabetes dropped from the 6th leading cause of death to the 8th most frequent cause of death in 2010; it was responsible for 2.6% of all deaths, down from 2.8% in 2000.

2000 – 2010 Trend in Deaths Due to Diabetes Mellitus

YEAR	United States					Virginia			
	RANK	% OF TOTAL DEATHS	CRUDE DEATH RATE*	AGE-ADJ DEATH RATE	RANK	DEATHS	% OF TOTAL DEATHS	DEATH RATE*	AGE-ADJ DEATH RATE
2010	7 th	2.8%	22.4	20.8	8 th	1,630	2.6	19.1	18.8
2009	7 th	2.8%	22.4	21.0	7 th	1,560	2.7	19.8	19.5
2008	7 th	2.9%	23.2	22.0	8 th	1,534	2.6	19.7	19.8
2007	7 th	2.9%	23.7	22.8	7 th	1,507	2.6	19.5	19.9
2006	6 th	3.0%	24.2	23.6	6 th	1,632	2.8	21.4	22.1
2005	6 th	3.15	25.3	24.9	6 th	1,642	2.8	21.7	22.9
2004	6 th	3.1%	24.9	24.7	6 th	1,602	2.8	21.5	22.9
2003	6 th	3.0%	25.5	25.5	6 th	1,587	2.7	21.5	23.0
2002	6 th	3.0%	25.4	25.6	6 th	1,558	2.7	22.4	23.2
2001	6 th	3.0%	25.1	25.4	6 th	1,613	2.9	22.4	24.6
2000	6 th	3.0%	25.2	25.0	6 th	1,564	2.8	22.4	24.5

Sources: CDC/NCHS Vital Statistics System for rank, crude death rate and % of total deaths; CDC WONDER for age-adjusted death rates per 100,000 people.

- Diabetes and its complications resulted in 5,401 potential years of life lost (PYLL) in 2010.
- In 2011, there were 12,957 hospitalizations for diabetes as an underlying disease, with complications in a variety of body systems; total Virginia inpatient hospital charges for these visits were over \$313 million, indicating the significant medical cost for inpatient hospital care of diabetes. Admissions for diabetes itself totaled over 6,000, and there were a significant number of admissions for the various secondary effects of

diabetes on the nervous system, peripheral vascular system, kidneys and other body systems; gestational diabetes resulted in 428 inpatient cases, totaling over \$6 million in charges in 2011. These totals do not include the significant number of deaths due to cardiovascular disease where diabetes is an underlying factor.

CY2011 Virginia Hospital Inpatient Discharges with ICD-9 Diagnosis Code of Diabetes Mellitus

Diagnosis Group	Discharges	Total Charges	Average Charge/Discharge
Diabetes – general	6,154	\$110,118,831	\$16,269
Neurological complications	1,922	\$46,432,397	\$24,158
Peripheral vascular complications	770	\$46,634,696	\$60,565
Renal (kidney) complications	288	\$23,982,601	\$83,273
Eye complications	23	\$680,956	\$29,607
Other manifestations	3,372	\$95,823,672	\$28,417
Gestational Diabetes	428	\$6,072,580	\$14,188
Total Diabetes	12,957	\$319,745,733	\$24,677

Source: VHI from Intellimed; diagnosis codes 250.00-250.92, 357.2, 362.01-362.07, 366.41 and 648.00-648.04

Definitions

- **Types of Diabetes** - There are several types of Diabetes Mellitus, each with a different cause, and different demographics, risk factors and health effects:
 - **Type 1 diabetes** results when the body loses its ability to metabolize blood glucose due to the destruction of the pancreatic beta cells which produce insulin; this condition often develops in children, teens and young adults but may occur at any time; type 1 diabetes accounts for about 5% of all diabetes cases; risk factors include autoimmune genetic or environmental factors.
 - **Type 2 diabetes** results from the body becomes both resistant to the action of insulin and unable to produce sufficient insulin to metabolize sugar; usually develops later in life, but has been increasingly affecting younger populations in recent years; about 90 to 95% of diabetes cases are type 2. Risk factors include age, race, obesity, physical inactivity, family history and previous gestational diabetes.
 - **Gestational diabetes** is a complication of pregnancy characterized by glucose intolerance in pregnancy and can result in problems for the mother and/or child, often resulting in the need for a cesarean section; gestational diabetes is often a risk factor for the development of type 2 diabetes after pregnancy such that 5% to 10% of women with gestational diabetes are found to have diabetes. Women who have been diagnosed with gestational diabetes have a 35-60% chance of developing diabetes in the 10 to 20 years following pregnancy. Risk factors include race and family history of diabetes.
 - **Other types of diabetes** result from a variety of surgical, genetic, medical treatment, infections or other illnesses which result in the inability to metabolize glucose.
- **Prediabetes** is a condition where blood glucose or hemoglobin A1c levels are higher than normal, between 5.7% and 6.4% of total Hb, but not in the range categorized as diabetes; individuals with prediabetes have increased risk of developing diabetes as well as heart disease and stroke.
- **Diabetes** is defined as a group of diseases characterized by high levels of blood glucose resulting from deficiencies in insulin production, insulin action on cells or both; the HbA1c and blood glucose test are the two main tests used to diagnose diabetes; HbA1c levels are 6.5% or more.

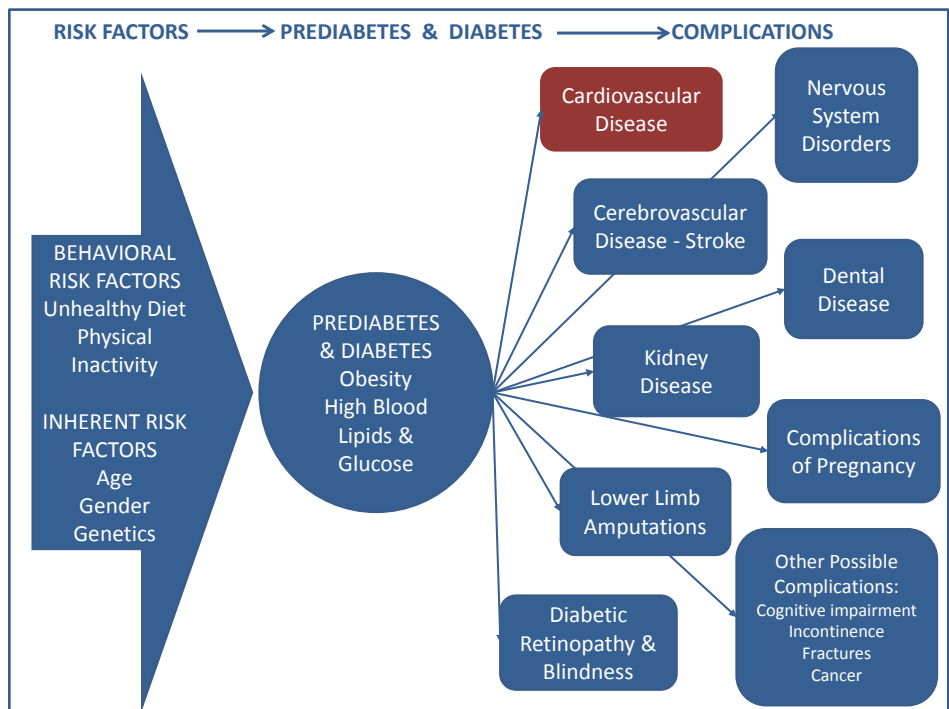
- **Hemoglobin A1c (HbA1c)** is the form of hemoglobin that attaches to glucose such that its levels indicate how much glucose has been in the blood stream over a period of time. The HbA1c blood test shows the blood glucose level over the past 2 to 3 months; Normal range is 4.0% to 5.6%, prediabetes range is 5.7% to 6.4% and diabetes is indicated at 6.5% or greater.
- **Glucose** is the main form of sugar ingested, found in the blood and metabolized by the body to produce energy; levels of glucose found in the blood at a point in time (blood glucose test) and over the past 2 to 3 months (HbA1c test) are the two main indicators of diabetes.

Risk Factors: Diabetes is an important disease because it is a disease from which many people suffer from chronic illness and death, but also because diabetes is a risk factor for many other diseases, most importantly cardiovascular disease. Diabetes results from a shared group of innate and behavioral risk factors:

- **Inherent or innate risk factors** are those over which the individual has no control, including gender, age and genetic predisposition as well as poverty, stress and urbanization; Type I diabetes usually occurs early in life.
- **Behavioral risk factors** are those which lead to conditions which place the individual at high risk of developing CVD; it is estimated that these behaviors are responsible for a significant proportion of Type II diabetes, which then leads to coronary heart, cerebrovascular disease (stroke) and many other chronic and life-threatening diseases; these behaviors include unhealthy diet including high fat and excess salt intake, physical inactivity, smoking and alcohol use, all of which may result in conditions which can then develop into or cause diabetes.
- **Intermediate risk factors** include overweight and obesity, high blood lipids and glucose, diabetes and high blood pressure, and are a direct result of behaviors and lifestyle.

Progression and Complications of Diabetes:

- Behavioral and inherent risk factors for diabetes can lead to prediabetes, where blood glucose and hemoglobin A1c levels are and remain at above normal ranges; in addition, BMI and blood lipids may be elevated.
- Diabetes is diagnosed when blood glucose and hemoglobin A1c are elevated beyond specific thresholds.
- Diabetes alone presents major medical challenges and threats to health due to risks related to high blood



glucose including diabetic ketoacidosis and hyperosmolar (nonketotic) coma as well as susceptibility to other diseases such as depression, pneumonia and influenza; in addition, activities of daily living are negatively impacted through reductions in stamina and fitness.

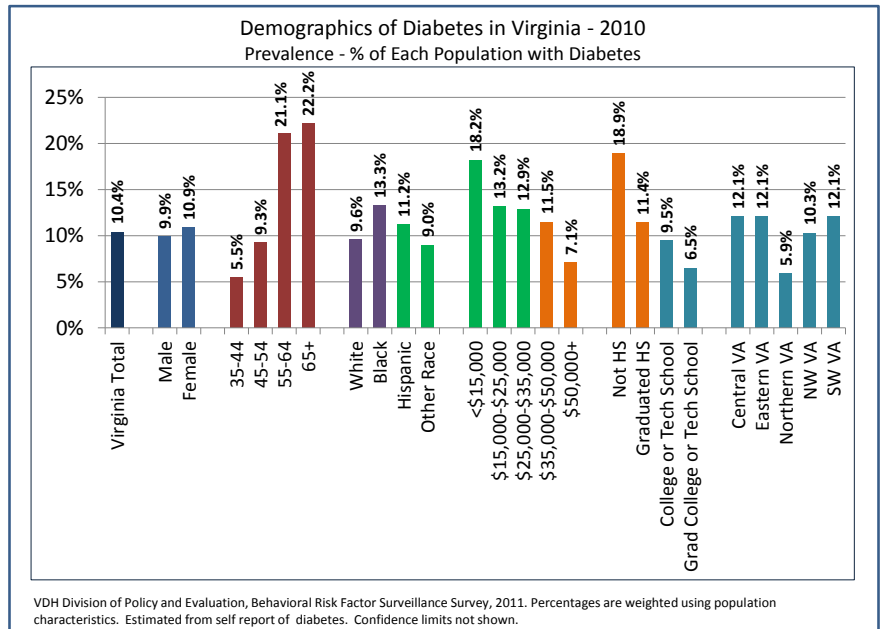
- Diabetes is a major risk factor for cardiovascular disease, hypertension and cerebrovascular disease (stroke), which are the result of many of the same clinical causes of diabetes such as obesity, high blood glucose and lipids.
- Other chronic and life-threatening conditions also result from diabetes including:
 - Blindness: diabetes is the leading cause of adult-onset blindness, mainly caused by diabetic retinopathy, among adults aged 20-74.
 - Kidney disease: as the leading cause of kidney failure, accounting for 44% of new cases in the U.S. in 2008, diabetes results in the need for dialysis or transplant.
 - Nervous system disease: nerve damage is a frequent result of diabetes, including impaired sensation or pain in the extremities, digestive problems, erectile dysfunction and other nerve problems;
 - Lower limb amputations: more than 60% of non-traumatic amputations of the lower limbs are a direct result of diabetes.
 - Dental disease; periodontal disease is a frequent complication, resulting in gum disease and loss of teeth; smoking exacerbates this situation.
 - Complications of pregnancy: 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 but when controlled, risks are reduced in many cases.
 - Other complications: there is mounting evidence that diabetes is a risk factor for incontinence, cognitive impairment and some types of cancer.

Prevention of Complications of Diabetes - some of the complications of diabetes can be prevented through treatment of the causes of diabetes:

- **Glucose control** – improved control of blood glucose can reduce the risk of microvascular complications in both type 1 and type diabetes; these complications include those involving the eyes, kidneys and nervous system.
- **Blood pressure control** – reduction in hypertension decreases the risk of cardiovascular and cerebrovascular disease as well as the microvascular complications.
- **Control of blood lipids** – control of LDL cholesterol can reduce the cardiovascular complications of diabetes significantly.
- **Preventive care** – early detection and intervention can reduce the severity of disability for many of the complications of diabetes:
 - Cardiovascular disease – control of blood lipids through improved diet and use of medication
 - Hypertension – monitoring and medical management of high blood pressure
 - Vision - use of laser therapy and glasses
 - Lower limbs and feet - foot care, early treatment to reduce infection and the need for amputation
 - Kidneys - reducing blood pressure and proteinuria, both of which injure the kidneys

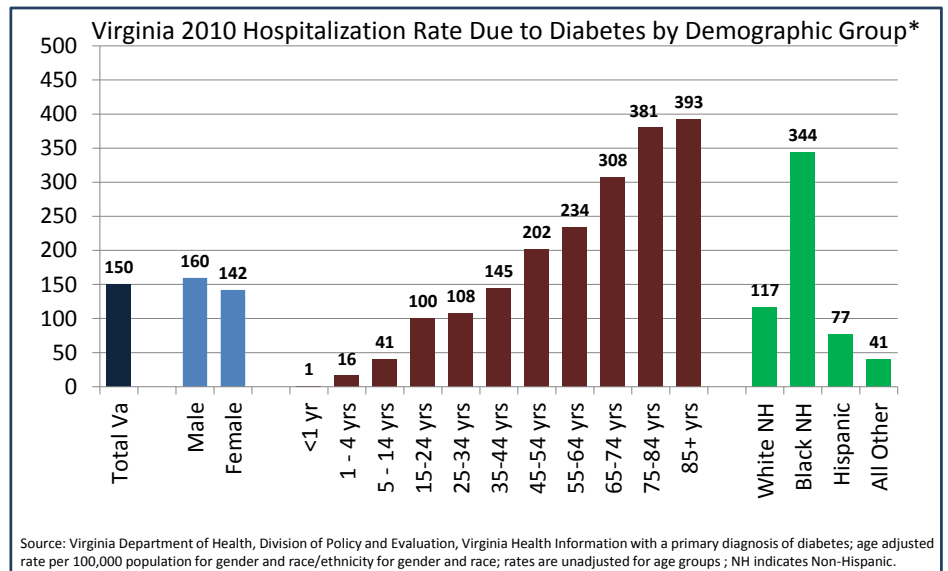
Socio-demographics of Diabetes in Virginia: Overall, 10.4 of Virginians or 637,837 individuals live with diabetes and its consequences; there is disproportionately high prevalence in certain populations:

- **Gender:** Women have slightly higher rates than men.
- **Aging** is a key factor in diabetes, with over 18% of the 65+ population living with diabetes; prevalence among people age 55 and older is more than double that of those under age 55.
- **Race** is an important determinant, with Blacks and Hispanics having higher rates than whites or other groups.
- **Income** is an important factor with those in poverty having double the prevalence of the total population.
- **Education level** is a key factor, with much higher prevalence among those who have not graduated from high school and decreasing prevalence as educational levels increase, with a low of 6.5% for those who have graduated from college or technical school.
- **Location** within Virginia is also important with only Northern Virginia showing lower prevalence compared with the remainder of Virginia.



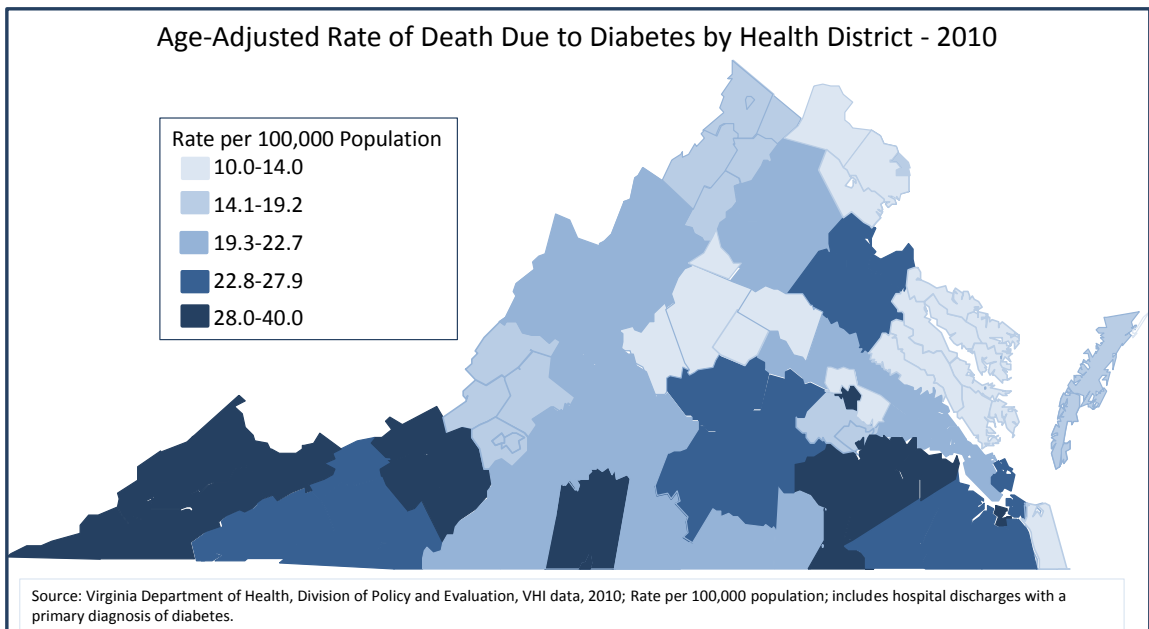
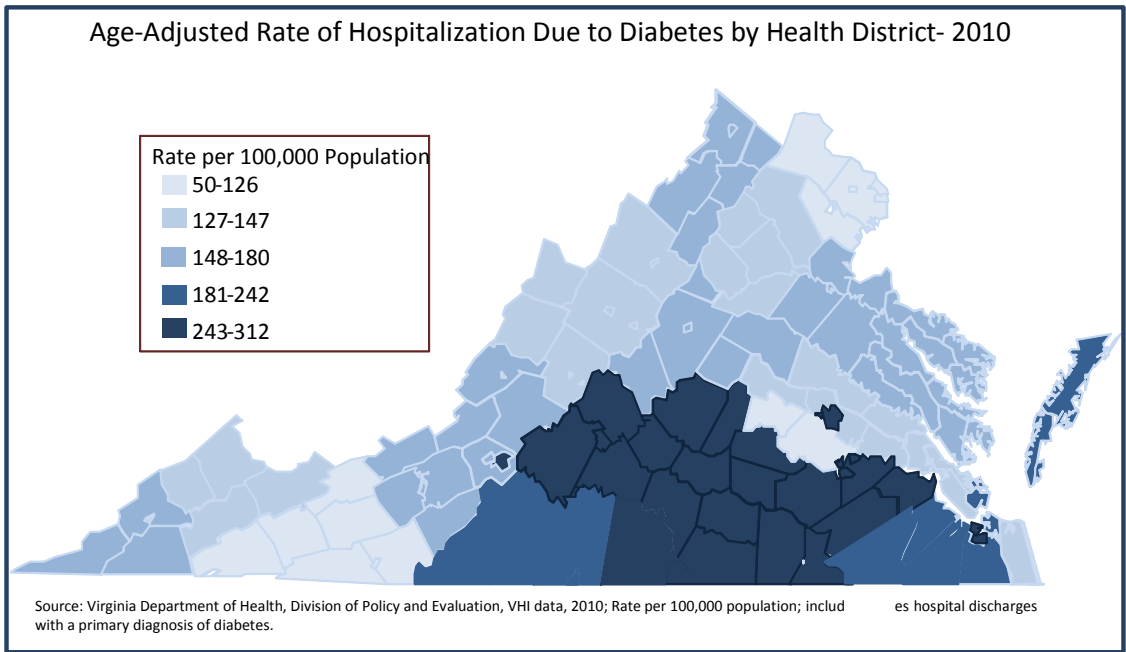
Morbidity and Mortality of Diabetes in Virginia: Rates of hospitalization and death from diabetes vary widely across different populations in Virginia.

- Advanced age is the strongest predictor of both hospitalization and death from diabetes in Virginia, increasing with age group.
- Males show significantly higher rates for both death and hospitalization compared with females.
- Hispanic and other racial groups have lower values compared with White non-Hispanic and Black non-Hispanic groups; Black non-Hispanics have the highest rates among the racial groups.



Regionality of Diabetes in Virginia: The distribution of diabetes varies widely across Virginia, with age-adjusted inpatient hospitalization and mortality rates showing some differences:

- Age-adjusted hospitalization rates are very high in the south central districts, extending into central Virginia.
- Age-adjusted death rates due to diabetes, shown below by Health Districts, is clearly higher in the far southwestern and eastern districts of Virginia, with rates almost double those of the northern districts.
- Urban regions, particularly the cities of Roanoke, Richmond and Norfolk, show higher death and hospitalization rates than the surrounding areas.



Data Sources:

1. VDH Division of Policy and Evaluation, Behavioral Risk Factor Surveillance Survey, 2011
2. VDH Division of Policy and Evaluation, Virginia Health Information, 2010
3. VDH Vital Records data, 2010 (Table 13, Resident Deaths from Fourteen Leading Causes of Death with Age-Adjusted Rates per 100,000 Population by Planning District and City or County, 210
4. World Health Organization Media Center, Fact Sheet Number 317, September 2012; www.who.int/mediacentre/factsheets/fs317/en/index.html
5. Healthy People 2020, Heart Disease and Stroke, U.S. Department of Health and Human Services
6. CDC WONDER; Detailed Mortality Tables
7. CDC National Diabetes Fact Sheet, 2011; National Center for Chronic Disease Prevention and Health Promotion, Division of Diabetes Translation.

CY2011 Diabetes Inpatient Discharges by DRG Group from Virginia Hospitals

	CASES	TOTAL CHARGES	AVERAGE CHARGE/CASE
Diabetes	8,976	\$ 169,471,676	\$ 18,881
Neurologic	1,852	\$ 41,969,672	\$ 22,662
Amputation	1,248	\$ 64,426,937	\$ 51,624
Cardiovascular	361	\$ 21,888,660	\$ 60,633
Kidney	71	\$ 15,646,208	\$ 220,369
Eye	21	\$ 270,001	\$ 12,857
Grand Total	12,529	\$ 313,673,153	\$ 25,036

Source: VHI from Intellimed; diagnosis codes 250.00-250.92, 357.2, 362.01-362.07, 366.41 and 648.00-648.04

**Age-Adjusted Rate of Death and Age Adjusted Rate of Hospitalization Due to Diabetes
by Virginia Planning District – 2010**

PLANNING DISTRICT	AGE-ADJUSTED DEATH RATE	AGE-ADJUSTED HOSPITALIZATION RATE
Arlington	14.6	53.8
Fairfax	11.9	64.4
Loudoun	12.1	68.7
Prince William	13.8	112.9
Alexandria	18.5	113.1
Virginia Beach	11.8	126.2
Chesterfield	14.9	125.4
Henrico	10.7	131.8
Mount Rogers	27.0	116.7
Central Shenandoah	19.4	135.8
Chickahominy	19.2	142.1
Peninsula	19.4	146.7
Rappahannock/Rapidan	21.7	144.4
Three Rivers	11.9	156.0
Lord Fairfax	14.8	156.8
Cumberland Plateau	32.3	140.0
Thomas Jefferson	11.9	168.8
New River	28.3	159.9
Rappahannock	23.4	169.6
Alleghany	19.2	178.7
Lenowisco	28.0	173.4
Chesapeake	23.6	183.3
Western Tidewater	23.6	193.6
Hampton	27.3	201.9
Eastern Shore	17.0	230.6
West Piedmont	22.7	235.7
Norfolk City	22.9	240.9
Piedmont	24.8	243.1
Pittsylvania/Danville	33.0	237.5
Central Virginia	19.6	252.1
Portsmouth	39.1	281.3
Crater	29.1	291.5
Southside	20.7	303.3
Roanoke City	14.4	310.0
Richmond City	28.3	310.8