Reportable Disease Surveillance in Virginia, 2016

Marissa J. Levine, MD, MPH
State Health Commissioner

Report Production Team:
Office of Epidemiology
Including the Division of Surveillance and Investigation, Division of Disease Prevention, Division of Environmental Epidemiology, Division of Immunization, and Division of Tuberculosis and Newcomer Health

Virginia Department of Health
Office of Epidemiology
Post Office Box 2448 Richmond,
Virginia 23218
www.vdh.virginia.gov

VDH VIRGINIA DEPARTMENT OF HEALTH

ACKNOWLEDGEMENT

In addition to the employees of the work units listed below, the Office of Epidemiology would like to acknowledge the contributions of all those engaged in disease surveillance and control activities across the state throughout the year.

We appreciate the commitment to public health of all epidemiology staff in local and district health departments and the Regional and Central Offices, as well as the conscientious work of nurses, environmental health specialists, infection preventionists, physicians, laboratory staff, and administrators. These persons report or manage disease surveillance data on an ongoing basis and diligently strive to control morbidity in Virginia. This report would not be possible without the efforts of all those who collect and follow up on morbidity reports.

Divisions in the Virginia Department of Health
Office of Epidemiology

Disease Prevention
Telephone: 804-864-7964

Environmental Epidemiology
Telephone: 804-864-8182

Immunization
Telephone: 804-864-8055

Surveillance and Investigation
Telephone: 804-864-8141

Tuberculosis and Newcomer Health
Telephone: 804-864-7906

TABLE OF CONTENTS

INTRODUCTION

DESCRIPTIVE EPIDEMIOLOGY OF REPORTABLE DISEASES

NUMBER OF REPORTED CASES AND RATE PER 100,000 POPULATION FOR SELECTED DISEASES BY LOCALITY, DISTRICT, AND REGION

MAPS OF INCIDENCE RATES OF SELECTED DISEASES BY LOCALITY

LIST OF TABLES

Introduction

The Virginia Department of Health, Office of Epidemiology is pleased to present its twenty-ninth annual report of disease surveillance activities. This report summarizes morbidity data reported by the Virginia Department of Health, Office of Epidemiology to the federal Centers for Disease Control and Prevention (CDC) during calendar year 2016.

The Office of Epidemiology, in conjunction with health departments in districts throughout Virginia, is responsible for the ongoing statewide surveillance of diseases according to the provisions of the Virginia Regulations for Disease Reporting and Control. Disease surveillance involves the collection of pertinent data, the tabulation and evaluation of these data, and the dissemination of information based on the analysis of the data. These data provide the foundation for public health activities to reduce morbidity.

Diseases must be diagnosed and reported to the health department before case investigations can occur and disease control activities can begin. Physicians, personnel in medical care facilities, laboratory directors, and other health care providers are therefore essential to the surveillance process. By reporting diseases, health care personnel aid the health department in identifying unusual disease patterns occurring in the community. The health department notifies physicians of these unusual disease patterns, which helps physicians provide a more rapid diagnosis and treatment of individuals who present with compatible symptoms.

This report summarizes those diseases and conditions that are listed as officially reportable in the Regulations for Disease Reporting and Control. The report is divided into four sections as described below.

Introduction and Data Summary: Tables 1 through 7 summarizing 2016 morbidity are included in this introductory section. These tables include the list of reportable diseases in Virginia; ten-year trends for both the number of reported cases and the incidence rate per 100,000 population for all reportable diseases; the five-year average for number of reported cases and incidence rate based on the five years previous to the current reporting year; the number of reported cases and incidence rate per 100,000 population for selected diseases by age group, race, sex, and health planning region; and the number and percent of reported cases by quarter of onset.

Descriptive Epidemiology of Reportable Diseases: This section consists of narratives and graphics describing the populations reported with each specific disease or condition. The section includes information about the total number of cases reported; the ten-year trend in number of reported cases and incidence rate; the demographics of cases in terms of age, race and sex; and the distribution of cases by both date of onset and health planning region within the state. Mortality, microbial species, and other attributes of diseases are also presented when applicable. Sources of information include the Virginia Electronic Disease Surveillance System (VEDSS) database, the CDC (http://www.cdc.gov/), Red Book: 2015 Report of the Committee on Infectious Diseases (American Academy of Pediatrics, Kimberlin, D., Brady, M., Jackson, M., Long, S., eds., 2015), and Control of Communicable Diseases Manual (Heymann, D., ed., 2015).

Population-based rates are often presented to provide a measure of disease frequency in the population and to allow for comparisons between groups. When calculating rates, population data prepared by the United States Census Bureau for the state's cities and counties were used. The data were based on Census population estimates for 2015.

Race is usually presented as black, white, or other. The "other" race category includes persons reported as Asian/Pacific Islanders, American Indians, Alaskan Natives or multi-racial persons.

In describing the occurrence of disease throughout the year, date of onset is used whenever it is available. Onset is the time when symptoms first occurred. Some cases reported in 2016 experienced onset prior to the year of report. For surveillance purposes, these cases are counted with this report due to receipt of notification or confirmatory test results in 2016. In some situations, information is only available on the date of report, or the date the report was first received by the health department, and these dates are used in place of date of onset. Date of specimen collection or date of diagnosis may also be used to estimate date of onset.

To the extent possible, rates by locality are calculated based on residence of the patient. When the address of the patient is neither reported by the health care provider nor ascertained by the health department, the location of the reporting source, such as the physician, hospital, or laboratory, is used.

Number of Cases and Rate by Locality: This section of the report presents the number of cases and incidence rate per 100,000 population for selected diseases by locality, district, and health planning region. In previous reports, cities and counties that shared one health department were combined and the data were presented as one jurisdiction. Beginning with the 2013 annual report, all independent cities and counties are listed as separate entities. Caution is urged in interpreting the data in this section, as well as in the following section because localities with small populations may have large disease rates but only a few reported cases of disease. Both numbers of cases and incidence rates should be considered when using these tables to rank morbidity by city or county. Population data have been adjusted to represent the specific population under surveillance when data are restricted to certain age groups, including childhood elevated blood lead levels (less than 16 years of age), Creutzfeldt-Jakob disease (less than 55 years of age), and invasive *Streptococcus pneumoniae* infection (less than 5 years of age) .

Maps of Incidence Rates: Disease-specific maps are presented within several of the narratives to depict incidence rates by locality. For each disease-specific map, the rates have been divided into four categories using the following process:

Category 1 – Localities reporting zero cases of the disease.

Category 2 – Localities with an incidence rate greater than zero and up to the mean for the state.

Category 3 – Localities with an incidence rate greater than the mean and up to one standard deviation above the mean for the state.

Category 4 – Localities with an incidence rate greater than one standard deviation above the mean for the state.

The Office of Epidemiology hopes that the readers of this report will find it to be a valuable resource for understanding the epidemiology of reportable diseases in Virginia. Any questions or suggestions about this report may be directed to Lala Wilson at the Virginia Department of Health, Office of Epidemiology, P.O. Box 2448, 109 Governor St., 5th Floor, Richmond, Virginia 23218, or by telephone at 804-864-8141.

Table 1. Reportable Diseases in Virginia, 2016

Acquired immunodeficiency syndrome (AIDS)	Measles (Rubeola)
Amebiasis	Meningococcal disease
Anthrax	Monkeypox (removed 10/20/2016)
Arboviral infection (e.g., CHIK, dengue, EEE, LAC, SLE, WNV, Zika)	Mumps
Botulism	Mycobacterial diseases (including AFB)
Brucellosis	
Campylobacteriosis	Ophthalmia neonatorum
Chancroid	Outbreaks, all (including foodborne, healthcare-associated, occupational, toxic substance-related, and waterborne)
Chickenpox (Varicella)	Pertussis
Chlamydia trachomatis infection	Plague
Cholera	Poliovirus infection, including poliomyelitis
Coronavirus infection, severe (e.g., SARS-CoV, MERS-CoV) (changed 10/20/2016 to include any severe coronavirus)	Psittacosis
Creutzfeldt-Jakob disease if <55 years of age	Q fever
Cryptosporidiosis	Rabies, human and animal
Cyclosporiasis	Rabies treatment, post-exposure
Diphtheria	Rubella, including congenital rubella syndrome
Disease caused by an agent that may have been used as a weapon	Salmonellosis
Ehrlichiosis/Anaplasmosis	Shigellosis
Escherichia coli infection, Shiga toxin-producing	Smallpox (variola)
Giardiasis	Spotted fever rickettsiosis, including RMSF
Gonorrhea	*Staphylococcus aureus* infection, vancomycin-intermediate or vancomycin-resistant (MRSA removed 10/20/2016)
Granuloma inguinale	Streptococcal disease, Group A, invasive or toxic shock
Haemophilus influenzae infection, invasive	*Streptococcus pneumoniae* infection, invasive, in children <5 years of age
Hantavirus pulmonary syndrome	Syphilis
Hemolytic uremic syndrome (HUS)	Tetanus
Hepatitis A	Toxic substance-related illness
Hepatitis B (acute and chronic)	Trichinosis (Trichinellosis)
Hepatitis C (acute and chronic)	Tuberculosis (TB), active disease
Hepatitis, other acute viral	Tuberculosis infection in children <4 years of age
Human immunodeficiency virus (HIV) infection	Tularemia
Influenza (Influenza A, novel virus, influenza-associated deaths in children < 18 years of age)	Typhoid/paratyphoid fever
Lead, elevated blood levels (reportable level changed 10/20/2016)	Unusual occurrence of disease of public health concern
Legionellosis	Vaccinia, disease or adverse event
Leprosy (Hansen disease)	*Vibrio* infection
Leptospirosis (added 10/20/2016)	Viral hemorrhagic fever
Listeriosis	Yellow fever
Lyme disease	Yersiniosis
Malaria	

Table 2a. Ten-Year Trend in Number of Reported Cases of Reportable Diseases in Virginia, 2007-2016

Disease	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Previous 5-year Avg
AIDS~	599	638	–	–	–	–	–	–	–	–	–
Amebiasis	53	42	20	14	17	29	26	29	25	39	25.2
Anthrax	0	0	0	0	0	0	0	0	0	0	0.0
Arboviral disease	5	3	8	20	20	51	34	84	69	154	51.6
Botulism, foodborne	1	0	0	0	0	0	0	0	0	0	0.0
Botulism, non-foodborne	0	3	4	1	2	2	3	1	3	5	2.2
Brucellosis	0	0	5	0	0	0	3	1	2	0	1.2
Campylobacteriosis	665	669	770	778	805	764	709	744	1,564	1,580	917.2
Chancroid	0	0	0	0	0	1	0	0	0	0	0.2
Chickenpox (Varicella)	1,582	1,489	773	548	549	505	374	324	354	284	421.2
Chlamydia trachomatis infection	24,528	31,205	30,904	30,799	36,317	35,016	33,561	35,725	35,341	39,535	35,192.0
Cholera	0	0	0	1	1	0	0	0	0	1	0.2
Creutzfeldt-Jakob disease (CJD)*****	1	0	0	0	0	0	0	2	0	1	0.4
Cryptosporidiosis	90	81	86	109	140	144	144	152	234	244	162.8
Cyclosporiasis	2	2	1	1	2	1	4	4	8	11	3.8
Diphtheria	0	0	0	0	0	0	0	0	0	0	0.0
Ehrlichiosis/Anaplasmosis	39	65	72	93	131	148	143	137	116	115	135.0
E. coli infection, Shiga toxin-producing	165	241	156	149	123	81	109	121	107	139	108.2
Giardiasis	582	432	503	512	290	272	278	256	269	317	273.0
Gonorrhea	6,267	10,336	7,791	7,401	6,521	6,894	6,992	8,196	8,095	11,046	7,339.6
Granuloma inguinale	0	0	0	0	0	0	0	0	0	0	0.0
Haemophilus influenzae infection, invasive	80	92	88	85	108	101	98	88	121	142	103.2
Hantavirus pulmonary syndrome	0	0	0	0	0	0	0	0	0	0	0.0
Hemolytic uremic syndrome	1	2	2	2	3	3	6	6	4	4	4.4
Hepatitis A	89	51	42	52	30	49	36	27	50	190	38.4
Hepatitis B, acute	144	130	110	97	84	84	72	61	69	56	74.0
Hepatitis C, acute	8	8	10	13	25	76	41	53	52	73	49.4
HIV disease~	836	844	1429*	1,194	1,085	1,105	1,151	1,090	1,062	918	1,098.6
Influenza	8,416	24,580	40,614	2,467	18,153	19,146	27,564	36,663	2,099	16,092	20,725.0
Influenza-associated deaths in children******	3	3	8	0	5	1	2	7	2	1	3.4
Kawasaki syndrome	2	3	3	2	–	–	–	–	–	–	0.0
Lead - elevated blood levels in children*******	394	307	389	350	274	201	164	264	226	955	225.8
Legionellosis	61	66	67	79	93	76	123	129	139	144	112.0
Leprosy (Hansen disease)	1	0	0	1	1	0	0	1	2	1	0.8
Listeriosis	16	17	16	13	15	18	29	25	22	23	21.8
Lyme disease	959	933	908	1,245	1,023	1,110	1,307	1,346	1,539	1,350	1,265.0
Lymphogranuloma venereum	0	0	0	0	0	0	0	0	0	0	0.0
Malaria	65	49	61	67	78	65	75	77	66	74	72.2
Measles	0	1	1	3	7	0	0	2	1	0	2.0

Table 2a. Ten-Year Trend in Number of Reported Cases of Reportable Diseases in Virginia, 2007-2016 (continued)

Disease	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Previous 5-year Avg
Meningococcal disease	23	24	18	21	18	5	7	10	10	10	10.0
Monkeypox	0	0	0	0	0	0	0	0	0	0	0.0
Mumps	27	9	9	13	13	7	109	20	34	17	36.6
Ophthalmia neonatorum	5	10	7	7	8	11	4	6	4	9	6.6
Pertussis	128	198	222	384	399	625	418	505	369	225	463.2
Plague	0	0	0	0	0	0	0	0	0	0	0.0
Poliovirus infection, including poliomyelitis	0	0	0	0	0	0	0	0	0	0	0.0
Psittacosis	0	0	0	0	0	0	0	0	0	0	0.0
Q fever	4	2	1	2	3	0	3	4	0	0	2.0
Rabies in animals	730	620	564	573	618	562	488	519	500	348	537.4
Rabies in humans	0	0	1	0	0	0	0	0	0	0	0.0
Rubella, including congenital rubella syndrome	0	0	0	2	0	0	0	0	0	0	0.0
Salmonellosis	1,249	1,165	1,095	1,210	1,208	1,144	1,048	1,150	1,181	1,193	1,146.2
Severe acute respiratory syndrome (SARS)	0	0	0	0	0	0	0	0	0	0	0.0
Shigellosis	200	310	198	145	107	91	115	214	317	358	168.8
Smallpox	0	0	0	0	0	0	0	0	0	0	0.0
Spotted fever rickettsiosis, including RMSF	123	155	53	145	231	461	350	373	296	312	342.2
Staphylococcus aureus infection, invasive (MRSA)	253	1,524	1,124	1,201	1,304	1,294	1,247	1,134	1,142	951	1,224.2
Staphylococcus aureus infection, VISA or VRSA	1	0	0	1	2	2	3	3	1	1	2.2
Streptococcal disease, Group A, invasive or TSS	162	150	174	191	192	168	190	210	222	240	196.4
Streptococcus pneumoniae infection, invasive****	52	52	47	59	33	36	37	19	28	36	30.6
Syphilis, early	407	500	529	553	502	593	676	556	745	1,072	614.4
Tetanus	0	0	0	0	0	1	2	0	0	1	0.6
Toxic shock syndrome (Staphylococcal)	1	0	0	2	–	–	–	–	–	–	0.0
Toxic substance-related illness	434	356	342	298	273	317	304	357	381	864	326.4
Trichinosis (Trichinellosis)	0	1	0	0	2	2	2	1	0	0	1.4
Tuberculosis	309	292	273	268	221	235	180	198	212	205	209.2
Tularemia	3	1	0	1	6	2	2	0	4	2	2.8
Typhoid fever	21	19	12	11	9	10	10	9	11	12	9.8
Vaccinia, disease or adverse event	0	1	0	0	0	0	1	0	0	0	0.2
Vibrio infection	33	29	29	40	30	41	42	59	40	40	42.4
Viral hemorrhagic fever	0	0	0	0	0	0	0	0	0	0	0.0
Yellow fever	0	0	0	0	0	0	0	0	0	0	0.0
Yersiniosis	10	14	11	13	10	8	11	21	17	23	13.4

~ Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

– Not a reportable disease at this time.

* Condition is reportable only in individuals < 55 years of age.

** Condition is reportable only in children < 18 years of age.

*** Condition is reportable only in children < 16 years of age.

**** Condition is reportable only in children < 5 years of age.

Table 2b. Ten-Year Trend in Incidence Rate per 100,000 Population for Reportable Diseases, Virginia, 2007-2016

Disease	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Previous 5-yr Annual Rate
AIDS~	7.8	8.3	–	–	–	–	–	–	–	–	–
Amebiasis	0.7	0.5	0.3	0.2	0.2	0.4	0.3	0.4	0.3	0.5	0.3
Anthrax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arboviral disease	0.1	0.0	0.1	0.3	0.2	0.6	0.4	1.0	0.8	1.8	0.6
Botulism, foodborne	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Botulism, non-foodborne	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Brucellosis	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Campylobacteriosis	8.7	8.7	9.9	9.9	10.1	9.4	8.7	9.0	18.8	18.8	11.2
Chancroid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chickenpox (Varicella)	20.7	19.3	9.9	7.0	6.9	6.2	4.6	3.9	4.3	3.4	5.2
Chlamydia trachomatis infection	320.9	404.6	397.8	390.7	453.9	432.5	410.0	432.5	424.5	471.6	430.5
Cholera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Creutzfeldt-Jakob disease (CJD)*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cryptosporidiosis	1.2	1.1	1.1	1.4	1.7	1.8	1.8	1.8	2.8	2.9	2.0
Cyclosporiasis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Diphtheria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ehrlichiosis/Anaplasmosis	0.5	0.8	0.9	1.2	1.6	1.8	1.7	1.7	1.4	1.4	1.7
E. coli infection, Shiga toxin-producing	2.2	3.1	2.0	1.9	1.5	1.0	1.3	1.5	1.3	1.7	1.3
Giardiasis	7.6	5.6	6.5	6.5	3.6	3.4	3.4	3.1	3.2	3.8	3.3
Gonorrhea	82.0	134.0	100.3	93.9	81.5	85.1	85.4	99.2	97.2	131.8	89.8
Granuloma inguinale	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haemophilus influenzae infection, invasive	1.0	1.2	1.1	1.1	1.3	1.2	1.2	1.1	1.5	1.7	1.3
Hantavirus pulmonary syndrome	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hemolytic uremic syndrome	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Hepatitis A	1.2	0.7	0.5	0.7	0.4	0.6	0.4	0.3	0.6	2.3	0.5
Hepatitis B, acute	1.9	1.7	1.4	1.2	1.0	1.0	0.9	0.7	0.8	0.7	0.9
Hepatitis C, acute	0.1	0.1	0.1	0.2	0.3	0.9	0.5	0.6	0.6	0.9	0.6
HIV disease~	10.9	10.9	18.4	15.1	13.6	13.6	14.1	13.2	12.8	11.0	13.4
Influenza	110.1	318.7	522.8	31.3	226.9	236.5	336.7	443.8	25.2	192.0	253.5
Influenza-associated deaths in children**	0.2	0.2	0.4	0.0	0.3	0.1	0.1	0.4	0.1	0.1	0.2
Kawasaki syndrome	0.0	0.0	0.0	0.0	–	–	–	–	–	–	–
Lead - elevated blood levels in children***	24.7	19.0	24.0	21.3	16.7	12.2	10.0	15.9	13.6	57.5	13.7
Legionellosis	0.8	0.9	0.9	1.0	1.2	0.9	1.5	1.6	1.7	1.7	1.4
Leprosy (Hansen disease)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Listeriosis	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.3	0.3	0.3	0.3
Lyme disease	12.5	12.1	11.7	15.8	12.8	13.7	16.0	16.3	18.5	16.1	15.5
Lymphogranuloma venereum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malaria	0.9	0.6	0.8	0.8	1.0	0.8	0.9	0.9	0.8	0.9	0.9
Measles	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Table 2b. Ten-Year Trend in Incidence Rate per 100,000 Population for Reportable Diseases, Virginia, 2007-2016 (continued)

Disease	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Previous 5-yr Annual Rate
Meningococcal disease	0.3	0.3	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Monkeypox	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mumps	0.4	0.1	0.1	0.2	0.2	0.1	1.3	0.2	0.4	0.2	0.4
Ophthalmia neonatorum	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1
Pertussis	1.7	2.6	2.9	4.9	5.0	7.7	5.1	6.1	4.4	2.7	5.7
Plague	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poliovirus infection, including poliomyelitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Psittacosis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q fever	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rabies in humans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rubella, including congenital rubella syndrome	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmonellosis	16.3	15.1	14.1	15.4	15.1	14.1	12.8	13.9	14.2	14.2	14.0
Severe acute respiratory syndrome (SARS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shigellosis	2.6	4.0	2.5	1.8	1.3	1.1	1.4	2.6	3.8	4.3	2.1
Smallpox	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spotted fever rickettsiosis, including RMSF	1.6	2.0	0.7	1.8	2.9	5.7	4.3	4.5	3.6	3.7	4.2
Staphylococcus aureus infection, invasive (MRSA)	3.3	19.8	14.5	15.2	16.3	16.0	15.2	13.7	13.7	11.3	15.0
Staphylococcus aureus infection, VISA or VRSA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Streptococcal disease, Group A, invasive or TSS	2.1	1.9	2.2	2.4	2.4	2.1	2.3	2.5	2.7	2.9	2.4
Streptococcus pneumoniae infection, invasive****	10.2	10.0	9.0	11.1	6.5	7.1	7.3	3.7	5.4	7.0	6.0
Syphilis, early	5.3	6.5	6.8	7.0	6.3	7.3	8.3	6.7	8.9	12.8	7.5
Tetanus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Toxic shock syndrome (Staphylococcal)	0.0	0.0	0.0	0.0	–	–	–	–	–	–	–
Toxic substance-related illness	5.7	4.6	4.4	3.8	3.4	3.9	3.7	4.3	4.6	10.3	4.0
Trichinosis (Trichinellosis)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tuberculosis	4.0	3.8	3.5	3.4	2.8	2.9	2.2	2.4	2.5	2.4	2.6
Tularemia	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Typhoid fever	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Vaccinia, disease or adverse event	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vibrio infection	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.7	0.5	0.5	0.5
Viral hemorrhagic fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yersiniosis	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.3	0.2	0.3	0.2

~ Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

– Not a reportable disease at this time.

* Condition is reportable only in individuals < 55 years of age.

** Condition is reportable only in children < 18 years of age.

*** Condition is reportable only in children < 16 years of age.

**** Condition is reportable only in children < 5 years of age.

Table 3. Number of Reported Cases of Selected Diseases and Rate per 100,000 by Age Group, Virginia, 2016

Disease	<1 year		1-9 years		10-19 years		20-29 years		30-39 years		40-49 years		50-59 years		60+ years		Unk.
Population:	102,863		930,662		1,059,818		1,199,023		1,131,723		1,104,698		1,177,195		1,677,011		
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	
Amebiasis	1	1.0	3	0.3	5	0.5	5	0.4	6	0.5	4	0.4	13	1.1	2	0.1	0
Arboviral disease	1	1.0	2	0.2	12	1.1	44	3.7	33	2.9	26	2.4	25	2.1	11	0.7	0
Campylobacteriosis	36	35.0	152	16.3	105	9.9	216	18.0	180	15.9	200	18.1	247	21.0	441	26.3	3
Chickenpox (Varicella)	38	36.9	107	11.5	50	4.7	27	2.3	27	2.4	24	2.2	7	0.6	4	0.2	0
Chlamydia trachomatis infection	3	2.9	3	0.3	10,273	969.3	23,391	1,950.8	4,393	388.2	973	88.1	354	30.1	84	5.0	61
Cryptosporidiosis	2	1.9	36	3.9	15	1.4	37	3.1	41	3.6	30	2.7	29	2.5	54	3.2	0
Ehrlichiosis/Anaplasmosis	0	0.0	0	0.0	5	0.5	4	0.3	11	1.0	10	0.9	26	2.2	59	3.5	0
E. coli infection, Shiga toxin-producing	6	5.8	43	4.6	29	2.7	22	1.8	12	1.1	9	0.8	4	0.3	14	0.8	0
Giardiasis	1	1.0	36	3.9	19	1.8	57	4.8	53	4.7	49	4.4	47	4.0	55	3.3	0
Gonorrhea	2	1.9	4	0.4	2,028	191.4	6,066	505.9	1,929	170.4	604	54.7	310	26.3	91	5.4	12
Haemophilus influenzae infection, invasive	8	7.8	8	0.9	1	0.1	5	0.4	5	0.4	12	1.1	22	1.9	81	4.8	0
Hemolytic uremic syndrome	0	0.0	2	0.2	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Hepatitis A	0	0.0	2	0.2	27	2.5	32	2.7	33	2.9	33	3.0	36	3.1	27	1.6	0
Hepatitis B, acute	0	0.0	0	0.0	1	0.1	3	0.3	26	2.3	8	0.7	14	1.2	4	0.2	0
Hepatitis C, acute	0	0.0	0	0.0	1	0.1	26	2.2	20	1.8	12	1.1	11	0.9	3	0.2	0
HIV disease*	1	1.0	0	0.0	40	3.8	368	30.7	234	20.7	134	12.1	104	8.8	37	2.2	0
Lead - elevated blood levels in children**	53	51.5	848	91.1	54	8.6	-	-	-	-	-	-	-	-	-	-	0
Legionellosis	0	0.0	0	0.0	1	0.1	1	0.1	7	0.6	16	1.4	36	3.1	83	4.9	0
Listeriosis	1	1.0	0	0.0	0	0.0	2	0.2	1	0.1	1	0.1	4	0.3	14	0.8	0
Lyme disease	0	0.0	171	18.4	180	17.0	121	10.1	138	12.2	159	14.4	222	18.9	359	21.4	0
Malaria	0	0.0	4	0.4	8	0.8	9	0.8	21	1.9	9	0.8	17	1.4	6	0.4	0
Measles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Meningococcal disease	1	1.0	0	0.0	3	0.3	1	0.1	0	0.0	0	0.0	3	0.3	2	0.1	0
Mumps	1	1.0	0	0.0	0	0.0	4	0.3	2	0.2	5	0.5	3	0.3	2	0.1	0
Pertussis	25	24.3	64	6.9	62	5.9	5	0.4	15	1.3	10	0.9	21	1.8	23	1.4	0
Q fever	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Salmonellosis	75	72.9	224	24.1	115	10.9	150	12.5	121	10.7	113	10.2	115	9.8	279	16.6	1
Shigellosis	4	3.9	142	15.3	44	4.2	51	4.3	46	4.1	20	1.8	24	2.0	27	1.6	0
Spotted fever rickettsiosis, including RMSF	0	0.0	8	0.9	27	2.5	41	3.4	33	2.9	52	4.7	62	5.3	89	5.3	0
Staphylococcus aureus infection, invasive (MRSA)	15	14.6	15	1.6	7	0.7	55	4.6	62	5.5	91	8.2	149	12.7	557	33.2	0
Streptococcal disease, Group A, invasive or TSS	3	2.9	10	1.1	2	0.2	21	1.8	24	2.1	29	2.6	37	3.1	114	6.8	0
Streptococcus pneumoniae, invasive***	17	16.5	19	4.6	-	-	-	-	-	-	-	-	-	-	-	-	0
Syphilis, early	0	0.0	0	0.0	53	5.0	484	40.4	283	25.0	131	11.9	101	8.6	20	1.2	0
Tuberculosis	0	0.0	4	0.4	9	0.8	38	3.2	33	2.9	34	3.1	31	2.6	56	3.3	0
Typhoid fever	0	0.0	2	0.2	6	0.6	4	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0
Vibrio infection	0	0.0	5	0.5	0	0.0	2	0.2	1	0.1	6	0.5	8	0.7	18	1.1	0

- Not reportable at this age.

***** Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

****** Condition is reportable only in children < 16 years of age. Rates are based on 0-15 year old population.

******* Condition is reportable only in children < 5 years of age. Rates are based on 0-4 year old population.

Table 4. Number of Reported Cases of Selected Diseases and Rate per 100,000 by Race, Virginia, 2016

Disease	Total	Black		White		Other		Unk.
Population:	8,382,993	1,729,691		6,003,584		649,718		
		N	Rate	N	Rate	N	Rate	N
Amebiasis	39	1	0.1	8	0.1	3	0.5	27
Arboviral disease	154	8	0.5	81	1.3	5	0.8	60
Campylobacteriosis	1,580	113	6.5	876	14.6	58	8.9	533
Chickenpox (Varicella)	284	22	1.3	148	2.5	22	3.4	92
Chlamydia trachomatis infection	39,535	15,216	879.7	7,866	131.0	2,292	352.8	14,161
Cryptosporidiosis	244	33	1.9	139	2.3	10	1.5	62
Ehrlichiosis/Anaplasmosis	115	4	0.2	56	0.9	0	0.0	55
E. coli infection, Shiga toxin-producing	139	5	0.3	83	1.4	4	0.6	47
Giardiasis	317	18	1.0	90	1.5	14	2.2	195
Gonorrhea	11,046	6,516	376.7	1,505	25.1	437	67.3	2,588
Haemophilus influenzae infection, invasive	142	31	1.8	82	1.4	7	1.1	22
Hemolytic uremic syndrome	4	0	0.0	4	0.1	0	0.0	0
Hepatitis A	190	16	0.9	120	2.0	8	1.2	46
Hepatitis B, acute	56	14	0.8	32	0.5	0	0.0	10
Hepatitis C, acute	73	5	0.3	47	0.8	2	0.3	19
HIV disease*	918	544	31.5	222	3.7	152	23.4	0
Lead - elevated blood levels in children**	955	150	38.4	173	15.3	108	76.6	524
Legionellosis	144	53	3.1	76	1.3	1	0.2	14
Listeriosis	23	2	0.1	14	0.2	3	0.5	4
Lyme disease	1,350	25	1.4	607	10.1	19	2.9	699
Malaria	74	54	3.1	4	0.1	1	0.2	15
Measles	1	0	0.0	0	0.0	1	0.2	0
Meningococcal disease	10	1	0.1	8	0.1	0	0.0	1
Mumps	17	2	0.1	10	0.2	0	0.0	5
Pertussis	225	15	0.9	137	2.3	5	0.8	68
Q fever	0	0	0.0	0	0.0	0	0.0	0
Salmonellosis	1,193	134	7.7	567	9.4	43	6.6	449
Shigellosis	358	135	7.8	122	2.0	8	1.2	93
Spotted fever rickettsiosis, including RMSF	312	12	0.7	121	2.0	3	0.5	176
Staphylococcus aureus infection, invasive (MRSA)	951	215	12.4	542	9.0	7	1.1	187
Streptococcal disease, Group A, invasive or TSS	240	44	2.5	149	2.5	2	0.3	45
Streptococcus pneumoniae, invasive***	36	8	6.6	17	4.8	2	4.7	9
Syphilis, early	1,072	612	35.4	277	4.6	82	12.6	101
Tuberculosis	205	50	2.9	62	1.0	93	14.3	0
Typhoid fever	12	1	0.1	1	0.0	7	1.1	3
Vibrio infection	40	6	0.3	21	0.3	0	0.0	13

* Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

** Condition is reportable only in children < 16 years of age. Rates are based on 0-15 year old population.

*** Condition is reportable only in children < 5 years of age. Rates are based on 0-4 year old population.

Table 5. Number of Reported Cases of Selected Diseases and Rate per 100,000 by Sex, Virginia, 2016

Disease	Total	Female		Male		Unk.
Population:	8,382,993	4,258,228		4,124,765		
		N	Rate	N	Rate	N
Amebiasis	39	15	0.4	22	0.5	2
Arboviral disease	154	92	2.2	62	1.5	0
Campylobacteriosis	1,580	752	17.7	821	19.9	7
Chickenpox (Varicella)	284	132	3.1	151	3.7	1
Chlamydia trachomatis infection	39,535	26,098	612.9	13,319	322.9	118
Cryptosporidiosis	244	152	3.6	91	2.2	1
Ehrlichiosis/Anaplasmosis	115	41	1.0	74	1.8	0
E. coli infection, Shiga toxin-producing	139	87	2.0	51	1.2	1
Giardiasis	317	115	2.7	202	4.9	0
Gonorrhea	11,046	5,046	118.5	5,972	144.8	28
Haemophilus influenzae infection, invasive	142	76	1.8	66	1.6	0
Hemolytic uremic syndrome	4	3	0.1	1	0.0	0
Hepatitis A	190	102	2.4	88	2.1	0
Hepatitis B, acute	56	23	0.5	32	0.8	1
Hepatitis C, acute	73	42	1.0	31	0.8	0
HIV disease*	918	157	3.7	761	18.4	0
Lead - elevated blood levels in children**	955	463	56.9	490	57.8	2
Legionellosis	144	66	1.5	78	1.9	0
Listeriosis	23	12	0.3	11	0.3	0
Lyme disease	1,350	617	14.5	730	17.7	3
Malaria	74	29	0.7	45	1.1	0
Measles	0	0	0.0	0	0.0	0
Meningococcal disease	10	8	0.2	2	0.0	0
Mumps	17	6	0.1	11	0.3	0
Pertussis	225	129	3.0	96	2.3	0
Q fever	0	0	0.0	0	0.0	0
Salmonellosis	1,193	625	14.7	564	13.7	4
Shigellosis	358	191	4.5	165	4.0	2
Spotted fever rickettsiosis, including RMSF	312	108	2.5	204	4.9	0
Staphylococcus aureus infection, invasive (MRSA)	951	390	9.2	558	13.5	3
Streptococcal disease, Group A, invasive or TSS	240	117	2.7	123	3.0	0
Streptococcus pneumoniae, invasive***	36	16	6.4	20	7.6	0
Syphilis, early	1,072	153	3.6	916	22.2	3
Tuberculosis	205	102	2.4	103	2.5	0
Typhoid fever	12	6	0.1	6	0.1	0
Vibrio infection	40	10	0.2	30	0.7	0

* Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

** Condition is reportable only in children < 16 years of age. Rates are based on 0-15 year old population.

*** Condition is reportable only in children < 5 years of age. Rates are based on 0-4 year old population.

Table 6. Number of Reported Cases of Selected Diseases and Rate per 100,000 by Health Planning Region, Virginia, 2016

Disease	Total		Northwest Region		Northern Region		Southwest Region		Central Region		Eastern Region	
Population:	8,382,993		1,302,405		2,447,654		1,356,177		1,421,951		1,854,806	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Amebiasis	39	0.5	4	0.3	24	1.0	2	0.1	4	0.3	5	0.3
Arboviral disease	154	1.8	22	1.7	84	3.4	15	1.1	20	1.4	13	0.7
Campylobacteriosis	1,580	18.8	441	33.9	546	22.3	175	12.9	196	13.8	222	12.0
Chickenpox (Varicella)	284	3.4	45	3.5	148	6.0	31	2.3	36	2.5	24	1.3
Chlamydia trachomatis infection	39,535	471.6	3,755	288.3	7,669	313.3	4,690	345.8	9,425	662.8	13,996	754.6
Cryptosporidiosis	244	2.9	45	3.5	79	3.2	24	1.8	18	1.3	78	4.2
Ehrlichiosis/Anaplasmosis	115	1.4	28	2.1	12	0.5	32	2.4	28	2.0	15	0.8
E. coli infection, Shiga toxin-producing	139	1.7	41	3.1	58	2.4	26	1.9	7	0.5	7	0.4
Giardiasis	317	3.8	48	3.7	151	6.2	30	2.2	32	2.3	56	3.0
Gonorrhea	11,046	131.8	542	41.6	1,364	55.7	1,317	97.1	3,402	239.2	4,421	238.4
Haemophilus influenzae infection, invasive	142	1.7	28	2.1	26	1.1	29	2.1	31	2.2	28	1.5
Hemolytic uremic syndrome	4	0.0	2	0.2	2	0.1	0	0.0	0	0.0	0	0.0
Hepatitis A	190	2.3	58	4.5	76	3.1	12	0.9	17	1.2	27	1.5
Hepatitis B, acute	56	0.7	4	0.3	3	0.1	21	1.5	19	1.3	9	0.5
Hepatitis C, acute	73	0.9	30	2.3	5	0.2	23	1.7	11	0.8	4	0.2
HIV disease*	918	11.0	66	5.1	251	10.3	59	4.4	217	15.3	325	17.5
Influenza	16,092	192.0	3,681	282.6	3,592	146.8	3,783	278.9	2,050	144.2	2,986	161.0
Lead - elevated blood levels in children**	955	57.5	121	47.5	329	61.4	139	59.3	221	81.4	145	39.7
Legionellosis	144	1.7	18	1.4	23	0.9	29	2.1	39	2.7	35	1.9
Listeriosis	23	0.3	4	0.3	6	0.2	4	0.3	7	0.5	2	0.1
Lyme disease	1,350	16.1	321	24.6	467	19.1	470	34.7	58	4.1	34	1.8
Malaria	74	0.9	6	0.5	57	2.3	0	0.0	3	0.2	8	0.4
Measles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Meningococcal disease	10	0.1	3	0.2	4	0.2	2	0.1	1	0.1	0	0.0
Mumps	17	0.2	1	0.1	12	0.5	1	0.1	3	0.2	0	0.0
Pertussis	225	2.7	85	6.5	28	1.1	63	4.6	30	2.1	19	1.0
Q fever	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rabies in animals ~	348	-	105	-	65	-	71	-	40	-	67	-
Salmonellosis	1,193	14.2	229	17.6	314	12.8	164	12.1	219	15.4	267	14.4
Shigellosis	358	4.3	20	1.5	57	2.3	46	3.4	62	4.4	173	9.3
Spotted fever rickettsiosis, including RMSF	312	3.7	65	5.0	35	1.4	96	7.1	80	5.6	36	1.9
Staphylococcus aureus infection, invasive (MRSA)	951	11.3	182	14.0	168	6.9	235	17.3	223	15.7	143	7.7

Table 6. Number of Reported Cases of Selected Diseases and Rate per 100,000 by Health Planning Region, Virginia, 2015 (continued)

Disease	Total		Northwest Region		Northern Region		Southwest Region		Central Region		Eastern Region	
Population:	8,382,993		1,302,405		2,447,654		1,356,177		1,421,951		1,854,806	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Streptococcal disease, Group A, invasive or TSS	240	2.9	39	3.0	49	2.0	55	4.1	38	2.7	59	3.2
Streptococcus pneumoniae, invasive***	36	7.0	11	14.7	11	6.4	5	7.2	3	3.7	6	5.1
Syphilis, early	1,072	12.8	42	3.2	242	9.9	43	3.2	286	20.1	459	24.7
Tuberculosis	205	2.4	13	1.0	126	5.1	13	1.0	23	1.6	30	1.6
Typhoid fever	12	0.1	0	0.0	8	0.3	2	0.1	1	0.1	1	0.1
Vibrio infection	40	0.5	4	0.3	3	0.1	0	0.0	10	0.7	23	1.2

* Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

** Condition is reportable only in children < 16 years of age. Rates are based on 0-15 year old population.

~ Population rate is not applicable for rabies in animals. Data reflect number of positive rabies results.

*** Condition is reportable only in children < 5 years of age. Rates are based on 0-4 year old population.

Table 7. Number of Reported Cases of Selected Diseases by Quarter of Onset, Virginia, 2016

Disease	Total	Prior to 2016		1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
		N	%	N	%	N	%	N	%	N	%
Amebiasis	39	2	5.1	9	23.1	8	20.5	7	17.9	13	33.3
Arboviral disease	154	5	3.2	26	16.9	34	22.1	79	51.3	10	6.5
Campylobacteriosis	1,580	8	0.5	334	21.1	440	27.8	490	31.0	308	19.5
Chickenpox (Varicella)	284	0	0.0	67	23.6	83	29.2	68	23.9	66	23.2
Chlamydia trachomatis infection	39,535	0	0.0	8,250	20.9	11,862	30.0	9,704	24.5	9,719	24.6
Cryptosporidiosis	244	5	2.0	45	18.4	58	23.8	102	41.8	34	13.9
Ehrlichiosis/Anaplasmosis	115	0	0.0	3	2.6	49	42.6	56	48.7	7	6.1
E. coli infection, Shiga toxin-producing	139	2	1.4	27	19.4	34	24.5	54	38.8	22	15.8
Giardiasis	317	15	4.7	70	22.1	87	27.4	90	28.4	55	17.4
Gonorrhea	11,046	0	0.0	2,050	18.6	3,005	27.2	3,119	28.2	2,872	26.0
Haemophilus influenzae infection, invasive	142	2	1.4	35	24.6	35	24.6	27	19.0	43	30.3
Hemolytic uremic syndrome	4	0	0.0	2	50.0	1	25.0	0	0.0	1	25.0
Hepatitis A	190	1	0.5	20	10.5	32	16.8	129	67.9	8	4.2
Hepatitis B, acute	56	1	1.8	16	28.6	14	25.0	12	21.4	13	23.2
Hepatitis C, acute	73	2	2.7	21	28.8	18	24.7	18	24.7	14	19.2
HIV disease*	918	0	0.0	203	22.1	242	26.4	238	25.9	235	25.6
Influenza	16,092	0	0.0	7,694	47.8	6,209	38.6	73	0.5	2,116	13.1
Legionellosis	144	1	0.7	16	11.1	40	27.8	46	31.9	41	28.5
Listeriosis	23	0	0.0	3	13.0	7	30.4	10	43.5	3	13.0
Lyme disease	1,350	62	4.6	138	10.2	509	37.7	467	34.6	174	12.9
Malaria	74	0	0.0	11	14.9	17	23.0	26	35.1	20	27.0
Measles	1	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
Meningococcal disease	10	0	0.0	3	30.0	5	50.0	1	10.0	1	10.0
Mumps	17	0	0.0	4	23.5	3	17.6	4	23.5	6	35.3
Pertussis	225	2	0.9	55	24.4	38	16.9	43	19.1	87	38.7
Q fever	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Salmonellosis	1,193	4	0.3	168	14.1	307	25.7	490	41.1	224	18.8
Shigellosis	358	2	0.6	120	33.5	119	33.2	67	18.7	50	14.0
Spotted fever rickettsiosis, including RMSF	312	4	1.3	22	7.1	129	41.3	126	40.4	31	9.9
Staphylococcus aureus infection, invasive (MRSA)	951	2	0.2	300	31.5	288	30.3	301	31.7	60	6.3
Streptococcal disease, Group A, invasive or TSS	240	1	0.4	69	28.8	67	27.9	53	22.1	50	20.8
Streptococcus pneumoniae, invasive**	36	0	0.0	10	27.8	7	19.4	7	19.4	12	33.3
Syphilis, early	1,072	0	0.0	171	16.0	332	31.0	316	29.5	253	23.6
Typhoid fever	12	0	0.0	1	8.3	3	25.0	8	66.7	0	0.0
Vibrio infection	40	0	0.0	1	2.5	17	42.5	22	55.0	0	0.0

* Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

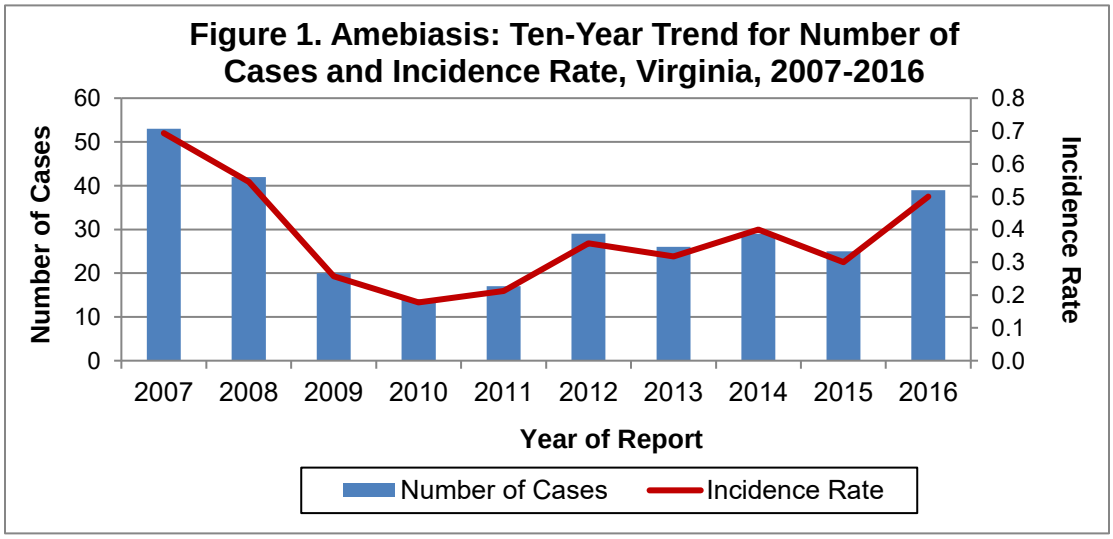
** Condition is reportable only in children < 5 years of age.

Amebiasis

Agent: *Entamoeba histolytica* (parasite)
Mode of Transmission: Ingestion of food or water contaminated with amebic cysts, by fecal-oral contact with an infected person, or by swallowing cysts picked up from contaminated surfaces or fingers.
Signs/Symptoms: Most infections are asymptomatic. Symptomatic infections are often mild and can include diarrhea, stomach pain, and stomach cramping. Amebic dysentery is a severe form of amebiasis associated with diarrhea (which may be bloody or contain mucus), fever, and chills. In a small number of cases, the parasite invades other body sites, such as the liver, lung, brain, or skin.
Prevention: Hands should be washed carefully after using the bathroom, after changing diapers or cleaning a child who has used the bathroom, and before preparing and eating food. When traveling to a country with poor sanitary conditions, do not eat or drink the following: fountain drinks or any drinks with ice cubes; fresh fruit or vegetables that you did not peel yourself; milk, cheese, or dairy products that may not have been pasteurized; anything sold by street vendors; or water unless it is bottled or has been boiled for 1 minute or made safe by filtering it through an "absolute 1 micron or less" filter and dissolving chlorine, chlorine dioxide, or iodine tablets in the filtered water.
Other Important Information: Amebiasis can affect anyone, but it is most common in people who live in tropical areas with poor sanitary conditions. In the United States, it is mainly seen in people who travel to or emigrate from these tropical areas, people living in institutions with poor sanitary conditions, and in men who have sex with men.

Amebiasis: 2016 Data Summary	
Number of Cases:	39
5-Year Average Number of Cases:	25.2
% Change from 5-Year Average:	+55%
Incidence Rate per 100,000:	0.5

Thirty-nine cases of amebiasis were reported in Virginia during 2016, which was noticeably higher than the 25 cases reported in 2015, and 55% higher than the five-year average of 25.2 cases per year (Figure 1). In 2009, the national surveillance case definition was changed and

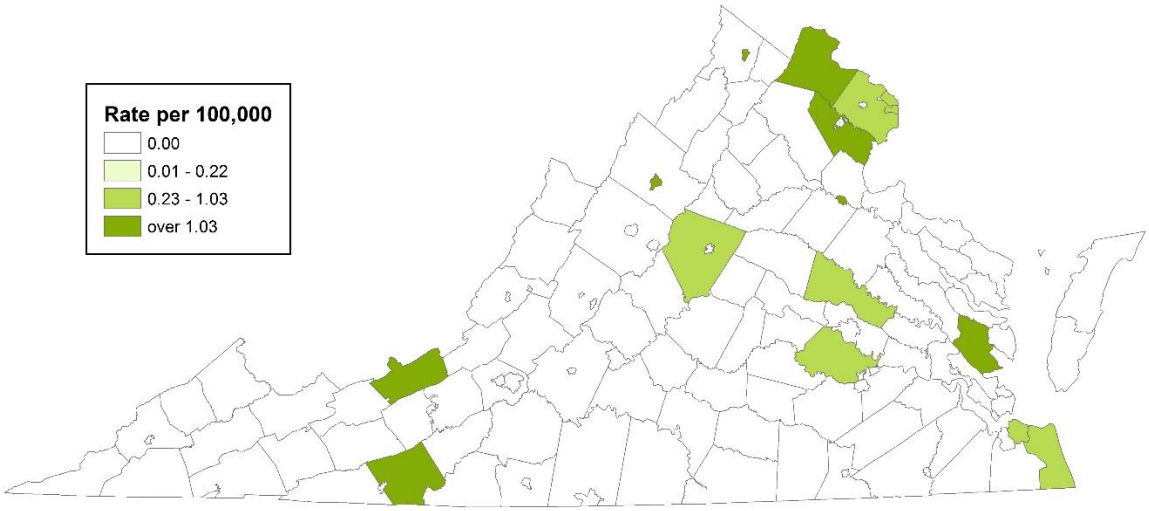


required that individuals with laboratory-confirmed infection also be symptomatic to be counted for surveillance purposes. Since 2012, the number of newly reported cases has remained stable, with the first increase occurring in 2016.

Among cases reported in 2016, the highest number of cases and incidence rate occurred in the 50-59 year age group (13 cases, 1.1 per 100,000). This was followed closely by the less than 1 year age group with an incidence rate of 1.0 per 100,000. All other age groups had rates that ranged from 0.3 to 0.5 per 100,000 population. Race was reported for just 31% of the cases and, therefore, cannot be an accurate demographic indicator for this condition. Incidence was slightly higher in males (0.5 per 100,000) than females (0.4 per 100,000).

Twenty-four of the thirty-nine cases of amebiasis were reported from the northern health planning region (incidence rate of 1.0 per 100,000). Five cases were reported from the eastern region (0.3 per 100,000) and four cases each from the central and northwest regions (0.3 per 100,000 population each). Two cases were reported from the southwest region (0.1 per 100,000). For incidence rates by locality, please see the map below. Cases occurred throughout the year, with 33% being reported during the fourth quarter (October through December). No outbreaks or deaths attributed to amebiasis were reported in Virginia in 2016.

Amebiasis Incidence Rate by Locality
Virginia, 2016



Anthrax

Agent: *Bacillus anthracis* (spore-forming bacteria)
Mode of Transmission: By direct contact with contaminated animal products; ingestion of contaminated, undercooked meat; and inhalation of spores during certain animal-related industrial practices (e.g., processing wool or hides) or through an intentional bioterrorism release of spores.
Signs/Symptoms: The type of illness that occurs depends on how anthrax enters the body. Cutaneous anthrax occurs when the bacteria enter a cut or abrasion on the skin and presents as a skin lesion that often develops a black scab. Intestinal anthrax occurs after the ingestion of contaminated meat and presents as abdominal distress (e.g., nausea, vomiting, diarrhea, fever). Inhalation anthrax, considered the most dangerous form, occurs when the bacteria are inhaled; the symptoms are initially nonspecific, (e.g., fever, cough, chest pain), but progress to respiratory distress and possible death. All types of anthrax can spread throughout the body and cause death if not treated properly.
Prevention: Contact with infected animals and animal products should be minimal. A vaccine is available to immunize high-risk individuals, such as laboratorians who work with *B. anthracis* or military personnel.
Other Important Information: Person-to-person transmission is very rare. The incubation period, or time from exposure to onset of symptoms, ranges from 1 to 60 days. Anthrax is classified as a potential bioweapon because it can cause serious public health problems, be spread across a large area, and require extensive planning to protect the public's health.

No cases of anthrax have been reported in Virginia since 2001. In 2001, two Virginia residents were reported with inhalation anthrax from an intentional release of *Bacillus anthracis* spores through a letter received by the U.S. Postal Service. Both individuals were exposed at their workplace and both survived. These represented the first reported cases of anthrax in Virginia since 1970.

Arboviral Disease[1]

Agent(s): In Virginia, the agents of arboviral infection, from most to least common, are the mosquito-borne West Nile virus (WNV), La Crosse encephalitis (LAC) virus, St. Louis encephalitis (SLE) virus and Eastern equine encephalitis (EEE) virus. Other arboviral agents causing illness in Virginians include imported Zika virus, dengue virus (DENV I-IV) and chikungunya virus (CHIKV), which typically infect travelers to endemic regions of the tropics and subtropics, but have not become established in Virginia's mosquito population. Virginia has also had cases of Zika virus via other routes of transmission. Powassan (POW) virus, which is a tick-borne encephalitis virus, was discovered in Virginia in 2009.

Mode of Transmission: Most commonly through the bite of an infected mosquito. WNV and Zika virus may also be transmitted by blood products via transfusion or transplanted organs from infected donors, and more rarely by cuts or punctures with contaminated scalpels or needles in a laboratory. Zika virus may also be sexually transmitted and transmitted from a mother to her fetus during pregnancy or around the time of birth. There has been one case of unknown transmission of Zika virus in the U.S., and the route of transmission is suspected to be close personal contact with a patient with an uncharacteristically high level of viremia.

Signs/Symptoms: Severity of symptoms differs depending on the particular virus and characteristics of the infected person. Most infections are asymptomatic. Mild cases may appear as fever with headache. More severe disease can cause encephalitis (i.e., inflammation of the brain) or meningitis (i.e., inflammation of the lining of the brain and spinal cord) and may lead to long term or permanent neurological impairment, or death. Dengue virus serotypes may cause fever, headache, body pain and a rash as well as mild or severe hemorrhagic symptoms in some patients. Chikungunya causes fever, headache, rashes, and severe, debilitating joint pain/arthritis in joints of the extremities (hands, arms, feet and legs). Unlike other arboviral diseases, Zika virus is less likely to cause encephalitis or meningitis, but has been linked to Guillain-Barré syndrome (GBS) and other neurological manifestations. Zika virus may cause several or more of the following symptoms, including a rash, myalgia, headache, fever, arthralgia or arthritis, and eye pain, as well as conjunctivitis. Zika virus can also cause congenital infections which may lead to fetal loss, ocular abnormalities, neural tube defects, microcephaly, or a distinct pattern of other birth defects, called congenital Zika syndrome. Congenital Zika syndrome is characterized by one or more of the following features: severe microcephaly with a partially collapsed skull, decreased brain tissue with a specific pattern of brain damage, damage to the back of the eye, joints with limited range of motion, or too much muscle tone that restricts body movement soon after birth.

Prevention: Minimize bites by avoiding areas infested by mosquitoes or ticks, and, when in those areas, use mosquito or tick repellents and wear long-sleeved, light-colored clothing with pants legs tucked into socks. Additional mosquito control measures include

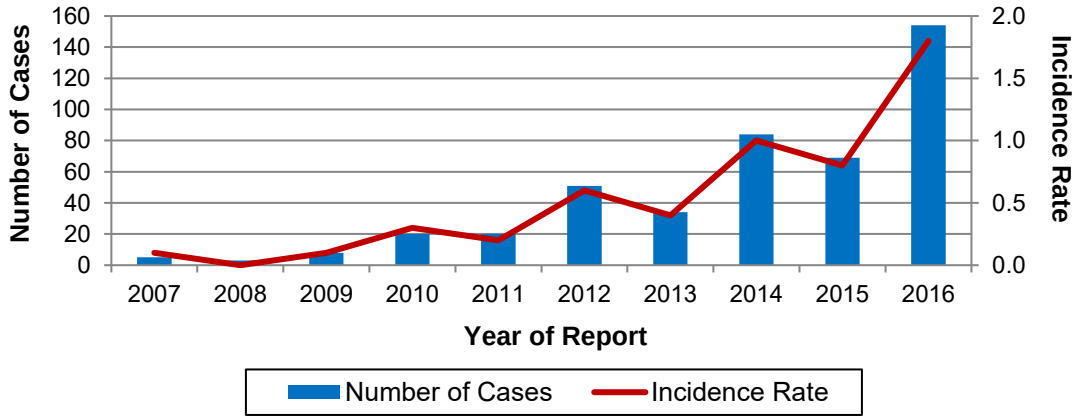
[1] The title of the arboviral section was changed from Arboviral Infection to Arboviral Disease to reflect the incorporation of Zika virus into the arboviral section. Zika virus disease and Zika virus infection cases are reported by VDH to the Centers for Disease Control and Prevention (CDC); however, only Zika virus disease cases are reported externally by CDC and VDH. The Virginia Reportable Disease List will continue to require reporting of all Arboviral infections.

maintaining screens on all open windows and doors and eliminating or regularly dumping all containers that could hold water and breed mosquitoes, including buckets, birdbaths and discarded tires. After visiting tick habitats, a person should thoroughly check all body surfaces for ticks and, if found, carefully remove attached ticks as soon as possible. Zika can also be prevented by practicing safe sex habits, by properly using a condom if a partner has traveled to an area with risk of Zika, or by abstaining from sex. Women with possible exposure to Zika virus should follow these recommendations for at least eight weeks, and men should follow these recommendations for at least six months. Blood collection centers in the U.S. and U.S. Territories began screening all donations for Zika virus with an individual donor nucleic acid test in 2016. All screening test positive donations are removed from the blood supply and undergo confirmatory testing.

Other Important Information: WNV and SLE infections are more likely to cause severe disease in persons over the age of 50, but the majority of infections are asymptomatic. LAC is seen primarily in individuals less than 16 years of age. EEE has a high fatality rate and is more likely to affect children under the age of 15 and adults over the age of 50 years. Dengue or chikungunya may affect persons of all ages. Dengue, chikungunya, and Zika viruses are found primarily in the tropical regions of the world, and travelers to those regions may become infected and return to Virginia carrying one of these viruses. In Virginia, Asian tiger mosquitoes, and the rare yellow fever mosquito, are capable of becoming infected with dengue, chikungunya or Zika if they bite an infected traveler, which could potentially result in local mosquito-borne transmission of these viruses.

Arboviral Disease: 2016 Data Summary	
Number of Cases:	154
5-Year Average Number of Cases:	51.6
% Change from 5-Year Average:	+191%
Incidence Rate per 100,000:	1.8

Figure 2. Human Arboviral Disease: Ten Year Trend for number of Cases and Incidence Rate, Virginia, 2007-2016



Human

In 2016, the World Health Organization (WHO) declared Zika virus a public health emergency of international concern, and the disease became a reportable condition in the United States. The Centers for Disease Control and Prevention (CDC) also released interim case definitions for Zika virus cases. The Virginia Department of Health has reported Zika virus cases to the CDC Arboviral Diseases Branch since January 2016. VDH case counts for Zika virus disease in 2016 will not match those reported by CDC because four of the cases had onset in 2015 and are included in the CDC case counts for 2015, but in the VDH case counts for 2016.

In 2016, 154 cases of arboviral disease were reported in Virginia. This case count is substantially higher than the previous 5-year average of 51.6 cases per year. The incidence of arboviral disease increased from 0.8 cases per 100,000 in 2015 to 1.8 cases per 100,000 in 2016 (Figure 2). The higher number of reported arboviral disease cases in 2016 compared to 2015 was attributed to the 2015-2016 Zika virus outbreak in the Americas. When Zika cases are excluded, the number of arboviral disease cases actually decreased from 69 in 2015 to 41 in 2016.

The majority (92%) of arboviral disease cases were acquired through travel to another country, and 1% were acquired indirectly due to travel (i.e., local sexual transmission by a sexual partner who traveled to a Zika affected country). One Zika virus disease case was acquired in Florida during the time of active local mosquito-borne Zika virus transmission. Two Zika virus disease cases were acquired via sexual transmission, and one case was transmitted transplacentally. There were no locally acquired cases of Zika from infected mosquitoes in Virginia. All six chikungunya virus disease cases were acquired during travel to foreign countries. The seven West Nile virus cases were determined to be acquired in the U.S., six in Virginia and one in Florida. No cases of La Crosse encephalitis, St. Louis encephalitis, Eastern equine encephalitis or Powassan virus were reported in 2016.

Zika virus disease occurred in every age group, with most cases being reported from the 20-29 year age group, followed by the 30-39 year age group. The median age was 33 years. Seventy-three (65%) Zika virus disease cases occurred in females and 40 (35%) occurred in males.

The Virginia Department of Health participates in CDC's U.S. Zika Pregnancy Registry (USZPR). Information is collected for the USZPR when a pregnant woman or her infant have laboratory evidence of Zika virus. The additional information helps to plan and support future clinical care recommendations, services, and prevention strategies. The USZPR reports data for three pregnancy outcomes: completed pregnancies with or without birth defects; liveborn infants with birth defects; and pregnancy losses with birth defects. In 2016, Virginia identified 50 completed pregnancies with or without birth defects, two liveborn infants with birth defects, and one pregnancy loss with birth defects.

The 24 asymptomatic Zika virus infection cases reported in Virginia in 2016 are not included in this report. Only those cases that meet clinical criteria for Zika virus disease are included.

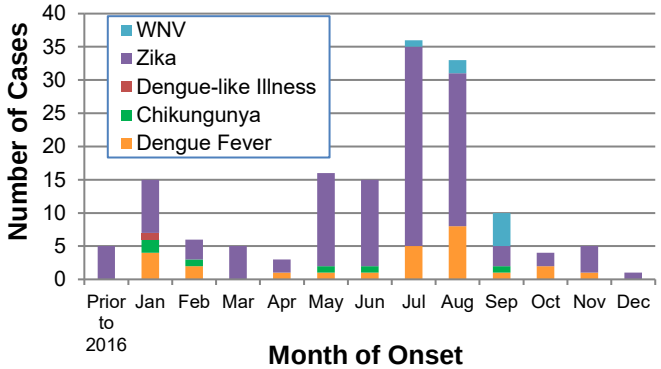
Six chikungunya virus disease cases were reported in 2016, with five cases being reported among persons 30-49 years of age and one case among those 60 years and older. Four cases were female and two cases were male. Two cases occurred in persons who traveled to India, and the remaining four cases were associated with travel to Central and South America. India has had a re-emergence of chikungunya since 2006, and chikungunya cases associated with travel to the American tropics resulted from the introduction and spread of the virus into the tropical Americas beginning in 2013.

All 27 dengue cases occurred among people who traveled to dengue endemic countries of Central America, South America, the Caribbean, or south Asia. The age range of persons with dengue virus infection was 18-77 years. Twelve (44%) of the 27 dengue cases were female. While no cases of dengue hemorrhagic fever were reported in 2016, one case of dengue-like illness was reported.

The number of WNV cases substantially decreased in 2016. Eight cases were reported in 2016, compared to 21 cases in 2015. The age range was 11 to 94 years of age. Cases occurred in four regions of the state; three in the northern region, two in the central region, two in the northwest, and one in the southwest region. No fatalities were attributed to WNV in 2016.

Arboviral cases occurred throughout the year, but locally-acquired arboviral infection (WNV) occurred only from July through September (Figure 3). Cases of imported dengue were reported nearly year round, except March and December, while cases of imported chikungunya were reported in three time periods of the year, January – February, May – June, and September. As these diseases were acquired out of the country, any seasonality would be based on travel patterns and seasonality of the illness in the endemic countries of origin.

Figure 3. Human Arboviral Disease: Month of Onset, Virginia, 2016



Animal

Several jurisdictions in Virginia have surveillance programs that routinely test for the presence of arboviruses in mosquitoes and sentinel chickens. These jurisdictions are limited to northern Virginia, the Richmond metropolitan area, and Hampton Roads. While jurisdictions in all three regions perform surveillance for WNV, only jurisdictions located in the Hampton Roads region conduct surveillance for EEE. Sentinel chicken flocks are maintained by surveillance programs in the Hampton Roads area only. Veterinary records for other animals are also obtained from around the state by the Virginia Department of Agriculture and Consumer Services (VDACS) Veterinary Program; this agency surveys for cases of arboviral infection in equines and other animals statewide. There are no mosquito or zoonotic surveillance and testing programs in place for LAC or SLE viruses.

In 2016, arboviral surveillance programs tested 363,501 mosquitoes for WNV, 117,683 for EEE, and 67,688 for Zika virus. All mosquitoes were tested as "pools" (i.e., batches of approximately 20 to 50 mosquitoes). Of the 10,518 pools tested for WNV, less than 1% (n=88) tested positive. Of the 2,641 pools tested for EEE, 3% (n=90) tested positive. All 1,949 pools tested for Zika virus were negative. Among the positive pools, each was likely to have only contained one infected mosquito. Of the 88 WNV positive pools, 77 were collected in northern Virginia, 9 in eastern Virginia, and 2 in central Virginia. All of the EEE positive pools were collected in eastern Virginia.

In 2016, seven EEE-infected horses were reported across Virginia with six in the eastern region and one in the central region. Testing of sentinel chickens revealed four WNV-positive chickens in the Chesapeake and Suffolk area, and 25 EEE-positive chickens in the Chesapeake, Norfolk, Suffolk, and Virginia Beach area.

Botulism

Agent: Neurotoxin produced by *Clostridium botulinum* (spore-forming, anaerobic bacteria)
Mode of Transmission: For foodborne botulism, ingestion of food that contains toxin and has not been sufficiently heated to inactivate the toxin. For non-foodborne botulism, ingestion of food contaminated with spores that then germinate, multiply, and produce toxin in the intestine (also known as infant botulism or adult intestinal botulism, depending on the age of the patient); or contamination of wounds or open fractures with soil or gravel that contain *C. botulinum* spores (also known as wound botulism). *C. botulinum* is not transmitted from person to person.
Signs/Symptoms: Both foodborne and non-foodborne botulism can result in descending, flaccid paralysis which can lead to cessation of breathing and death unless respiration is aided. Additional distinguishing symptoms of foodborne botulism, which usually begin 12-36 hours after the toxin is ingested, but might be delayed for up to several days after exposure, include fatigue, weakness, vertigo, and sometimes diarrhea and vomiting. Infant botulism is characterized by constipation, weakness, loss of appetite, poor feeding or sucking, an altered cry and loss of head control. Symptoms of wound botulism are similar to those associated with foodborne botulism.
Prevention: For prevention of foodborne botulism, all canned and preserved food should be properly processed and prepared. Boiling food for 10 minutes will destroy the toxin. To prevent non-foodborne botulism, honey and corn syrup should not be given to children younger than 12 months of age because *C. botulinum* spores have been identified in these foods. Also, all wounds should be maintained properly and medical attention should be sought when wounds become infected.
Other Important Information: Botulism is a condition that requires rapid reporting to the local health department. Botulism antitoxin, released by public health authorities, is effective in reducing the severity of symptoms if administered early. Botulism is listed by CDC as a potential bioweapon because an aerosolized or foodborne botulinum-toxin weapon could cause widespread, severe disease and would require rapid public health response to control.

Foodborne

No cases of foodborne botulism were reported in Virginia during 2016. The last reported case in Virginia occurred in 2007 in an adult female.

Non-Foodborne (including infant, intestinal and wound botulism)

Five cases of non-foodborne botulism were reported in Virginia during 2016, with all five being infant botulism. Among the five infants, two were female and three were male. All five were reported from the white population. Three were from the northwest region, and one each from the central and eastern regions. All were caused by type B neurotoxin. The five infants survived and no risk factors were identified. The five-year average for non-foodborne botulism cases in Virginia is 2.2 cases per year.

Brucellosis

Agent: *Brucella* species (bacteria)
Mode of Transmission: Most commonly through ingestion of unpasteurized milk or milk products from infected animals, but also may be transmitted by contamination of skin wounds with infected animal tissue or body fluids and by inhalation of the organism.
Signs/Symptoms: Intermittent or irregular fever, headache, chills, sweating, and muscle pain. Some signs and symptoms may persist for longer periods of time, while others may never resolve.
Prevention: Unpasteurized dairy products, especially milk, cheese, or ice cream, should not be consumed. Barrier precautions, such as wearing rubber gloves, should be used when handling animal tissue. Laboratory workers should take proper infection control precautions when handling samples known to contain or suspected of containing *Brucella*.
Other Important Information: Considered an occupational disease of those working with infected animals, especially farm workers, veterinarians, and abattoir workers. Hunters of certain game animals such as elk, moose and feral swine may also be at increased risk of exposure. *Brucella* is listed by the CDC as a potential bioterrorism agent because the organism may be relatively easily disseminated, may cause moderate injury or death, and may need enhanced surveillance for detection.

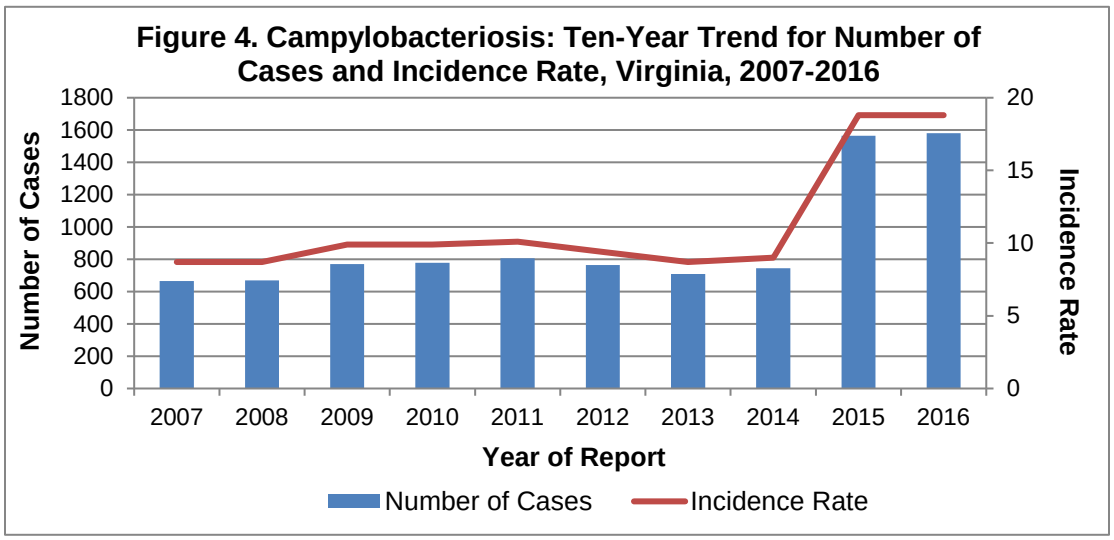
No cases of brucellosis were reported in 2016. Two cases of brucellosis were reported in Virginia in 2015. While consumption of unpasteurized milk and calving assistance while traveling in Central America were considered likely risk factors for illness for one case reported in 2015, a definitive exposure could not be determined for the other case. The 5-year average for number of cases of brucellosis in Virginia is approximately one case per year.

Campylobacteriosis

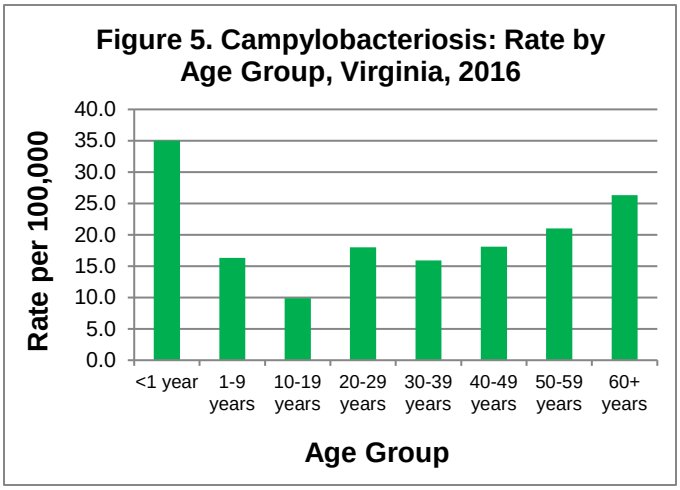
Agent: *Campylobacter* species (bacteria)
Mode of Transmission: Ingestion of undercooked meat, particularly poultry; ingestion of contaminated food, water, or raw milk; and direct contact with fecal material from infected animals or people.
Signs/Symptoms: Include diarrhea (frequently with bloody stools), abdominal pain, malaise, fever, nausea, or vomiting. In neonates and young infants, bloody diarrhea without fever may be the only manifestation of illness. Many infections are asymptomatic. Rarely, complications can develop, including reactive arthritis, febrile convulsions, or Guillain-Barré Syndrome; bacteremia can occur in children.
Prevention: Hands should be washed carefully after using the bathroom, after changing diapers or cleaning a child who has used the bathroom, after handling animals or their feces, and before preparing and eating food. Pasteurization of milk and chlorination of water supplies are also important. All foods containing eggs and meats, particularly poultry, should be cooked thoroughly.
Other Important Information: In 2015, a change was implemented to the campylobacteriosis case definition, allowing cases identified by the detection of *Campylobacter* species in a clinical specimen using a culture independent diagnostic test (CIDT) method to count as probable cases; prior to 2015, these cases were classified as suspect cases and were not included in campylobacteriosis case counts. Data regarding the performance of CIDTs indicate variability in the sensitivity, specificity, and positive predictive value of these assays depending on the manufacturer (CDC unpublished data). The use of CIDT methods by laboratories is increasing and may contribute to an increase in probable campylobacteriosis cases and a decline in confirmed campylobacteriosis cases.

Campylobacteriosis: 2016 Data Summary	
Number of Cases:	1,580
5-Year Average Number of Cases:	917.2
% Change from 5-Year Average:	+72%
Incidence Rate per 100,000:	18.8

In 2016, 1,580 cases of campylobacteriosis were reported in Virginia, including 741 confirmed cases and 839 probable cases. This represents a slight increase from the 1,564 cases (712 confirmed and 852 probable) reported in 2015, and a 72% increase from the five-year average of 917.2 cases per year (Figure 4). The dramatic increase in cases compared to the 5-year average number of cases is explained by a change in the national case definition that went into effect in 2015, as described above in Other Important Information. The 5-year average number of cases will continue to include counts established under the previous case definition until 2020.



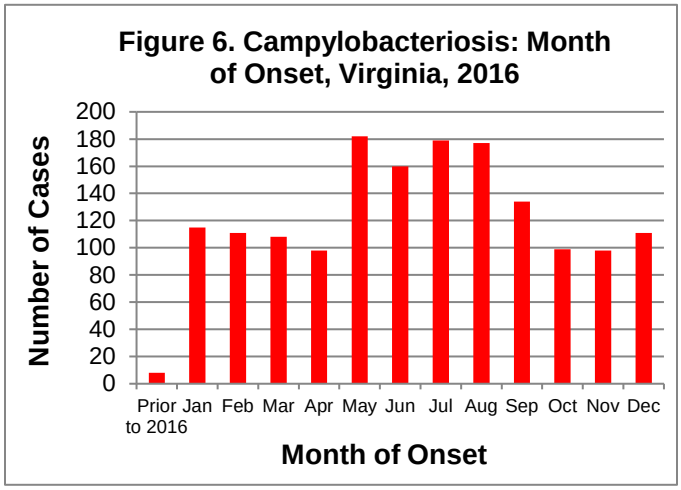
In Virginia, the highest incidence rates of *Campylobacter* infection are typically seen in children less than one year of age. In 2016, incidence was again highest among this age group, at 35.0 cases per 100,000 persons, while rates among other age groups ranged from 9.9 (10-19 years) to 26.3 (60 years and older) per 100,000 (Figure 5).

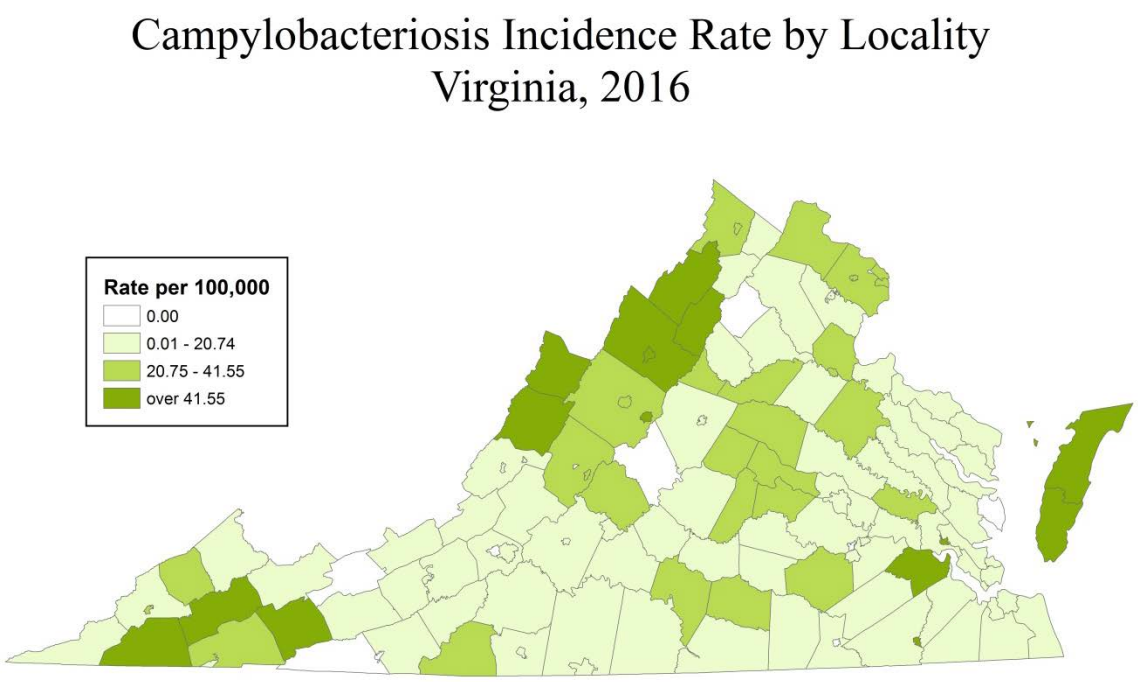


Race information was not reported for 34% of cases. For cases with a known race, incidence was highest among the white population (14.6 per 100,000), followed by the "other" race population (8.9 per 100,000), and the black population (6.5 per 100,000). Historically in Virginia, incidence is higher in males; this remained unchanged in 2016, with a rate of 19.9 per 100,000 among males and 17.7 per 100,000 among females.

Regionally, the highest incidence rate occurred in the northwest region (33.9 per 100,000), while the lowest rate was seen in the eastern region (12.0 per 100,000). Rates in the remaining regions ranged from 12.9 to 22.3 per 100,000. Of note, incidence in the northwest region was more than double the statewide rate of 18.8 per 100,000. The occurrence of campylobacteriosis varied widely by locality, with the highest rates tending to be reported from adjacent localities (see map below).

While cases were reported in every month of the year, more cases were seen during the warmer months, with an average of 174.5 cases each during the months of May through August (Figure 6). Three outbreaks of *Campylobacter* infection were reported during 2016. These outbreaks occurred in the eastern, northwest, and southwest regions and involved two private homes and one daycare/pre-K facility. Three deaths attributed to campylobacteriosis were reported in 2016. These deaths occurred in two adults from the 60 year and older age group and one adult from the 20 to 29 year age group.





Chancroid

Agent: *Haemophilus ducreyi* (bacteria)
Mode of Transmission: Sexual transmission through skin-to-skin contact with open sores. Transmission not related to sexual contact is rare. Auto-inoculation to non-genital sites from open sores may occur.
Signs/Symptoms: One or more sores or raised bumps on the genitals. Sores are surrounded by a narrow red border and become filled with purulent secretion, and eventually rupture, leaving a painful open lesion. The chancroid ulcer is soft to the touch. In 50% of untreated cases, the chancroid bacteria infect the lymph nodes in the groin.
Prevention: Preventive measures include adhering to safe sexual practices and abstaining from sexual relations with an infected partner until the infection is cleared.
Other Important Information: Chancroid is uncommon in the United States. Most cases are seen in tropical countries. This disease is a cofactor for HIV transmission; high rates of HIV infection among patients who have chancroid are seen worldwide.

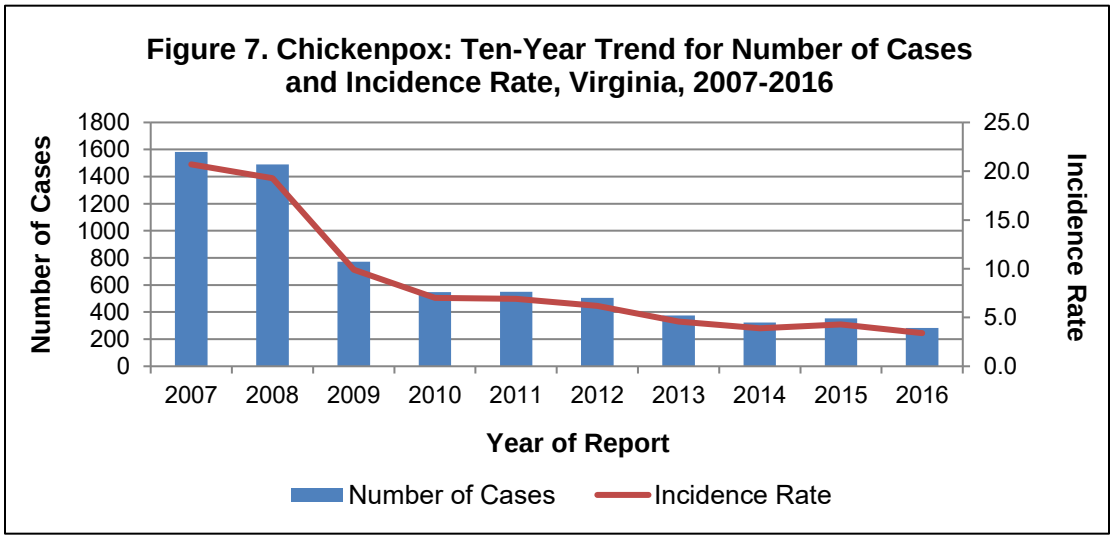
No cases of chancroid were reported in Virginia in 2016. Only two cases have been reported in Virginia since 2005.

Chickenpox (Varicella)

Agent: Varicella-zoster virus (VZV)
Mode of Transmission: Person-to-person transmission by direct contact or through droplet or airborne spread of vesicular lesion fluids or respiratory secretions from an infected person.
Signs/Symptoms: Acute onset of fever and generalized, pruritic, vesicular rash typically consisting of 250-500 lesions. Successive crops of lesions appear first on the head and progress to the trunk and extremities. Lesions can appear on the scalp, armpit, and mucous membranes of the mouth, respiratory tract, and eye.
Prevention: Administration of vaccine should occur for children starting at age 12 months followed by a second dose at age 4-6 years.
Other Important Information: The disease is highly transmissible; susceptible household contacts have an 80-90% risk of becoming infected. In healthy children, acute varicella is generally mild and self-limited; however, severe complications can result from the disease, especially in adults. Herpes zoster, or shingles, occurs when latent VZV reactivates and causes recurrent disease.

Chickenpox: 2016 Data Summary	
Number of Cases:	284
5-Year Average Number of Cases:	421.2
% Change from 5-Year Average:	-33%
Incidence Rate per 100,000:	3.4

In 2016, 284 cases of varicella were reported, which represents a 33% decline from the five-year average of 421.2 cases per year (Figure 7). This decline is likely attributable to the two dose vaccine requirement for daycare and school entry adopted in 2010. Overall, the incidence rate for the state was 3.4 cases per 100,000.

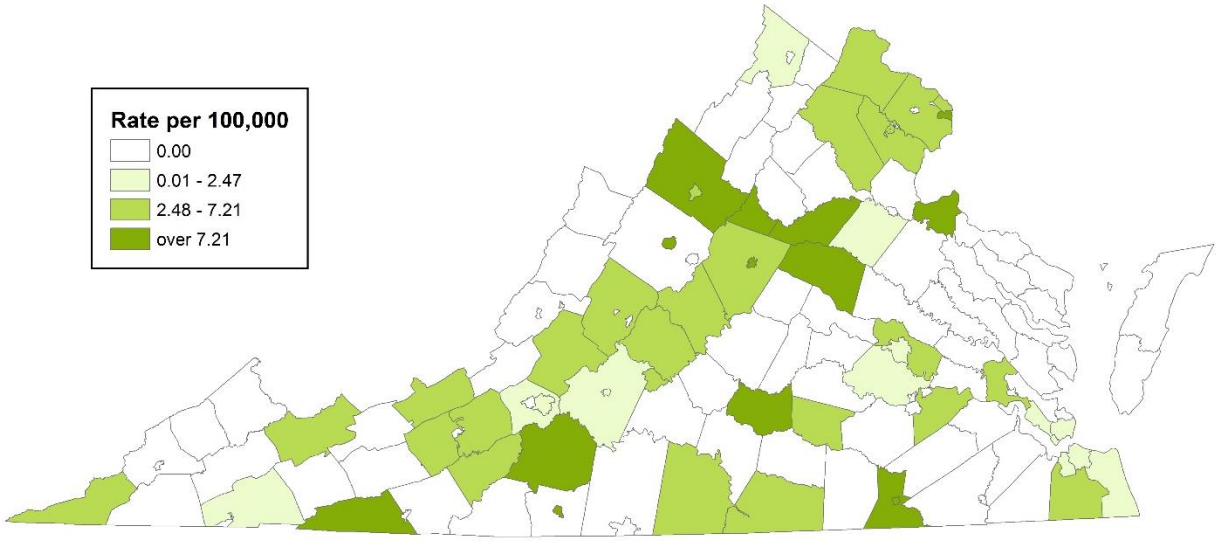


The highest incidence rates occurred among the youngest age groups, with those less than one year of age having an incidence rate (36.9 cases per 100,000) over ten times the state incidence rate, followed by the 1-9 year age group with a rate of 11.5 cases per 100,000). Incidence rates generally declined with age, with 4.7 cases per 100,000 in the 10-19 year age group compared to 0.2 cases per 100,000 in the 60 year and older age group. Race information was not reported for 32% of cases. For cases with a known race, the incidence rate was highest for the "other" race population (3.4 cases per 100,000) followed by the white population (2.5 cases per 100,000) and the black population (1.3 cases per 100,000). Incidence was slightly higher in males compared to females (3.7 and 3.1 cases per 100,000, respectively).

Incidence was much higher in the northern region (6.0 cases per 100,000) when compared to other regions in the state. Incidence in the northwest region was 3.5 cases per 100,000, while incidence rates for the remaining three regions ranged from 1.3 to 2.5 cases per 100,000. Incidence by locality can be seen in the map below. Onset of illness occurred throughout the year with a slight increase (29%) during the second quarter.

In 2016, one outbreak of varicella, consisting of seven cases, was reported from a daycare setting in the northern region. A majority of the clients associated with this outbreak were less than one year of age and, therefore, not recommended to receive vaccine. Of those eligible for vaccine based on age, one of the three cases had received one dose of vaccine. This is a decrease from the four outbreaks reported in 2015.

Chickenpox Incidence Rate by Locality
Virginia, 2016



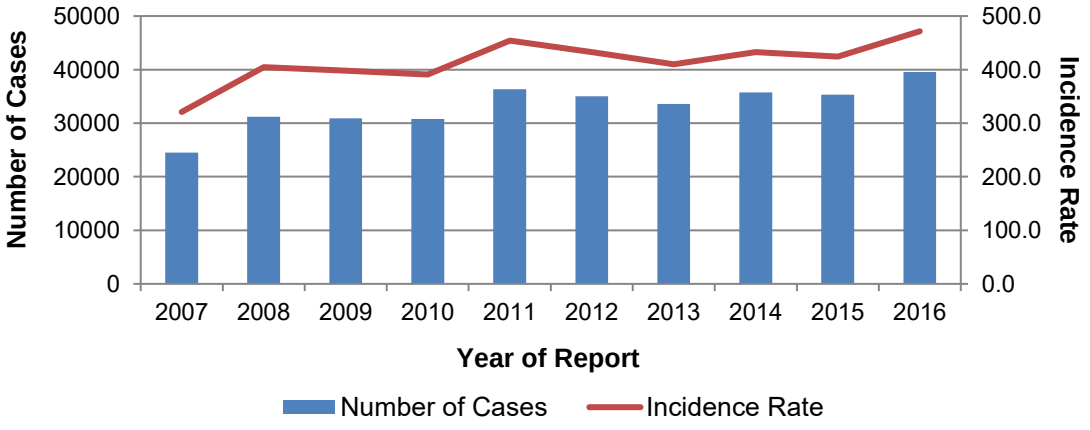
Chlamydia trachomatis Infection

Agent: *Chlamydia trachomatis* (bacteria)
Mode of Transmission: Person-to-person via sexual transmission, or from the genital tract of an infected mother to her infant during birth.
Signs/Symptoms: Men may experience urethritis with discharge, itching, and burning upon urination. Women may experience cervical inflammation, discharge, and vaginal bleeding, but are frequently asymptomatic. Untreated *Chlamydia* can lead to pelvic inflammatory disorder and infertility. Infants may become infected in the eyes or respiratory tract.
Prevention: Preventive measures include adhering to safe sexual practices, screening women less than 25 years of age, and presumptive treatment for *Chlamydia* infection among people who are exposed. Pregnant women who have recently been infected with *Chlamydia* should be retested during the third trimester to prevent postnatal infection in the infant.
Other Important Information: Many chlamydial infections go undiagnosed and unreported. Approximately 70% of infected women are asymptomatic, and patients are frequently not tested at extragenital (pharyngeal or rectal) sites.

***Chlamydia trachomatis* Infection: 2016 Data Summary**	
Number of Cases:	39,535
5-Year Average Number of Cases:	35,192.0
% Change from 5-Year Average:	+12%
Incidence Rate per 100,000:	471.6

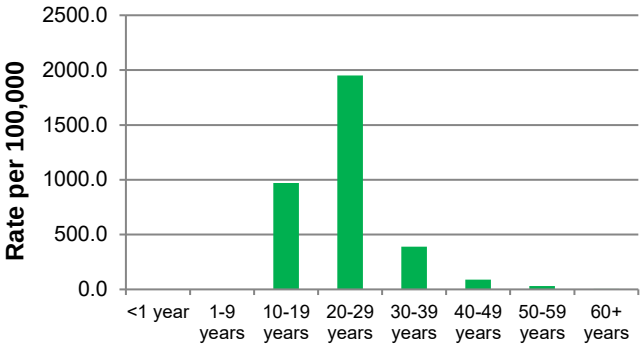
A total of 39,535 cases of *Chlamydia trachomatis* were reported in Virginia during 2016 with a statewide incidence rate of 471.6 cases per 100,000 population (Figure 8). *C. trachomatis* diagnoses remained relatively stable from 2011 through 2015, but increased by 12% in 2016 compared to the previous 5-year average. Nationwide, *C. trachomatis* remains the most frequently reported bacterial sexually transmitted infection. Despite improvements in expanded screening, laboratory test sensitivity, and reporting, CDC estimates that *C. trachomatis* infection is significantly underreported. *C. trachomatis* cases are frequently asymptomatic, and screening programs are focused largely on sexually active women and male partners of infected women.

Figure 8. *Chlamydia trachomatis* Infection: Ten-Year Trend for Number of Cases and Incidence Rate, Virginia, 2007-2016



In 2016, the highest incidence rate occurred in the 20-29 year age group (1,950.8 per 100,000), followed by the 10-19 year age group (969.3 per 100,000) and the 30-39 year age group (388.2 per 100,000) (Figure 9). Incidence rates in the remaining age groups ranged from 88.1 to 0.3 cases per 100,000. Nine cases of *C. trachomatis* ophthalmia neonatorum were reported in infants in 2016; however, ophthalmic (eye) infections due to perinatal exposure are counted as cases of Ophthalmia Neonatorum and not *C. trachomatis* infection. For information on these cases, please see the Ophthalmia Neonatorum section of this report.

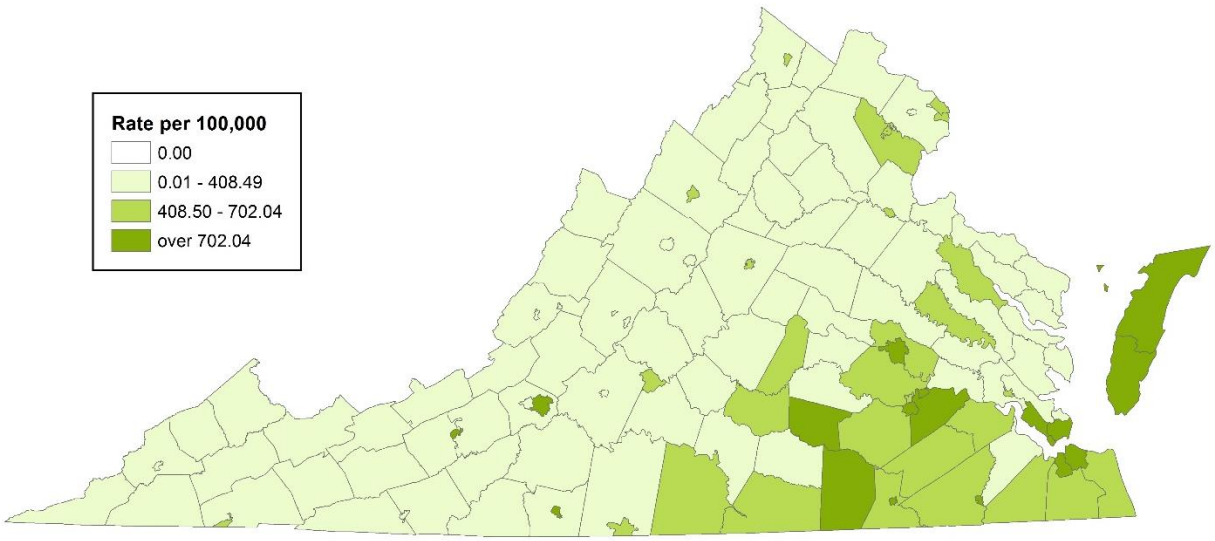
Figure 9. *Chlamydia trachomatis* Infection: Rate by Age Group, Virginia, 2016



C. trachomatis infection was more than six times higher in the black population (879.7 per 100,000) when compared to the white population (131.0 per 100,000) in 2016. Sixty-six percent of *C. trachomatis* infection occurred in females. While women remain disproportionately affected by *C. trachomatis*, the gender gap in infection rates has been narrowing as rates of infection in men increase.

Since 2001, the highest incidence rates each year of *C. trachomatis* infection have occurred in the eastern region. In 2016, a rate of 754.6 cases per 100,000 were reported from the eastern region, while the rate in the central region was 662.8 per 100,000. The remaining regions had incidence rates ranging from 345.8 to 288.3 per 100,000. The map below displays incidence rates by locality.

Chlamydia trachomatis Infection Incidence Rate by Locality
Virginia, 2016



Cholera

Agent: *Vibrio cholerae* (serogroup O1 and O139)
Mode of Transmission: Epidemics and pandemics are strongly linked to the consumption of unsafe water and food, poor hygiene, inadequate water treatment, poor sanitation, and crowded living conditions. Conditions leading to epidemics exist in many developing countries where cholera is either endemic or a recurring problem in a large number of areas. The disease is not easily spread directly from one person to another.
Signs/Symptoms: Sudden onset of profuse, painless watery stools, often described as rice-water stool, provoked by a toxin that affects the small intestine. Nausea and profuse vomiting occur early in the course of illness. In untreated cases, rapid dehydration, dangerously high levels of acid or low levels of glucose in the blood, circulatory collapse, and renal failure can rapidly lead to death. In most cases infection is asymptomatic or causes mild diarrhea.
Prevention: Safe drinking water and proper sanitation are the keys to cholera prevention. When traveling in countries where cholera is present, only thoroughly cooked hot foods or fruits/vegetables that are peeled just before eating should be eaten, and only bottled beverages or water that has been boiled or treated with chlorine should be used for drinking, brushing teeth, or cleaning food preparation surfaces. Hands should be washed thoroughly with soap after using the bathroom and before preparing or eating food. Seafood should be cooked thoroughly before it is eaten. Existing oral cholera vaccines are not available in the U.S. and are not recommended for most travelers.
Other Important Information: In severely dehydrated cases, death may occur within a few hours and the case-fatality rate may exceed 50%. With proper and timely rehydration, this rate can be less than 1%.

One case of cholera was reported in Virginia during 2016. The illness occurred in a traveler returning from Africa. The last two reported cholera cases occurred in 2010 and 2011; both were travel-associated. No cases of cholera were reported in Virginia from 1995 to 2009.

Creutzfeldt-Jakob Disease (CJD)

Agent: Believed to be caused by a protein called a prion
Mode of Transmission: The disease is not spread through contact with a person who has CJD except that it can be spread if surgical instruments used on a CJD patient are not thoroughly sterilized and then are used on someone else. The majority of CJD cases (about 85%) are sporadic CJD, with no recognizable source. A small percentage of cases (5-15%) develop due to inheritance of a mutated prion protein gene (familial CJD). Very rarely, exposure to organ tissue contaminated with the prion can result in transmission (iatrogenic CJD). Classic CJD includes sporadic CJD, familial CJD, and iatrogenic CJD. A form of the disease, variant Creutzfeldt-Jakob disease (vCJD), is thought to be transmitted through ingestion of beef from cattle with bovine spongiform encephalopathy (BSE, commonly referred to as mad cow disease).
Signs/Symptoms: Classic CJD symptoms may begin with confusion, and they rapidly progress to a wide range of neurological signs and symptoms, including loss of coordination and dementia. The symptoms of vCJD begin with prominent psychiatric and behavioral symptoms, impairment of senses, and delayed neurological signs. The disease is always fatal, with death usually occurring within one year of onset of illness.
Prevention: Organ and tissue transplants from infected individuals should be avoided. Hospitals should take extra precautions to dispose of or sterilize surgical instruments used on CJD patients. For protection against vCJD, the federal government has regulations in place to prevent the spread of BSE in the United States.
Other Important Information: vCJD occurs in younger individuals, while classic CJD occurs more often in older individuals and has a slower progression. In Virginia, CJD is reportable when it occurs in persons under 55 years of age.

One case of classic CJD was diagnosed in Virginia in 2016 in a person less than 55 years of age with no known exposures. The person died as a result of this condition. There were no cases of classic CJD reported in Virginia in 2015. In 2014, two classic CJD cases were identified in Virginia, both had no known exposures. Eleven cases of CJD have been reported in Virginia residents less than 55 years of age since 1995. All but one case was diagnosed with classic CJD.

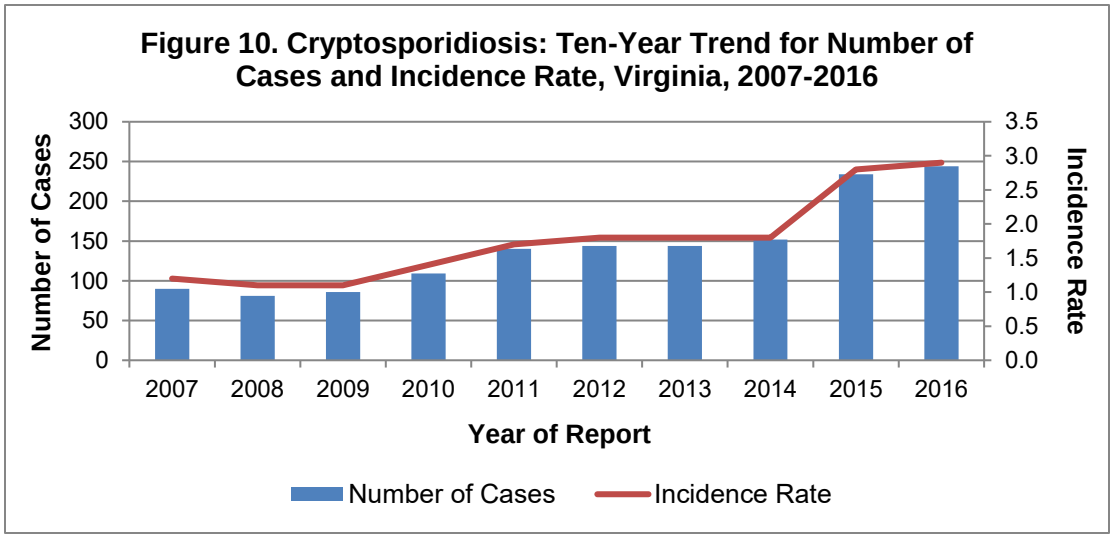
The only case of vCJD diagnosed in a Virginia resident less than 55 years of age occurred in 2006. Based on the patient's history, the infection most likely occurred from consumption of contaminated cattle products as a child while living in Saudi Arabia. This is one of four cases of vCJD reported in U.S. residents. The most recent vCJD case in the U.S. occurred in 2014 in a Texas resident. This person is thought to have acquired the infection while living overseas.

Cryptosporidiosis

Agent: *Cryptosporidium parvum* and *Cryptosporidium hominis* are the most common species that cause disease in humans (parasite)
Mode of Transmission: Occurs via the fecal-oral route and can include person-to-person, animal-to-person, foodborne, and waterborne transmission. Animals such as cattle, sheep, and goats have tested positive for the parasite and are an important reservoir, contributing to both direct transmission and contamination of water supplies; however, many other animals, including cats and dogs, can be infected and transmit disease. *Cryptosporidium* oocysts may be excreted from infected individuals for up to several months after diarrhea has resolved. Oocysts can remain infectious for 2-6 months after being excreted. The oocysts are very resistant to chemicals used to purify drinking water and disinfect recreational water (e.g., chlorine in pools).
Signs/Symptoms: Profuse watery diarrhea with nausea, cramping, and abdominal pain. The diarrhea may be preceded by anorexia and vomiting in children. Illness is typically self-limiting, and will either resolve on its own or have no harmful long-term effects. However, immunocompromised persons have a higher risk of severe disease, which can lead to poor outcomes, including death. Asymptomatic infections are common.
Prevention: Preventive measures include careful hand hygiene after using the bathroom, after changing diapers or cleaning a child who has used the bathroom, after handling animals or their feces, and before preparing and eating food. People with diarrhea should not enter public recreational water. Water purification methods, including boiling water or filtration, should be considered when drinking water from natural streams, lakes, springs, or any unknown source.

Cryptosporidiosis: 2016 Data Summary	
Number of Cases:	244
5-Year Average Number of Cases:	162.8
% Change from 5-Year Average:	+50%
Incidence Rate per 100,000:	2.9

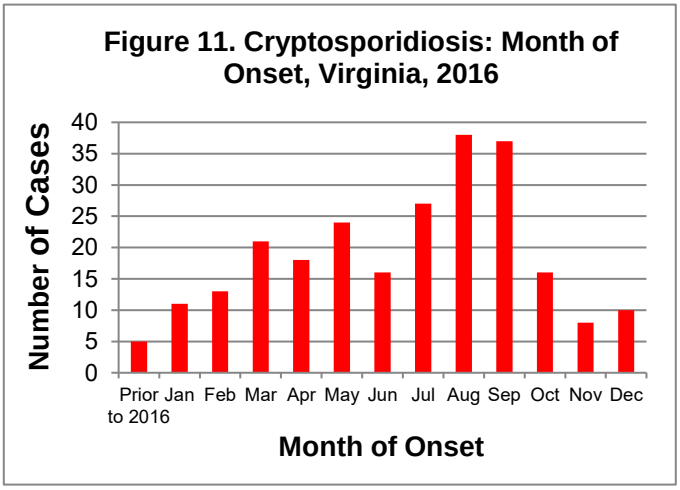
In 2016, 244 cases of cryptosporidiosis were reported in Virginia. This is slightly higher than the 234 cases reported in 2015, and a 50% increase from the five-year average of 162.8 cases per year (Figure 10). The statewide incidence rate of 2.9 cases per 100,000 population in 2016 represented a slight increase from the rate of 2.8 per 100,000 in 2015.



In 2016, the highest incidence rate in Virginia was observed in the 1-9 year age group (3.9 per 100,000), followed by the 30-39 (3.6 per 100,000), 60 year and older (3.2 per 100,000), and 20-29 (3.1 per 100,000) years age groups. Incidence among all other age groups fell below the statewide rate of 2.9 cases per 100,000, and ranged from 1.9 to 2.7 per 100,000.

Race information was not available for 25% of cases in 2016. Among cases with a known race, incidence was higher among the white population (2.3 per 100,000) than the black population (1.9 per 100,000) and the "other" race population (1.5 per 100,000). Incidence was higher among females (3.6 per 100,000) compared to males (2.2 per 100,000) during 2016.

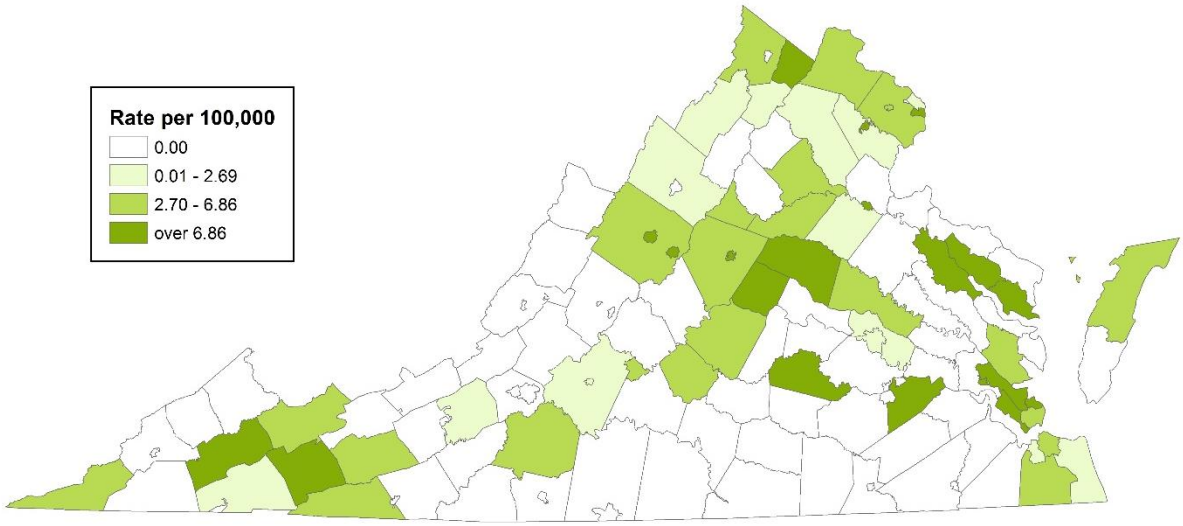
Geographically, the highest incidence rate was observed in the eastern region (4.2 per 100,000). Rates ranged from 1.3 to 3.5 cases per 100,000 in other regions, with the lowest incidence occurring in the central region (see map below for incidence by locality).



Nationally, a higher number of illnesses are typically seen during the summer and early fall months, which is consistent with increased recreational water exposure, including public pools. This seasonal pattern was also observed in Virginia, with disease onset peaking during August and September (Figure 11).

Among patients that had risk factor information recorded, the most commonly reported risk factors in 2016 include travel (45/202 cases, 22%), recreational water exposure (46/188 cases, 24%), and contact with animals (69/178 cases, 39%). No cryptosporidiosis outbreaks were reported in Virginia in 2016.

Cryptosporidiosis Incidence Rate by Locality
Virginia, 2016



Cyclosporiasis

Agent: *Cyclospora cayetanensis* (parasite)
Mode of Transmission: Can be spread by ingesting food or water contaminated with *Cyclospora*. *Cyclospora* are resistant to chlorine and iodine treatment and are unlikely to be killed by routine chemical disinfection or sanitizing methods. Direct person-to-person transmission has not been documented.
Signs/Symptoms: Profuse watery diarrhea commonly occurs, along with nausea, anorexia, substantial weight loss, abdominal bloating or cramping, increased gassiness and prolonged fatigue. Low-grade fever and vomiting are uncommon but can occur. Some infected persons are asymptomatic, particularly in settings where cyclosporiasis is endemic. If not treated, symptoms can persist for a month or more.
Prevention: Fresh produce should be washed thoroughly before it is consumed. No vaccine for cyclosporiasis is available.
Other Important Information: *C. cayetanensis* is known to be endemic in many resource-limited countries and has been reported as a cause of traveler's diarrhea. Most outbreaks reported in the U.S. have been associated with the consumption of imported fresh produce, including raspberries, basil, cilantro, snow peas and lettuce. No commercially frozen or canned produce has been implicated as the source of an outbreak.

Cyclosporiasis: 2016 Data Summary	
Number of Cases:	11
5-Year Average Number of Cases:	3.8
% Change from 5-Year Average:	+189%
Incidence Rate per 100,000:	0.1

During 2016, 11 cases of cyclosporiasis were reported in Virginia, representing a 38% increase from the eight cases reported in 2016 and a 189% increase from the five-year average of 3.8 cases per year. All cases occurred among adults (age range: 23 to 81 years). Eight cases were in females and three cases were in males.

Geographically, the northern region had the highest number of *Cyclospora* infections with seven, followed by the northwest region with three cases, and central region with one case. Seven of the patients traveled internationally during their exposure period. Most cases and outbreaks of cyclosporiasis in the U.S. occur in spring and summer months, but not all cases identified during the same time of year are caused by the same exposure. During 2016, all cases in Virginia occurred during June and August.

Changes in diagnostic testing may affect the number of reported cases of cyclosporiasis. Prior to the current widespread use of molecular testing methods, testing for *Cyclospora* would need to be specifically requested, and the testing required special microscopy methods. Test type was known for nine of the reported cases in 2016, and seven were diagnosed by a molecular gastrointestinal illness panel test. The remaining two cases of cyclosporiasis were diagnosed by traditional microscopy methods.

Diphtheria

Agent: Toxin secreted by strains of the bacterium *Corynebacterium diphtheriae*
Mode of Transmission: Person-to-person transmission via respiratory droplets. Rarely, transmission may occur from contact with skin lesions or articles soiled with discharges from the lesions of infected persons.
Signs/Symptoms: Sore throat, anorexia, nasal discharge, and formation of a bluish-white, grayish-green, or black adherent membrane in the throat. More severe cases can include swelling of the neck and airway passages.
Prevention: Diphtheria vaccine is available as part of the diphtheria/tetanus/pertussis (DTaP) vaccine for children and the combination tetanus/diphtheria/pertussis (Tdap) vaccine for adolescents and adults. One dose of Tdap should be given at 11 to 12 years of age with booster doses of tetanus/diphtheria (Td) every ten years thereafter.
Other Important Information: The overall case-fatality rate for diphtheria is 5%-10%, with higher death rates in young children and those over 40 years of age.

No cases of diphtheria have been reported in Virginia since 1989. Nationally, only two cases have been reported in the last decade. The most recent cases of diphtheria reported nationally occurred in 2014 and in 2012. Diphtheria is still endemic in certain areas of the world, with 7,097 cases being reported to the World Health Organization in 2016.

Ehrlichiosis/Anaplasmosis

Agent(s): Bacteria belonging to the family *Anaplasmataceae. Ehrlichia chaffeensis* infects monocytes (a type of white blood cell involved with immune function) and causes an illness called human monocytic ehrlichiosis (HME). *E. ewingii* infects granulocytes (a different category of white blood cells) and causes a disease referred to as an *E. ewingii* infection. *Anaplasma phagocytophilum* also infects granulocytes, causing an illness called human granulocytic anaplasmosis (HGA).

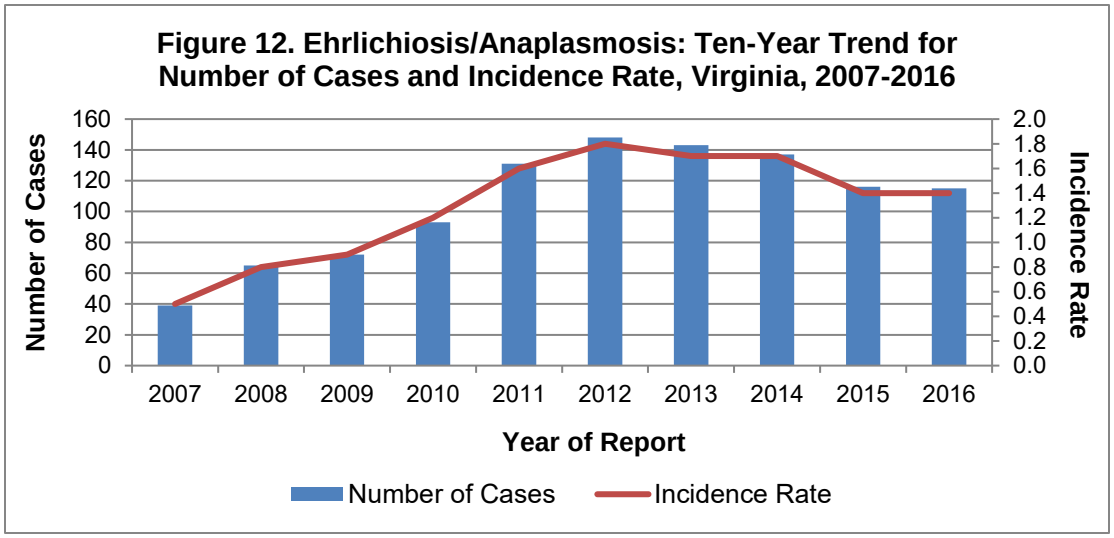
Mode of Transmission: Transmitted to humans through the bite of an infected tick. *E. chaffeensis* and *E. ewingii* may infect adult and nymph stage lone star ticks and be transmitted to a host. *Anaplasma phagocytophilum* may infect nymph stage and adult blacklegged ticks (a.k.a., deer ticks) and is primarily transmitted by the nymph stage ticks. Transmission of these pathogens occurs when an infected tick bites a person and feeds on that person and remains attached for more than 24 hours.

Signs/Symptoms: Illness symptoms commonly include the sudden onset of fever, accompanied by one or more of the following symptoms: headache, body aches, nausea, vomiting and rash. In cases of ehrlichiosis, a rash may occur in up to 30% of adults and 60% of children; rashes are rare in cases of anaplasmosis. Patients may exhibit signs of thrombocytopenia (low blood platelet count) and leucopenia (low white blood cell count) and have elevated liver function test results. Severe forms of illness can result in meningitis/encephalitis, bleeding disorders, difficulty breathing, organ damage and death. Persons with weakened immune systems are prone to develop more severe disease. Persons who do not have a spleen have a high risk of death.

Prevention: Common practice should include minimizing tick bites by recognizing and avoiding the habitats of lone star ticks and blacklegged ticks. These habitats include humid forest environments with undergrowth or heavy leaf litter, and tall weeds, grass and vegetative ground cover along shady forest margins, tree lines, forest trails and forest clearings. As ticks are always found at shoe level, it is best to wear permethrin treated shoes, socks and pants, with pants legs tucked into the socks. If long pants are not worn, repellents containing DEET, Picaridin, BioUD, IR3535, or oil of lemon eucalyptus are effective against ticks and should be applied to exposed areas of skin on the legs before entering tick habitats. After visiting tick habitats, a person should remove and wash clothing, thoroughly check all body surfaces for ticks and, if found, carefully remove attached ticks as soon as possible.

Other Important Information: Due to the many difficulties associated with diagnosis and testing of tick-borne diseases, cases of ehrlichiosis or anaplasmosis may be misdiagnosed as Rocky Mountain spotted fever (RMSF). However, based on tick infection surveys, ehrlichiosis is thought to be much more common than RMSF in Virginia.

Ehrlichiosis/Anaplasmosis: 2016 Data Summary	
Number of Cases:	115
5-Year Average Number of Cases:	135.0
% Change from 5-Year Average:	-15%
Incidence Rate per 100,000:	1.4



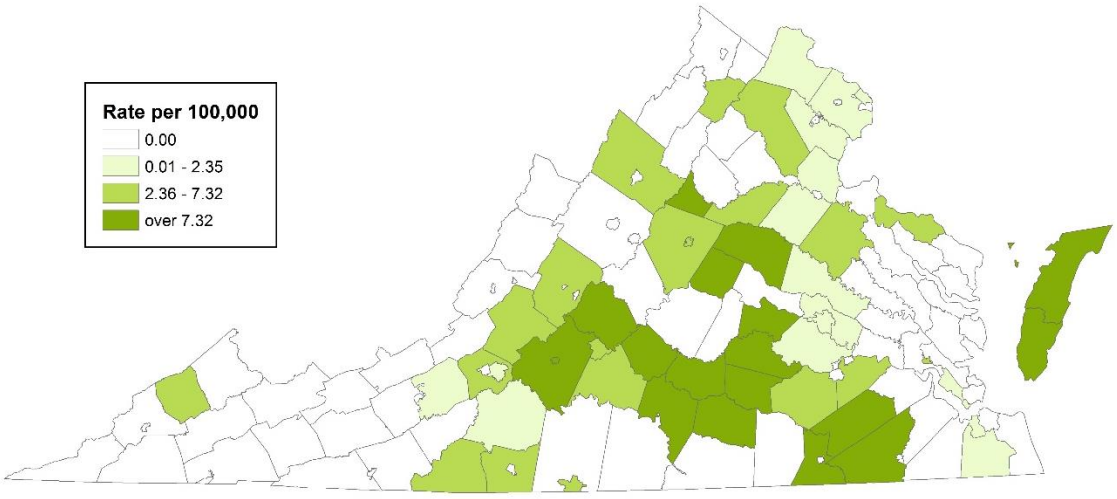
In 2016, 115 cases of ehrlichiosis/anaplasmosis were reported in Virginia. This is similar to the 116 cases reported in 2015 and represents a 15% decrease from the five-year average of 135.0 cases per year (Figure 12). The decline in reported cases over the past three years can partially be attributed to fewer cases of ehrlichiosis. The decrease in ehrlichiosis cases might further be explained by unusually colder temperatures during recent winters in Virginia and the subsequent effect on the lone star tick population, the natural carriers of the ehrlichiosis agent. Lone star ticks are normally found in the warmer southeast areas of the U.S., and are not tolerant of extremely cold conditions. In contrast, the northern blacklegged tick is the natural carrier of the bacteria causing anaplasmosis in Virginia. This tick species spread into Virginia from the north and is relatively resistant to cold weather, so the lower temperatures have had less impact on blacklegged tick populations and the number of human anaplasmosis cases in recent years. Among ehrlichiosis/anaplasmosis cases reported in 2016, 93 (81%) were specified as HME, 16 (14%) were specified as HGA, and 6 (5%) were ehrlichiosis/anaplasmosis unspecified.

In 2016, ehrlichiosis/anaplasmosis incidence rates were highest in the 60 year and older age group, with 3.5 cases per 100,000, followed by the 50-59 year age group, with 2.2 cases per 100,000. Together, these two age groups accounted for 74% of all cases. The younger age groups had the lowest incidence rates. This predominance of illnesses among those 50 years of age and older is typical of what is observed for ehrlichiosis and anaplasmosis in other endemic areas in the U.S. Race information was not reported for 48% of cases. Among those with a known race, incidence in the white population (0.9 per 100,000) was higher than the rate in the black population (0.2 per 100,000). Incidence was higher among males than females (1.8 and 1.0 per 100,000, respectively).

Cases were reported from all regions of the state. The highest incidence rate (2.4 per 100,000) was observed in the southwest region followed by the northwest region (2.1 per 100,000). Rates in the remaining three regions ranged from 0.5 to 2.0 per 100,000, with the central region seeing an increase from last year to a rate of 2.0. While the incidence rate for the southwest region was highest among all regions, the map below shows reported cases occurred mostly along the eastern part of that region (east of the Blue Ridge

Mountains). Likewise, for the northwest region, reported cases occurred in localities located along the eastern edge of the region, and not from localities located along the western edge. In the eastern region, the incidence rate was higher on the Eastern Shore than in any other locality in that region. The largest proportion of cases (49%) had symptom onset in the third quarter of the year, while 43% had symptom onset in the second quarter. The second and third quarters represent the spring and summer months, when ticks are most likely to feed.

Ehrlichiosis / Anaplasmosis Incidence Rate by Locality
Virginia, 2016



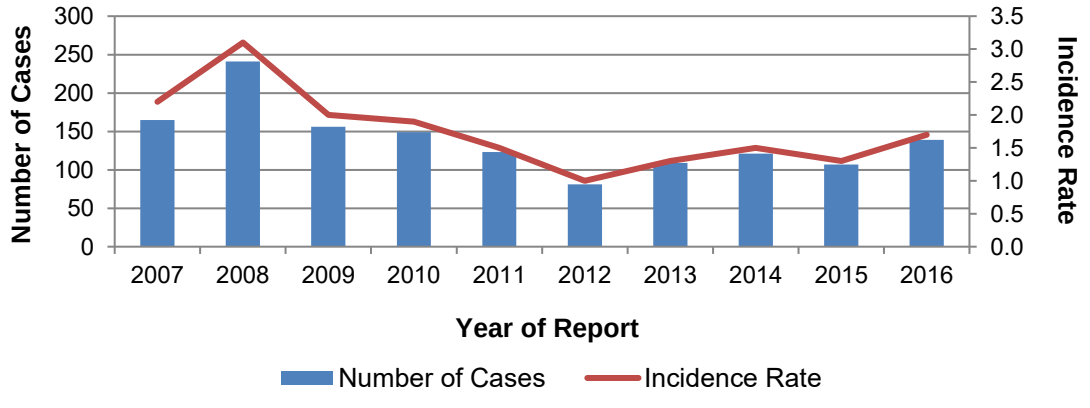
Escherichia coli Infection, Shiga Toxin-Producing

Agent: Shiga toxin-producing *Escherichia coli* (bacteria), also known as Verocytotoxin-producing *E. coli* (VTEC), enterohemorrhagic *E. coli* (EHEC), or STEC for short.
Mode of Transmission: Ingestion of food or water contaminated with human or animal feces, or direct transmission from infected persons or animals. Fomites and contaminated environments may also play a role in transmission.
Signs/Symptoms: Diarrhea, which may be bloody or non-bloody, and severe abdominal cramps with little or no fever. In some people, including children less than five years of age and older adults, the infection can cause a complication called hemolytic uremic syndrome (HUS), in which the red blood cells are destroyed and the kidneys fail.
Prevention: Hands should be washed carefully after using the bathroom, after changing diapers or cleaning a child who has used the bathroom, after handling animals or their feces, and before preparing and eating food. All ground beef should be cooked thoroughly to an internal temperature of at least 160°. All milk, other dairy products, and juices should be pasteurized before being consumed.
Other Important Information: The most virulent STEC is *E. coli* O157:H7. In the U.S., *E. coli* O157:H7 is the serotype most commonly associated with hemolytic uremic syndrome (HUS). See the section on Hemolytic Uremic Syndrome in this report for more information. Shiga toxin-producing *E. coli* infection has been a reportable condition in Virginia since 1999.

***Escherichia coli* Infection, Shiga Toxin-Producing: 2016 Data Summary**	
Number of Cases:	139
5-Year Average Number of Cases:	108.2
% Change from 5-Year Average:	+28%
Incidence Rate per 100,000:	1.7

In 2016, 139 cases of Shiga toxin-producing *Escherichia coli* (STEC) infection were reported in Virginia. This represents a 30% increase from the 107 cases reported in 2015, and a 28% increase from the five-year average of 108.2 cases per year (Figure 13).

Figure 13. *Escherichia coli* Infection, Shiga Toxin-Producing: Ten-Year Trend for Number of Cases and Incidence Rate, Virginia, 2007-2016

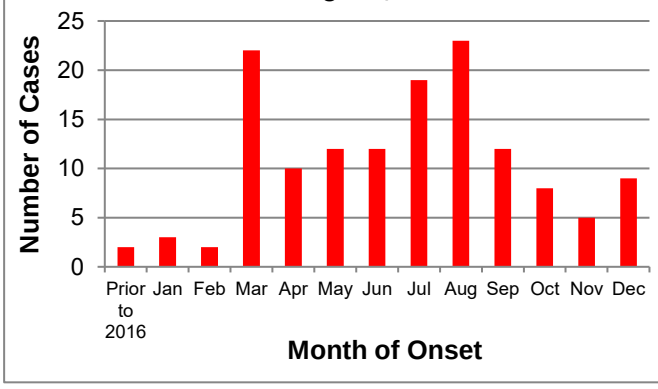


STEC infection occurs among all age groups, but the majority of cases occur in children. Children and the elderly are also more likely to develop severe illness. The incidence rate was highest in those less than one year of age (5.8 per 100,000), followed by the 1-9 year age group (4.6 per 100,000). Other age groups had rates between 0.3 and 2.7 per 100,000. Race information was not reported for 34% of cases. Among those with a known race, incidence was highest in the white population (1.4 per 100,000) compared to the black and "other" race populations (0.3 and 0.6 per 100,000, respectively). Incidence was higher among females than males (2.0 and 1.2 per 100,000, respectively).

The northwest region experienced the highest incidence rate with 3.1 cases per 100,000 population, followed by the northern region with 2.4 cases per 100,000. Incidence rates in the other regions ranged between 0.4 and 1.9 case per 100,000. Incidence rates by locality can be seen in the map below.

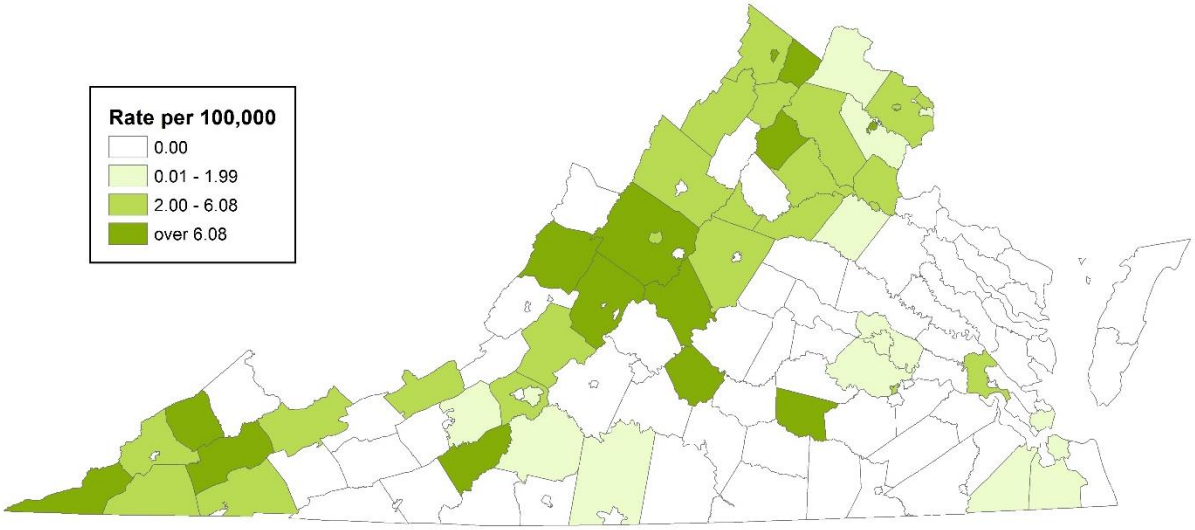
While infections occurred throughout the year, most cases were reported during the warmer months with 39% of cases being reported from July through September (Figure 14).

Figure 14. *Escherichia coli* Infection, Shiga Toxin-Producing: Month of Onset, Virginia, 2016



Two outbreaks attributed to STEC were reported during 2016. The outbreaks were associated with consumption of raw (unpasteurized) milk and travel outside the U.S. The number of cases ranged from twelve to fourteen per outbreak. The route of transmission was determined to be foodborne for both outbreaks.

Escherichia coli Infection, Shiga Toxin-Producing Incidence Rate by Locality, Virginia, 2016

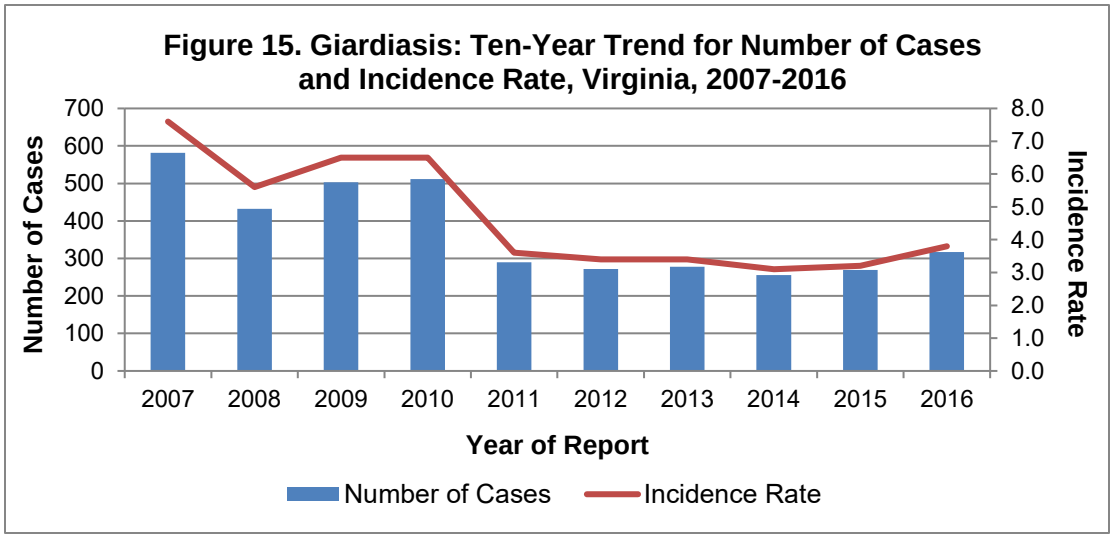


Giardiasis

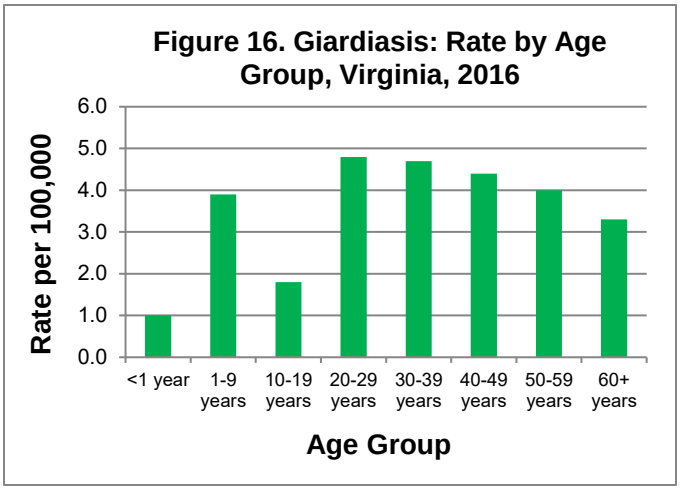
Agent: *Giardia intestinalis* (parasite)
Mode of Transmission: Person-to-person transmission by hand-to-mouth transfer of cysts from the feces of an infected person. Localized outbreaks are more often due to ingestion of cysts in fecally-contaminated drinking and recreational water (e.g., lakes, rivers, springs, ponds, and streams) than from fecally-contaminated food.
Signs/Symptoms: Symptoms may include diarrhea, abdominal pain, bloating, nausea and vomiting. A person may be asymptomatic or develop a prolonged illness.
Prevention: Hands should be washed carefully after using the bathroom, after changing diapers or cleaning a child who has used the bathroom, after handling animals or their feces, and before preparing and eating food. Recreational water or untreated water from shallow wells, lakes, rivers, springs, ponds or streams should not be consumed unless boiled or appropriately filtered. Persons with diarrhea should not swim at recreational water venues.

Giardiasis: 2016 Data Summary	
Number of Cases:	317
5-Year Average Number of Cases:	273.0
% Change from 5-Year Average:	+16%
Incidence Rate per 100,000:	3.8

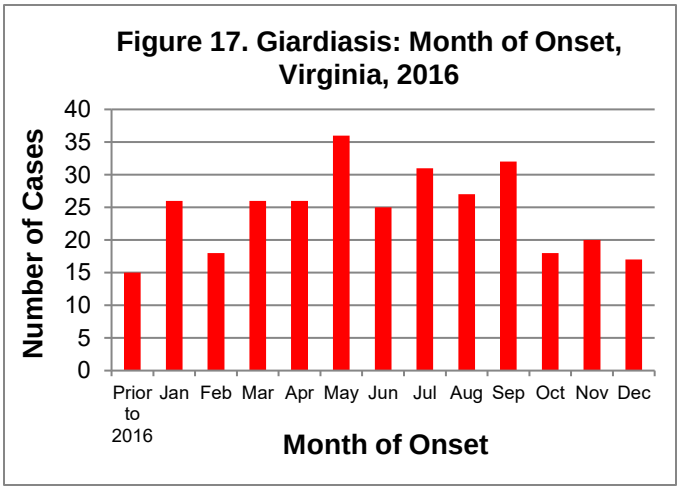
In 2016, 317 cases of giardiasis were reported in Virginia. This represents an 18% increase from the 269 cases reported in 2015, and a 16% increase from the previous 5-year average of 273 cases per year. The ten-year trend in reported cases of giardiasis in Virginia is shown in Figure 15. The lower number of cases that has been seen beginning in 2011 is the result of a change in the national surveillance case definition which occurred in that year. The change in definition required documentation of clinically compatible illness in addition to a positive laboratory result in order for the case to be counted in public health surveillance.



In each of the four age groups that represent adults age 20-59 years of age, the incidence rate was 4.0-4.8 per 100,000 population (Figure 16); 65% of the cases reported in 2016 occurred in persons within this age range. This age distribution is different from what was seen in 2015, where the rate was the highest in the 1-9 year age group. Race information was not reported for 62% of cases in 2016. Among cases with a known race, the incidence rate was highest among the "other" race population (2.2 per 100,000), followed by the white population (1.5) and the black population (1.0). A much higher incidence rate was seen among males (4.9 per 100,000) than females (2.7 per 100,000). Nearly two-thirds (64%) of the cases occurred among males.

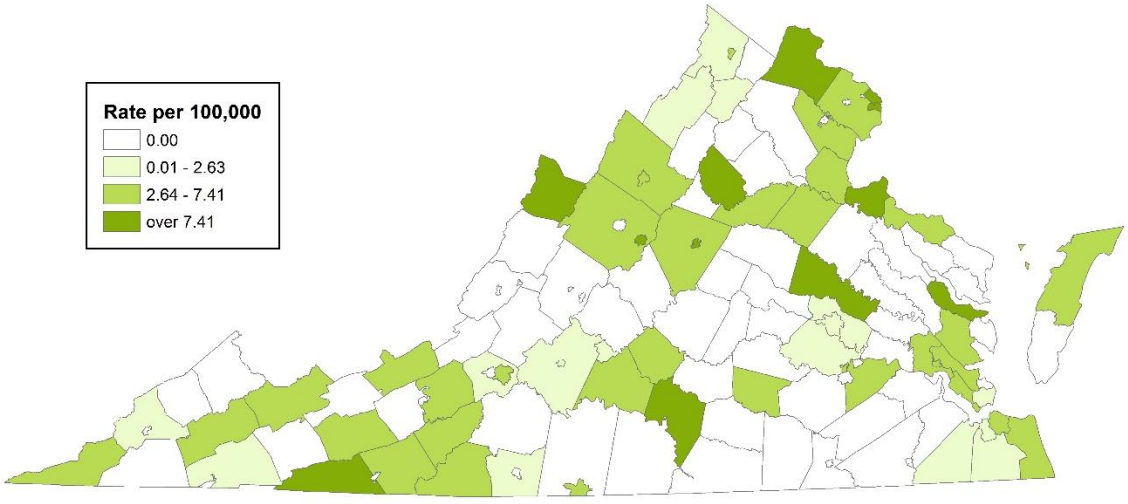


As in 2015, the northern region experienced the largest number of cases (151 cases) and the highest incidence rate (6.2 per 100,000), followed by the northwest region (3.7 per 100,000) and the eastern region (3.0 per 100,000). Rates were lowest in the central (2.3 per 100,000) and southwest (2.2 per 100,000) regions. Rates by locality can be seen in the map below. Cases occurred throughout the year, with the highest number (36 cases) occurring in May. (Figure 17).



While the source of exposure for sporadic cases cannot usually be determined, 37% of cases in 2016 occurred in people who reported travel prior to illness onset, including 12 persons who traveled to other states in the U.S. and 52 who traveled to other countries. Over 20% reported recreational water exposure, and approximately 10% reported consuming untreated water. Fifteen cases (5%) required hospitalization.

Giardiasis Incidence Rate by Locality
Virginia, 2016

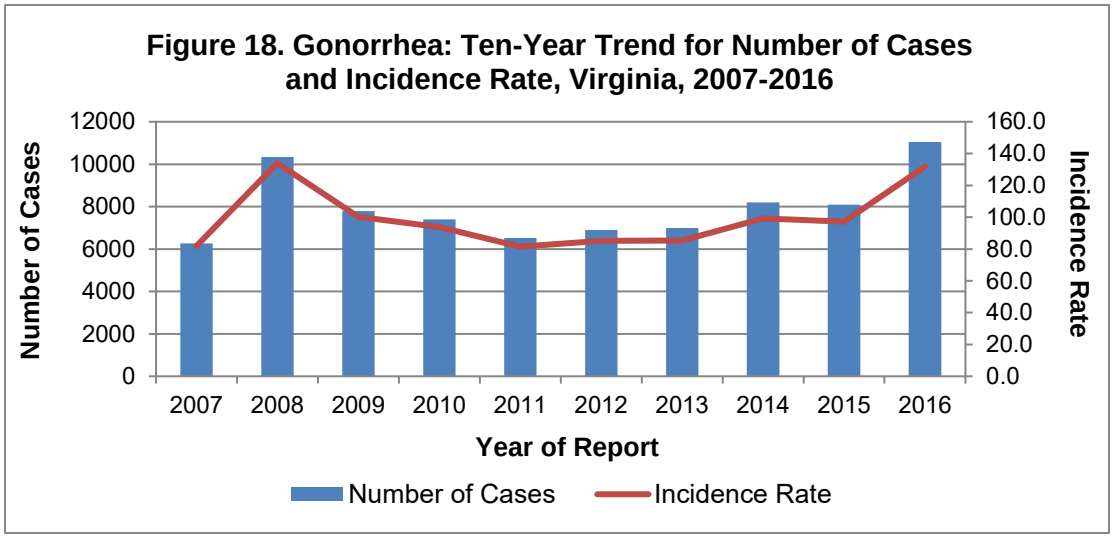


Gonorrhea

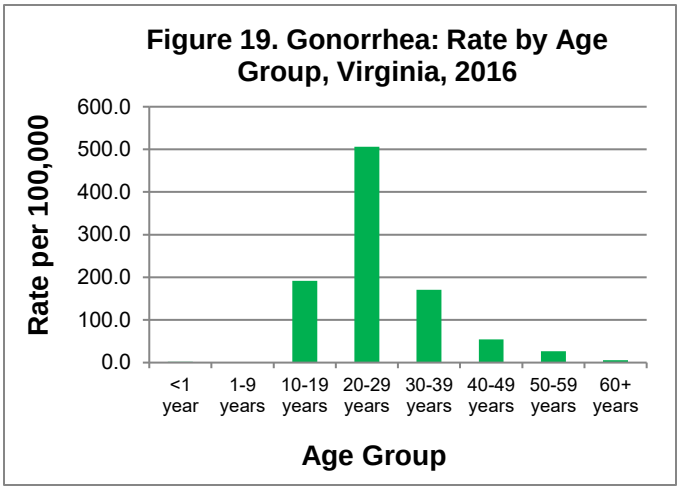
Agent: *Neisseria gonorrhoeae* (bacteria)
Mode of Transmission: Sexually transmitted through direct contact with secretions from an infected person.
Signs/Symptoms: Infected men may experience a burning sensation while urinating and a yellowish white discharge from the urethra. Infected women are usually asymptomatic, although vaginal discharge, burning while urinating, abdominal pain and/or bleeding after intercourse may occur. Symptoms usually appear within a week, but could take up to 30 days to develop. Untreated gonorrhea among women can lead to pelvic inflammatory disease and infertility.
Prevention: Preventive measures include safe sexual practices and antibiotic treatment of infected sexual contacts.
Other Important Information: The progressive development of antibiotic resistance continues to hinder gonorrhea prevention efforts. Antibiotic resistance undermines treatment success, heightens the risk of complications and facilitates transmission of infection. Drug resistant *N. gonorrhoeae* is one of only three organisms currently designated by CDC as an antimicrobial resistance "urgent threat." Since April 2007, CDC has advised against the use of fluoroquinolones for the treatment of gonorrhea, based on data indicating widespread drug resistance in the United States. As of August 2012, CDC no longer recommends cefixime (an oral cephalosporin) at any dose as a first-line regimen for treatment of gonococcal infections. The CDC now recommends combination therapy for gonorrhea with ceftriaxone administered intramuscularly and either azithromycin or doxycycline given orally for seven days.

Gonorrhea: 2016 Data Summary	
Number of Cases:	11,046
5-Year Average Number of Cases:	7,339.6
% Change from 5-Year Average:	+50%
Incidence Rate per 100,000:	131.8

In 2016, 11,046 cases of gonorrhea were reported in Virginia. This represents a 50% increase from the 5-year average of 7,339.6 cases per year (Figure 18). Gonorrhea has increased in almost every geographic region and among almost every demographic. This trend is particularly concerning due to increased antibiotic resistance to *N. gonorrhoeae*. CDC estimates that up to 50% of gonorrhea infections are undiagnosed and remain unreported.



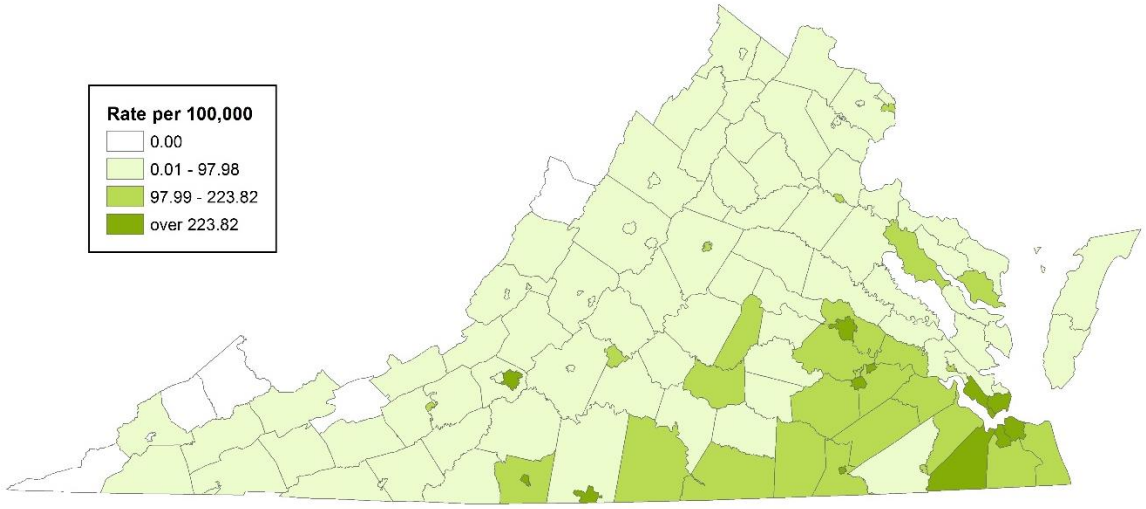
Gonorrhea incidence was substantially higher in the 20-29 year age group compared to other age groups, with a rate of 505.9 cases per 100,000 population. This was followed by the 10-19 year age group (191.4 per 100,000), and the 30-39 year age group (170.4 per 100,000) (Figure 19). This age distribution is consistent with historical trends. Racial disparity in gonorrhea incidence is dramatic; in 2016, the incidence rate among the black population was 376.7 per 100,000, which is more than 15 times higher than the rate seen in the white population (25.1 per 100,000), and more than five times higher than the rate in the "other" race population (67.3 per 100,000). The incidence rate for gonorrhea has historically been higher in females than in males; however, beginning in 2015, the incidence rate in males surpassed that of females. For 2016, incidence among males (144.8 per 100,000) was again higher than females (118.5 per 100,000). This mirrors nationwide trends in the sex distribution of reported cases.



Since 2008, the eastern and central regions have experienced the largest number of reported gonorrhea cases and the highest incidence rates. In 2016, the incidence rate in the central region (239.2 per 100,000) was slightly higher than the rate in the eastern region (238.4 per 100,000). The remaining regions had incidence rates ranging from 97.1 per 100,000 in the southwest region, 55.7 per 100,000 in the northern region, and 41.6 per 100,000 in the northwest region. Incidence by locality can be seen in the map below.

Ophthalmia in infants caused by *Neisseria gonorrhoeae* is reported separately as Ophthalmia Neonatorum in this report; however, no cases of gonorrhea ophthalmia neonatorum were reported in 2016.

Gonorrhea Incidence Rate by Locality
Virginia, 2016



Granuloma Inguinale

Agent: *Klebsiella granulomatis* (bacteria; formerly *Calymmatobacterium granulomatis*)
Mode of Transmission: Presumably by sexual activity; specifically, exposure to the bacteria from an open lesion in the genital area. Young children can become infected by contact with infectious secretions.
Signs/Symptoms: Painless, slowly progressive ulcerative lesions in the genital area, which may become open sores. If left untreated, the bacteria can lead to the destruction of genital organs and spread to other parts of the body through autoinoculation.
Prevention: Sexual partners should be examined, counseled to practice safe sex, and offered antimicrobial therapy if lesions are present.

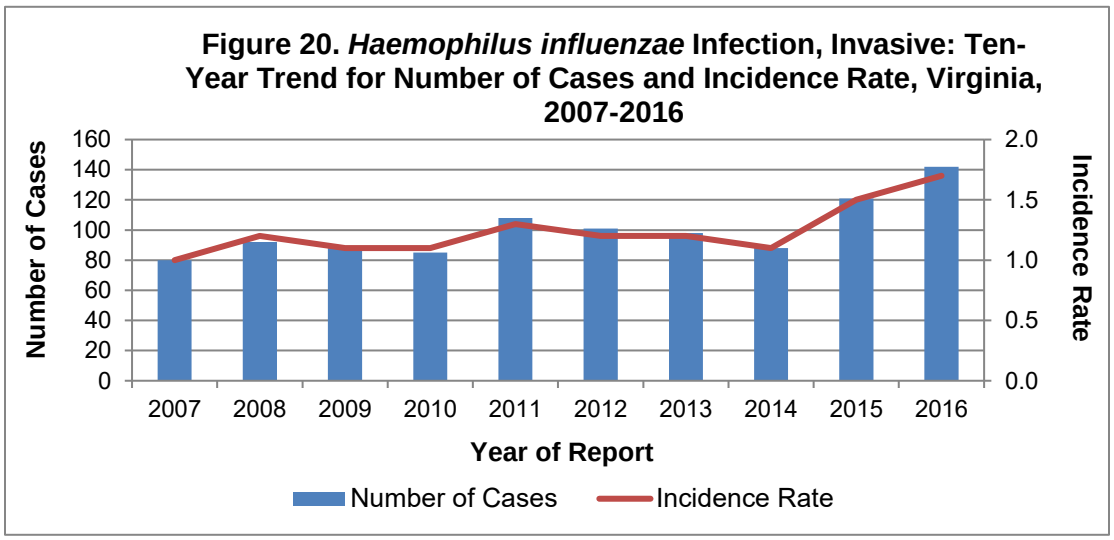
Although granuloma inguinale is endemic in certain developing tropical countries, it remains uncommon in the United States. No cases of granuloma inguinale were reported in Virginia in 2016. The last reported case occurred in 2001.

***Haemophilus influenzae* Infection, Invasive**

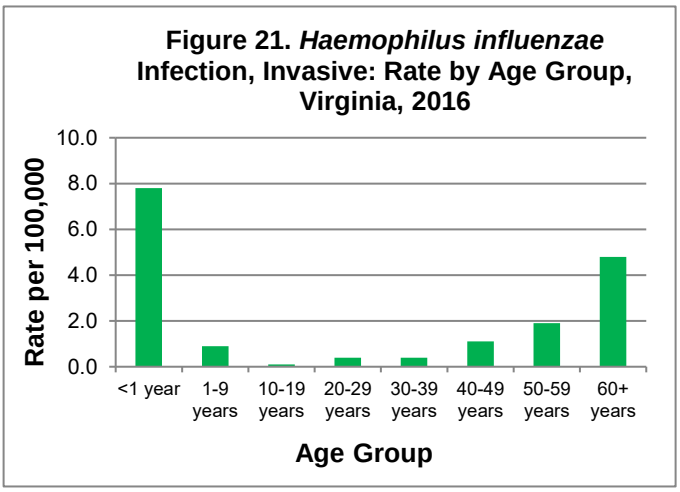
Agent: *Haemophilus influenzae* (bacteria)
Mode of Transmission: Person-to-person transmission by inhalation of respiratory droplets or direct contact with nose and throat secretions from an infected person or an asymptomatic carrier.
Signs/Symptoms: Inflammation of the lining of the brain and spinal cord (i.e., meningitis), inflammation of the epiglottis which may lead to blockage of upper airway and death, pneumonia, deep skin infection, arthritis, or bloodstream infection.
Prevention: Vaccination with a 3 or 4 dose series (depending on manufacturer) of conjugate *Haemophilus influenzae* type b (Hib) vaccine beginning at 2 months of age and concluding with a booster at 12 to 15 months of age. If vaccination is delayed, children 7 months of age and older may not require a full series of three or four doses. The total number of doses a child needs to complete the series depends on the child's age at the time the first dose is administered.
Other Important Information: *Haemophilus influenzae* is categorized into two major groupings: encapsulated and non-encapsulated. Encapsulated strains are more virulent and produce a polysaccharide capsule which is further characterized into six antigenically distinct serotypes (types a through f). Nontypable serotype results indicate a non-encapsulated strain. Vaccine is currently only available for one serotype, type b. In the pre-Hib vaccine era, type b organisms accounted for 95% of all strains that caused invasive disease. Since the licensure of conjugate Hib vaccine in the late 1980s, the incidence of invasive Hib disease in the U.S. has declined by more than 99% compared with the pre-vaccine era.

***Haemophilus influenzae* Infection, Invasive: 2016 Data Summary**	
Number of Cases:	142
5-Year Average Number of Cases:	103.2
% Change from 5-Year Average:	+38%
Incidence Rate per 100,000:	1.7

In 2016, 142 cases of invasive *H. influenzae* were reported in Virginia. This represents a 38% increase compared to the five-year average of 103.2 cases per year. This increase could indicate the start of a cyclical trend as incidence rates have risen from 1.1 cases per 100,000 in 2014, to 1.5 cases per 100,000 in 2015, to 1.7 cases per 100,000 in 2016. The rise in incidence is also a reflection of the opportunistic nature of *H. influenzae*, infecting susceptible clients, namely the young and elderly. While culture is the gold standard as a diagnostic test for confirming *H. influenza*, in 2015 the case definition was updated to include PCR as an acceptable confirmatory laboratory test. For 2016, only one case in Virginia was confirmed by PCR.



The oldest and youngest were the most frequently affected age groups as shown in Figure 21. Infants less than one year of age had the highest incidence rate (7.8 cases per 100,000), while those age 60 years and older had the second highest rate (4.8 cases per 100,000). Incidence rates in the remaining age groups ranged from 0.1 to 1.9 cases per 100,000.



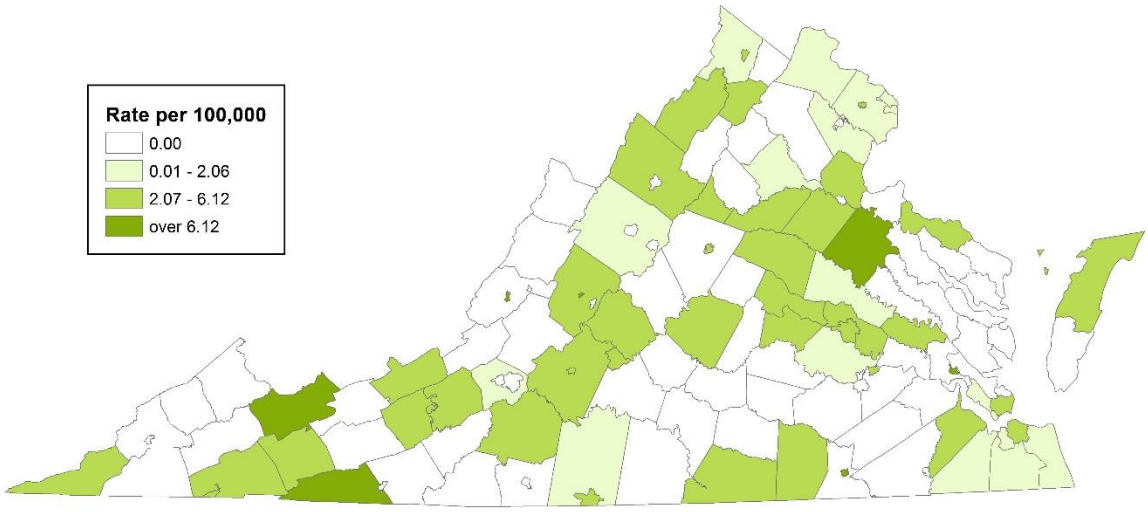
Information on race was not reported for 15% of cases. Among those with a known race, incidence was highest for the black population with 1.8 cases per 100,000, followed closely by the white population (1.4 cases per 100,000) and the "other" race population (1.1 cases per 100,000). Incidence was similar among females and males, with females having a slightly higher rate (1.8 and 1.6 cases per 100,000, respectively).

The highest incidence rate occurred in the central region with 2.2 cases per 100,000, followed closely by the northwest and southwest regions, both with rates of 2.1 per 100,000. Incidence rates for the eastern and northern regions were 1.5 and 1.1 cases per 100,000, respectively. Incidence rates by locality can be seen in the map below. Cases occurred throughout the year with a slight increase (30%) during the fourth quarter.

Serotype information was provided for 123 (87%) of the reported cases. Of these 123 cases, non-encapsulated *H. influenzae* was the most common (93 cases; 76%) strain reported. For the encapsulated strains, serotype f was the most common (21 cases; 17%), followed by serotype a (five cases; 4%), serotype e (three cases; 2%), and serotype b (one case; 1%). The single *H. influenzae* type b case occurred in a female in the 60 year and older age group who was not vaccinated based on age.

No outbreaks of *H. influenzae* were reported in 2016. In total, 16 deaths were attributed to infection with *H. influenzae*; over two-thirds of the deaths (11 cases; 69%) were associated with a nontypable serotype. Over half of the deaths (10 cases; 63%) occurred in persons from the 60 year and older age group.

Haemophilus influenzae Infection, Invasive, Incidence Rate by Locality, Virginia, 2016



Hantavirus Pulmonary Syndrome

Agent: Hantavirus family
Mode of Transmission: Several different types of hantaviruses that can cause hantavirus pulmonary syndrome (HPS) have been identified in the United States and each is associated with a different rodent species. Rodents infected with hantavirus do not become ill, but they can transmit the virus to humans when their urine, feces, or saliva is aerosolized and inhaled. While uncommon, other ways people may be exposed to the virus are rodent bites and direct contact between contaminated materials and a person's nose or mouth. Person-to-person transmission does not occur.
Signs/Symptoms: Early symptoms include fever and muscle pain, and may also include gastrointestinal complaints, headaches and dizziness. These symptoms may be accompanied by or followed by an abrupt onset of respiratory distress and decreased blood pressure. Respiratory failure and shock follow quickly.
Prevention: Rodents should be excluded from houses and other buildings. Protective measures include disinfecting rodent-contaminated areas with a spray disinfectant solution prior to cleaning. Contaminated areas should be cleaned with a wet mop and not be vacuumed or swept so as to decrease the likelihood of creating an aerosol containing the virus. While routine use of respirators by farmers and homeowners in rural areas is not recommended, respirator use is recommended when cleaning up very heavy rodent infestations or cleaning homes associated with known cases of HPS. Professional pest control companies may be best suited for the cleaning that would be needed in these situations.
Other Important Information: Although most common in the southwestern part of the U.S., hantavirus infections can occur anywhere. Nationally, the Sin Nombre virus is responsible for the majority of cases of HPS. The host of the Sin Nombre virus is the deer mouse (*Peromyscus maniculatus*), which is present throughout much of the U.S.

No cases of hantavirus pulmonary syndrome were reported in Virginia during 2016. The only HPS case reported in Virginia occurred in 1993. In 2004, a resident of southwest Virginia died from HPS following an exposure that occurred in West Virginia. For surveillance purposes, that case was attributed to West Virginia.

Healthcare-Associated Infection (HAI)

Agent: Any infectious agent (e.g., bacteria, virus, or fungus)
Mode of transmission: Person-to-person transmission via direct contact with an infected person, or by indirect contact with contaminated medical devices or equipment, environmental surfaces, or the hands of healthcare workers. Medical devices may include central lines (can lead to central line-associated bloodstream infections or CLABSIs) and urinary catheters (can lead to catheter-associated urinary tract infections or CAUTIs). A *central line* is a flexible tube that is inserted into one of the large veins or arteries near the patient's heart that can be used to give fluids or medications or measure the amount of fluid in the body. Because a central line is located in a blood vessel, any introduction of bacteria, viruses, or fungi during central line insertion, maintenance, or removal may lead to a bloodstream infection. A *urinary catheter* is a tube that is inserted into the bladder and is used to drain urine. Similar to central lines, any introduction of an infectious agent during catheter insertion, maintenance, or removal may lead to a urinary tract infection.
Signs/symptoms: Varies depending on the type of healthcare-associated infection. May include symptoms such as fever, chills, low blood pressure, diarrhea, or redness/tenderness at the device insertion or surgical site. Most types of infections also require a positive laboratory result identifying an organism.
Prevention: To prevent HAIs, healthcare providers should follow CDC infection prevention guidelines, including: using antibiotics appropriately; removing unnecessary medical devices; complying with recommended practices for hand hygiene, device insertion, and device maintenance; using appropriate personal protective equipment; using evidence-based methods to clean, disinfect, and sterilize medical equipment and devices, as well as clean and disinfect the healthcare environment; and following standard and transmission-based precautions meticulously.
Other important information: Hospitals are required to provide information on HAIs to the Virginia Department of Health (VDH) via the Centers for Disease Control and Prevention's online surveillance system, the National Healthcare Safety Network (NHSN). Hospitals first began reporting CLABSI data to VDH in July 2008. On September 25, 2015, the Virginia HAI reporting regulations were amended to expand the amount of HAI data that is shared with VDH. The updated regulations align reporting to the state health department with what hospitals are already reporting to the NHSN for the purposes of complying with the Centers for Medicare and Medicaid Services Hospital Inpatient Quality Reporting Program. Under the regulations, the state reporting requirements include: CLABSI in intensive care units and select inpatient wards; CAUTI in adult and pediatric intensive care units and select inpatient wards; surgical site infections (SSIs) following abdominal hysterectomy and colon procedures; *Clostridium difficile* laboratory-identified events; methicillin-resistant *Staphylococcus aureus* bacteremia laboratory-identified events; and healthcare personnel influenza vaccination summary data. More information about NHSN is available here: www.cdc.gov/nhsn. Data on healthcare personnel influenza vaccination are found in the Influenza chapter of this annual report.

In 2016, 78 acute care hospitals reported HAI data to VDH for one or more types of infections. Reports of hospital-specific and statewide data are available on the VDH HAI Program's public reporting website: http://www.vdh.virginia.gov/surveillance-and-investigation/healthcare-associated-infections-hais/public-reporting-of-hai-data-in-virginia/. Critical access hospitals now

have separate infection ratio risk models and because they are not mandated to report to VDH, their data have been excluded from this report.

Table 8 shows the statewide summary of the number of infections and standardized infection ratios (SIRs), and 95% confidence intervals (CIs) for all reportable HAIs in 2016. The SIR is a summary measure that adjusts for differences between hospitals, such as types of patients and procedures. It compares the number of infections reported in a given time period to the number of infections that would be predicted using national data from a baseline time period. Data reported to NHSN in the calendar year 2015 serve as the new baseline for SIR calculations. Beginning with 2015 data, updated risk-adjustment models are now used to measure HAI prevention progress in comparison to infection data reported to NHSN. An SIR equal to 1.0 indicates that the number of infections reported during the surveillance period is the same as the number of infections predicted given the baseline data. A lower SIR indicates better performance. A summary of the data reported by Virginia acute care hospitals in 2016 is provided below:

- There were 24% fewer central line-associated bloodstream infections (CLABSIs) in Virginia acute care hospitals than predicted based on the national experience from 2015. This was a statistically significant reduction from the national baseline.
- There were about the same number of catheter-associated urinary tract infections (CAUTIs) in Virginia acute care hospitals as predicted based on the national experience from 2015.
- There were about the same number of surgical site infections (SSIs) following abdominal hysterectomies and about the same number of SSIs following colon surgeries in adult patients in Virginia acute care hospitals as predicted based on the national experience from 2015.
- There were 14% fewer hospital-onset methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia laboratory-identified events in Virginia acute care hospitals than predicted based on the national experience from 2015. This was a statistically significant reduction from the national baseline.
- There were about the same number of hospital-onset *Clostridium difficile* laboratory-identified events in Virginia acute care hospitals as predicted based on the national experience from 2015.

Outbreaks reported from healthcare settings are described in the Outbreaks chapter of this annual report. In 2016, 81 outbreaks were reported from healthcare settings, including 44 suspected or confirmed to be due to norovirus, 18 suspected or confirmed to be due to influenza, and 19 suspected or confirmed to have another pathogen identified as a causal agent.

Table 8. Statewide Standardized Infection Ratios (SIRs) for Central Line-Associated Bloodstream Infection (CLABSI), Catheter-Associated Urinary Tract Infection (CAUTI), Surgical Site Infection (SSI), and Laboratory-Identified Hospital-Onset Methicillin-Resistant *Staphylococcus aureus* (MRSA) Bacteremia and *Clostridium difficile* (CDI) Laboratory-Identified Events; Virginia Acute Care Hospitals; 2016

				Number of Infections		Standardized Infection Ratio (SIR) and 95% CI		
HAI	**Unit/Type**	**No. of Facilities**	**Device Days/ Procedures Performed/ Patient Days**	**Observed**	**Predicted**	**SIR**	**Lower**	**Upper**
CLABSI	**All ICUs[b] and Wards[c] (total)**	78	429,493	313	411.88	0.76	0.68	0.85
	Adult and Pediatric ICUs[b] (only)	75	197,384	159	203.79	0.78	0.67	0.91
	Adult and Pediatric Wards[c] (only)	78	200,295	119	165.70	0.72	0.60	0.86
	Neonatal ICUs (only)	25	30,741	33	41.31	0.80	0.56	1.11
CAUTI	**All ICUs[b] and Wards[c] (total)**	78	437,203	474	476.49	1.00	0.91	1.09
	Adult and Pediatric ICUs[b] (only)	75	223,068	303	290.30	1.04	0.93	1.17
	Adult and Pediatric Wards[c] (only)	78	213,374	168	185.51	0.91	0.78	1.05
SSI Adult[a]	**Colon Surgery**	74	7,594	209	182.95	1.14	1.00	1.31
	Abdominal Hysterectomy	65	8,347	53	52.11	1.02	0.77	1.32
MRSA	**Facility-wide LabID**	78	3,453,257	177	205.81	0.86	0.74	0.99
CDI	**Facility-wide LabID**	78	3,146,854	2,312	2,400.26	0.96	0.93	1.00

Green highlighting indicates an SIR significantly LOWER than the national baseline. Baseline period for CLABSI, CAUTI, SSI, MRSA, and CDI is calendar year 2015.
Red highlighting indicates an SIR significantly HIGHER than the national baseline.
[a]SSI SIRs are based on the complex admission/readmission model. For more information on this model, go to: http://www.cdc.gov/nhsn/pdfs/pscmanual/9pscssicurrent.pdf
[b]NHSN has a separate CLABSI and CAUTI risk model for oncology intensive care units (ICUs); these data are not shown separately here. Oncology ICUs are included in the total for CLABSI and CAUTI but are excluded from the ICU only data.
[c]Inpatient ward locations included are adult and pediatric medical, surgical, and medical/surgical wards.

Hemolytic Uremic Syndrome (HUS)

Agent: Serious sequelae associated with infection from Shiga toxin-producing bacteria (*E. coli* or *Shigella). E. coli* O157:H7 is the bacterium most commonly associated with HUS.
Mode of Transmission: HUS is not transmitted from person to person. Infection with Shiga toxin-producing bacteria can result from ingestion of food or water contaminated with human or animal feces or exposure to fomites or contaminated environments.
Signs/Symptoms: Classic signs of hemolytic uremic syndrome include red blood cell destruction (hemolytic anemia), low number of platelets (thrombocytopenia), and acute kidney failure. Symptoms include decreased frequency of urination, fatigue, progression to kidney failure often requiring dialysis, and neurological impairment (e.g., stroke or seizures). HUS, if it occurs, develops on average seven days after the first symptoms of infection.
Prevention: Since most cases of HUS result from infection with Shiga toxin-producing bacteria, initial preventive measures should include careful hand washing after using the bathroom, changing diapers, handling animals or their feces, and before preparing and eating food. All ground beef should be cooked thoroughly to an internal temperature of at least 160°. Raw milk, unpasteurized dairy products, and unpasteurized juices should not be consumed. People with proven or suspected *E. coli* infection should not use recreational water venues. Once infection with Shiga toxin-producing bacteria occurs, additional measures to prevent the infection further developing to HUS may include hospital admission and close monitoring of the patient, especially in children under five years and adults over 75 years. Family history of HUS should be obtained. Prompt rehydration of the patient should begin. Possible development of HUS should be monitored using appropriate laboratory testing methods. Antimicrobial agents should not be administered. The case should be reported to the local health department in order to initiate an epidemiologic investigation to identify the source of transmission and to prevent further spread.
Other Important Information: Five to ten percent of persons diagnosed with Shiga toxin-producing *E. coli* infection develop HUS. The syndrome occurs in up to 15% of children with *E. coli* O157:H7 infection. For more information, see the section of this report on *E. coli* Infection, Shiga Toxin-Producing.

Hemolytic Uremic Syndrome (HUS): 2016 Data Summary	
Number of Cases:	4
5-Year Average Number of Cases:	4.4
% Change from 5-Year Average:	-9%
Incidence Rate per 100,000:	0.0

Four cases of HUS were reported in Virginia during 2016, which is the same number of cases reported in 2015. The four cases in 2016 represent a slight decrease from the five-year average of 4.4 cases per year. Among the cases, one person was Shiga toxin positive and three did not have Shiga toxin testing performed but did report diarrheal illness. The age of the cases ranged from 1 to 19 years. All cases occurred in the white population. Three cases were in females and one was in a male. Two cases each were reported from the northern and northwest regions. Three cases occurred between March and June and one occurred in December. Two cases were part of an *E. coli* outbreak. No deaths were attributed to HUS in 2016.

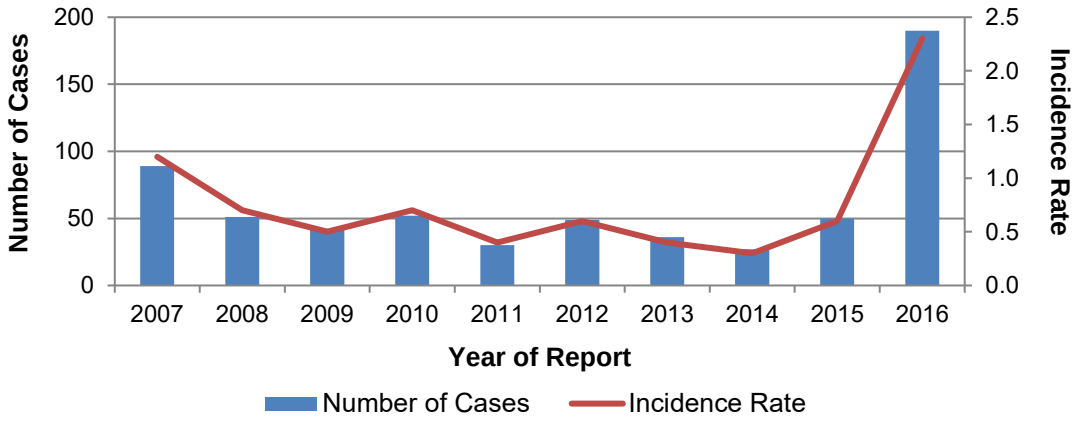
Hepatitis A

Agent: Hepatitis A virus (HAV), a member of the Picornavirus family
Mode of Transmission: Ingestion of food or water contaminated by fecal matter or through close contact with an infected household member or sex partner.
Signs/Symptoms: Fever, malaise, nausea, abdominal discomfort, dark urine, joint pain, and jaundice. In older children and adults, symptoms usually occur for several weeks, though prolonged or relapsing liver disease can last up to six months. Younger children often exhibit no symptoms.
Prevention: Preventive measures include immunization, safe food preparation, and good personal hygiene (e.g., washing hands with soap after using the bathroom, after changing diapers, and before preparing and eating food). Administration of immune globulin (IG) or single-antigen vaccine as soon as possible after exposure to hepatitis A can protect against symptomatic infection.
Other Important Information: This is an acute illness only; chronic infection does not occur. A vaccine was first introduced in 1995 and is currently recommended for all children at the age of one year, persons who are at increased risk of infection (i.e., international travelers), and persons who are at increased risk for developing complications from hepatitis A.

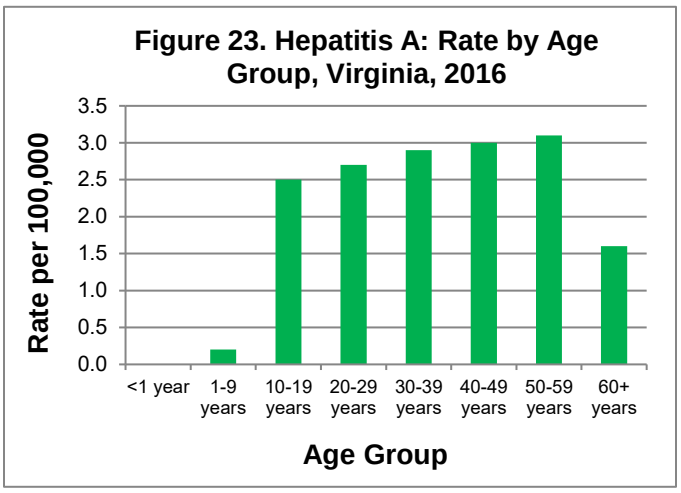
Hepatitis A: 2015 Data Summary	
Number of Cases:	190
5-Year Average Number of Cases:	38.4
% Change from 5-Year Average:	+395%
Incidence Rate per 100,000:	2.3

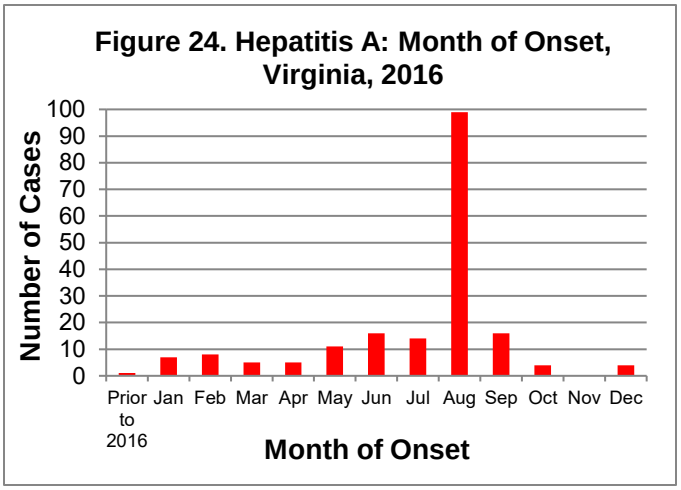
In 2016, 190 cases of hepatitis A were reported in Virginia. This represents an 280% increase from the 50 cases reported in 2015, and is 395% higher than the five-year average of 38.4 cases per year (Figure 22). As explained below, 131 of the cases were associated with outbreaks, leaving 59 sporadic cases reported for the year, which is higher than but more consistent with data from recent years.

Figure 22. Hepatitis A: Ten-Year Trend for Number of Cases and Incidence Rate, Virginia, 2007-2016



Cases were reported among people ranging in age from 9 to 95 years. The incidence rate was highest in the 50-59 year age group (3.1 per 100,000). Rates among the other affected age groups ranged from 0.2 to 3.0 per 100,000, with an incremental increase in age groups from 10 to 59 years. No cases were reported in children less than one year of age (Figure 23). Race information was not reported for 24% of cases. Among cases with a known race, the incidence rate was highest in the white population (2.0 per 100,000) compared to rates observed in the black and "other" race populations (0.9 and 1.2 per 100,000, respectively). The incidence rate among females (2.4 per 100,000) was higher than the rate among males (2.1 per 100,000).





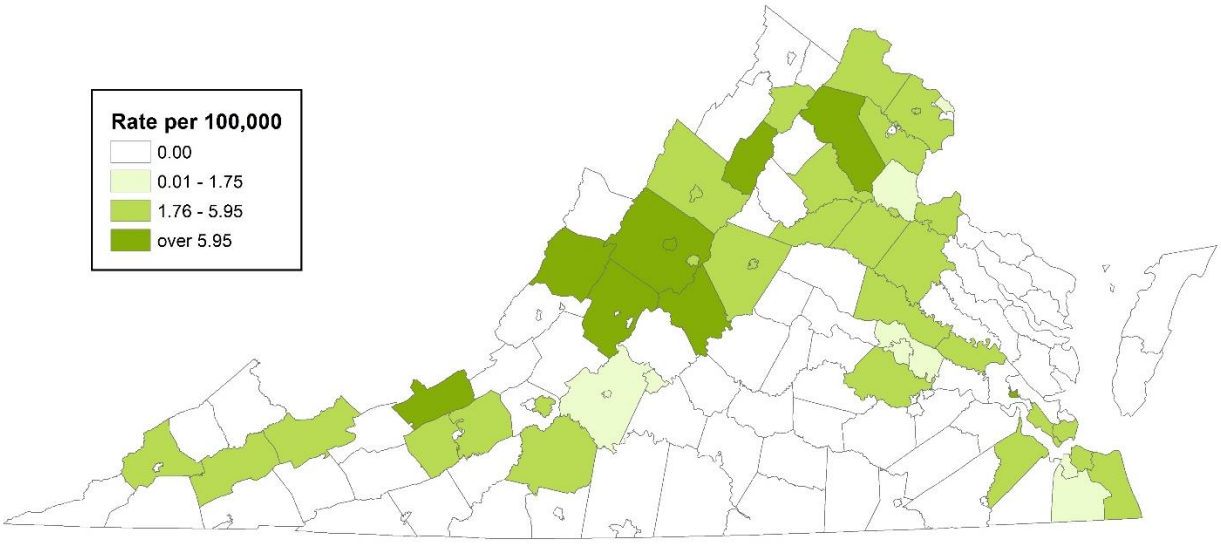
By region, incidence was highest in the northwest region (4.5 per 100,000) and lowest in the southwest region (0.9 per 100,000). Incidence by locality can be seen in the map below. Although cases occurred throughout the year, 52% had illness onset during the month of August (Figure 24). This spike in cases can be attributed to one of two hepatitis A outbreaks described below. One death, in an adult female over 60 years of age, was attributed to hepatitis A during 2016.

The increase in cases over the 5-year average is attributable to two outbreaks. A foodborne outbreak of hepatitis A occurred in 2016 involving 110 cases; 108 were primary cases and 2 were secondary cases. Sixty-one cases (55%) occurred in females and 49 cases (45%) occurred in males. The age range of patients involved in the outbreak was 14 to 70 years (average: 36 years). Illness onset occurred May through October, with the majority of illness onsets occurring in August. Cases were identified in all regions of the state except for the southwest region. The cause of the outbreak was contaminated strawberries imported from Egypt that were consumed by patients in commercially-available smoothies.

Another hepatitis A outbreak was reported in the northwest region involving person-to-person transmission through close interaction involving sexual contact, household contact, and recreational drug use. Twenty-one patients were identified as part of the outbreak; 13 were male and 8 were female. Persons involved in the outbreak ranged from 9 to 78 years of age (average: 40 years). The onset of illness occurred January through September.

Excluding the 131 (69%) cases associated with the two outbreaks, 14 cases (7%) reported traveling outside of the country prior to illness, or were contacts of someone who traveled outside the country.

Hepatitis A Incidence Rate by Locality
Virginia, 2016

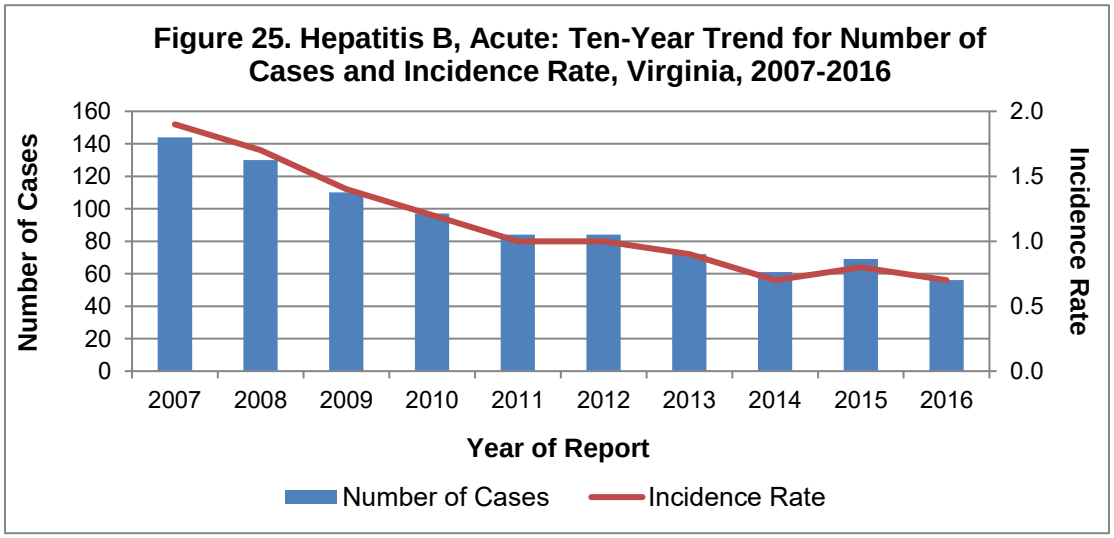


Hepatitis B, Acute

Agent: Hepatitis B virus (HBV), a hepadnavirus
Mode of Transmission: Person-to-person transmission through infected blood or body fluids (e.g., sexual, perinatal, or through the skin by nonsterilized needles or syringes).
Signs/Symptoms: Fever, fatigue, loss of appetite, nausea, abdominal pain, and jaundice. Infection can be asymptomatic. The likelihood of developing symptoms is age-dependent, with adults and children over the age of five years being more likely to develop symptoms.
Prevention: Preventive strategies include immunization of people at increased risk of infection; screening of all pregnant women and treatment of children born to women who test positive; routine immunization of infants; routine immunization of adolescents who have not previously been immunized; and screening of donated blood and organs. Additional preventive measures include adherence to safe sexual practices, not sharing items contaminated with blood (i.e., needles, razors, and toothbrushes), and following standard precautions and infection control practices during all medical procedures.
Other Important Information: Infection with hepatitis B virus can lead to chronic (i.e., long-term) infection. Persons who become infected at a younger age are more likely to develop chronic infection. Death from liver disease occurs in 15-25% of those with chronic infection. A nationwide strategy to eliminate hepatitis B infection was initiated in 1991. It included vaccination of infants at birth, prevention of perinatal hepatitis B infections, vaccination of children and adolescents, and vaccination of adults at high risk of infection.

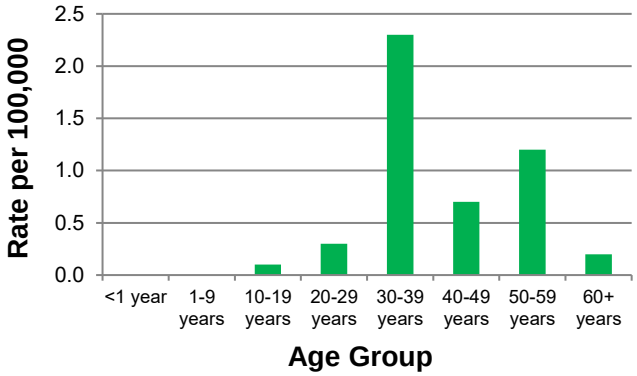
Hepatitis B, Acute: 2016 Data Summary	
Number of Cases:	56
5-Year Average Number of Cases:	74.0
% Change from 5-Year Average:	-24%
Incidence Rate per 100,000:	0.7

In 2016, 56 cases of acute hepatitis B were reported in Virginia, a 19% decrease from the 69 cases reported in 2015 and a 24% decrease from the five-year average of 74.0 cases per year (Figure 25). The decrease in reported cases in Virginia reflects a national trend.



The highest incidence rate was observed in the 30-39 year age group (2.3 per 100,000), followed by the 50-59 year age group (1.2 per 100,000) (Figure 26). No cases were reported among individuals younger than 10 years of age. Race information was not reported for 18% of cases. Among those with a known race, incidence was highest among the black population (0.8 per 100,000) compared to the white population (0.5 per 100,000). The incidence rate among males (0.8 per 100,000) was higher than females (0.5 per 100,000).

Figure 26. Hepatitis B, Acute: Rate by Age Group, Virginia, 2016

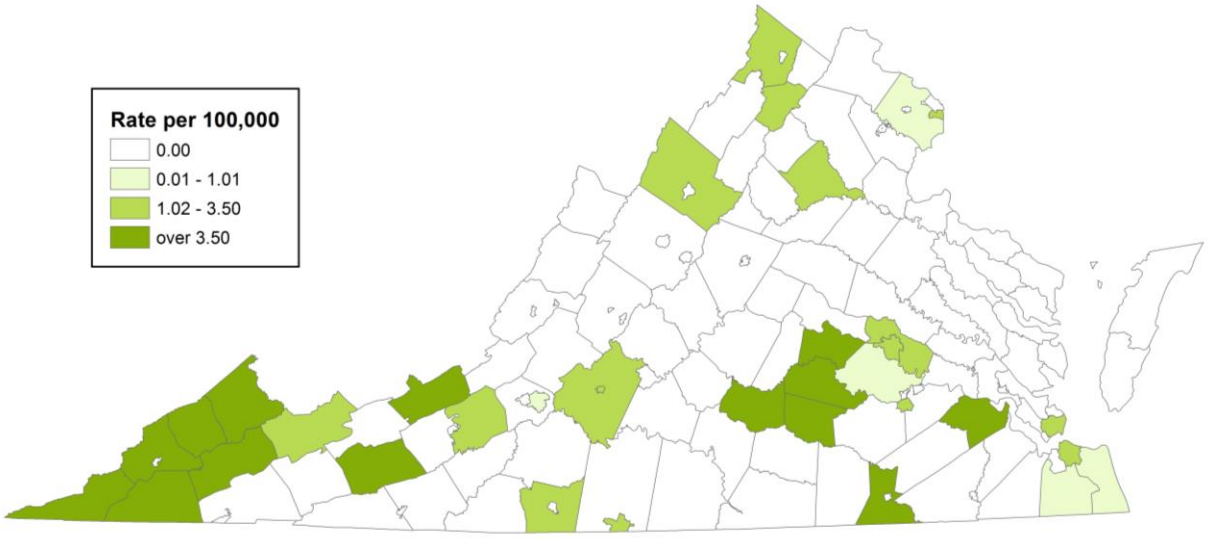


During 2016, the southwest region had the highest incidence rate for acute hepatitis B infections (1.5 per 100,000), followed closely by the central region (1.3 per 100,000). The remaining regions had lower incidence rates ranging from 0.5 to 0.1 cases per 100,000. Illness onset occurred evenly throughout the year. No acute hepatitis B outbreaks were reported in Virginia in 2016. No deaths were attributed to acute hepatitis B infections in 2016.

Certain behaviors can place a person at greater risk for infection with hepatitis B virus. These behaviors can include engaging in unsafe sexual practices, injecting drugs or sharing needles or other drug equipment, being exposed to blood while on the job, living or associating with a person who has hepatitis B, traveling to countries with high rates of hepatitis B, or practicing unregulated, unsafe or unclean body piercing or tattooing. In Virginia, risk factor information is not collected on every case. Among the 56 cases of acute hepatitis B reported in 2016, ten individuals reported having contact with a person who was confirmed or suspected of having acute or chronic hepatitis B; nine reported using non-injected street drugs; five reported having been incarcerated; four individuals reported injecting street drugs; four reported receiving a tattoo; two reported having their body pierced; and two reported having been exposed to blood. It cannot be determined if these exposures were the source of the infection.

An additional 1,768 newly identified hepatitis B cases were reported in 2016 that were classified as chronic hepatitis B infections for surveillance purposes. These cases were either ruled out as acute hepatitis B or their acute status could not be established because the case was not investigated. The median age of these cases was 43 years. Risk factor information is not routinely collected on chronic hepatitis B cases; however, 35 were institutionalized at the time of their diagnoses.

Hepatitis B, Acute, Incidence Rate by Locality
Virginia, 2016

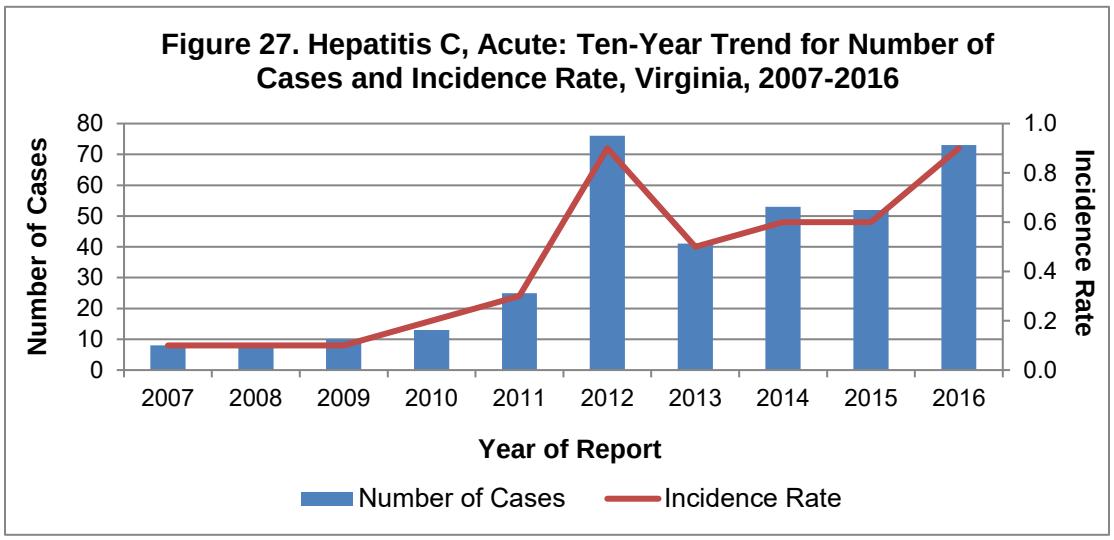


Hepatitis C, Acute

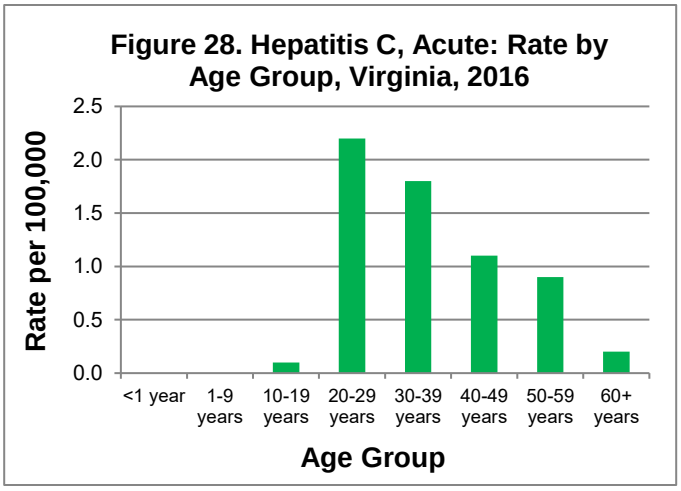
Agent: Hepatitis C virus (HCV), a member of the Flavivirus family
Mode of Transmission: Hepatitis C is primarily spread when blood from someone infected with HCV enters the body of someone not infected, usually by passing through the skin. The most common means of HCV infection in the U.S. is injection drug use, including the sharing of needles, syringes, or other equipment used to inject drugs. Infection can also occur from needlestick injuries in health care settings, or by being born to an HCV-infected mother. Infrequently, the virus can be spread by sharing personal items contaminated with infectious blood (razors or toothbrushes), or by having sexual contact with someone infected with HCV. Before 1992, when blood screening for HCV became available, receipt of donated blood, blood products, and organs was a common means of transmission. This is now a rare occurrence.
Signs/Symptoms: Often (70-80% of the time), no symptoms occur. Fever, fatigue, loss of appetite, nausea, abdominal discomfort, and jaundice are common symptoms when they do occur.
Prevention: Preventive measures include avoiding behaviors that can spread the disease, including sharing needles or other equipment used to inject drugs. Standard precautions and infection control practices should be followed during all medical and dental procedures. Any body piercing or tattooing should take place in a licensed facility. Sharing of personal items potentially contaminated with blood, such as razors and toothbrushes, should be avoided. Safe sexual practices and not donating blood if infected with HCV are also recommended.
Other Important Information: HCV infections become chronic in 75-85% of cases. As people with chronic HCV infection age, they are at higher risk for developing chronic liver disease, such as cirrhosis and liver cancer. No vaccine is available to prevent HCV.

Hepatitis C, Acute: 2016 Data Summary	
Number of Cases:	73
5-Year Average Number of Cases:	49.4
% Change from 5-Year Average:	+48%
Incidence Rate per 100,000:	0.9

In 2016, 73 cases of acute hepatitis C infection were reported in Virginia, compared to 52 cases reported in 2015. This is a 48% increase when compared to the 5-year average of 49.4 cases per year (Figure 27). While incidence is likely increasing, it is difficult to assess a true rise in cases due to a recent change made to the national surveillance case definition. In 2016, a probable case classification was added which, for surveillance purposes, now includes persons who are hepatitis C antibody positive to be considered a case. This change in case classification has led to an increase in the number of reported acute hepatitis C cases in 2016. However, it is likely that the true number of acute hepatitis C cases is still undercounted due to the large percentage of acute hepatitis C infections that go undetected because of the absence of clinical symptoms.



The highest incidence rate (2.2 per 100,000) occurred in the 20-29 year age group, followed by the 30-39 year age group (1.8 per 100,000). No cases of acute hepatitis C infection were reported in persons less than 10 years of age (Figure 28). Race information was not reported for 26% of cases. Among those with a known race, incidence was highest among the white population (0.8 per 100,000) compared to the black and "other" race populations (each with 0.3 per 100,000, respectively). Incidence was slightly higher among females (1.0 per 100,000) compared to males (0.8 per 100,000).

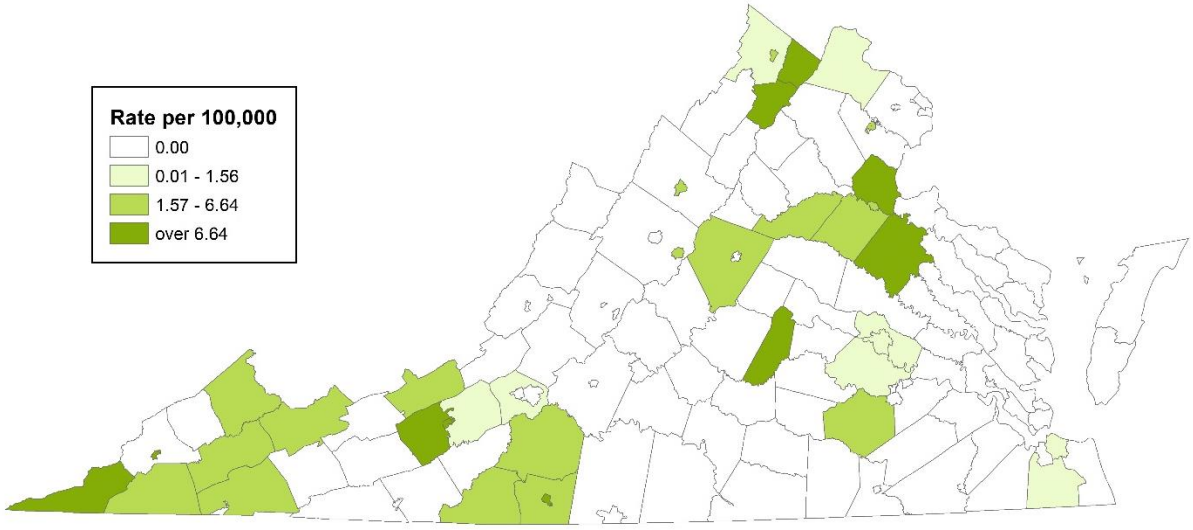


In 2016, 73% percent of acute hepatitis C cases occurred in two regions in the state. The largest number of cases and highest incidence rate were seen in the northwest region with 30 cases and an incidence of 2.3 per 100,000. This was followed closely in the southwest region with 23 cases and a rate of 1.7 per 100,000. Eleven cases were from the central region (0.8 per 100,000), five cases were from the northern region (0.2 per 100,000), and four cases were from the eastern region (0.2 per 100,000). Incidence rates by locality can be seen in the map below. Illness onset occurred throughout the year with 29% of cases having illness onset in the first quarter of the year. No outbreaks of acute hepatitis C were reported in Virginia during 2016. One death was attributed to acute hepatitis C infection.

Certain behaviors can place a person at greater risk for infection with hepatitis C virus. In Virginia risk factor information is not collected on every case. Among the 73 cases of acute hepatitis C reported in 2016, 14 of the individuals reported injecting drugs; nine reported using non-injected street drugs; eight reported receiving a tattoo; three reported having their body pierced; and eight reported being incarcerated. While these are potential risk factors for this infection, it cannot be determined if these exposures were the source of the infection.

In addition, 11,332 newly identified hepatitis C cases were reported in 2016. These cases were classified as chronic hepatitis C cases for surveillance purposes because they were either ruled out as acute hepatitis C cases or their acute status could not be established because the case was not investigated. The median age of these cases was 50 years. Risk factor information is not routinely collected on chronic hepatitis C cases; however, 1,247 were institutionalized at the time of their diagnosis.

Hepatitis C, Acute, Incidence Rate by Locality
Virginia, 2016



Human Immunodeficiency Virus (HIV) Disease

Agent: Human Immunodeficiency Virus (retrovirus)
Mode of transmission: Person-to-person via unprotected sexual intercourse, use of contaminated needles, blood transfusions and transplants with organs from infected donors, from mother-to-child before or during birth or through breastfeeding, or contact of cut or abraded skin with body secretions carrying the virus.
Signs/Symptoms: Initial infection with HIV can cause an acute illness or fever, muscle pain, enlarged lymph nodes, and/or a rash which occurs approximately 2-4 weeks post-exposure; however, a person can be asymptomatic for several years. When the immune system is affected, the infection develops into AIDS.
Prevention: Preventive measures include safe sexual practices, such as consistent condom use; routine HIV/STD testing; antiretroviral medication as prevention including: pre-exposure prophylaxis (PrEP), post-exposure prophylaxis (PEP), and non-occupational post-exposure prophylaxis (nPEP) (for more information about PrEP, PEP and nPEP, please see: http://www.vdh.virginia.gov/disease-prevention/disease-prevention/prep-and-npep/); not sharing or reusing needles or syringes; among all HIV-infected persons, taking and adhering to antiretroviral therapy regimens to maintain viral suppression and prevent transmission to partners; screening of blood and plasma; and among infected mothers, cesarean delivery before labor, and avoidance of breastfeeding.
Other Important Information: Data analysis methods for HIV/AIDS were changed in 2009. Statistics are presented for HIV disease rather than HIV and AIDS as separate conditions, as explained below. More detailed epidemiologic analyses of HIV/AIDS, as well as other sexually transmitted infections, can be found at the following website address: http://www.vdh.virginia.gov/disease-prevention/sexually-transmitted-diseases-std-surveillance-operations-data-administration/hiv-data-statistics/. Rapid tests (which provide results within 30 minutes) are becoming more widely available and are used at various testing sites in Virginia. For more information, call your local health department, or contact the Virginia Department of Health HIV/STD/Viral Hepatitis Hotline at 1-800-533-4148.

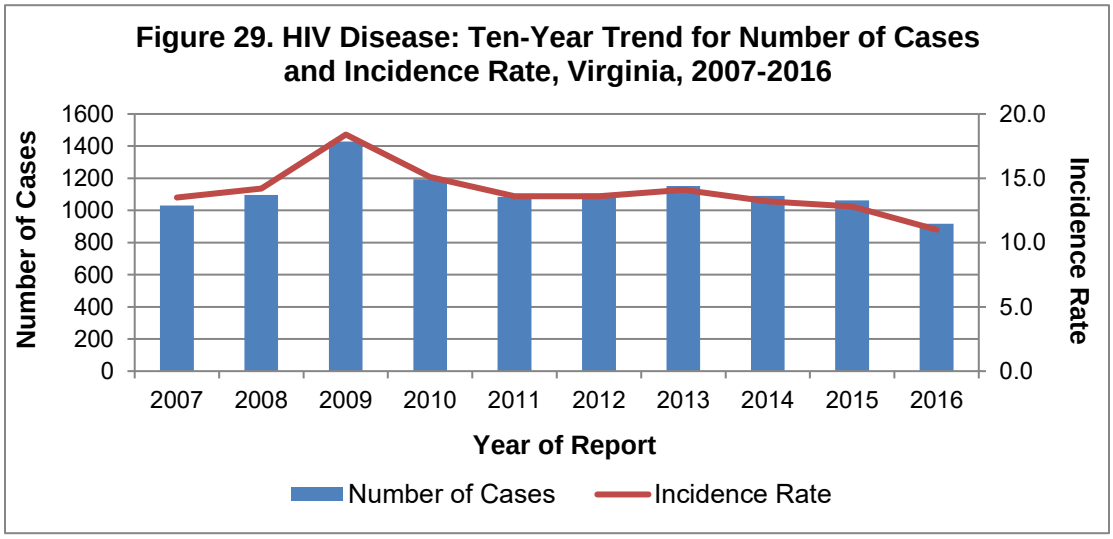
HIV Disease: 2016 Data Summary	
Number of Cases:	918
5-Year Average Number of Cases:	1,098.6
% Change from 5-Year Average:	-16%
Incidence Rate per 100,000:	11.0

Change in Epidemiologic Analyses of HIV Disease

Beginning in 2009, VDH reassessed the way HIV and AIDS surveillance data were reported in order to better illustrate the epidemic in Virginia. Instead of approaching HIV and AIDS as two separate conditions of the same disease, it was found to be more helpful for epidemiologic and community planning purposes to evaluate all HIV and AIDS cases as one encompassing group: persons diagnosed or living with HIV disease. Before 2009, cases that were reported as having an AIDS-defining condition were excluded from the

count of newly diagnosed HIV infections. Due to this change in methodology from previous years, those calculations pre-2009 are not comparable to calculations from 2009 and later, where HIV and AIDS are treated as one disease without considering disease progression. Currently, any case that presents as having HIV or an AIDS-defining condition at the time of diagnosis is considered a newly diagnosed HIV disease case. It is not considered an incident case, however, as the person may have had HIV for a significant time prior to diagnosis. Figure 29 below displays the trend in new HIV diagnoses when the current methodology is applied to the entire 2007-2016 period. For a more thorough discussion of the changes in the analysis of HIV and AIDS surveillance data, please refer to the website address listed in the "Other Important Information" section above.

Figure 29. HIV Disease: Ten-Year Trend for Number of Cases and Incidence Rate, Virginia, 2007-2016



HIV Disease

In 2016, 918 cases of HIV disease were reported in Virginia, as illustrated in Figure 29. On average, there were 1,098.6 new cases per year from 2011 to 2015, reflecting the stability of new HIV disease diagnoses over the last several years. The statewide incidence rate of new HIV diagnoses was 11.0 per 100,000 in 2016.

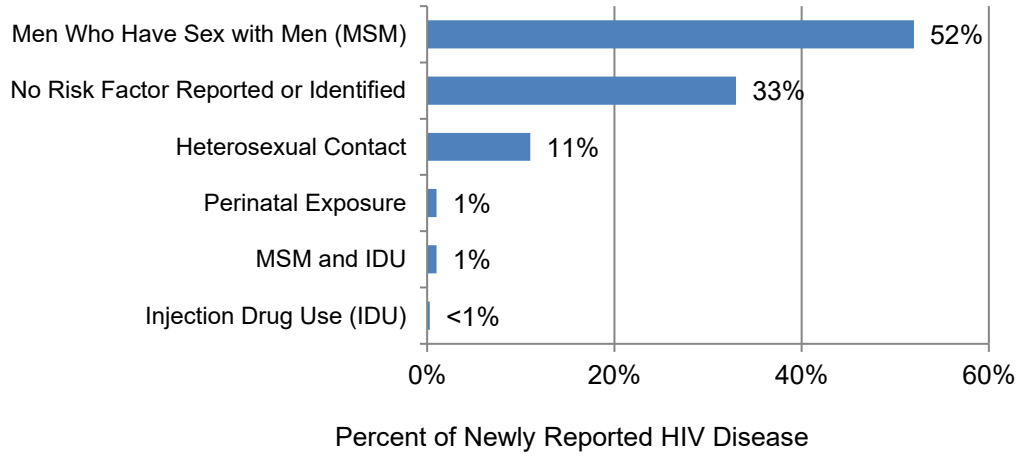
The highest HIV incidence rates in 2016 occurred among the 20-29 year age group (32.9 per 100,000), followed by the 30-39 year age group (30.7 per 100,000). The 20-29 year age group has consistently experienced the highest incidence rate of new diagnoses since 2007 and represented 40% of all new diagnoses reported in 2016. When combining the two age groups, approximately 65% of all new HIV diagnoses in 2016 were among persons aged 20-39 years. Incidence rates among the black, non-Hispanic population and Hispanic/Latino population were higher than their white, non-Hispanic population counterparts in 2016. The black, non-Hispanic and Hispanic/Latino populations were approximately eight and four times more likely than the white, non-Hispanic population to be newly diagnosed with HIV in 2016. Overall, HIV incidence rates by race/ethnicity have

remained relatively stable over the past few years. Males have consistently shown higher incidence rates of HIV disease compared to females over time, and males were nearly five times more likely than females to be diagnosed with HIV disease in 2016 (18.4 and 3.7 per 100,000, respectively).

Among the five regions in Virginia, the highest incidence rate in 2016 was observed in the eastern region, with 17.5 cases per 100,000, followed by the central region at 15.3 cases per 100,000. The lowest HIV incidence rate (4.4 per 100,000) occurred in the southwest region. Incidence by locality can be seen in the map below.

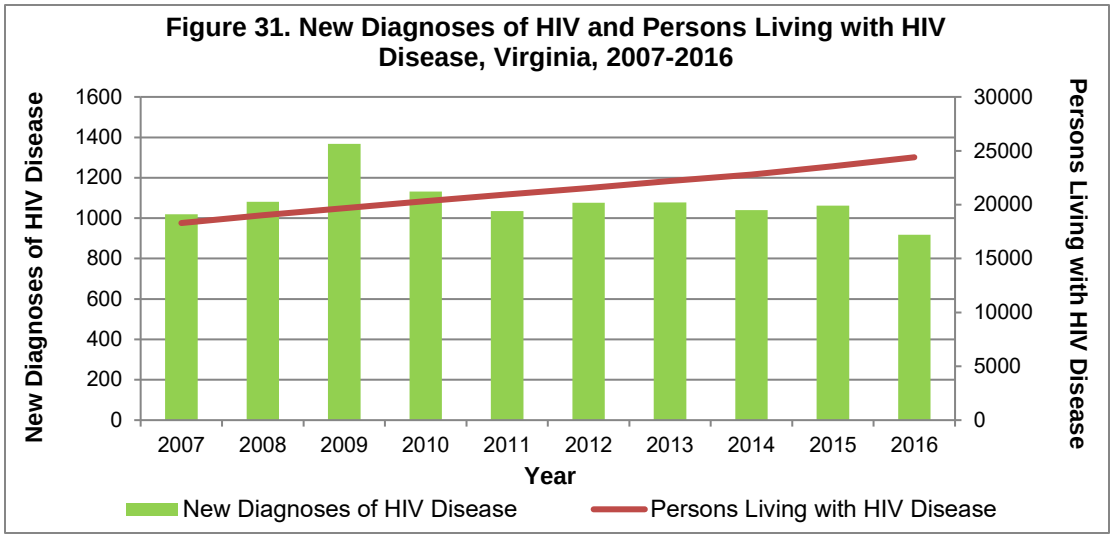
In 2016, men who have sex with men (MSM) was the most frequently reported transmission risk category for HIV disease, representing 52% of new cases in Virginia (Figure 30). Among identified MSM cases, 51% were 20-29 years of age at diagnosis and 57% were black, non-Hispanic. Eleven percent of newly diagnosed cases for 2016 were attributed to heterosexual contact. No specific risk factors for transmission were reported or identified for 33% of newly diagnosed HIV cases in 2016.

Figure 30. HIV Disease: Mode of Transmission, Virginia, 2016

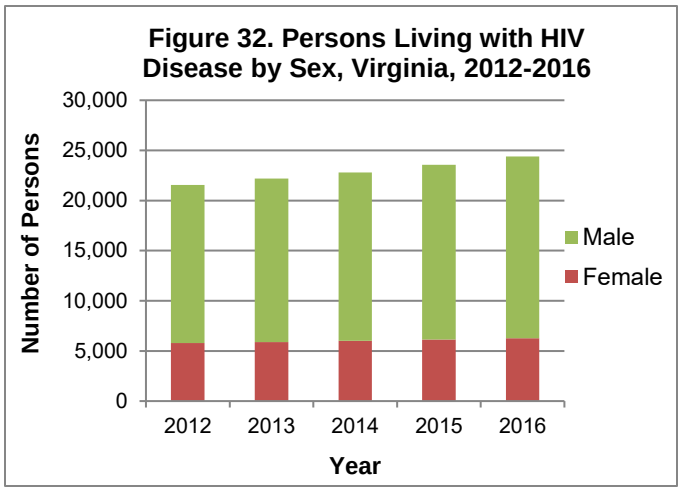


Persons Living with HIV Disease

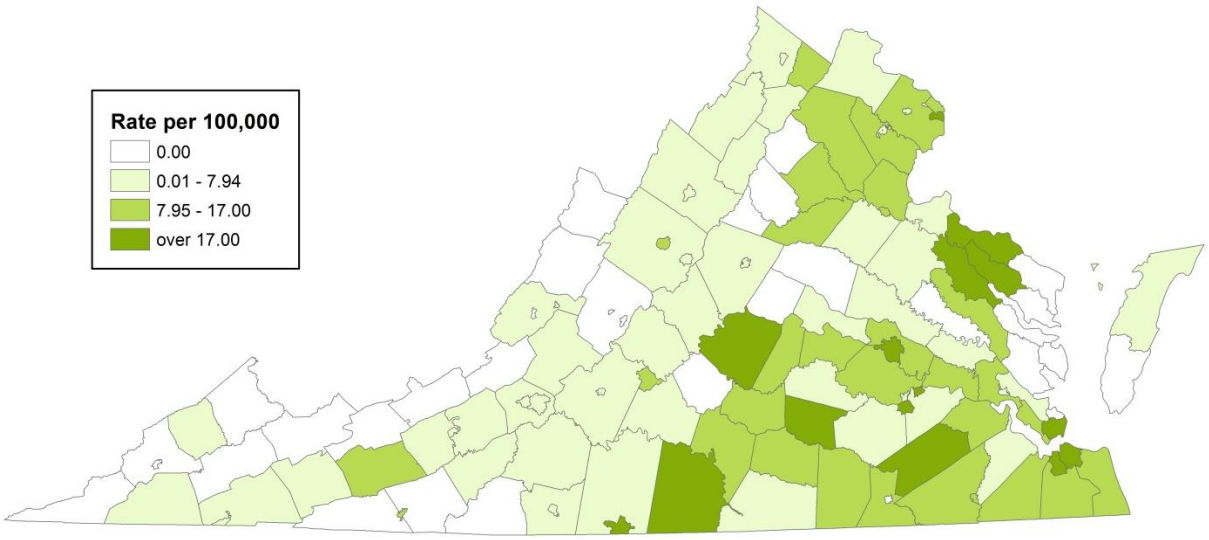
Due to advances in medical therapies and care strategies, the number of persons living with HIV disease (PLWH) has continued to increase. As of December 31, 2016, there were 24,396 persons known to be living with HIV disease in Virginia (Figure 31).



Approximately three-quarters of PLWH are male (Figure 32). In addition, 55% of PLWH were between 40-59 years of age as of December 31, 2016. Among PLWH, 59% were black, non-Hispanic and 47% were attributed to male-to-male sexual contact, 19% to heterosexual contact, and 8% to injection drug use. The highest rates of PLHW were in the central and eastern regions with 412.2 and 402.4 cases per 100,000, respectively. The lowest rate of PLWH was in the southwest region with 149.9 cases per 100,000. Approximately 47% of those living with HIV disease were also diagnosed with an AIDS-defining condition.



HIV Disease Incidence Rate by Locality
Virginia, 2016



Influenza

Agent: Influenza virus; Types A, B and (rarely) C cause human disease.
Mode of Transmission: Directly from person-to-person, primarily through inhalation of droplets released through coughing or sneezing. Less commonly, the influenza virus can be transmitted by contact with a contaminated object or surface and then touching one's mouth or nose.
Signs/Symptoms: Fever, headache, muscle pain, fatigue, sore throat and cough. Children may also have gastrointestinal symptoms, such as nausea, vomiting, or diarrhea. Complications of influenza can include lower respiratory tract involvement (e.g., bronchitis), viral or bacterial pneumonia, ear infections, sinus infections, dehydration, and worsening of chronic medical conditions, such as congestive heart failure, asthma, or diabetes.
Prevention: Annual vaccination is the primary prevention strategy; antiviral medications are supplemental to vaccine and may be used to prevent illness or lessen illness severity. Transmission may be reduced by washing hands frequently or using alcohol-based hand-sanitizers; avoiding touching the eyes, nose, and mouth with contaminated hands; and covering the nose and mouth with a tissue or the bend of the elbow when coughing or sneezing. Persons who are sick with influenza symptoms are encouraged to stay home to avoid spreading the disease to others.
Other Important Information: The influenza virus changes slightly from year to year (antigenic drift), making it necessary to prepare a new vaccine each year. Periodically, the virus will change to form a completely new subtype (antigenic shift), which can lead to pandemics.

Influenza Surveillance

In Virginia, influenza surveillance is conducted throughout the year. However, efforts are most intensively focused during the period of highest influenza activity, which normally begins in early October (week 40) and ends in late May (week 20). Surveillance efforts in Virginia do not count every individual case of influenza, but instead monitor indicators of illness within the community. For the 2016-2017 influenza season, data sources included visits for influenza-like illness to hospital emergency departments and urgent care centers, confirmed laboratory reports, evaluations of outbreak investigations, influenza-associated pediatric deaths, and school absenteeism. These data sources are used to determine weekly influenza levels, provide insight on the severity of illness, and characterize influenza virus subtypes circulating in the community.

National Overview of 2016-2017 Influenza Season

According to the Centers for Disease Control and Prevention (CDC), during the 2016-2017 influenza season, influenza A (H3N2) viruses predominated. Smaller numbers of influenza A (H1N1) and influenza B viruses were also identified. Compared with past influenza seasons, the 2016-2017 season produced a higher percentage of outpatient visits for influenza-like illness, higher hospitalization rates, and a higher percentage of deaths related to influenza and pneumonia. There were reports of hospitalizations and deaths in young, otherwise healthy individuals who were infected with influenza A (H3N2) viruses and who were not vaccinated. However, severity indicators were within the range that has been observed in previous H3N2-dominant seasons.

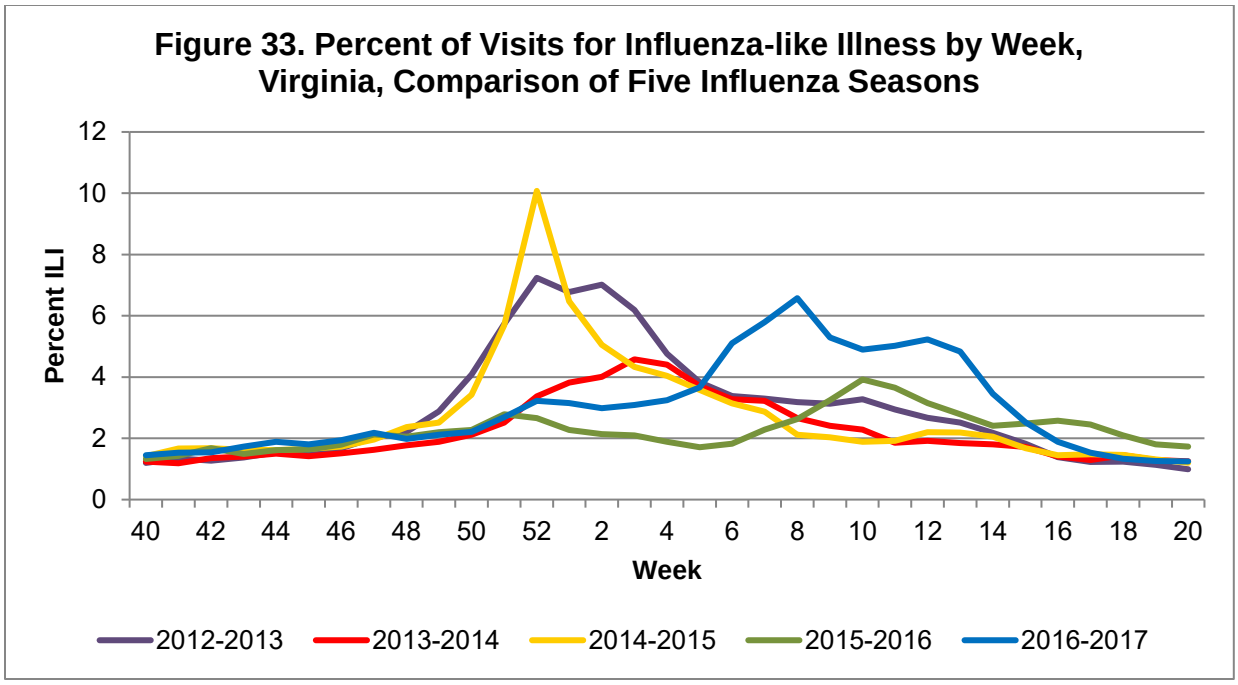
Nationally, of the influenza A (H3N2) viruses tested by the CDC, 95% were antigenically similar to the strain contained in the 2016-2017 influenza vaccine. Further, 99% of the influenza A (H1N1) viruses, 87% of the influenza B (Victoria lineage) viruses, and all of the influenza B (Yamagata lineage) viruses tested by the CDC were antigenically similar to the 2016-2017 vaccine components.

Based on data collected from November 28, 2016 through April 14, 2017, CDC reported overall influenza vaccine effectiveness (VE) of 42%. This means that getting the influenza vaccine reduced the risk of having to see a healthcare provider due to influenza by 42%. More specific VE estimates are as follows: 34% VE against the influenza A (H3N2) viruses that were most predominant during the season and 56% VE against all influenza B viruses. Estimates of VE against influenza A (H1N1) viruses are not available because of the small number of infections with those viruses during the season.

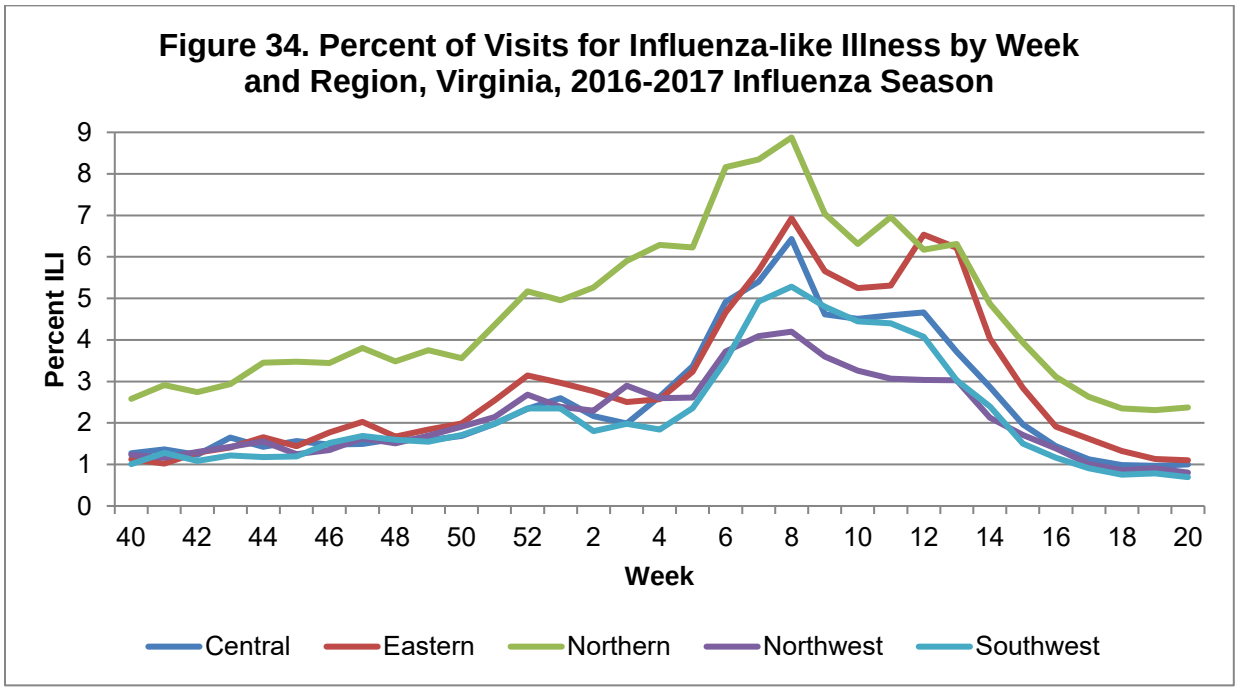
Influenza-like Illness Surveillance

The Virginia Department of Health (VDH) receives information regarding patient visits to emergency departments and urgent care facilities for influenza-like illness (ILI) symptoms. ILI symptoms include a complaint of fever with cough and/or sore throat. Other illnesses may show similar symptoms, but the strategy has proven to be a reliable indicator of influenza activity during flu season. During the 2016-2017 influenza season, 157 emergency departments and urgent care facilities provided data to VDH for surveillance monitoring.

Nationally, the weekly percentage of outpatient visits for ILI to healthcare providers participating in the Outpatient Influenza-Like Illness Surveillance Network (ILINet) was at or above the national baseline level of 2.2% for 17 consecutive weeks during the 2016-2017 influenza season. Across the United States, the peak percentage of outpatient visits for ILI was 5.1%, and occurred in early February (week 6). In Virginia, the proportion of patient visits for ILI during the 2016-2017 season peaked at 6.6%, during week 8 (week ending February 25, 2017) (Figure 33).

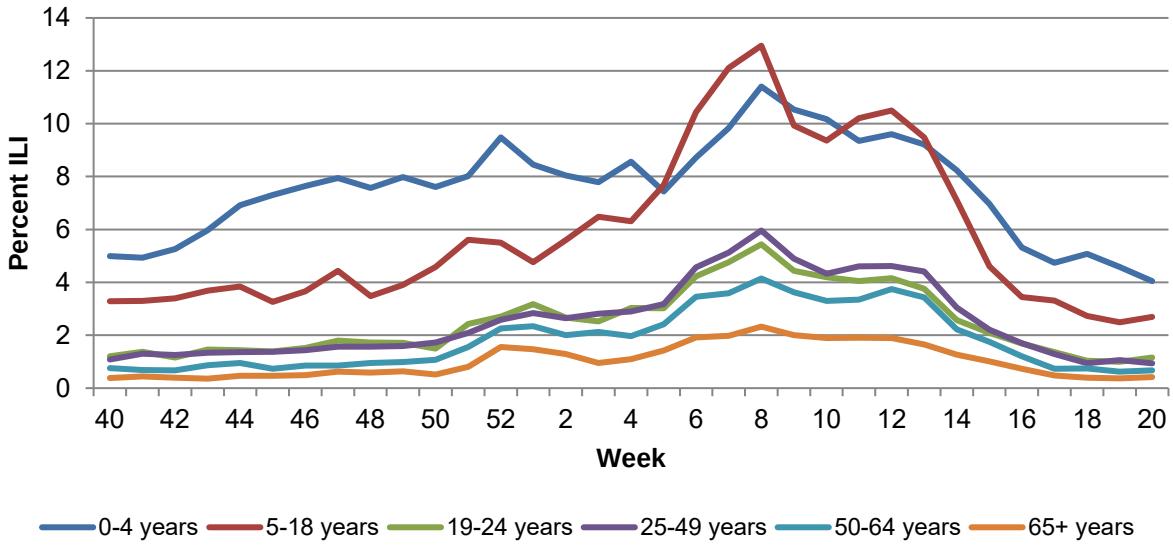


ILI activity in each region in Virginia peaked in late February (week 8), with the northern region experiencing the highest proportion of visits for ILI (8.9%) (Figure 34). The peak ILI proportions in the other regions were as follows: eastern region, 6.9%; central region, 6.4%; southwest region, 5.3%; and northwest region, 4.2%.



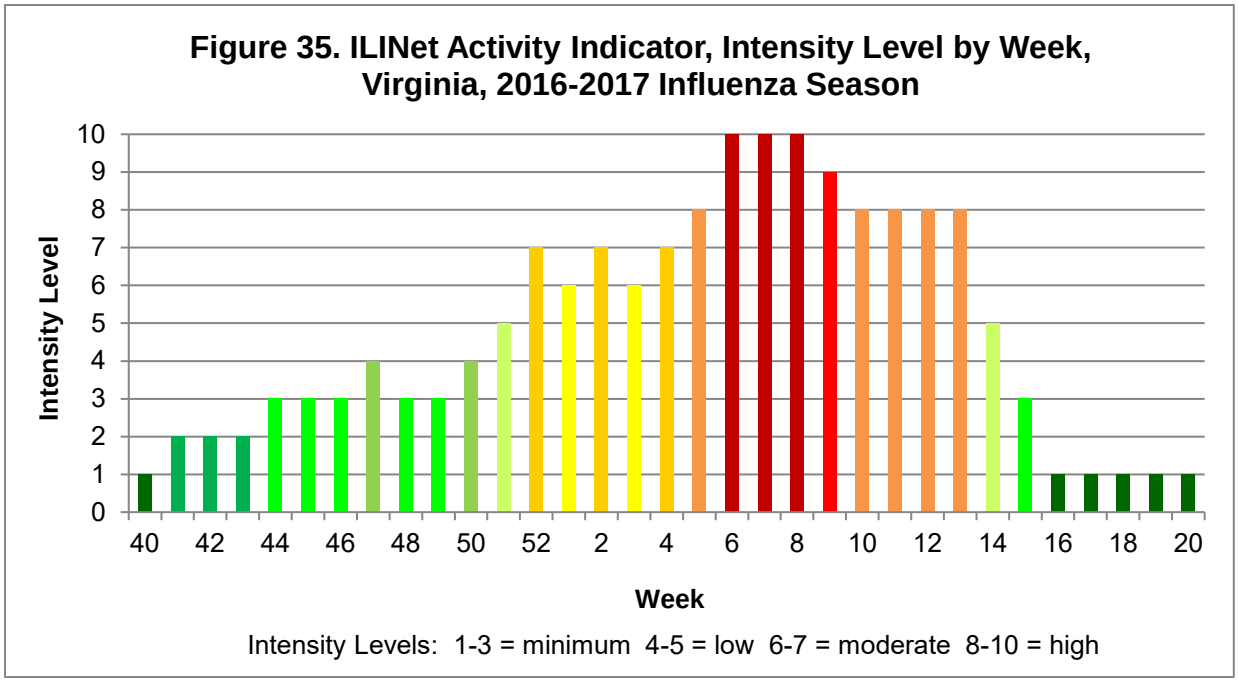
Analyzing ILI activity by age provides additional insight into disease patterns. While influenza vaccination efforts have historically often targeted the elderly because of concerns over complications of infection, the youngest age groups show the largest proportions of healthcare visits to emergency departments and urgent care facilities for ILI. Specifically, the largest proportion of visits due to ILI occurred in the 5-18 year age group during week 8 (13.0%). For the most weeks during the influenza season, the 0-4 age group experienced the largest proportion of visits due to ILI. The smallest proportion of visits for ILI occurred in the 65 years and older age group (Figure 35); it may be that this population seeks healthcare elsewhere.

Figure 35. Percent of Visits for Influenza-like Illness by Week and Age Group, Virginia, 2016-2017 Influenza Season



Influenza Intensity Levels

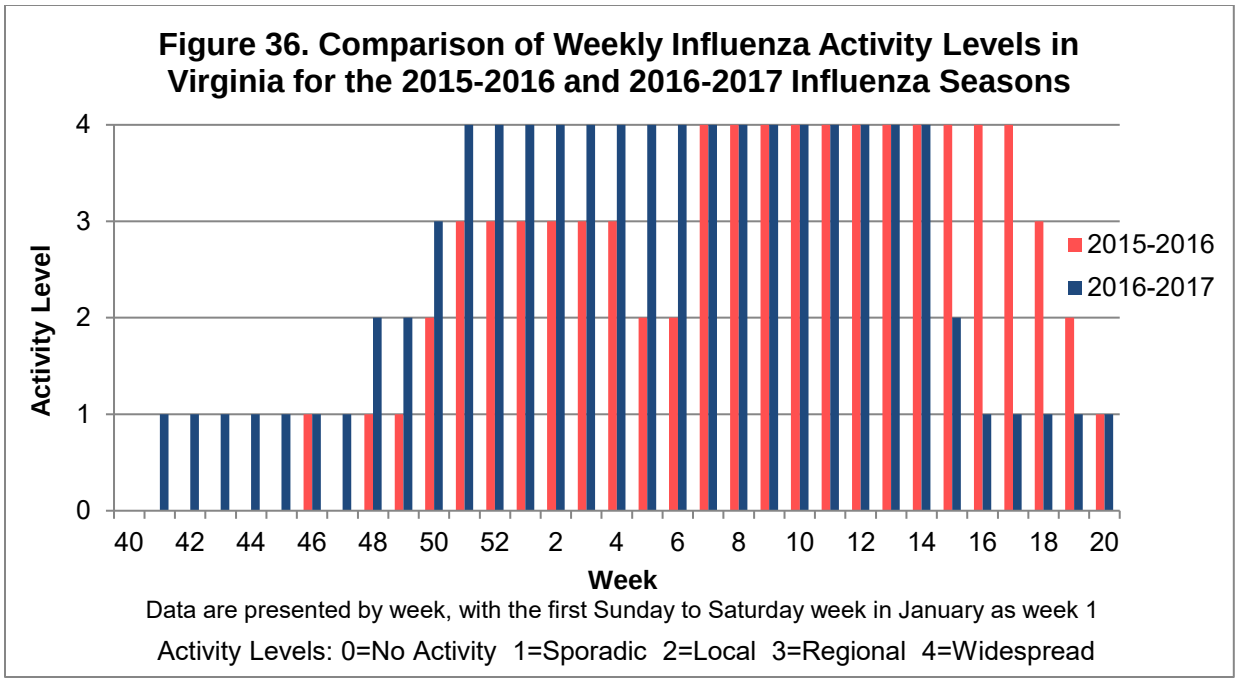
CDC reported weekly influenza intensity levels (ranging from 1 to 10) by state. This measure, first introduced during the 2010-2011 season, is calculated by comparing the percent of patient visits due to ILI for that week to the average proportion of ILI visits that occurred during a designated baseline period for which there is minimal or no influenza virus circulation. During the 2016-2017 season, influenza intensity levels in Virginia gradually increased during the winter, reaching moderate intensity levels in late December (week 52) and peak intensity level in February (weeks 6-8). The level remained relatively high until the beginning of April (week 13), and then gradually decreased to minimal levels. During the previous 2015-2016 season, influenza intensity levels in Virginia slowly increased during the winter, reaching moderate intensity levels in late February and peak intensity level in mid-March (week 10). The level then gradually dropped, rising only slightly before reaching minimal levels. Influenza intensity levels for Virginia for the 2016-2017 season are presented by week in Figure 35.



Influenza Activity Levels

Virginia follows CDC guidelines to describe the geographic distribution of influenza activity. The weekly activity level is based on ILI data, laboratory findings, and outbreak occurrences. The activity level is classified into the following categories: no activity, sporadic, local, regional, or widespread. The levels are not indicators of the severity of influenza illness but instead serve as a gauge for the geographic distribution of influenza activity around the state. Six weeks of ILI data, collected during the summer months of July through September, are used to establish baseline thresholds for the five health planning regions. ILI activity is considered elevated when visits in a region exceed the regional threshold.

The 2016-2017 influenza season began with sporadic activity in October through November, and then jumped to local activity level in early December (week 48). Virginia reached widespread activity in late December (week 51), and remained widespread for 16 consecutive weeks until the beginning of April (Figure 36). The same number of weeks of widespread activity occurred during the 2009-2010 season and was higher than the average of the past five influenza seasons (10 weeks).

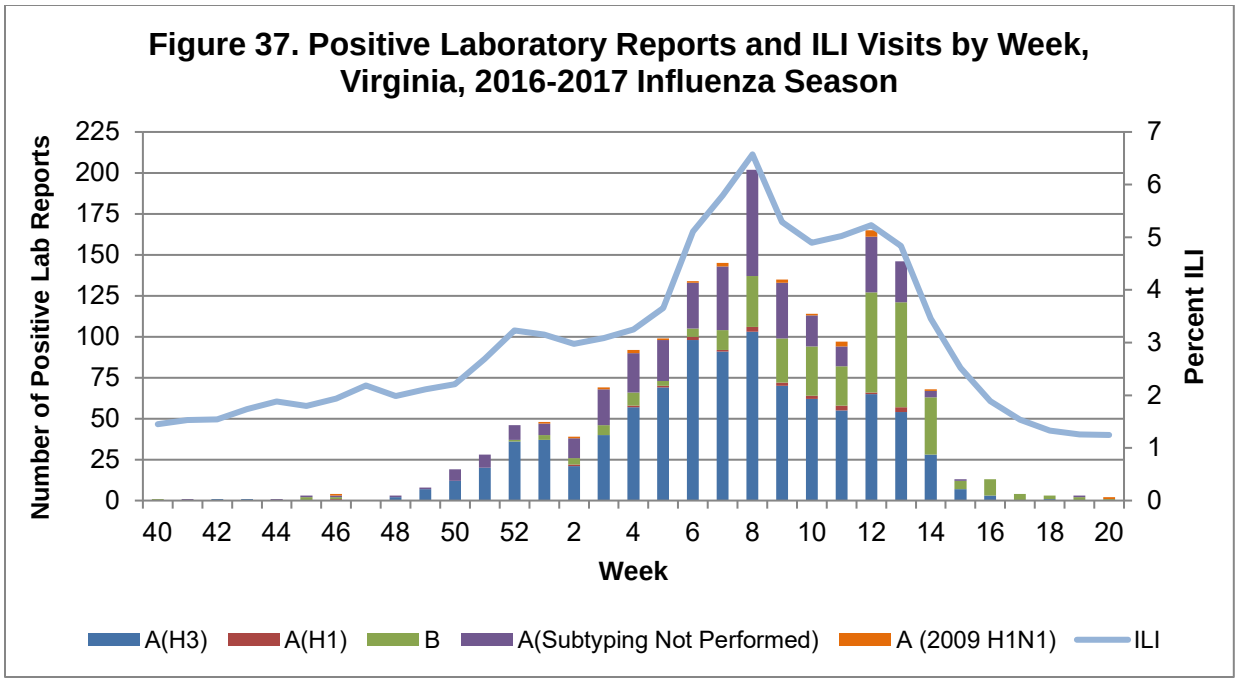


Laboratory Surveillance

Laboratory surveillance for influenza uses findings from three diagnostic testing procedures: DFA (direct fluorescent antibody), PCR (polymerase chain reaction), and viral culture. Rapid antigen tests are not included. Information is obtained from specimens submitted by sentinel providers, specimens obtained during outbreaks, influenza reporting by private laboratories, and laboratory findings from Virginia facilities participating in the National Respiratory and Enteric Viruses Surveillance System (NREVSS).

Sentinel providers include private physicians and medical facilities located throughout Virginia. Statewide representation is achieved through the efforts of health districts to enlist providers from their area. During the influenza season, sentinel providers submit specimens from patients with ILI to the Virginia Division of Consolidated Laboratory Services (DCLS), the state public health laboratory, for analysis. Regular sentinel providers were asked to submit up to five specimens per week from patients exhibiting influenza-like illness.

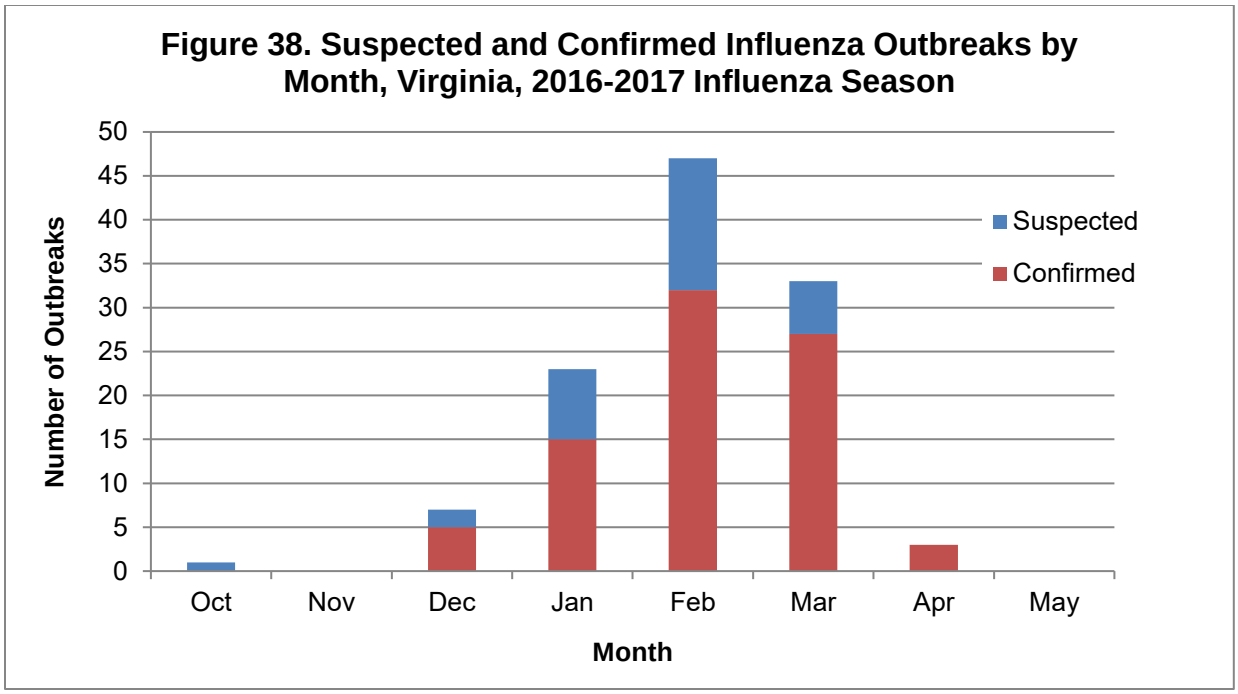
During the 2016-2017 season, influenza A (subtyping not performed), A (H3), A (H1), A (2009 H1N1), and B viruses were all circulating in the state, as shown in Figure 37. Influenza A (H3) viruses predominated during the 2016-2017 influenza season. Laboratory tests indicate that 80% of positive influenza findings were influenza A (all subtypes) and 20% were influenza B. For the 2015-2016 season, 77% of positive influenza findings were influenza A (all subtypes) and 23% were influenza B. As more providers have gained access to quicker, more reliable diagnostic testing methods such as PCR, the volume of confirmatory testing has increased substantially. During the 2016-2017 season, Virginia received 1,708 unique confirmatory influenza laboratory reports.



Influenza Outbreaks

During the 2016-2017 season, 114 influenza outbreaks were reported. In comparison, 45 outbreaks of influenza were reported during the 2015-2016 season and 152 reported during the 2014-2015 season. Outbreaks reported by month of occurrence are shown in Figure 38. Specimens from 82 influenza outbreaks tested positive for influenza virus (by rapid test or confirmatory laboratory report), confirming 22 (27%) as influenza A (H3)-associated, 1 (1%) as influenza A (H1)-associated, 36 (44%) as influenza A-associated (not further characterized), 8 (10%) as influenza B-associated, and 15 (18%) as unspecified type. The first confirmed outbreak was reported in late December 2016. During the previous season (2015-2016), the first confirmed outbreak also occurred in late December. During the 2016-2017 season, confirmed influenza outbreaks were reported from 32 nursing homes, 25 assisted living facilities, 14 schools (K-12), 3 daycare/pre-school facilities, 3 medical facilities (not long-term care related), 2 multi-care settings, 2 facilities classified as other, and 1 residential behavioral health facility.

By region, the largest percentage of outbreaks (26%, 30 outbreaks) were reported from the eastern region, followed by the northern region (25%, 28 outbreaks), northwest region (24%, 27 outbreaks), southwest region (13%, 15 outbreaks), and central region (12%, 14 outbreaks). On average, 35 cases were associated with each influenza outbreak, with a range of 2 to 330 cases per outbreak. A total of 126 hospitalizations were associated with these outbreaks.



Influenza-associated Deaths

Virginia disease reporting regulations require physicians and directors of medical care facilities to report suspected or confirmed influenza-associated deaths in children less than 18 years of age to allow monitoring of this severe outcome of influenza illness. Two pediatric influenza-associated deaths were reported during the 2016-2017 influenza season. The deaths occurred in a school age child (5-12 years) from the northwest region and a teenage child (13-17 years) from the eastern region. Influenza A (2009 H1N1) and influenza A (H3) were identified by PCR, respectively. During the 2015-2016 influenza season, one pediatric influenza-associated death was reported in Virginia. Nationally, a total of 101 influenza-associated pediatric deaths were reported during the 2016-2017 season. Of note, Table 2a of this report lists one pediatric influenza-associated death in 2016. The death in Table 2a was reported for calendar year 2016, while the information in this narrative is representative of the 2016-2017 influenza season.

School Absenteeism

School absenteeism surveillance was added to influenza surveillance in Virginia during the 2009-2010 pandemic season, and continues because of the valuable insights it provides. Information on absenteeism is voluntarily submitted by school divisions and made available to health districts to identify emerging problems and monitor potential influenza activity in their communities. Centrally, it is evaluated by region and school level (elementary, middle, and high school) for unusual patterns. During the 2016-2017 season, school divisions provided absenteeism data for 419 schools, which represented 12 school systems. Although school absenteeism provides a general, but not influenza-specific measure of illness, school absenteeism data are useful for monitoring illness activity and identifying schools with possible outbreaks during the influenza season.

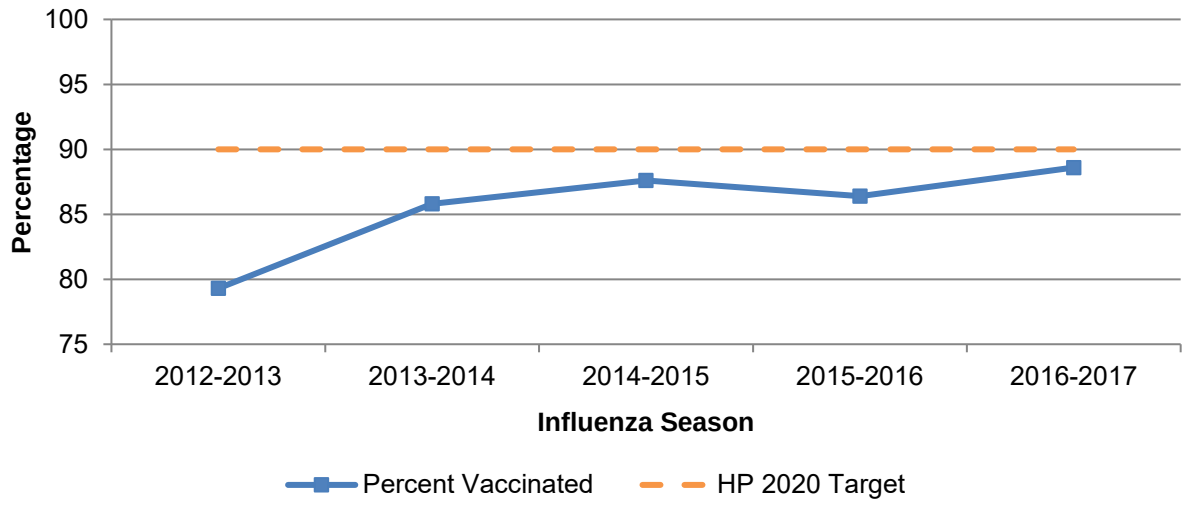
Influenza Vaccination among Healthcare Personnel

The best way to prevent influenza infection is by receiving the influenza vaccine every year. CDC recommends that all healthcare personnel who work in a healthcare setting receive influenza vaccine each year to help prevent the spread of influenza viruses within the workplace. Healthcare personnel include all facility employees, licensed independent practitioners, adult students/trainees, and volunteers regardless of full time/part time status, clinical responsibility or patient contact. Numerous studies have shown that patients benefit when healthcare workers get vaccinated. Many hospitals choose to provide the influenza vaccine to their employees, and some hospitals even have policies requiring mandatory vaccination. Currently, there are no state regulations requiring vaccination of healthcare workers in Virginia, and healthcare workers are able to decline the influenza vaccine.

VDH receives healthcare personnel influenza vaccination summary data from the National Healthcare Safety Network. In accordance with disease reporting regulations, acute care hospitals report the percentage of all healthcare workers in their hospitals who received the flu vaccine for each season. The Department of Health and Human Services (HHS) Healthy People 2020 goal is to have 90% of healthcare personnel vaccinated against seasonal influenza. For the 2016-2017 season, Virginia's overall influenza vaccination percentage was 89%, which is close to but not quite reaching the Healthy People 2020 goal (Figure 39). Of the 78 acute care hospitals reporting vaccination data, 45 hospitals (58%) met this goal for the 2016-2017 season.

For more information on healthcare personnel influenza vaccination, please visit the VDH Healthcare-associated Infections (HAI) Program's website at the following address: http://www.vdh.virginia.gov/surveillance-and-investigation/hai/hai-surveillance-and-public-reporting/.

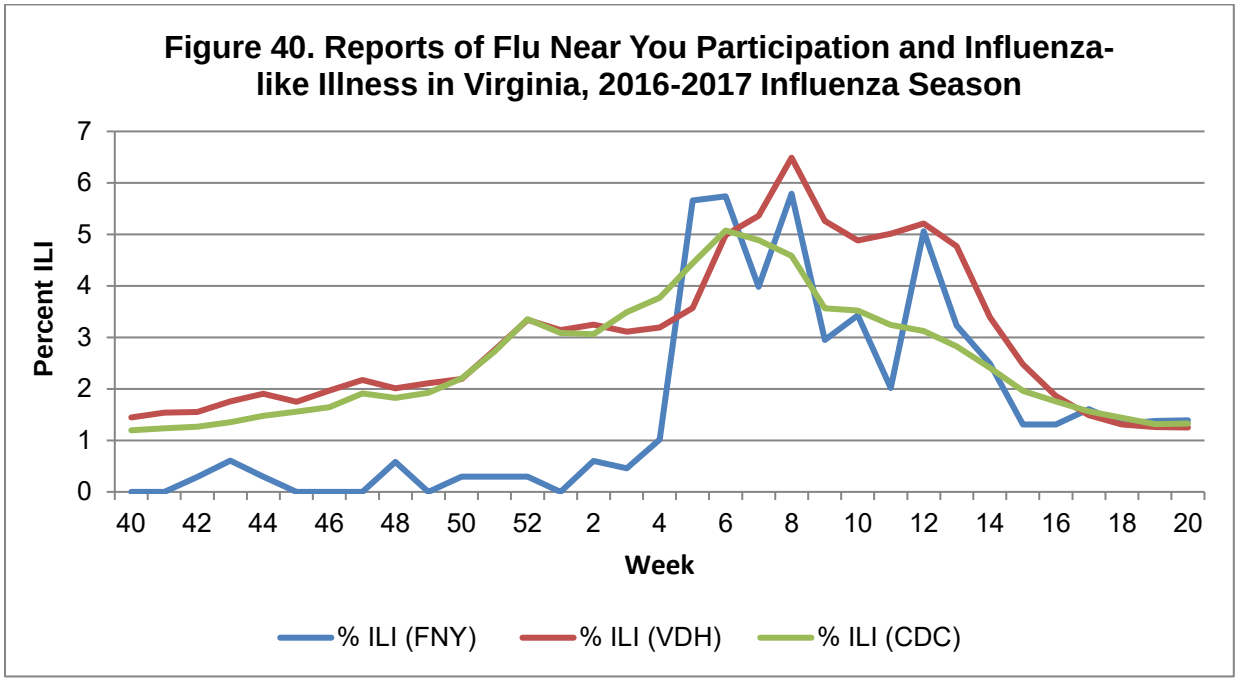
Figure 39. Percent of Influenza Vaccination Among Healthcare Personnel in Acute Care Hospitals Across Five Influenza Seasons, Virginia



Flu Near You

Flu Near You is an influenza-like illness (ILI) surveillance system that allows members of the public to report their health status anonymously each week through a website or mobile application. Users who report having a fever and any of the following symptoms: cough, sore throat, fatigue, shortness of breath, chills, body aches, headache, diarrhea or nausea are classified as having an ILI syndrome. Flu Near You then analyzes these reports and maps them to provide local and national views of self-reported influenza activity. This information empowers people to get engaged in public health and take steps to protect their health, such as finding nearby locations that offer influenza vaccines and connecting with local public health resources.

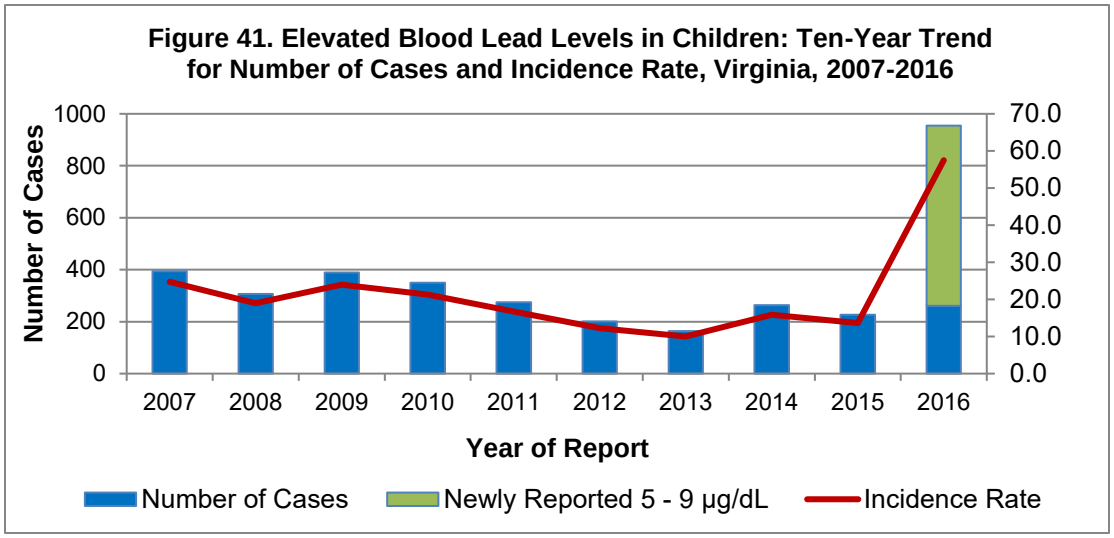
For the 2016-2017 influenza season, VDH partnered with the Council of State and Territorial Epidemiologists (CSTE) and the Skoll Global Threats Fund (SGTF) to promote Flu Near You and assess how self-reported ILI data from Flu Near You compared with data from current VDH influenza surveillance systems. Assessing how Flu Near You data reported in Virginia correlates to VDH data could potentially give local health departments another important tool to monitor influenza activity in their communities. The graph below (Figure 40) shows similar overall trends in the percent of ILI for Flu Near You, VDH, and CDC's ILINet data. Flu Near You and VDH data showed that the percent ILI peaked during week 8, and CDC's ILINet data showed the peak during week 6. These findings indicate that Flu Near You could be a useful tool to supplement traditional influenza surveillance in Virginia.



Lead - Elevated Blood Levels in Children

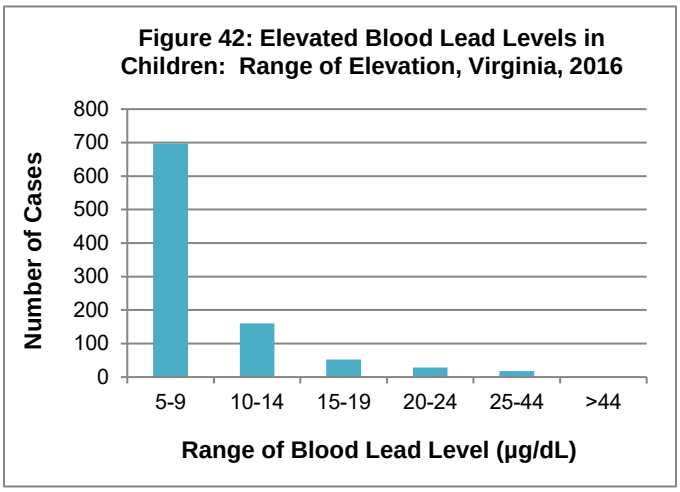
Agent: Lead (soft, dense metal, with a past use in paint and gasoline)
Mode of Transmission: The primary source of lead poisoning in children is ingesting lead-contaminated paint found in buildings built before 1978. Lead exposure can also happen through chewing objects painted with lead paint; ingesting lead contaminated soil, food, or water; inhaling lead contaminated air or dust; or using glassware, healthcare products or folk remedies containing lead.
Signs/Symptoms: Low levels of blood lead in children have been associated with reduced Intelligence Quotient (IQ), hyperactivity, reduced stature, reduced hearing, and headaches. Nervous system damage, learning disabilities (e.g., attention deficit hyperactivity disorder), behavior problems (withdrawn behavior, issues with sociability), muscle weakness, decreased growth, delayed puberty, and anemia can also be attributed to exposure to lead. Children who ingest large amounts of lead can develop kidney and brain damage. Furthermore, children can appear healthy despite having elevated levels of lead in their blood.
Prevention: Ingestion of lead-contaminated materials and use of lead-containing materials should be avoided. Educating healthcare professionals and parents is important in detecting and reducing lead exposure. Recommendations for parents who live in older homes should include testing the home and water for lead, precautionary lead testing in young children, and washing children's hands, faces and toys often in order to eliminate exposure to lead in dust and soil. Parents who have an occupation or hobby that might involve lead should wear personal protective equipment, not wear work clothes or shoes home, shower after working with lead, and avoid bringing other lead-contaminated materials from work into the home. Children should be kept away from any home renovations involving the sanding or scraping of paint.
Other Important Information: In 2016, the Virginia Department of Health changed the elevated blood lead level for surveillance from $\geq$10 µg/dL to $\geq$5 µg/dL in children age 15 years and younger. This new level is based on the 97.5th percentile of blood lead levels of children aged 1-5 years who were included in a national survey. The change was also in response to CDC's 2012 updates to its recommendations which indicate no safe blood lead level in children has been identified and established 5 µg/dL as the reference level at which ongoing monitoring and response is recommended. On October 20, 2016, the Virginia Department of Health modified its disease reporting requirements to read: "Lead, reportable levels" means any detectable blood lead level in children 15 years of age and younger and levels greater than or equal to 5 µg/dL in persons older than 15 years of age. For surveillance purposes, only levels $\geq$5 µg/dL are included in this report.

Lead – Elevated Levels in Children: 2016 Data Summary	
Number of Cases:	955
5-Year Average Number of Cases:	225.8
% Change from 5-Year Average:	+323%
Incidence Rate per 100,000:	57.5



In 2016, 955 new cases of elevated blood lead levels in children were reported in Virginia. This represents a 323% increase from the 226 cases reported in 2015, and a 323% increase from the five-year average of 225.8 cases per year (Figure 41). This increase is attributed to the change in blood lead levels used for surveillance purposes, as described above. Of these newly reported cases in 2016, the majority represent blood lead levels in the range of 5-9 µg/dL, which were not captured in previous years.

Among the 955 children reported with elevated blood lead levels in 2016, 694 (73%) had confirmed blood lead levels in the 5-9 µg/dL range, 160 (17%) had levels in the 10-14 µg/dL range, 52 (5%) had levels in the 15-19 µg/dL range, 28 (3%) had levels in the 20-24 µg/dL range, 18 (2%) had levels in the 25-44 µg/dL range, and 3 (<1%) had a level above 44 µg/dL (Figure 42).

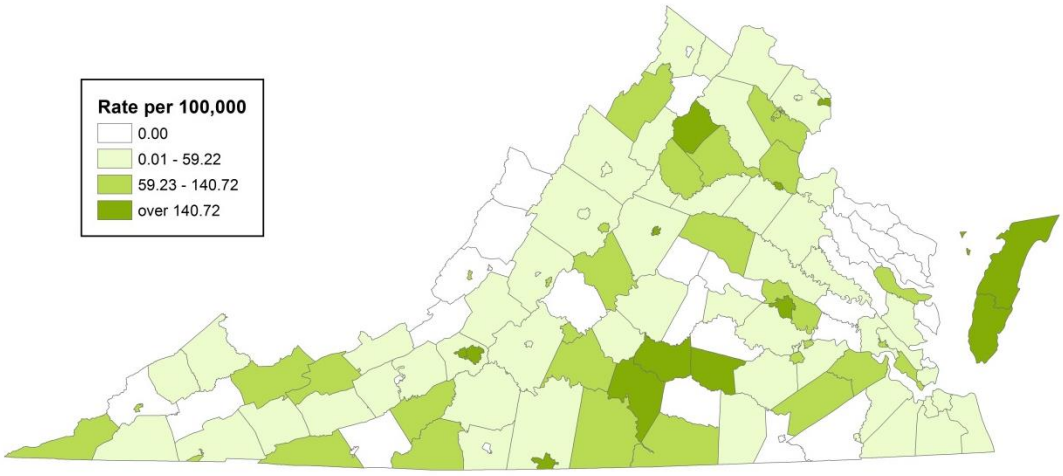


Public health follow-up care is based on the confirmed blood lead level. For blood lead levels in the 5-9 µg/dL range, children and families are provided educational materials and blood lead levels are monitored by primary care providers. Blood lead levels of ≥10 µg/dL in children require public health action. Blood lead levels in the 10-14 µg/dL require a nursing assessment, lead awareness education, and follow-up monitoring. Blood lead levels in the 15-19 µg/dL range require nutritional and environmental education, as well as additional testing to ascertain if the blood lead level is increasing or persistently elevated. Blood lead levels equal to or greater than 20 µg/dL require greater degrees of case management. For instance, these cases require the initiation of an environmental investigation to identify and eliminate lead hazards and may require medical intervention.

Incidence rates for children with elevated blood lead levels are based on population figures for children age 0-15 years. By age group, the majority (89%) of elevated blood lead levels and the highest incidence rate occurred in those aged 1-9 years (848 cases, 91.1 per 100,000), followed by infants (53 cases, 51.5 per 100,000). Rates were lowest among those 10-15 years of age (54 cases, 8.6 per 100,000). Race information was not reported for 55% of cases. Among cases with a known race, incidence among the "other" race population was the highest (76.6 per 100,000), followed by the black population (38.4 per 100,000). The white population had the lowest incidence rate (15.3 per 100,000). Incidence rates among males and females were similar (57.8 and 56.9 per 100,000, respectively). Geographically, incidence rates ranged from 81.4 per 100,000 in the central region to 39.7 per 100,000 in the eastern region, resulting in a statewide incidence rate of 57.5 per 100,000 in children less than 16 years of age. Incidence rates by locality can be seen in the map below.

Blood lead results on approximately 77,000 children were received by VDH in 2016. Continued improvement in reporting of specimen type (e.g., capillary or venous) by physicians and laboratories has enhanced interpretation of test findings, reduced ambiguity, and yielded more accurate information on the number of children with confirmed elevated blood lead levels.

Lead - Elevated Blood Levels in Children
Incidence Rate by Locality, Virginia, 2016

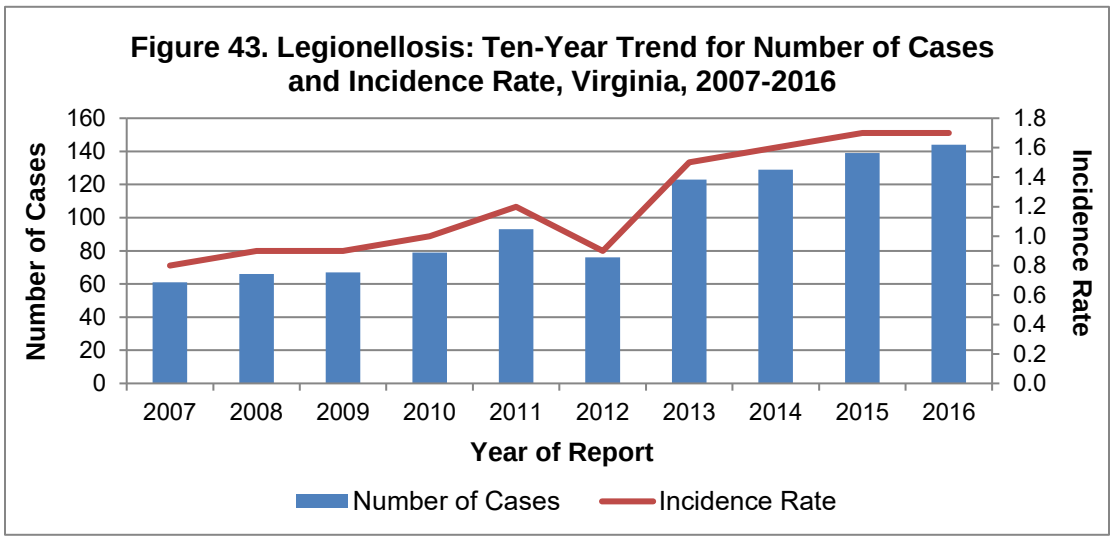


Legionellosis

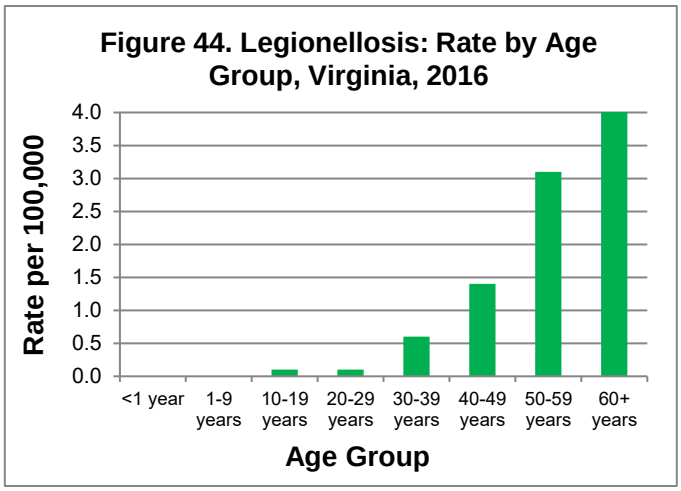
Agent: *Legionella* species (bacteria); most infections in the United States are caused by *Legionella pneumophila*
Mode of Transmission: Inhalation of contaminated aerosolized water (e.g., sprays, mists).
Signs/Symptoms: Infection with *L. pneumophila* causes two distinct illnesses: Legionnaires' disease, characterized by fever, muscle aches, headaches, malaise, cough, and pneumonia with progressive respiratory distress; or Pontiac fever, a milder influenza-like illness without pneumonia characterized by quick onset. Pontiac fever and Legionnaires' disease are referred to as "legionellosis", separately or together.
Prevention: Ensuring that water systems in buildings (i.e., hot tubs, cooling water systems, hot water tanks, decorative fountains) are maintained properly in order to reduce the growth and spread of *Legionella*. For outbreaks, control measures include disinfection of contaminated water sources by chlorination or superheating of water from 160° to 170°F, and appropriate mechanical cleaning.
Other Important Information: Legionellosis is more common among people who are elderly, are immunocompromised, or have underlying lung disease. Virginia has experienced a pattern, also seen nationally, in which there was an increase in legionellosis cases in 2003, followed by a higher incidence in the post-2003 period than in the pre-2003 period. The cause of this increase is not clearly understood. The number of legionellosis cases has been on the rise in Virginia over the past decade (2007-2016). During 2000–2014, in the U.S. there was several fold increase in reported cases of legionellosis. According to CDC it is unclear whether this increase represents artifact (i.e., due to increased awareness, improved diagnosis and reporting of the condition including CDC's call for more active and timely surveillance of travel-associated cases), increased susceptibility of the population, an increasing population of older persons and persons at high risk for infection, increased *Legionella* in the environment, or some combination of factors.

Legionellosis: 2016 Data Summary	
Number of Cases:	144
5-Year Average Number of Cases:	112.0
% Change from 5-Year Average:	+29%
Incidence Rate per 100,000:	1.7

In 2016, 144 legionellosis cases were reported in Virginia compared to 139 cases reported in 2015. This is the highest number of legionellosis cases ever reported in Virginia and represents a 4% increase from 2015, and a 29% increase compared to the five-year average of 112 cases per year (Figure 43). Overall, there has been an increase in reported cases in Virginia since 2007. Similarly, legionellosis data from the CDC indicate the number of cases reported nationally have increased more than four-fold since 2000.



Legionellosis incidence rates were closely associated with age. In 2016, the highest incidence occurred in the 60 year and older age group (4.9 per 100,000), followed by the 50-59 year age group (3.1 per 100,000) (Figure 44). Of the 144 cases reported in 2016, 83 (58%) were reported among persons age 60 years or older. The median age at time of onset of symptoms was 62 years, with a range of 19-97 years. No cases were reported in persons younger than 10 years of age. Race information was not reported for 10% of cases. Among those with a known race, incidence was highest in the black population (3.1 per 100,000) when compared to the white and "other" race populations (1.3 and 0.2 per 100,000, respectively). The incidence rate was higher among males compared to females (1.9 and 1.5 per 100,000, respectively).



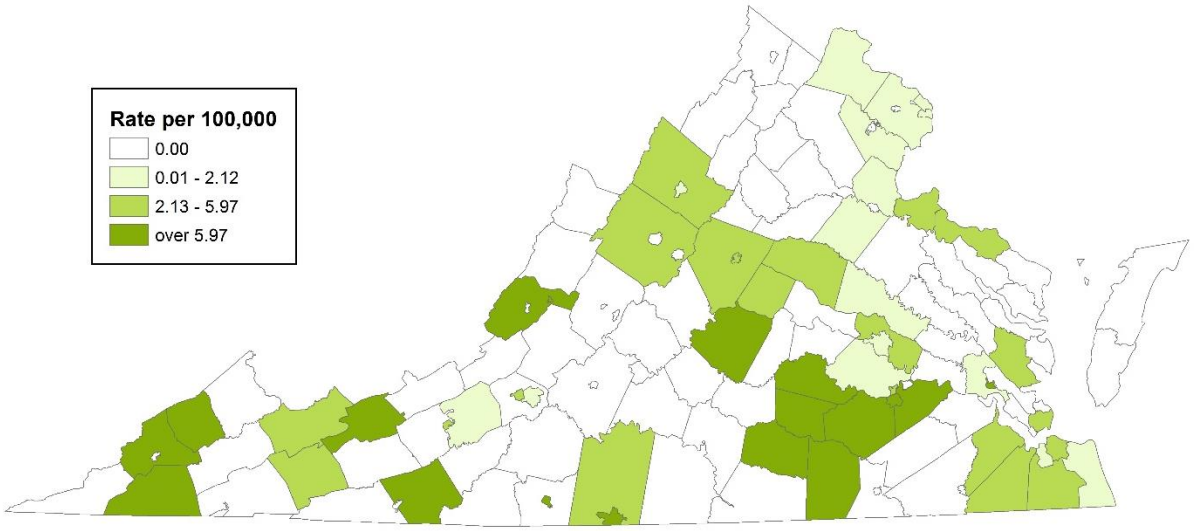
Incidence rates were highest in the central region (2.7 per 100,000), followed by the southwest region (2.1 per 100,000). Incidence rates in the other regions were between 0.9 and 1.9 cases per 100,000. Geographically, cases were dispersed among a number of localities throughout Virginia (refer to map below). While cases occurred throughout the year, the highest percentage of cases (32%) was observed during the warmer months of the third quarter.

Information on spending a night away from home in the 10 days prior to symptom onset was obtained for 121 (84%) of 144 cases in 2016. Of those, 21 (17%) cases reported spending at least one night away from home; seven (33%) spent at least one night in a hotel, and 14 (67%) spent at least one night away from home in a location other than a hotel or the type of location was not reported.

Information on exposure to a healthcare setting in the 10 days prior to symptom onset was obtained for 115 (80%) of 144 cases. Of those, 22 (19%) reported exposure to a healthcare setting. Healthcare settings include hospitals, clinics, long-term care facilities, or other healthcare settings. Individuals with possible exposure in a healthcare setting include inpatients, outpatients, visitors, volunteers, or employees of a healthcare setting. Among those 22 persons who reported a healthcare exposure, 20 (91%) were determined to be "possible" exposures, defined as exposure to a healthcare setting for only a portion of the 10 days prior to symptom onset. Two (9%) persons were determined to be "definite" exposures, defined as a patient who was hospitalized or a resident of a long-term care facility who was confined for the entire 10 days prior to symptom onset.

No outbreaks of legionellosis were reported in Virginia in 2016. Six deaths (4%) were attributed to legionellosis in 2016 in persons ranging in age from 57 to 89 years. Three deaths occurred in the central region, two in the southwest region, and one in the northwest region.

Legionellosis Incidence Rate by Locality
Virginia, 2016



Leprosy (Hansen Disease)

Agent: *Mycobacterium leprae* (bacteria)
Mode of Transmission: Person-to-person transmission, probably through inhaling respiratory droplets that are released when a person with the disease coughs or sneezes. Transmission can also occur from exposure to nasal secretions from an infected person.
Signs/Symptoms: A chronic disease with varying symptoms, including skin lesions (tuberculoid leprosy); discolored, flat spots on the skin (lepromatous leprosy); numbness on affected areas of the skin; eye problems; nasal congestion; nosebleeds; and nerve damage. If left untreated, the nerve damage can result in paralysis of hands and feet. The bacteria that cause this condition grow very slowly and signs and symptoms may take 2-10 years to appear.
Prevention: Early diagnosis and treatment is important. Hand washing when in contact with patients with lepromatous leprosy and disinfection of surfaces contaminated with infectious nasal secretions should be performed until treatment is established.
Other Important Information: The early diagnosis and proper treatment of this disease can prevent disability and allow the individual to lead an active life. In the past, leprosy was considered highly contagious and devastating. However, it is now known that the disease is hard to spread and is easily treatable once recognized. Education and improved access to treatment are necessary to eliminate the stigma and prejudice still associated with this condition.

One case of leprosy was reported in Virginia during 2016. The case occurred in an adult male who acquired the disease while residing in Pakistan. Since 2000, nine cases of leprosy have been diagnosed in Virginia, with a 5-year average of less than one case per year.

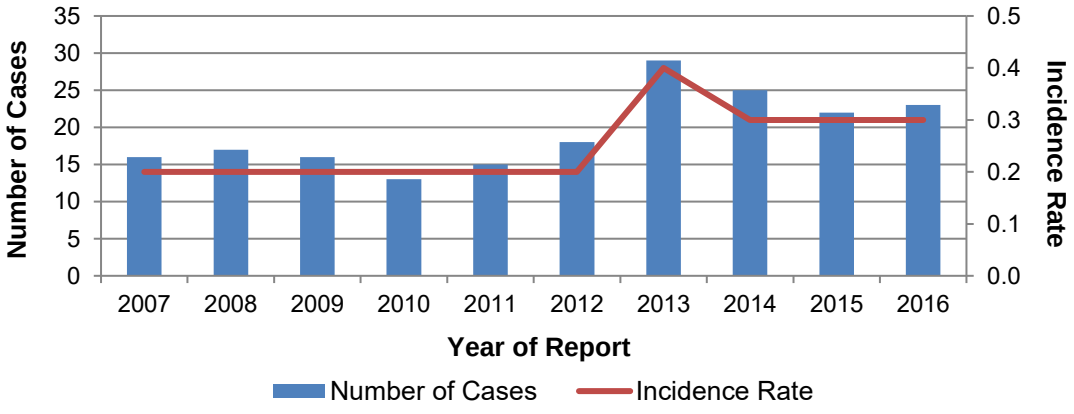
Listeriosis

Agent: *Listeria monocytogenes* (bacteria)
Mode of Transmission: Ingestion of contaminated foods or beverages (e.g., sprouts, soft cheese, unpasteurized milk). Transmission can also occur from mother to fetus if the mother consumes a contaminated food item/beverage during pregnancy.
Signs/Symptoms: Typically fever, headache, muscle aches, and sometimes gastrointestinal symptoms, such as nausea, diarrhea, and vomiting. Infection can lead to serious disease, including shock and inflammation of the brain and the fluid surrounding the brain and spinal cord (i.e., meningitis). Among infected pregnant women, miscarriage, stillbirth, premature delivery, or neonatal infection may occur.
Prevention: Preventive measures include safe food preparation (e.g., thoroughly cooking or reheating food from animal sources and washing raw fruits and vegetables) and avoiding raw (unpasteurized) milk and milk products. Persons at higher risk for disease should avoid soft cheeses (unless labeled as made with pasteurized milk), refrigerated smoked seafood (unless contained in a cooked dish), and hot dogs and other deli/luncheon meats (unless heated until steaming hot just before serving).
Other Important Information: Persons at higher risk include pregnant women and their unborn babies and newborns, older adults, and persons with weakened immune systems.

Listeriosis: 2016 Data Summary	
Number of Cases:	23
5-Year Average Number of Cases:	21.8
% Change from 5-Year Average:	+6%
Incidence Rate per 100,000:	0.3

Twenty-three cases of listeriosis were reported in Virginia during 2016. This is similar to the 22 cases reported in 2015 and the 5-year average of 21.8 cases per year. The statewide incidence rate was 0.3 cases per 100,000, which remained unchanged from 2015 (Figure 45). Incidence rates in Virginia are similar to rates observed nationally, with a U.S. rate of 0.2 cases per 100,000 reported by CDC in 2015.

Figure 45. Listeriosis: Ten-Year Trend for Number of Cases and Incidence Rate, Virginia, 2007-2016



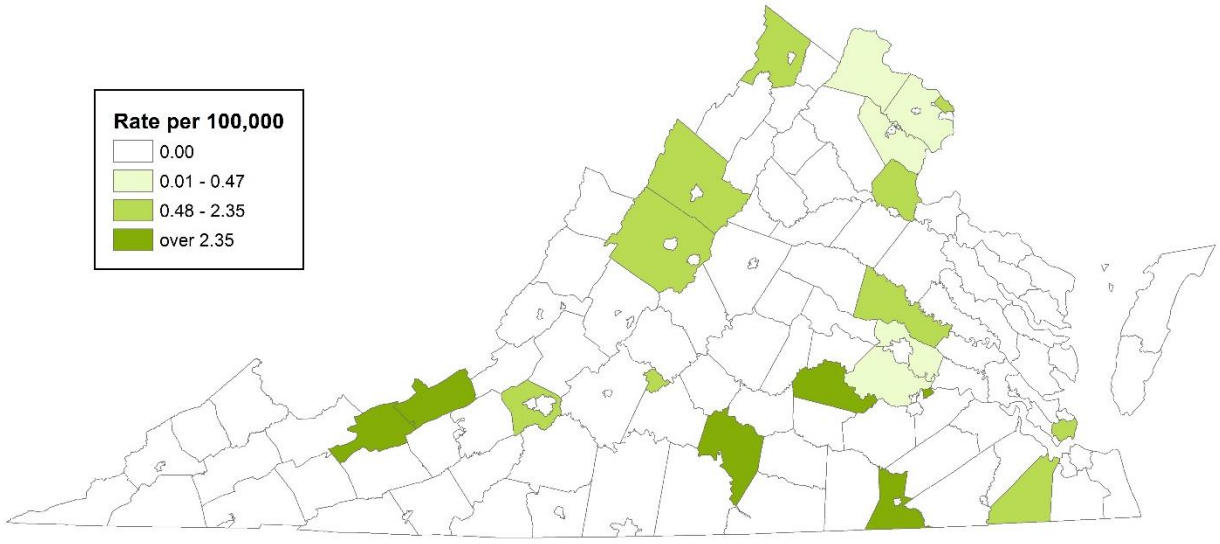
Consistent with the national trend, the 60 year and older age group had the highest number of listeriosis cases reported in 2016, with 14 cases and an incidence rate of 0.8 per 100,000. While one case was reported among children less than one year of age, no cases were reported in children one to 19 years of age. The remaining age groups had between one and four cases each.

Race information was not reported for 17% of cases. Among those with a known race, incidence was highest in the "other" race population with a rate of 0.5 per 100,000. Rates among the white and black populations were similar (0.2 and 0.1 per 100,000, respectively). Rates among females and males were also similar, with 0.3 per 100,000 each, respectively.

Geographically, the central region had the highest incidence rate at 0.5 per 100,000. The remaining regions had similar rates, ranging from 0.1 to 0.3 per 100,000. Incidence rates by locality can be viewed in the map below. Although cases occurred throughout the year, 74% of cases had onset during the spring and summer months of 2016.

During 2016, 91% of cases required hospitalization emphasizing the seriousness of the condition. One infant case was associated with pregnancy in 2016, and another case occurred in a pregnant female.[i] Two deaths were attributed to listeriosis, both occurring in adult females.

Listeriosis Incidence Rate by Locality
Virginia, 2016



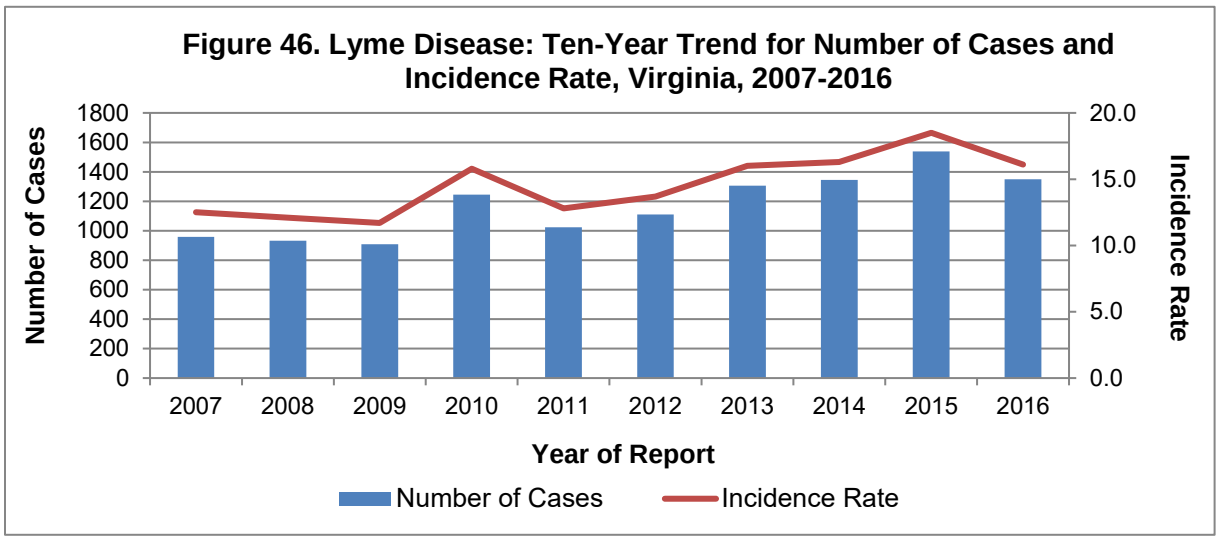
[i] Per case definitions established by the Council of State and Territorial Epidemiologists, confirmed listeriosis cases must be positive for *Listeria monocytogenes* by laboratory testing. The lab specimen from the infant was positive for *Listeria monocytogenes* yet the mother did not experience illness. Presumably the infection in the infant resulted from a contaminated food or beverage item the mother consumed. The pregnant woman who tested positive for *Listeria monocytogenes*, delivered a healthy infant with no complications.

Lyme Disease

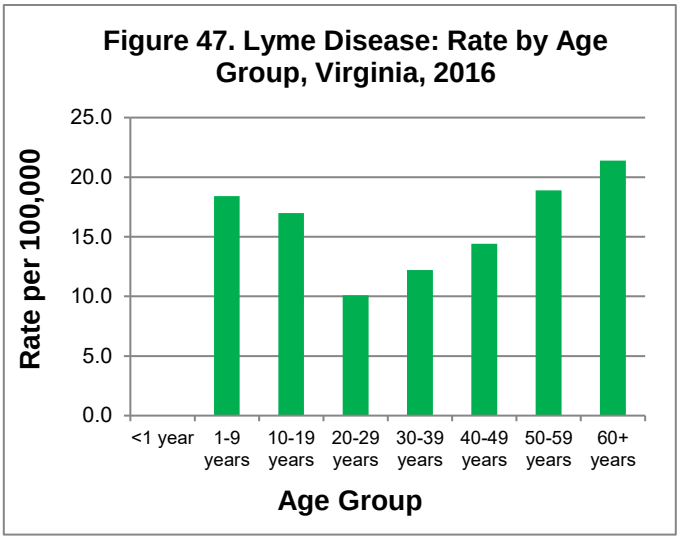
Agent: *Borrelia burgdorferi* (spirochete bacteria)
Mode of Transmission: Transmitted to humans through the bite of infected nymph or adult blacklegged ticks (formerly known as deer ticks). No other tick species plays a role in Lyme disease transmission to humans in the eastern United States. Infected ticks must bite a person and remain attached for a minimum of 30 to 36 hours to be able to transmit the bacteria.
Signs/Symptoms: Initial symptoms include fever, headache, fatigue, joint pains, swollen glands, chills and a characteristic "bulls-eye" skin rash called erythema migrans, or EM rash. If untreated, infection can progress to affect a person's joints, heart or nervous system.
Prevention: Minimize tick bites by avoiding tick habitats such as humid forest environments with dense undergrowth or heavy forest leaf litter, as well as low vegetative ground cover along shady forest margins, tree lines, forest trails and forest clearings. When in tick-prone habitats, light-colored clothing should be worn with pants legs tucked into socks and shirts tucked into pants. Permethrin-based repellants should be applied to clothing, socks and shoes. If treated clothing is not worn, repellents containing DEET, Picaridin, BioUD, IR3535, or oil of lemon eucalyptus as active ingredients are effective against ticks and should be applied to exposed areas of skin before entering tick habitats. After visiting tick-prone habitats, a person should thoroughly check all body surfaces for ticks and, if found, attached ticks should be removed carefully with tweezers as soon as possible. Pets should also be examined for ticks; pets can bring ticks into the home and are also susceptible to disease.
Other Important Information: Lyme disease is diagnosed based on symptoms, physical findings (e.g., rash), and laboratory evidence of infection. The EM rash is the only physical manifestation/symptom that is distinctive enough to allow a diagnosis in the absence of laboratory testing. The EM rash causes little or no sensation, and may be missed or overlooked in up to 30% of persons with Lyme disease, particularly if it occurs on a part of the body that is difficult to observe.

Lyme Disease: 2016 Data Summary	
Number of Cases:	1,350
5-Year Average Number of Cases:	1,265.0
% Change from 5-Year Average:	+7%
Incidence Rate per 100,000:	16.1

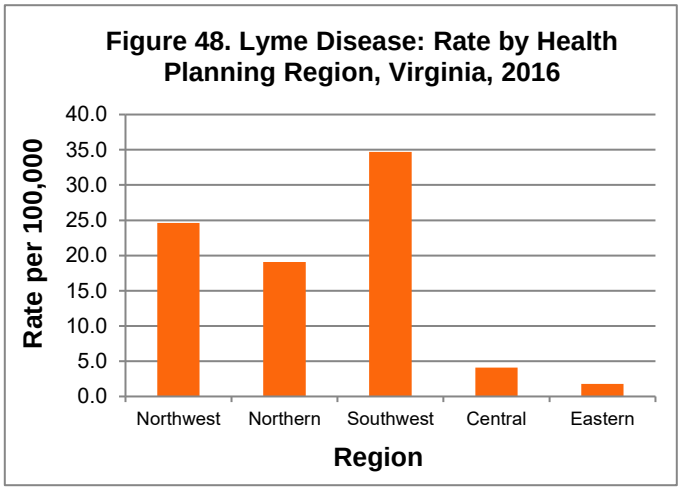
The 1,350 cases of Lyme disease reported in Virginia during 2016 were the second highest number of cases ever reported in the state, and represented a 7% increase from the five-year average of 1,265 cases per year. Despite the high number of cases observed in 2016, this still represents a 12% decrease from the highest number of cases reported in 2015 (Figure 46). Since 2006, there has been a marked increase in the number of Lyme disease cases in Virginia which can be attributed to several factors including an increase in actual disease occurrence, a change from voluntary to mandatory reporting of positive Lyme results from laboratories, and improved investigation procedures by local health departments. Environmental and land use practices, particularly the growth of suburbanization, have had an effect on incidence rates. In newly developed suburban environments, deer hunting activities decrease allowing the deer population to increase and enhancing the population of the white-footed mouse. Both species of animals have essential roles in the transmission of Lyme disease by blacklegged ticks to humans.



The highest incidence rates were observed in older adults and young children (Figure 47). The highest rates were in the 60 year and older and the 50-59 year age groups (21.4 and 18.9 per 100,000, respectively) followed by the 1-9 year age group (18.4 per 100,000). This bimodal distribution is similar to what is observed in other regions of the U.S. where Lyme disease is endemic.

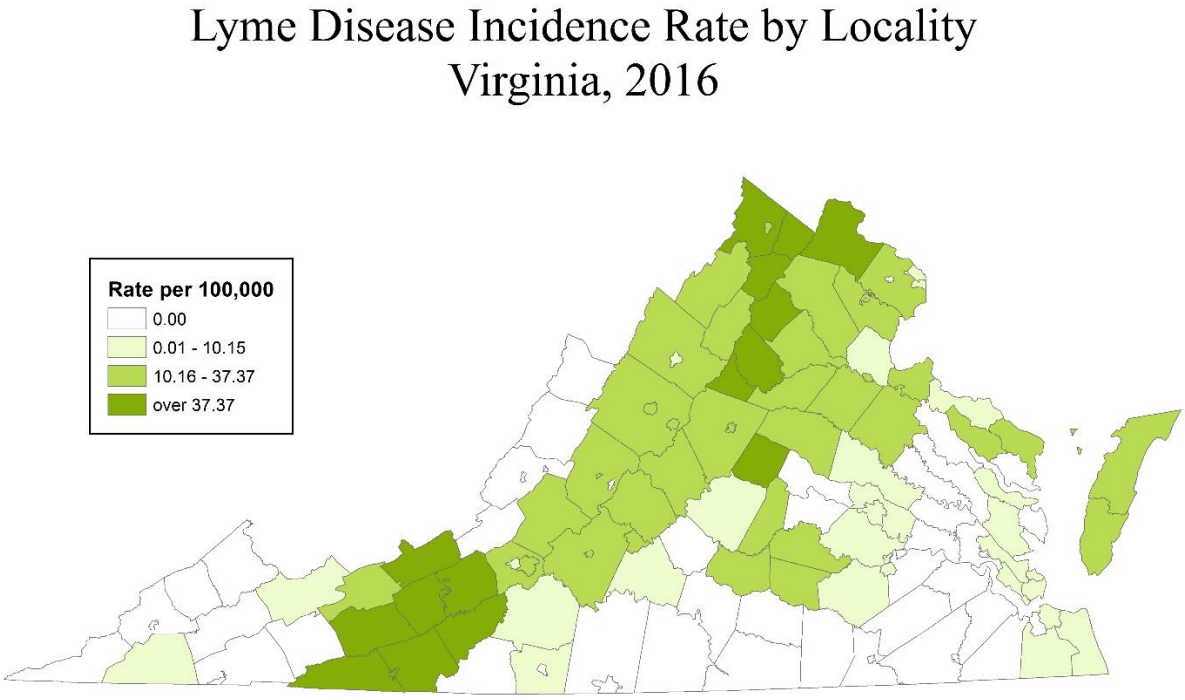


Race information was not reported for 49% of cases. Among those with a known race, the white population had the highest incidence rate (12.1 cases per 100,000), followed by the "other" race population (4.9 per 100,000), and the black population (1.4 per 100,000). Racial differences may be related in part to differences in access to healthcare for diagnosis, variation in exposure to suburban and rural tick habitats, and potentially easier detection of the EM rash in individuals with lighter skin pigmentation. Incidence was higher in males than females (20.7 and 16.4 per 100,000, respectively).



Cases were reported from all regions of the state. However, three regions were noticeably higher, with the highest incidence rate in the southwest region (34.7 per 100,000), followed by the northwest region (24.6 per 100,000), and the northern region (19.1 per

100,000) (Figure 48). Incidence rates in the central and eastern regions were much lower, with the eastern region having the lowest incidence of Lyme disease in Virginia. Although Lyme disease cases were reported in every quarter during 2016, there was a seasonal pattern, with 38% of cases occurring in the second quarter and 37% of cases in the third quarter. This pattern is correlated with the period when the majority of nymph stage blacklegged ticks, the primary vectors of Lyme disease, are actively feeding.



Lymphogranuloma Venereum

Agent: Specific strains of the bacterium *Chlamydia trachomatis*
Mode of Transmission: Sexually transmitted through direct contact with the lesions of an infected person.
Signs/Symptoms: Ulcerative lesions on the penis or vulva, inflammation of the lymph nodes in the genital area, or rectal ulcers. Fever, chills, headache, anorexia, and joint pain may also be present. Some infections are asymptomatic, especially in females.
Prevention: Preventive measures include adhering to safe sexual practices.
Other Important Information: Lymphogranuloma venereum has historically been rare in developed countries. Recent outbreaks have occurred in Europe and North America, primarily among men who have sex with men.

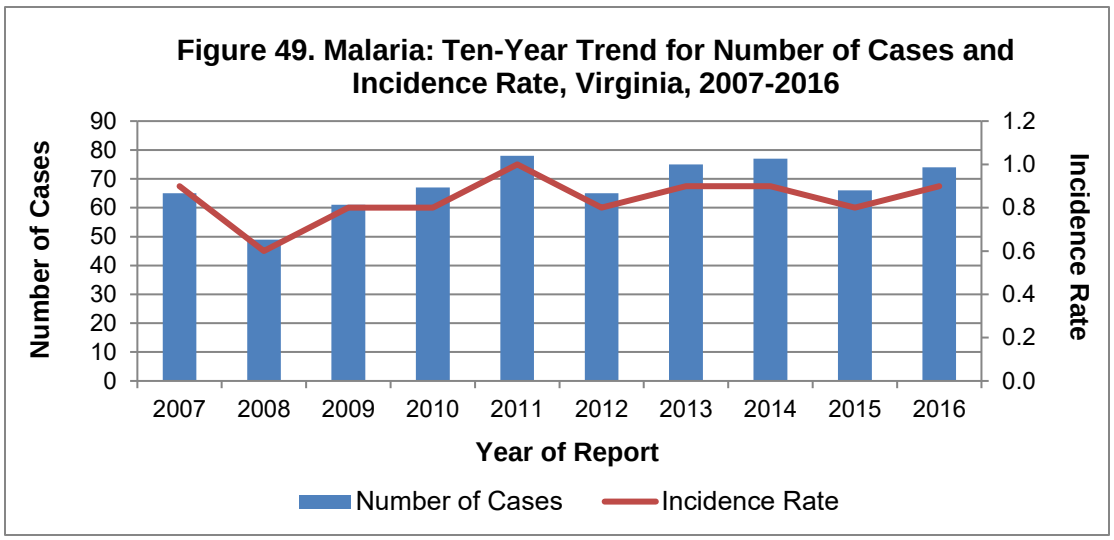
No cases of lymphogranuloma venereum were reported in Virginia in 2016. The last two reported cases occurred in 2005.

Malaria

Agent(s): Four different species of protozoan parasites: *Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale,* and *Plasmodium malariae*
Mode of Transmission: Transmission through the bite of an infected female *Anopheles* mosquito. Transmission might also occur from infected mother to child during pregnancy or delivery, by blood product transfusion or through transplanted organs from infected donors. Humans and certain *Anopheles* mosquito species are the only natural reservoirs for malaria.
Signs/Symptoms: Typically, high fever, chills, sweats, severe headache, muscle and joint pain, anorexia, nausea, flu-like illness, anemia and an enlarged spleen. *P. falciparum* infections may progress to severe malaria if not treated promptly; symptoms include acute alteration of brain structure and function (i.e., cerebral malaria), severe anemia, jaundice, renal failure and coma.
Prevention: Appropriate medication for malaria prophylaxis should be taken by travelers when traveling to malaria-endemic countries. Anopheles mosquitoes bite only at dusk, dawn or during night-time hours and tend to enter buildings. Control measures include staying in structures with adequate screening and bed nets, and when outdoors, wearing long-sleeved, loose-fitting, light-colored clothing and mosquito repellents.
Other Important Information: Almost all infections reported in Virginia occur in persons who were infected in other countries. Although malaria is not endemic to Virginia, it may be brought to this region by travelers or immigrants with dormant or inapparent infections. Malaria might also arrive in Virginia with infected mosquitoes transported in aircraft or ships arriving from foreign destinations. Two potential mosquito vectors for malaria are present in Virginia: *Anopheles quadrimaculatus* and *An. punctipennis*.

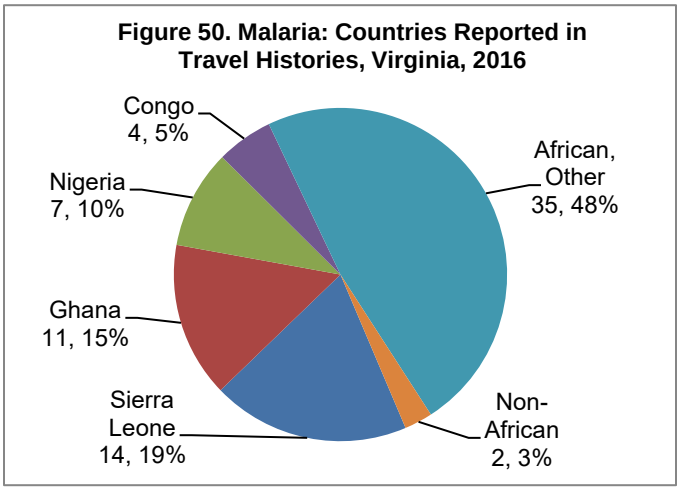
Malaria: 2016 Data Summary	
Number of Cases:	74
5-Year Average Number of Cases:	72.2
% Change from 5-Year Average:	+2%
Incidence Rate per 100,000:	0.9

In 2016, 74 cases of malaria were reported in Virginia. This represents a 12% increase from the 66 cases reported in 2015, and a 2% increase from the five-year average of 72.2 cases per year (Figure 49). Incidence rates were highest in the 30-39 year age group (1.9 per 100,000), followed by the 50-59 year age group (1.4 per 100,000 each). Incidence among the remaining age groups ranged from 0.4 to 0.8 per 100,000, with no cases occurring in infants. Race information was not reported for 20% of cases. For those with a known race, the incidence rate in the black population (3.1 per 100,000) was noticeably higher than the "other" race population (0.2 per 100,000) and the white population (0.1 per 100,000). Incidence among males was higher than females (1.1 and 0.7 per 100,000, respectively).



The majority (77%) of cases and the highest incidence rate (2.3 per 100,000) were both reported from the northern region, where the rate was more than double the statewide rate of 0.9 per 100,000. Rates from the remaining regions ranged from 0.2 to 0.5 per 100,000. No cases were reported from the southwest region. Incidence by locality can be viewed in the map below. Cases occurred throughout the year, with 35% being reported during the third quarter. Malaria almost always occurs among U.S. travelers returning from malaria-endemic countries, as well as among foreign visitors and immigrants from malaria-endemic countries; therefore, any observed temporal patterns are related to patterns of travel to and from endemic countries.

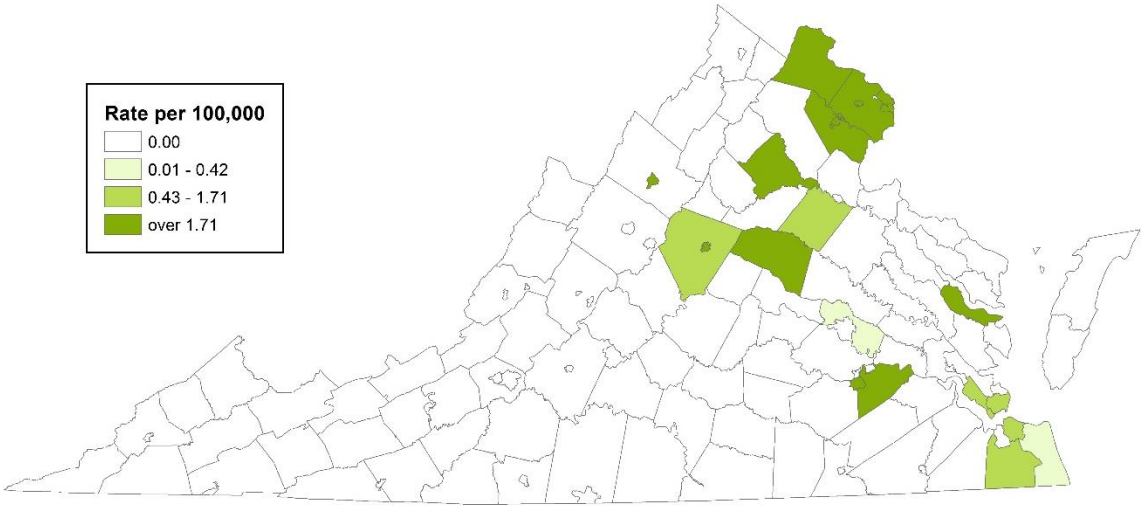
During 2016, 73 of 74 cases had a known travel history outside the U.S. in the two years prior to symptom onset. One case had an unknown travel history. Among those with travel outside the U.S., 97% reported travel to Africa and 3% reported travel to a non-African country. The distribution of specific countries reported as part of travel history can be seen in Figure 50.



The parasitic species of *Plasmodium* was identified in 60 of 74 cases. Of these 60 cases, 90% were *P. falciparum*, 3% *P. ovale*, 2% *P. vivax*, and 2% *P. malarie.* Two cases (3%) were infected with more than one malaria species.

Information on malaria prophylaxis usage was obtained for 62 of 74 cases. Of these 62 cases, 31% reported receiving prophylaxis for malaria. Among those receiving prophylaxis, 47% reported missing at least one dose. One malaria death was reported in 2016 and was attributed to cerebral malaria.

Malaria Incidence Rate by Locality
Virginia, 2016



Measles

Agent: Measles virus
Mode of Transmission: Primarily person-to-person transmission by inhalation of respiratory droplets or direct contact with nasal or throat secretions of infected people; however, airborne transmission via aerosolized droplet nuclei has been documented.
Signs/Symptoms: Fever, cough, conjunctivitis, coryza (inflammation of the mucous membrane inside the nose), and a typical rash on the third to seventh day after onset of symptoms.
Prevention: Measles vaccine should be given as part of the measles, mumps, and rubella (MMR) series beginning at 12-15 months of age followed by a second dose at age 4-6 years. Infants <12 months of age traveling internationally should be vaccinated with an additional dose if at least 6 months of age.
Other Important Information: Measles is highly communicable, with secondary attack rates greater than 90% among susceptible people who have close contact with the infected person. Measles elimination has been maintained in the United States since it was declared no longer endemic in 2000. While measles has been eliminated in the United States, imported cases still occur in unvaccinated persons following international travel to endemic countries, or following contact with infected travelers visiting the United States. Many imported cases originate in Asia, Europe, the Pacific, and Africa. As cases are imported and can be costly to control, it is important for individuals planning international travel to be aware of their immune status and obtain a vaccination if necessary.

Measles: 2016 Data Summary	
Number of Cases:	0
5-Year Average Number of Cases:	2.0
% Change from 5-Year Average:	-100%
Incidence Rate per 100,000:	0.0

No cases of measles were reported in Virginia in 2016. Previously, one case was reported in 2015 and two cases were reported in 2014. The five-year average of cases reported in Virginia is 2.0 per year.

Nationally, the number of cases reported in the U.S. declined from 188 cases in 2015 to 70 cases in 2016. In 2016, cases were reported in 16 states and included one outbreak in Arizona. Thirty-one cases were reported as part of the Arizona outbreak and prompted multiple vaccination clinics for susceptible clients. Over half of the reported cases in 2015 were part of a large outbreak that began in 2014 and was not contained until mid-year of 2015. The decline in U.S. cases in 2016 is likely the result of not having a large, multi-jurisdictional outbreak in 2016 similar to the outbreak seen in 2015.

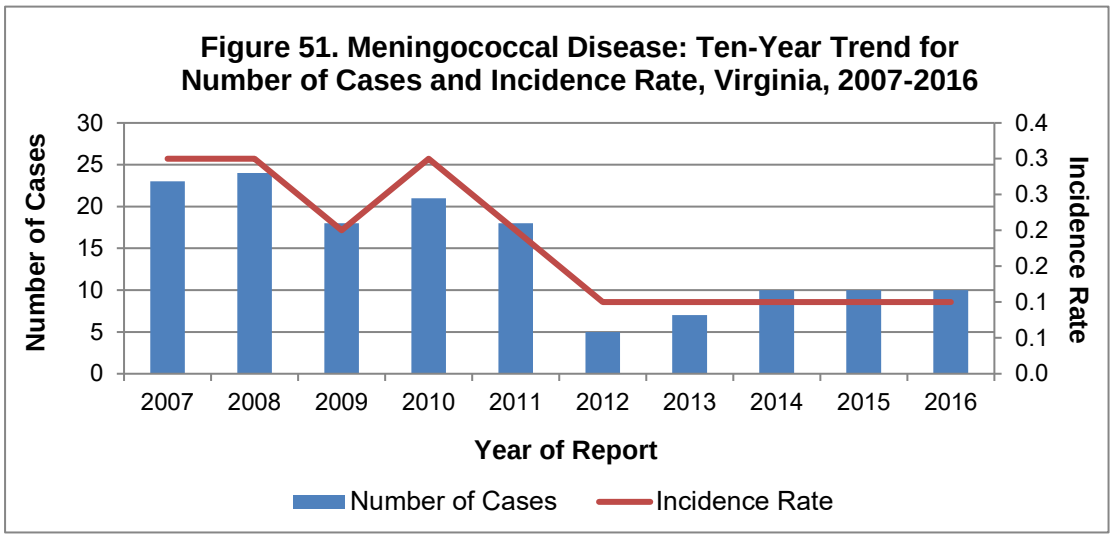
While no cases were reported in Virginia in 2016, outbreaks and the importation of cases highlight the need to maintain high vaccination coverage at a local level to prevent the spread of disease.

Meningococcal Disease

Agent: *Neisseria meningitidis* (bacteria)
Mode of Transmission: Transmission occurs through contact with respiratory droplets from the nose or throat of an infected person (e.g., through coughing or kissing).
Signs/Symptoms: Meningitis is the most common presentation of invasive disease and includes sudden onset of fever, headache, and stiff neck, and often nausea, vomiting, sensitivity to light, and confusion. A rash may be present. A bloodstream infection may also occur (without meningitis), leading to abrupt onset of fever and a rash; it is often associated with shock and multi-organ failure. Less commonly, meningococcal disease can lead to pneumonia, arthritis, middle ear infections, or inflammation of the epiglottis.
Prevention: Almost all invasive disease is caused by one of five serogroups (A, B, C, W, and Y), with serogroups B, C, and Y causing the majority of meningococcal disease cases in the United States. The Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination with a quadrivalent (protects against serogroups A, C, W, and Y) meningococcal conjugate vaccine for adolescents 11-12 years of age, with a booster dose at 16 years. Vaccination is also recommended for certain other groups at increased risk for meningococcal disease. In October 2014, the FDA approved the first serogroup B vaccine as a three-dose series. ACIP recommends use of a serogroup B meningococcal vaccine in certain persons aged 10 years or older who are at increased risk for meningococcal disease. Vaccination is also recommended to control outbreaks.
Other Important Information: Crowding, exposure to tobacco smoke, and concurrent upper respiratory tract infections increase the risk of disease. Individuals with certain medical conditions, such as complement component deficiency (immunodeficiency disorders) and asplenia (no spleen), are also at increased risk for disease. Meningococcal disease is more commonly diagnosed among infants, adolescents, and young adults than other age groups. Five to ten percent of people carry *N. meningitidis* in their nose without having any symptoms of disease; those who develop the disease are usually infected by a carrier who does not have symptoms. The case-fatality for meningococcal disease is eight to fifteen percent, even with appropriate antibiotic therapy.

Meningococcal Disease: 2016 Data Summary	
Number of Cases:	10
5-Year Average Number of Cases:	10.0
% Change from 5-Year Average:	0%
Incidence Rate per 100,000:	0.1

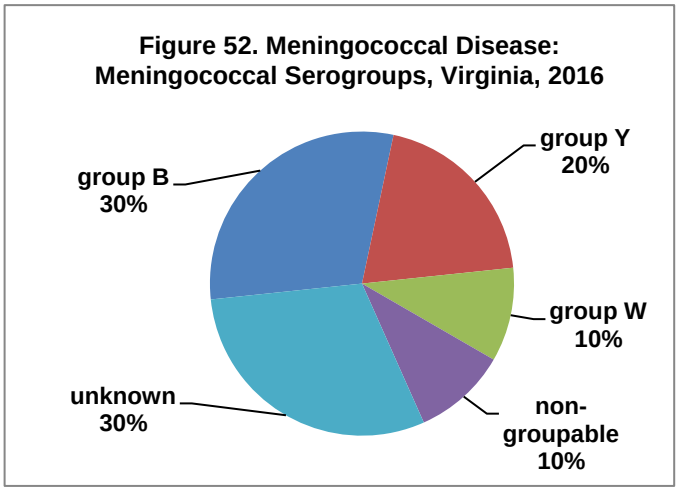
During 2016, ten cases of meningococcal disease were reported in Virginia, with a statewide incidence rate of 0.1 cases per 100,000 population (Figure 51). The 10 cases reported in 2016 match the number of cases reported in 2014 and 2015, and also reflect the five-year average of 10.0 cases per year. In general, rates of meningococcal disease have been declining in the U.S. and Virginia over the last two decades.



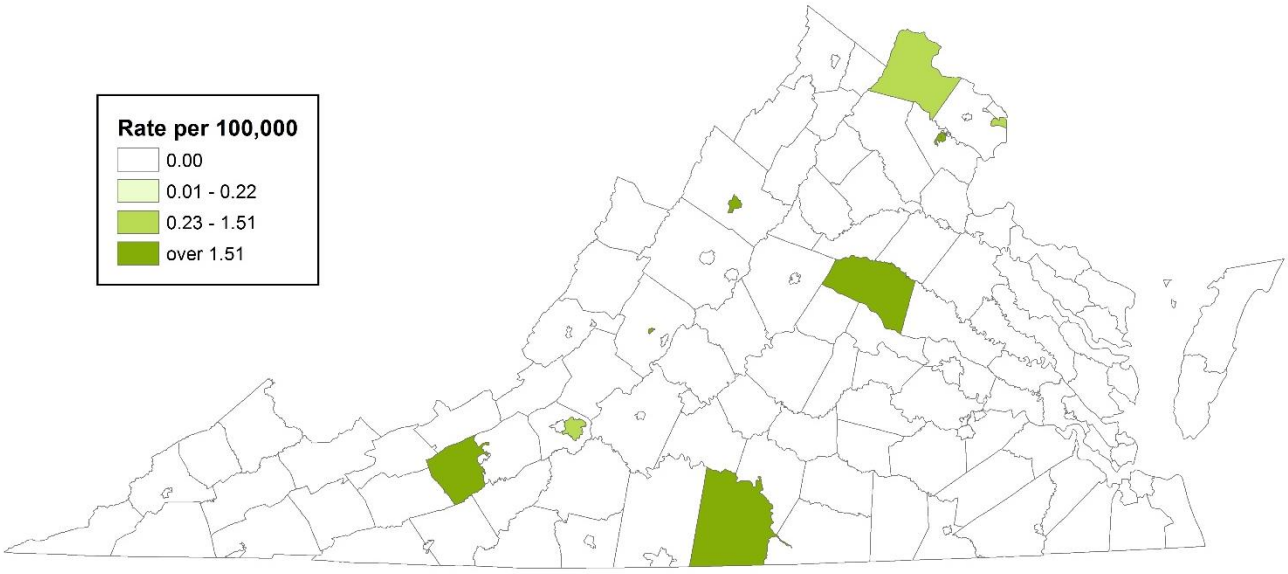
In Virginia, the 10-19 and 50-59 year age groups each had three cases and an incidence rate of 0.3 per 100,000. The 60 year and older age group accounted for two cases, while the remaining two cases occurred in the less than 1 year and 20-29 year age groups. Race information was not reported for 10% of cases. Among those with a known race, eight occurred in the white population, resulting in an incidence rate of 0.1 per 100,000. One case was reported in the black population. Eight cases were male, and two cases were female.

Four cases were reported from the northern region, three cases from the northwest region, two cases from the southwest region, and one case from the central region. No cases were reported from the eastern region. Cases were dispersed among nine different localities, which can be seen in the map below. While cases occurred throughout the year, 50% were reported during the second quarter.

Serogroup was reported for seven (70%) cases. Group B was the most common serogroup identified (3 cases, 30%), followed by Group Y (2 cases, 20%). One case (10%) was identified as serogroup W, and one (10%) case was non-groupable (Figure 52). Vaccination with a quadrivalent meningococcal vaccine was reported for one individual, and the case was linked to disease caused by serogroup B. Of the remaining nine cases, 8 had an unknown vaccination status, and 1 did not receive vaccine. Three deaths were attributed to meningococcal disease in 2016, all occurring in females older than 50 years of age. No outbreaks of meningococcal disease were reported in 2016.



Meningococcal Disease Incidence Rate by Locality
Virginia, 2016



Monkeypox

Agent: Monkeypox virus (genus *Orthopoxvirus*)
Mode of Transmission: Transmission to humans from an infected animal by bite or direct contact with lesions or body fluids. Though less common, infection can be transmitted directly from person to person by respiratory droplets or contact with body fluids of an infected person, or indirectly by contact with virus-contaminated objects, such as bedding.
Signs/Symptoms: Similar to smallpox, though more mild. Initial symptoms include fever, headache, backache, sore throat, cough and swollen lymph nodes. Three days after fever onset, a rash develops.
Prevention: Contact with exotic or wild mammals that originate from areas where monkeypox has occurred should be avoided.
Other Important Information: Monkeypox is a rare disease that occurs primarily in central and western Africa. The condition was first discovered in 1958 when two outbreaks of a pox-like disease occurred in monkeys being kept for research in a facility in Denmark. The first case recorded in humans occurred in the Democratic Republic of Congo in 1970. Monkeypox has been reported in humans in other African countries. In 2003, a monkeypox outbreak in the United States was identified among persons exposed to native prairie dogs that had contact with imported African rodents previously infected with the virus.

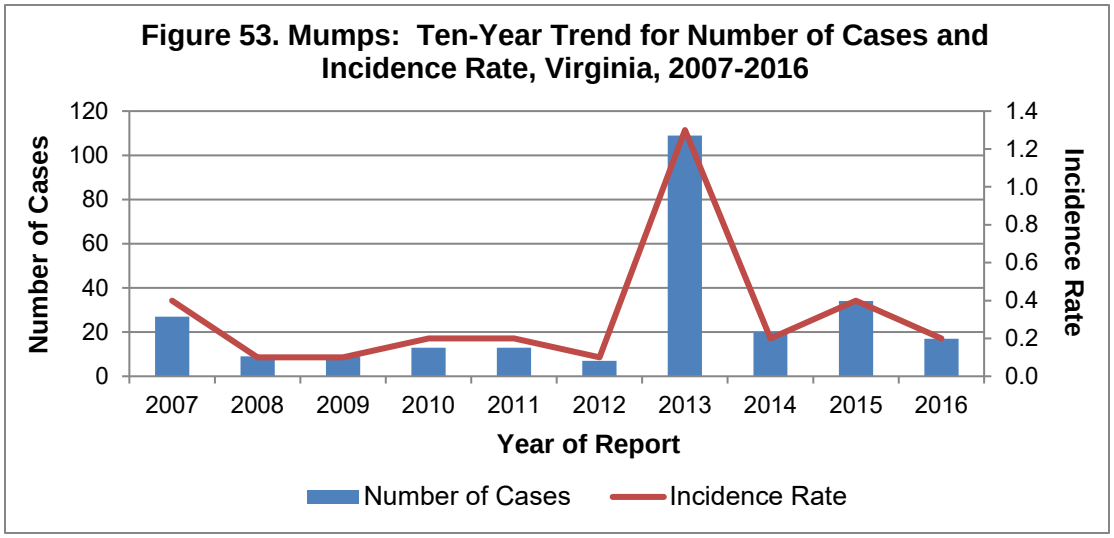
Monkeypox became a reportable disease in 2004. No cases of monkeypox have ever been reported in Virginia. According to the newly published Virginia Reportable Disease List which became effective October 20, 2016, monkeypox is no longer a reportable condition in Virginia.

Mumps

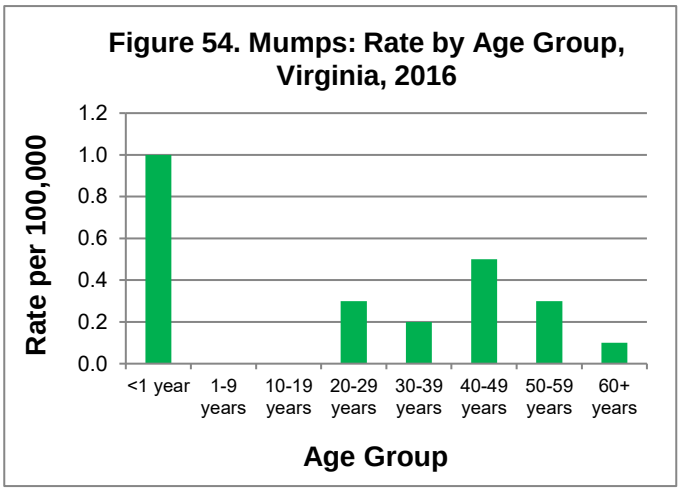
Agent: Mumps (virus)
Mode of Transmission: Person-to-person transmission through respiratory droplets, as well as through direct contact with saliva of an infected person.
Signs/Symptoms: Fever, swelling and tenderness of one or more salivary glands. Mumps infection may present with only nonspecific or primarily respiratory symptoms and as many as 20% of mumps infections are asymptomatic. Serious complications are rare but can occur in the absence of parotitis (inflammation of salivary glands).
Prevention: Vaccination, preferably as measles-mumps-rubella (MMR) vaccine, should be administered beginning at age 12 months. Two doses of mumps-containing vaccine are recommended for school-aged children, healthcare workers, international travelers, and college students. Although MMR vaccine is very effective, it does not provide complete protection against mumps. Two doses are 88% effective at protecting against mumps; one dose is 78% effective. Outbreaks can still occur in highly vaccinated U.S. communities, particularly in close-contact settings. However, high vaccination coverage helps limit the size, duration, and spread of mumps outbreaks.
Other Important Information: Cases and outbreaks of mumps continue to occur across the United States. In 2016, the United States reported the most cases of mumps in a decade. The increase in cases was driven by two outbreaks that occurred in Arkansas and Iowa. The community outbreak in Arkansas accounted for over 1,800 cases while Iowa reported over 680 cases. While the outbreak in Iowa began on a university campus, it spread to the community. Arkansas' outbreak was a community event but those affected by the outbreak had the same close contact as seen at a university setting. Both outbreaks occurred within populations with high two-dose MMR vaccine coverage; a third dose was recommended as outbreak response. Four other states (Indiana, Illinois, Massachusetts, and Oklahoma) reported over 100 cases each. Previous increases in mumps cases were observed in 2006 and 2014; university and community-based outbreaks were also reported in those years.

Mumps: 2016 Data Summary	
Number of Cases:	17
5-Year Average Number of Cases:	36.6
% Change from 5-Year Average:	-54%
Incidence Rate per 100,000:	0.2

In 2016, 17 cases of mumps were reported in Virginia which represents a 54% decrease from the five-year average of 36.6 cases per year. The statewide incidence rate in 2016 of 0.2 cases per 100,000 decreased from the rate observed in 2015 (0.4 per 100,000) (Figure 53).

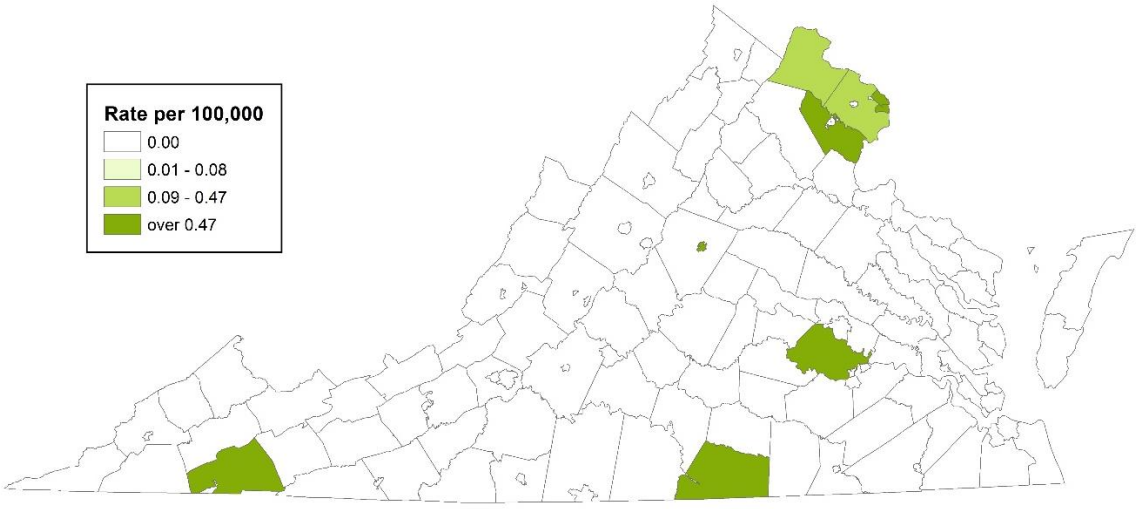


Incidence was highest among infants less than one year of age with a rate of 1.0 cases per 100,000, followed by the 40-49 year age group with 0.5 cases per 100,000. All other age groups had incidence rates under the state rate of 0.4 cases per 100,000 (Figure 54). These incidence rates do not mirror the national trend of cases occcuring within the college age groups. Race information was not reported for 29% of cases. Among those with a known race, incidence was slightly higher in the white population (0.2 cases per 100,000) than the black population (0.1 cases per 100,000). The incidence rate for males (0.3 per 100,000) was higher than the rate in females (0.1 per 100,000).



Cases were reported in four of five regions, with the largest proportion and highest incidence occurring in the northern region (12 cases, 0.5 per 100,000). The remaining regions had incidence rates ranging from 0.2 to 0.0 per 100,000, with no cases being reported from the eastern region. Geographically, cases were clustered as seen in the map below. Onset of cases occurred throughout the year with the highest percentage (35%) reported during the fourth quarter.

Mumps Incidence Rate by Locality
Virginia, 2016



Ophthalmia Neonatorum

Agent: *Chlamydia trachomatis* (bacteria) or *Neisseria gonorrhoeae* (bacteria). *C. trachomatis* is more common.
Mode of Transmission: Infants are typically exposed to the organism in the birth canal during childbirth. Rarely, infection during cesarean delivery or in utero may occur.
Signs/Symptoms: Redness or swelling of one or both eyes beginning five to fourteen days after birth.
Prevention: All pregnant women should be screened for chlamydia and gonorrhea. Women who were infected with *C. trachomatis* or *N. gonorrhoeae* in the first trimester of pregnancy should be retested during the third trimester to prevent postnatal infection in the infant. Topical prophylactic agents applied to newborns' eyes are highly effective at preventing development of gonorrhea ophthalmia, but do not always effectively prevent chlamydia ophthalmia.

Ophthalmia Neonatorum: 2016 Data Summary	
Number of Cases:	9
5-Year Average Number of Cases:	6.6
% Change from 5-Year Average:	+36%
Incidence Rate per 100,000:	0.1

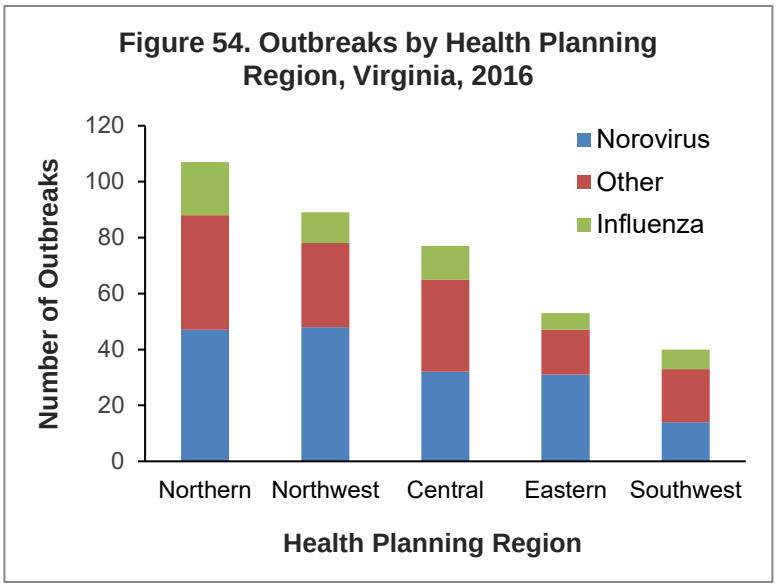
In 2016, nine infants were reported with ophthalmia neonatorum in Virginia. All were caused by *C. trachomatis*. This is the highest number of cases reported since 2012, when 11 cases were reported, and more than double the number reported in 2015 (four cases).

Outbreaks

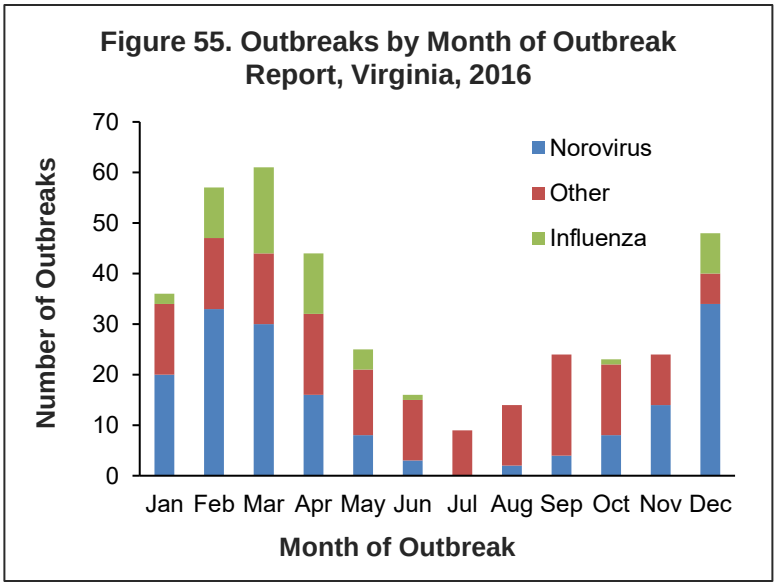
Introduction

In 2016, a total of 381 outbreaks were reported to the Virginia Department of Health (VDH). More than half of the outbreaks (227, 60%) were suspected or confirmed to be caused by norovirus (172, 45%) or influenza (55, 14%). Other etiologic agents were suspected or confirmed to have contributed to the remaining outbreaks (154, 40%).

Geographically, 107 (28%) outbreaks were reported from the northern region, followed in frequency by the northwest (89 outbreaks, 23%), central (77 outbreaks, 20%), eastern (53 outbreaks, 14%), and southwest (40 outbreaks, 10%) regions (Figure 54). The VDH Central Office led investigations in 15 multi-state or multi-jurisdictional outbreaks (4%).

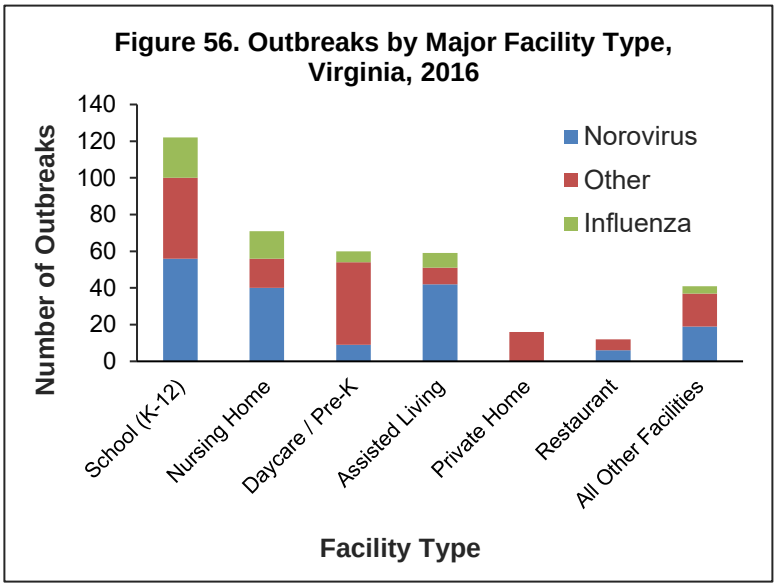


Outbreaks were reported throughout the year in 2016, but more outbreaks were reported in the colder months. More than one-half of outbreaks occurred in January, February, March, or December of 2016 (202, 53%). Consistent with previous years, the majority of outbreaks during the colder months were confirmed or suspected to be caused by norovirus or influenza, reflecting the active circulation of these pathogens in colder months (Figure 55).



Senior living facilities reported more than one-third of all outbreaks in 2016. These outbreaks included 59 (15%) in assisted living facilities and 71 (19%) in nursing homes (Figure 56). The next most common outbreak settings were schools, with 122 (32%) outbreaks in schools (K-12), and daycare centers, with 60 (16%) outbreaks. Outbreaks were also reported from private homes (16, 4%), restaurants (12, 3%), medical facilities (8, 2%), colleges (8, 2%), hotels/resorts (7, 2%), correctional facilities (6, 2%), businesses/workplaces (3, 1%), behavioral health facilities (2, 1%) and other settings (3,1%). One outbreak was reported from each of the following settings: independent living facility, adult daycare center, military base, and church.

The following sections describe norovirus outbreaks that were transmitted through person-to-person contact, influenza outbreaks, outbreaks transmitted through foodborne, waterborne, or zoonotic mechanisms, vaccine-preventable disease outbreaks, outbreaks that occurred in healthcare facilities, and outbreaks related to other types of illnesses.



Person-to-person Norovirus Outbreaks

Please see the Foodborne Outbreaks section below for a description of norovirus outbreaks that had a foodborne route of transmission.

Norovirus was suspected or confirmed as the cause of 172 (45%) outbreaks in Virginia in 2016. Among these, 156 were transmitted through person-to-person contact, 9 through food, 5 through water, and 2 where mode of transmission was unknown. The average number of persons who became ill in person-to-person norovirus outbreaks was 42, with a range of 3 to 708 persons ill per outbreak.

Person-to-person norovirus outbreaks were reported from all regions of Virginia in 2016. Overall, the most person-to-person norovirus outbreaks were reported from the northern region (43, 28%), followed by the northwest region (40, 26%), central region (31, 20%), eastern region (29, 19%), and southwest region (13, 8%).

The most frequent settings for person-to-person norovirus outbreaks were schools (K-12) (56, 36%), assisted living facilities (41, 26%), and nursing homes (40, 26%). Outbreaks from these three settings accounted for the majority (137, 88%) of all person-to-person norovirus outbreaks in 2016. This distribution pattern was similar to that of 2015, in which 37%, 35%, and 15% of person-to-person norovirus outbreaks occurred at assisted living facilities, nursing homes, and schools (K-12), respectively. Person-to-person norovirus outbreaks also occurred in other types of settings, including daycare facilities (9, 6%), medical facilities (3, 2%), colleges (2, 1%), and correctional facilities (2, 1%). In addition, an adult daycare program and independent living facility each reported one person-to-person norovirus outbreak.

Although person-to-person norovirus outbreaks occurred throughout the year in 2016, the majority of these outbreaks occurred in the colder months of January (19, 12%), February (32, 21%), March (27, 17%), and December (28, 18%).

Norovirus was confirmed by laboratory testing in 68 (44%) of the 156 reported person-to-person norovirus outbreaks. Based on further genetic sequencing of the virus, 59 of the outbreaks were attributed to the GII genogroup and 9 outbreaks were attributed to the GI genogroup.

In addition to the 156 person-to-person norovirus outbreaks, there were two norovirus outbreaks in 2016 for which the transmission route could not be determined. One outbreak occurred in the northern region and one in the eastern region. One was associated with a medical facility and the other was associated with a workplace.

Influenza Outbreaks

After norovirus, influenza (55, 14%) was the most common suspected or confirmed etiologic agent responsible for causing outbreaks in Virginia in 2016. An average of 30 people became ill in each influenza outbreak, with a range of 3 to 192 people ill per outbreak.

Influenza outbreaks were reported from all regions in Virginia in 2016. The northern region had 19 (35%) influenza outbreaks, followed by the central (12, 22%), northwest (11, 20%), southwest (7, 13%), and eastern (6, 11%) regions.

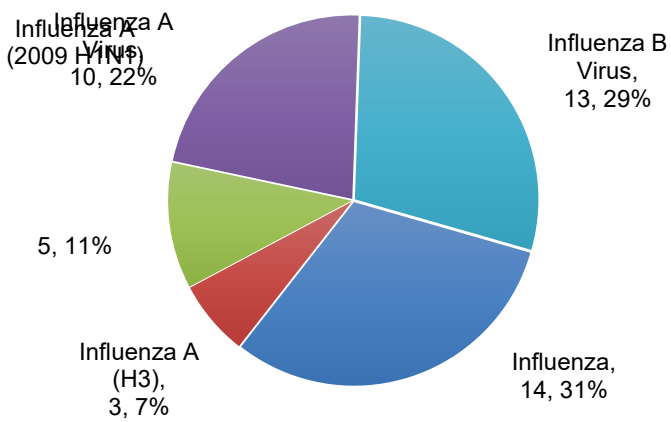
The majority of influenza outbreaks occurred in school (K-12) (22, 40%), nursing home (15, 27%) or assisted living (8, 15%) settings in 2016. The 22 influenza outbreaks reported in schools (K-12) during 2016 was double the number reported from 2015. Influenza outbreaks were also occasionally reported in other settings, including child daycare (6, 11%), medical (1, 2%), business/workplace (1, 2%), and behavioral health (1, 2%) facilities.

The month in which most influenza outbreaks were reported was March of 2016 (17, 31%). The remaining outbreaks were scattered throughout the following months of 2016: February (10, 18%), April (12, 22%), May (4, 7%), and December (8, 15%).

Among the 55 influenza outbreaks occurring in 2016, 45 (82%) were confirmed by laboratory testing. Influenza A virus predominated in 18 (40%) of these confirmed outbreaks. Specifically, among laboratory-confirmed influenza outbreaks, influenza A (H3) was identified in 3 (7%) outbreaks, influenza A (2009 H1N1) was identified in 5 (11%) outbreaks, influenza A (not further specified) was identified in 10 (22%) outbreaks, and influenza B was identified in 13 (29%) outbreaks (Figure 57).

For information on influenza outbreaks that occurred in the 2016-2017 influenza season (rather than calendar year 2016, as described above), please see the "Outbreaks" section of the "Influenza" chapter of this annual report.

Figure 57. Strain of Influenza Virus in Confirmed Influenza outbreaks, Virginia 2016



Foodborne Outbreaks

During 2016, 29 foodborne outbreaks were reported and investigated in Virginia (Table 9). This is similar to the number of outbreaks reported in 2015 (26). The average number of ill persons per outbreak was 15 and ranged from one to 110 ill per outbreak.

Foodborne outbreaks occurred throughout the year from January to December in 2016. Geographically, nine (31%) outbreaks occurred in the northwest region, followed by 4 (14%) in the northern, 3 (10%) in the eastern, one (3%) in the central, and one (3%) in the southwest regions. In addition, eight (28%) outbreaks were multi-state outbreaks that involved cases from Virginia and other states, which is a similar number to the seven multi-state outbreaks reported in 2015.

Etiologic agents were confirmed by laboratory testing in 27 (93%) of the 29 foodborne outbreaks. Among the 27 confirmed outbreaks, 18 (67%) were due to bacterial agents, which is higher than the 52% of foodborne outbreaks caused by bacteria in 2015. The remaining 9 (33%) outbreaks were caused by viral agents. Specifically, the 27 confirmed etiologic agents included norovirus (8, 30%), *Salmonella* (9, 33%), *Escherichia coli* (4, 15%) with three being specifically identified as *Escherichia coli* O157:H7, *Clostridium perfringens* (3, 11%), *Campylobacter* (2, 7%), and hepatitis A (1, 4%). Norovirus was suspected in the two remaining outbreaks.

Most foodborne outbreaks were associated with food prepared in private home (12, 41%) or restaurant (11, 38%) settings. The remaining outbreak settings included one college, one assisted living facility, one hotel, one workplace, and two other settings. The food vehicle associated with illness was detected in six outbreaks: frozen imported strawberries in one hepatitis A outbreak; pistachios, alfalfa seeds, and prepackaged leafy greens in three *Salmonella* outbreaks; ground beef in one *Escherichia coli* outbreak; and Ramen, pork broth in one *Clostridium perfringens* outbreak. The following food items were suspected in ten outbreaks: shrimp was suspected in a norovirus outbreak; mung bean sprouts, salad mix, and chicken (two outbreaks) were suspected in four *Salmonella* outbreaks; flour and raw milk were suspected in two *Escherichia coli* outbreaks; blackened chicken and chicken salad were suspected in two *Clostridium perfringens* outbreaks; and pork BBQ was suspected in one *Staphylococcus* outbreak. Food items could not be determined in 12 outbreaks.

As generally documented, contributing factors for foodborne outbreaks usually included bare-hand or glove-hand contact by an infected food handler, foods contaminated by a non-food handler who was suspected to be infectious, contaminated raw product that was consumed without undergoing the food preparation step intended to kill the microorganism (such as cooking to the required temperature), food intended to be served raw was contaminated, failure to control food temperature or the length of time food was out of temperature control, improper cold holding or hot holding due to improper procedure or protocol, improper/slow cooling, and insufficient time and/or temperature control during initial cooking/heat processing or during reheating.

Table 9. Foodborne Outbreaks Reported in Virginia, 2016

Onset Date	Health District	Number of Cases	Etiologic Agent	Vehicle	Facility Type
1/5/2016	Central Office	12	*Escherichia coli*	Unknown	Hotel / Resort
1/7/2016	Multi-state	1 VA 10 US	*Salmonella* Montevideo	Pistachio	Private Home
1/28/2016	Lord Fairfax	6	Norovirus GII	Unknown	Restaurant
2/4/2016	Multi-state	3 VA 53 US	*Escherichia coli* O157:H7	Flour suspected	Private Home
2/11/2016	Rappahannock Rapidan	14	Norovirus GII.4 Sydney/GII.8	Unknown	Restaurant
2/16/2016	Thomas Jefferson	30	*Clostridium perfringens*	Ramen, pork broth	Restaurant
02/29/2016	Three Rivers	6	*Clostridium perfringens*	Blackened chicken suspected	Restaurant
3/4/2016	Central Office	14	*Escherichia coli* O157:H7	Raw milk suspected	Other
3/9/2016	Rappahannock Rapidan	3	*Clostridium perfringens*	Chicken salad suspected	Restaurant
3/15/2016	Western Tidewater	11	Norovirus GII.6	Unknown	Restaurant
3/19/2016	Lenowisco	25	Norovirus GII	Pork BBQ suspected	Private Home
3/21/2016	Multi-state	3 VA 29 US	*Salmonella* Muenchen	Alfalfa seeds	Private Home
3/29/2016	Fairfax	8	Norovirus GII.4 Sydney	Unknown	Restaurant
4/5/2016	Multi-state	1 VA 7 US	*Salmonella* Enteritidis	Prepackaged leafy greens	Private Home
4/7/2016	Fairfax	2	*Salmonella* Enteritidis	Unknown	Restaurant
5/2/2016	Central Office	137	Hepatitis A Virus	Smoothie	Restaurant
5/5/2016	Multi-state	1 VA 10 US	*Escherichia coli* O157:H7	Ground beef	Private Home
5/24/2016	Chesapeake	15	*Campylobacter jejuni*	Unknown	Other
5/30/2016	Multi-state	1 VA 31 US	*Salmonella* Braenderup	Mung bean sprouts suspected	Restaurant
6/11/2016	Rappahannock	4	*Campylobacter*	Unknown	Private Home
6/24/2016	Multi-state	4 VA 24 US	*Salmonella* Enteritidis	Salad mix suspected	Restaurant
7/16/2016	Multi-state	5 VA 65 US	*Salmonella* Saintpaul	Chicken suspected	Private Home
7/24/2016	Lord Fairfax	4	*Salmonella* Heidelberg	Chicken suspected	Private Home

Table 9. Foodborne Outbreaks Reported in Virginia, 2016 (cont.)

Onset Date	Health District	Number of Cases	Etiologic Agent	Vehicle	Facility Type
8/31/2016	Thomas Jefferson	6	*Salmonella* Typhimurium	Unknown	Other
10/1/2016	Piedmont	11	Norovirus GII.7	Unknown	Restaurant
10/23/2016	Rappahannock Rapidan	15	Unknown	Vegetable fried rice suspected	Private Home
12/03/2016	Thomas Jefferson	65	Norovirus	Shrimp suspected	Assisted Living
12/9/2016	Fairfax	30	Norovirus GII	Unknown	Restaurant
12/10/2016	Arlington	10	Norovirus GI.7A Winchester	Unknown	Restaurant

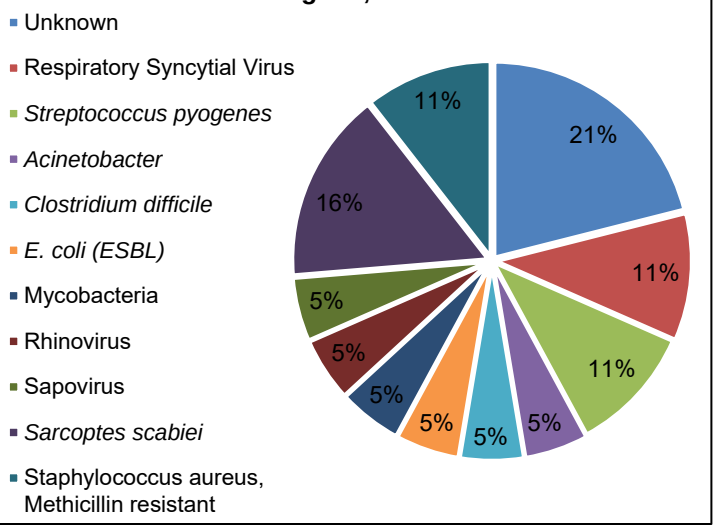
Healthcare-Associated Outbreaks

A healthcare-associated outbreak is a group of illnesses with a common etiology among patients, residents, or staff in a healthcare setting (e.g., hospital, medical center, nursing home, physician's office, dialysis center, or other healthcare facility), where the illness is associated with that setting. Note that prior to 2008, only outbreaks that occurred in hospitals and nursing homes (facilities meeting the definition of a medical care facility in 12VAC5-90-10) were included in these statistics.

During 2016, 19 healthcare-associated outbreaks with suspected or confirmed etiologic agents other than norovirus or influenza were reported in Virginia. This is 12% higher than the 17 non-norovirus, non-influenza outbreaks reported from healthcare facilities in 2015. The average number of ill persons per healthcare-associated outbreak in 2016 was 10, and ranged from two to 31 persons. The majority of reported healthcare-associated outbreaks occurred in nursing homes (16, 84%) and the remaining outbreaks (3, 16%) occurred in medical facilities, specifically in hospitals.

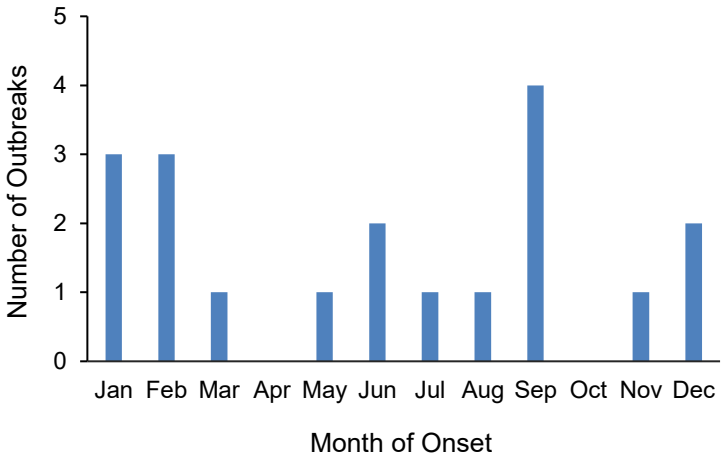
The majority of healthcare-associated outbreaks (16, 84%) were attributed to person-to-person transmission. One outbreak (5%) was attributed to environmental transmission. The route of transmission could not be determined in two outbreaks (11%). Etiologic agents were confirmed in 10 (53%) of the outbreaks, suspected in 5 (26%) and unknown in 4 (21%). Specifically, respiratory syncytial virus was confirmed in two outbreaks and *Streptococcus pyogenes* was confirmed in two outbreaks. *Acinetobacter*, *Clostridium difficile*, rhinovirus, sapovirus, *Sarcoptes scabiei* (scabies), and methicillin-resistant *Staphylococcus aureus* were each

Figure 58. Healthcare-Associated Outbreaks: Etiologic Agent Confirmed or Suspected, Virginia, 2016



responsible for one confirmed outbreak In addition, *Sarcoptes scabiei* (scabies) was suspected in two outbreaks, and extended-spectrum, beta-lactamase-producing *E. coli*, mycobacteria, and methicillin-resistant *Staphylococcus aureus* were each suspected in one outbreak (Figure 58).

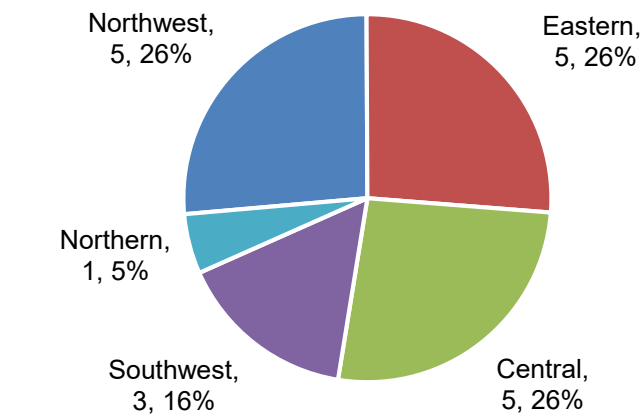
Figure 59. Healthcare-Associated Outbreaks: Month of Onset, Virginia, 2016



Healthcare-associated outbreaks were reported most frequently during the first (37%) and third (32%) quarters of the year in 2016, and less frequently during the second (16%) and fourth quarters (16%) (Figure 59). Seasonality is inconsistent from year to year; in 2015 healthcare-associated outbreaks were reported throughout the year and did not show particular seasonality.

In 2016, healthcare-associated outbreaks were reported most frequently from the northwest, eastern, and central regions, with five (26%) healthcare-associated outbreaks reported in each region. Three (16%) healthcare-associated outbreaks were reported in the southwest region, and one (5%) healthcare-associated outbreak was reported from the northern region (Figure 60).

Figure 60. Healthcare-Associated Outbreaks: Region of Occurrence, Virginia, 2016

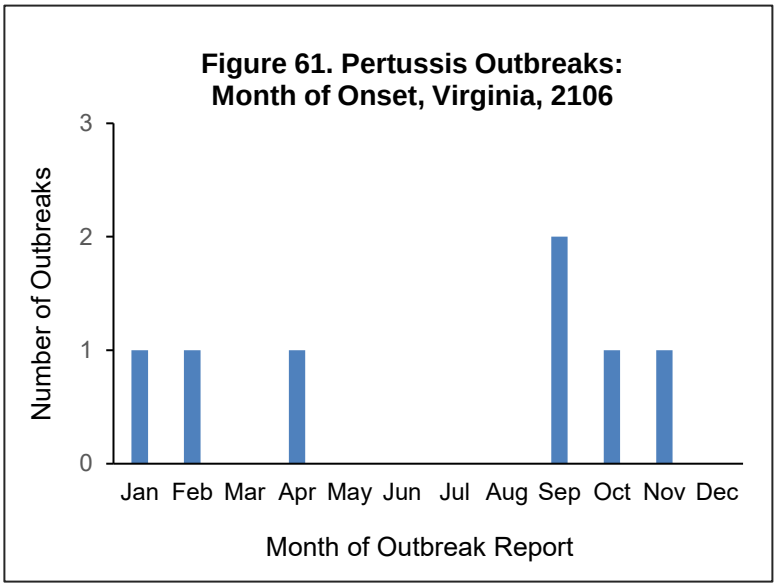


Vaccine-Preventable Disease Outbreaks

Eight outbreaks of vaccine-preventable illness were reported in Virginia in 2016. This is less than the 15 outbreaks reported in 2015. Pertussis was confirmed for seven outbreaks in 2016, while there was one suspect varicella outbreak. Four of the eight outbreaks occurred in the northwest region, followed by two in the northern and two in the southwest regions.

The average number of ill persons per outbreak in the seven pertussis outbreaks was six, with a range from two to 13 persons. Six (86%) of the seven pertussis outbreaks occurred in schools (K-12) and one (14%) occurred in a church.

Pertussis outbreaks occurred throughout the year, with one outbreak in each of the following months: January, February, April, October, and December. September had two pertussis outbreaks (Figure 61).



In 2016, one suspect outbreak of varicella consisting of seven cases was reported from a daycare setting. This suspected outbreak occurred in the northern region and none of the cases was laboratory confirmed. For the clients associated with this outbreak, four (57%) were under one year of age and therefore not recommended to receive vaccine. Of those eligible for vaccine based on age, one of the three ill persons had received one dose of vaccine. In 2015, four varicella outbreaks were reported. No other outbreaks of vaccine-preventable diseases such as measles, rubella, or *Haemophilus influenzae* type B were reported in 2016.

Waterborne Outbreaks

In 2016, six waterborne outbreaks were reported in Virginia (Table 10), compared to four outbreaks reported in 2015. Five outbreaks were reported in the northwest region and one was reported in the central region. Four outbreaks were confirmed, three with norovirus and one with uranium as the cause. The remaining two outbreaks were suspected to be caused by norovirus.

Table 10. Waterborne Outbreaks Reported in Virginia, 2016

Onset Date	Health District	Number of Cases	Etiologic Agent	Suspected Vehicle	Place Where Outbreak Occurred
10/9/2016	Central Shenandoah	28	Norovirus Suspected	Water	Hotel / Resort
10/21/2016	Crater	30	Uranium	Water	Assisted Living
11/7/2016	Central Shenandoah	14	Norovirus GI	Water	Hotel / Resort
11/13/2016	Central Shenandoah	31	Norovirus GI.3B Potsdam	Water	Hotel / Resort
11/27/2016	Central Shenandoah	10	Norovirus Suspected	Water	Hotel / Resort
12/4/2016	Central Shenandoah	26	Norovirus GI.3B Potsdam	Water	Hotel / Resort

Zoonotic Outbreaks

In 2016, two zoonotic outbreaks were reported. Both outbreaks were caused by *Salmonella*. The outbreaks were associated with multiple PFGE clusters linked to live poultry and small turtle exposures caused by *Salmonella* Enteritidis and *Salmonella* Poona, respectively (Table 11).

Table 11. Zoonotic Outbreaks Reported in Virginia, 2016

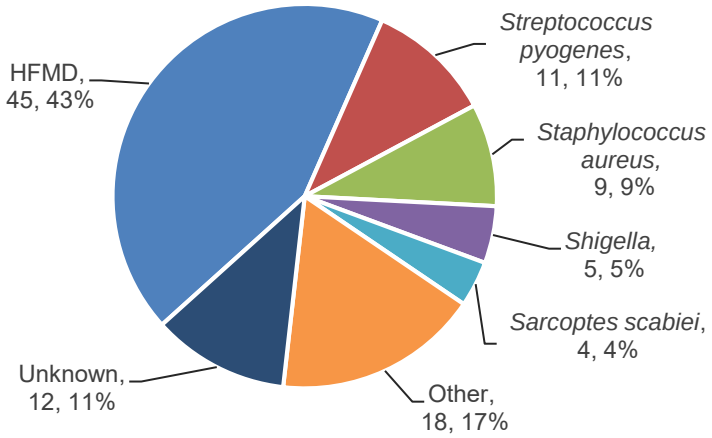
Onset Date	Health District	Number of Cases	Etiologic Agent	Vehicle	Place Where Outbreak Occurred
5/12/2016	Central Office	35	*Salmonella* Enteritidis	Poultry	Multistate
12/7/2015	Central Office	1	*Salmonella* Poona	Turtles	Multistate

Other Outbreaks

In addition to the norovirus, influenza, foodborne, healthcare-associated, vaccine-preventable, waterborne, and zoonotic disease outbreaks discussed above, 104 outbreaks related to other types of illness were reported in Virginia in 2016. This was a 13% increase compared to the 92 outbreaks reported in this category in 2015. The average number of ill persons per outbreak was 22, and ranged from 2 to 677 persons. As in previous years, the majority of these outbreaks (96, 92%) were attributed to person-to-person transmission. Three outbreaks were attributed to environmental exposure, while chemical exposure contributed to one (1%) outbreak. The remaining four (4%) outbreaks were attributed to undetermined factors.

The most frequent causes of illness reported from these "other" outbreaks were confirmed or suspected hand, foot, and mouth disease (HFMD) (45 outbreaks, 43%), *Streptococcus* (11, 11%), *Staphylococcus* (9, 9%), *Shigella* (5, 5%), and *Sarcoptes scabiei* (4, 4%). (Figure 62). Of the remaining 30 outbreaks reported in 2016, 18 were suspected or confirmed to be caused by a variety of etiologic agents, while the etiologic agent was unknown in 12 outbreaks. The number of HFMD outbreaks noticeably increased when compared to the previous year. In 2015, there were 18 HFMD outbreaks, which represented 20% of all outbreaks in this category for that year.

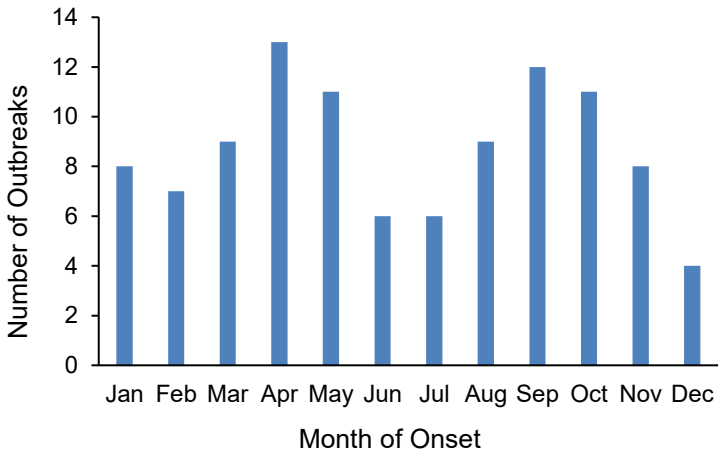
Figure 62. Other/Miscellaneous Outbreaks: Etiologic Agent Confermed or Suspected, Virginia, 2016



Overall, the most common settings for these 104 outbreaks were daycare/pre-K facilities (44, 42%), schools (K-12) (38, 37%), and assisted living facilities (8, 8%). In addition, five (5%) outbreaks were reported from colleges, four outbreaks were reported from correctional facilities (4%), and two outbreaks were reported from private homes (2%). Furthermore, three single outbreaks occurred at a restaurant, a military base, and other type of facility.

Based on onset date, "other" outbreaks occurred throughout the year with no distinct pattern of seasonality (Figure 63). Regionally, "other" outbreaks occurred throughout the state in 2016, with the largest proportions in the northern (37, 36%), and central (27, 26%) regions, followed by the northwest (15, 14%), the southwest (14, 13%) and eastern (9, 9%) regions. Two outbreaks (2%) in this category were investigated by central office staff.

Figure 63. Other/Miscellaneous Outbreaks: Month of Onset,, Virginia, 2016



Spotlight on Outbreaks

This section of the report is used to spotlight those outbreaks that proved to be the most interesting or unusual of all the outbreaks reported during the 2016 reporting year.

Outbreak spotlight: Hand, foot, and mouth disease

Among the 104 other outbreaks in 2016, 45 (43%) were outbreaks suspected to be due to hand, foot, and mouth (HFM) disease, a viral illness that can cause fever, blister-like sores in the mouth, and a skin rash. This is a 150% increase from the 18 HFM disease outbreaks reported in 2015. Most of the HFM disease outbreaks occurred in daycare facilities (36, 80%), and the remaining outbreaks occurred in school (K-12) settings (8, 18%), and one (2%) on a military base, consistent with the pattern in 2015. HFM disease usually affects infants and children younger than five years of age, but can sometimes occur in adults. HFM disease is caused by the Enterovirus group of viruses, which includes polioviruses, coxsackieviruses, echoviruses, and enteroviruses. There is no vaccine to protect against hand, foot, and mouth disease. Effective preventive measures include handwashing, cleaning and disinfecting touched surfaces and soiled items, and avoiding close contact with people with hand, foot, and mouth disease.

Outbreak spotlight: Multiple waterborne outbreaks from the same facility

Between October and December of 2016, the Central Shenandoah Health District (CSHD) received reports of five outbreaks of gastrointestinal illness (nausea, vomiting, and diarrhea) associated with one

local venue. CSHD conducted an epidemiologic, environmental health, and laboratory investigation to assess the potential for foodborne, waterborne, environmental, and person-to-person transmission.

The epidemiologic study revealed water as a common, significant risk factor between the three outbreaks included in the analysis. Whole genome sequencing identified genetically indistinguishable norovirus G1.3B in human specimens from multiple outbreaks. Results of water testing indicated the presence of total coliform and *E. coli* in the well water. A water disinfection system was installed, and no further outbreaks were reported. These outbreaks highlight the importance of adequate septic systems, safe water, and safe food preparation at venues that serve large numbers of people each year.

Outbreak spotlight: Hepatitis A

From May–October 2016, 110 Virginia residents were linked to an outbreak of hepatitis A associated with consumption of smoothies containing frozen Egyptian strawberries from a single restaurant chain. A total of 77 persons tested positive for hepatitis A virus (HAV) genotype IB, which is rarely detected in the Americas but is endemic in North Africa and the Middle East. Public health action was undertaken early in the investigation to identify the source of infection, remove the likely implicated product from the restaurant chain, and provide information about methods to prevent further transmission of HAV.

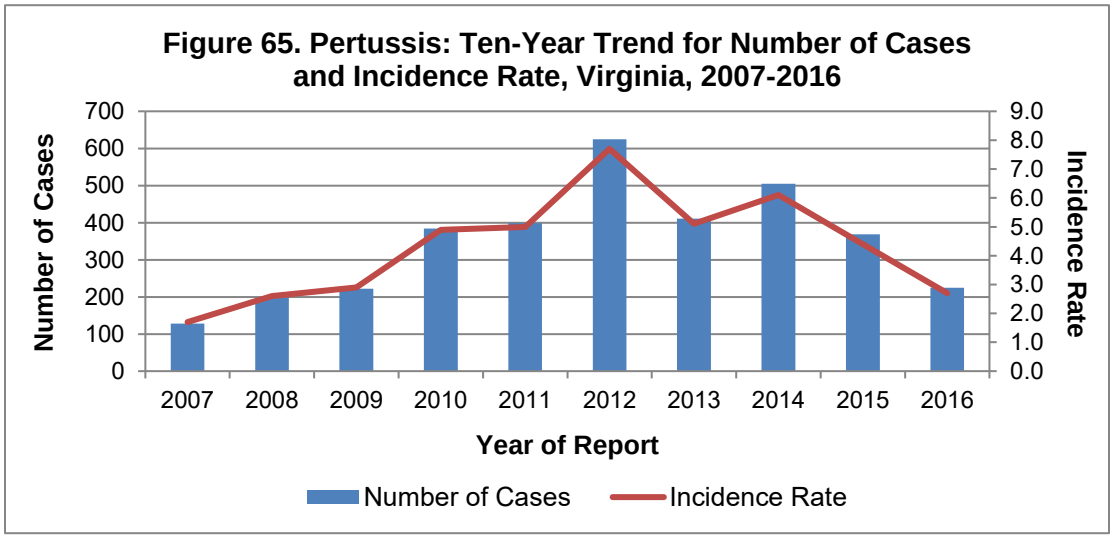
The response involved the activation of the Virginia Rapid Response Team, efforts by local health departments throughout Virginia, several offices in the Virginia Department of Health central office, the Virginia Department of Agriculture and Consumer Services, the Division of Consolidated Laboratory Services, the U.S. Food and Drug Administration (FDA), and the Centers for Disease Control and Prevention, and cooperation by the restaurant chain and the food importer. The outbreak highlights the importance of hepatitis A vaccination and of having a strong network in place to detect and respond to threats to food safety.

Pertussis

Agent: *Bordetella pertussis* (bacteria)
Mode of Transmission: Person-to-person transmission by contact with respiratory droplets from infected patients.
Signs/Symptoms: Insidious cough that progresses to paroxysmal coughing (i.e., severe, sequential coughs with difficulty inhaling) and may be accompanied by post-cough vomiting.
Prevention: Appropriate vaccine should be administered beginning at 2 months of age.
Other Important Information: Pertussis is also known as whooping cough. The occurrence of coughing fits can last up to 10 weeks or more. In vaccinated populations, the case-fatality rate is low. When deaths occur, they are generally in children less than six months of age who are too young to have been vaccinated.

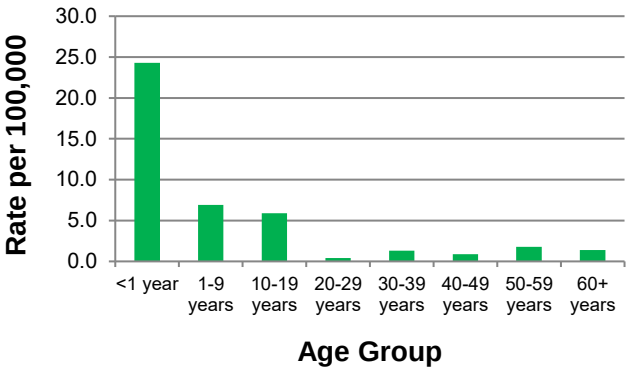
Pertussis: 2016 Data Summary	
Number of Cases:	225
5-Year Average Number of Cases:	463.2
% Change from 5-Year Average:	-51%
Incidence Rate per 100,000:	2.7

In 2016, 225 cases of pertussis were reported in Virginia, which represents a 51% decrease from the five-year average of 463.2 cases per year (Figure 65). This is consistent with the cyclical trend of pertussis with peaks and valleys every three to five years, and can be further observed by the reduction of cases since 2014. The overall increase in cases over the past 20-30 years may be attributed to increased awareness of pertussis, improved and more frequent diagnostic testing, increased circulation of the bacteria, and waning immunity in all age groups. While vaccination against pertussis is recommended for all ages, those receiving whole cell vaccine appear to have longer lasting protection compared to those that received only the acellular vaccine, given to those born after 1996, as demonstrated by incidence rates by age.



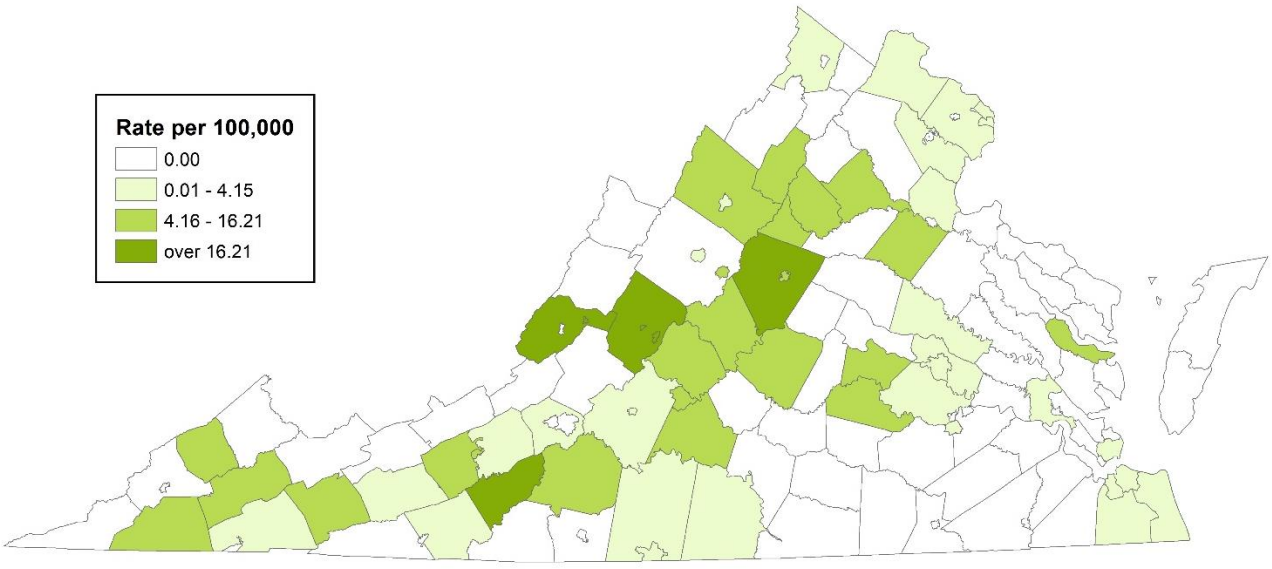
Incidence rates were highest among the three youngest age groups (Figure 66). The rate was noticeably higher in the less than one year age group (24.3 cases per 100,000), followed by the 1-9 and 10-19 year age groups (6.9 and 5.9 cases per 100,000 respectively). Race information was not reported for 30% of cases. Among those with race information, the incidence rate for the white population (2.3 cases per 100,000) was more than twice the rate in the black population (0.9 cases per 100,00) and "other" race population (0.8 cases per 100,000). Incidence rates were higher for females (3.0 cases per 100,000) compared to males (2.3 cases per 100,000).

Figure 66. Pertussis: Rate by Age Group, Virginia, 2016



Pertussis cases occurred in every region of the state, with the highest incidence rate being reported from the northwest region (6.5 per 100,000), followed by the southwest region (4.6 per 100,000). Rates in the remaining three regions ranged from 2.1 to 1.0 per 100,000. Incidence by locality can be seen in the map below. Cases of pertussis followed a seasonal trend, with more cases occurring during the cold weather months of the fourth quarter (89 cases, 40%). In 2016, seven pertussis outbreaks were reported. Four of those outbreaks occurred in the northwest region. Schools were the most common (85%) outbreak setting. The number of cases associated with each outbreak was low and did not impact the rate for any age group as seen in past years. No deaths from pertussis were reported in 2016.

Pertussis Incidence Rate by Locality
Virginia, 2016



Plague

Agent: *Yersinia pestis* (bacteria)
Mode of Transmission: Transmitted to humans through the bite of infected fleas or through handling tissue or body fluids of a plague-infected animal. If the disease attacks the lungs, it may be spread from person to person by respiratory droplets released when coughing.
Signs/Symptoms: Fever, chills, nausea, headache and body aches. Specific types of plague also lead to other symptoms, such as swollen lymph nodes ("buboes"), bloodstream infections, and pneumonia.
Prevention: In areas where plague occurs, travelers should avoid contact with rodents and fleas and avoid handling stray animals. Persons with plague that results in pneumonia should be isolated until 48 hours after antibiotics have been started.
Other Important Information: Modern antibiotics are effective in treating plague; however, without prompt treatment, the disease can result in serious illness or death. Fewer than 20 people in the United States are diagnosed with plague every year. The last urban plague epidemic in the U.S. occurred in Los Angeles from 1924 through 1925. Human plague infections continue to occur in the western United States in two particular regions, one being northern New Mexico, northern Arizona, and southern Colorado and the other being California, southern Oregon, and far western Nevada. In the past few decades, an average of seven cases of human plague have been reported each year. In 2015, a total of 16 confirmed cases of plague were reported to CDC. These are the most reported cases since 2006. Four cases in 2015 were fatal. Many more cases occur internationally, mostly in Africa and Asia. *Y. pestis* is considered to be one of the agents that could be used for bioterrorism because the bacteria can be spread from person to person and would cause increased illness and death in the population if it were used as a weapon.

No cases of plague have been reported in Virginia since the nineteenth century.

Poliovirus Infection, Including Poliomyelitis

Agent: Poliovirus
Mode of Transmission: Person-to-person transmission through ingestion of contaminated food or direct contact with fecal material from infected people.
Signs/Symptoms: Up to 90% of all polio infections are asymptomatic. Ten percent will develop into a non-specific syndrome with fever, malaise, headache, nausea, and vomiting. Flaccid paralysis occurs in less than 1% of poliovirus infections.
Prevention: Vaccine should be administered beginning at 2 months of age. Four doses of trivalent, inactivated poliovirus vaccine (IPV) are recommended with the last dose administered prior to kindergarten entry and after the fourth birthday.
Other Important Information: Polio eradication programs, which primarily utilize oral poliovirus vaccine (OPV), have led to the elimination of the disease in four of the six World Health Organization (WHO) designated regions. Polio incidence has dropped more than 99% since the launch of global polio eradication efforts in 1988, and 80% of the world's population now live in polio-free areas. Additional progress toward polio eradication was made in 2015 when type 2 poliovirus, one of the three serotypes, was declared eradicated. No cases of type 3 poliovirus have been detected since 2012. Type 1 poliovirus is the most pervasive and continues to circulate in endemic countries of Afghanistan, Pakistan, and Nigeria. The WHO recommended in 2015 that all countries using oral poliovirus vaccine change from trivalent (types 1, 2, and 3) to bivalent (types 1 and 3) to reduce the risk of vaccine-derived poliovirus transmission (VDPV).

No poliovirus infections were reported in Virginia in 2016. The last reported case of poliomyelitis in Virginia occurred in 1978. In 2011, Virginia's reporting requirements were changed to require reporting of any poliovirus infection, not only poliomyelitis.

Progress was made during 2016 for worldwide polio elimination in the endemic countries of Afghanistan and Pakistan. Afghanistan reported 13 cases; this is a continued decline from 20 cases in 2015 and 28 cases in 2014. Pakistan also reported a significant reduction with 20 cases reported in 2016 compared to 54 cases reported in 2015, and a 93% reduction from the 306 cases reported in 2014.

After being declared "polio-free" by the World Health Organization in 2015, progress made in Nigeria has been compromised by insurgency-related insecurity. Following the liberation of areas that were under insurgent control, such as Boko Haram, at least three cases of polio were found. Until poliovirus transmission is interrupted in these endemic countries, all countries remain at risk of importation of polio, especially in the "wild poliovirus importation belt" stretching from west Africa to central Africa and the Horn of Africa.

Psittacosis

Agent: *Chlamydia psittaci* (bacteria)
Mode of Transmission: Transmission usually occurs when a person inhales organisms that have been aerosolized from dried feces or respiratory tract secretions of infected birds. Other means of exposure include mouth-to-beak contact and handling of feathers or tissues from infected birds.
Signs/Symptoms: Most commonly fever, headache, weakness, muscle aches, chills, and nonproductive cough. The severity of the disease ranges from a mild, non-specific influenza-like illness to a systemic illness with severe pneumonia. With appropriate treatment, the infection is rarely fatal.
Prevention: Preventive measures include proper design and management of facilities that raise and sell birds and use of protective clothing (e.g., wearing of masks or respirators and gloves) by those working with birds confirmed with avian chlamydiosis or birds exposed to confirmed avian cases. Bird cages should be cleaned regularly with disinfectants and the contents of the cage should be disposed of properly. People who work with birds or have birds as companion animals who experience symptoms compatible with psittacosis should bring this potential exposure to their healthcare provider's attention.
Other Important Information: Birds may or may not show signs of illness when infected. The severity of clinical illness in humans can range from subtle upper respiratory disease or mild conjunctivitis to death and depends on the virulence of the particular *Chlamydia* strain and the immune status of the host. Chlamydial organisms have been isolated from over 460 bird species, but are most commonly identified in psittacine (parrot-type) birds, especially cockatiels and budgerigars (also called parakeets or budgies). Among caged, nonpsittacine birds, infection with *C. psittaci* occurs most frequently in pigeons and doves. People who raise, sell or keep birds should consult with a licensed veterinarian about protocols and best practices for preventing and treating avian psittacosis.

No cases of psittacosis were reported in Virginia during 2016. The most recent psittacosis case was reported in 2003.

Q Fever

Agent: *Coxiella burnetii* (bacteria)
Mode of Transmission: Inhalation of air contaminated with *Coxiella burnetii*. Most commonly, people are exposed to this organism via inhalation of infectious aerosols directly from birth fluids of infected animals or via inhalation of dust contaminated with dried birth fluids or tissues. Less common routes of transmission include ingestion of raw milk and dairy products or contact with contaminated clothing. Person-to-person transmission is rare.
Signs/Symptoms: Illness with Q fever has both acute and chronic forms. Approximately 50% of people infected with Q fever will develop the acute form. Acute Q fever is characterized by high fever, severe headache, fatigue, chills and muscles aches. Serious illness can progress to pneumonia or inflammation of the liver. Children with Q fever are less likely than adults to have symptoms and might have a milder illness. When symptomatic with acute Q fever, children are more likely to manifest gastrointestinal symptoms of illness and develop a skin rash. Chronic Q fever is a severe disease developing in less than 5% of patients exposed to the bacterium that causes Q fever, and is rarely reported in children. Endocarditis is the major form of chronic disease, comprising 60-70% of all reported cases. It may present within a few months after an acute infection or may manifest years later. Chronic disease can occur after symptomatic or asymptomatic infections. The three groups at highest risk for developing chronic Q fever are pregnant women, immunocompromised persons and patients with a pre-existing heart valve defect.
Prevention: Preventive measures include appropriate disposal of potentially infectious tissues and proper hygiene when handling animal birth material.
Other Important Information: Although infection has been confirmed in many species, cattle, sheep and goats are the main natural reservoirs for *C. burnetii*. The infectious form of these bacteria is highly resistant to heat, desiccation, and disinfectant substances, and can persist in the environment for long periods of time. Windborne particles containing infectious organisms can travel a half-mile or more, which may contribute to cases with no known animal contact. From 2000-2010, information associated with Q fever cases reported to the CDC indicated that 60% of patients reported no animal contact. This bacterium is classified by the CDC as a potential bioterrorism agent because it could easily be disseminated and result in a moderate amount of illness.

No cases of Q fever were reported in Virginia in 2016. Four cases were reported in 2014, three acute and one chronic. Of these, one acute case had a confirmed history of raw milk consumption and another reported travel to South America where raw dairy products may have been consumed. No specific risk factors were identified for the third acute case. The single chronic case from 2014 was associated with valvular heart disease. The five-year average for Q fever in Virginia is 2.0 cases per year.

Rabies

Agent: Rabies virus, a rhabdovirus of the genus Lyssavirus
Mode of Transmission: Most commonly transmitted through the bite of an infected animal, but may be transmitted through any method by which virus-infected saliva or central nervous system tissue enters the body.
Signs/Symptoms: Vary widely, but in people, symptoms often include an initial headache, fever and apprehension which progresses to paralysis, spasms of the muscles used for swallowing, delirium and convulsions. Once symptoms appear, rabies is almost invariably fatal.
Prevention: Important prevention methods include vaccinating cats, dogs, and ferrets; using animal control to remove stray animals; and avoiding handling wildlife. A series of vaccines is recommended for people whose occupations increase their likelihood of being exposed to rabies (e.g., veterinarians and laboratorians working with rabies virus) and a vaccine series is also available for people who have been exposed.
Other Important Information: The main reservoir of rabies in the United States is wildlife. In most other countries, the main reservoir is dogs. Not everyone who meets the health department's definition of possible exposure to rabies is required to undergo the rabies vaccination series, also known as post-exposure prophylaxis (PEP). A person may receive PEP if he is considered exposed to rabies and the animal associated with the exposure is either not available or tests positive for rabies.

Human

There were no human rabies cases reported in Virginia in 2016. The last human rabies case reported in Virginia occurred in 2009 in an adult male who was infected with the Indian canine variant of the rabies virus. This person was thought to have been exposed during an encounter with a dog while traveling in India. The patient died as a result of this infection.

In 2016, 1,567 individuals were reported as having received rabies post-exposure prophylaxis in Virginia. This represents a statewide rate of 18.7 per 100,000 individuals receiving PEP and represents no change from 2015 when 1,568 individuals were reported as having received PEP. All health districts reported residents receiving rabies PEP. The Fairfax Health District had the highest number of individuals (n=231) receiving PEP, while the Three Rivers Health District reported the lowest number of individuals receiving PEP with two. The highest rate of PEP based on population was 56.3 per 100,000 reported from the Thomas Jefferson Health District, while the lowest rate (1.4 per 100,000) was reported from the Three Rivers Health District. By region, the northwest region had the highest rate of people receiving PEP at 29.7 per 100,000 and the eastern region had the lowest rate at 7.5 per 100,000. See Table 12 and the map insert for rabies PEP by individual health district.

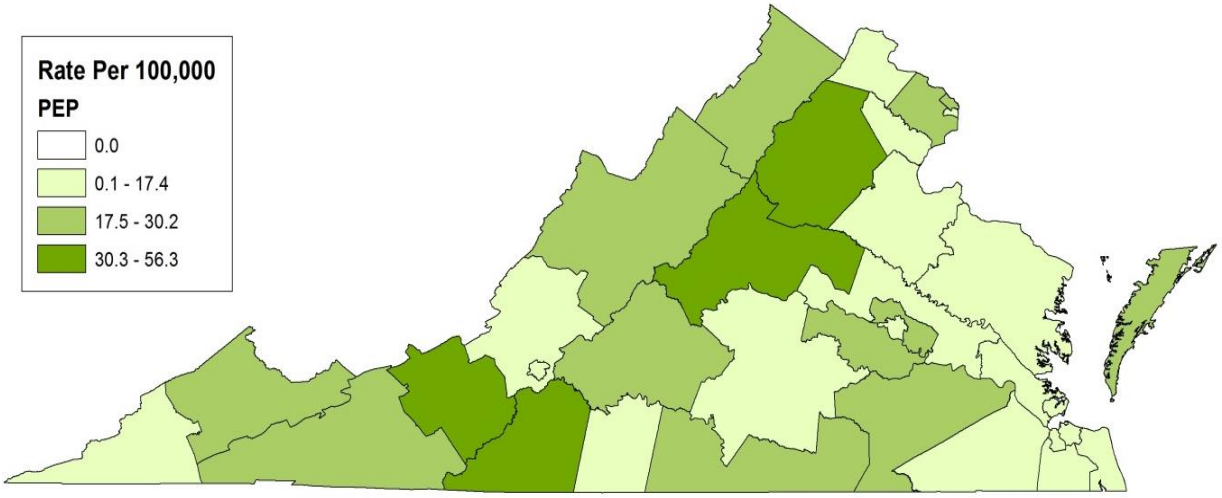
For health districts that recorded exposures by species among those receiving PEP, 37% of individuals received PEP due to exposure to a wildlife species, 32% received PEP due to exposure to a dog, and 26% received PEP due to exposure to a cat. Less than 3% of people received PEP due to livestock exposure. Twenty-four individuals received PEP due to an unknown or other animal exposure. Most potential human exposures to rabies that are reported to the health department each year are associated with dogs and cats.

Table 12: Number of People Receiving Rabies PEP by Health District, Virginia, 2016

Health District	Population	PEP	
		Number	Rate Per 100,000
Alexandria	153,511	24	15.6
Alleghany/Roanoke City*	279,631	16	5.7
Arlington	229,164	54	23.6
Central Shenandoah	294,270	81	27.5
Central Virginia	259,950	60	23.1
Chesapeake	235,429	8	3.4
Chesterfield	381,538	67	17.6
Chickahominy	152,912	9	5.9
Crater	156,374	31	19.8
Cumberland Plateau	108,681	37	17.9
Eastern Shore	45,128	10	22.2
Fairfax	1,180,139	231	19.6
Hampton	136,454	6	4.4
Henrico	325,155	82	25.2
Lenowisco	90,525	13	14.4
Lord Fairfax	230,845	50	21.7
Loudoun	375,629	64	17.0
Mount Rogers	191,532	50	26.1
New River	181,747	108	40.2
Norfolk	246,393	19	7.7
Peninsula	350,480	12	3.4
Piedmont	102,779	16	15.6
Pittsylvania/Danville	104,276	6	5.8
Portsmouth	96,201	4	4.2
Prince William	509,211	83	16.3
Rappahannock	356,095	31	8.7
Rappahannock/Rapidan	174,111	86	49.4
Richmond City	220,289	14	6.4
Southside	82,904	22	19.3
Thomas Jefferson	247,084	139	56.3
Three Rivers	140,902	2	1.4
Virginia Beach	452,745	64	14.1
West Piedmont	139,835	53	37.9
Western Tidewater	151,074	8	5.3
Total for 2016	**8,382,993**	**1,567**	**18.7**

* For surveillance purposes, rabies PEP data and population figures are combined for these two health districts.

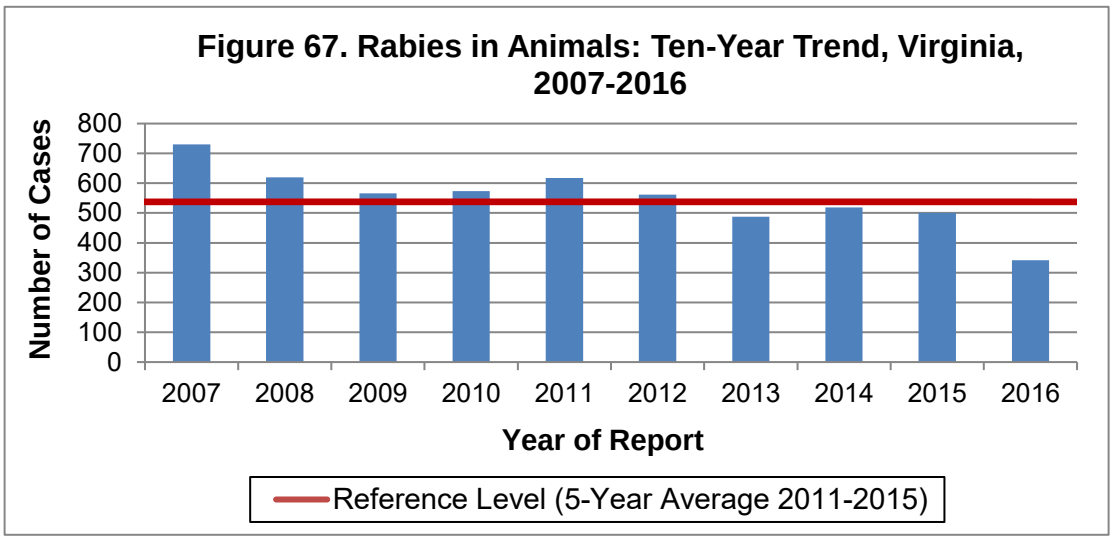
Table 12 Map Insert: Persons Receiving Rabies PEP per 100,000 by Health District, Virginia, 2016



For reference, a link to health districts and their corresponding localities can be found at http://www.vdh.virginia.gov/content/uploads/sites/10/2016/03/vamap.jpg

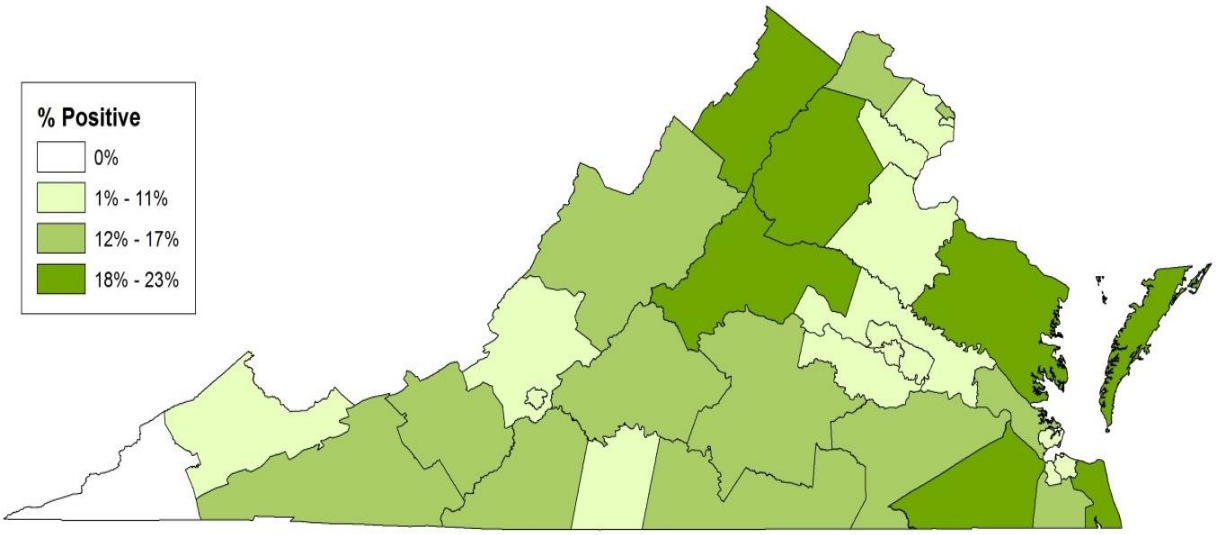
Animal

In 2016, health districts investigated over 19,000 incidents where either an animal potentially exposed a person to rabies or the animal itself was potentially exposed to rabies. Over 62% of these incidents involved dogs. Cats accounted for almost 25% of all incidents and wildlife accounted for almost 11% of incidents. Among all the incidents investigated, only 3,075 animals were submitted for rabies testing from Virginia. Out-of-state submissions included one dog from Connecticut and one cat from New York. Of the submitted animals, 348 (11%) were laboratory confirmed positive for rabies. The percent of animals testing positive for rabies in 2016 is slightly lower than the range of 13-16% of animals testing positive that has been observed over the last 10 years. The 348 animals testing positive for rabies in 2016 represents a 30% decrease from the 500 animals that tested positive for rabies in 2015, and is below the five-year average of 537 cases per year (Figure 67). An animal is submitted for testing when a person or another domestic animal meets the VDH definition of exposure to rabies. All animals are tested for rabies by the Division of Consolidated Laboratory Services or the Fairfax County Health Department Laboratory.



Based on laboratory submission data, eight localities submitted no animals for rabies testing. Of the localities that did submit animals for testing, Fairfax County submitted the highest number at 248 and had the highest number of positives with 20. By district, the largest number of rabid animals were reported from the Fairfax County Health District (33), followed by the Lord Fairfax Health District (30), and Rappahannock/Rapidan Health District (27). Although animals were submitted for testing, no rabid animals were identified from the Lenowisco Health District. At the regional level, the largest number of laboratory-confirmed rabid animals was reported from the northwest region (105), followed by the southwest region (71). The number of lab-confirmed rabid animals in the remaining regions ranged from 40 to 67. More detailed information about the number of animals testing positive by locality, health district, and region can be found in the section of this report entitled Number of Reported Cases and Rate per 100,000 Population for Selected Diseases by Locality, District and Region. The map below depicts data reflecting the percent of animals testing positive for rabies by health district.

Percent of Animals Testing Positive for Rabies by Health District, Virginia, 2016



Among all animal species, cats were the most frequently tested for rabies (803), and had the highest number of positives (27) among domestic animals (Table 13). Bats were the most commonly tested wildlife species, with 668 specimens submitted and 16 testing positive. Aside from a single bobcat testing positive (100%), skunks had the highest percentage of positive test results (61%), followed by raccoons (37%) and foxes (27%). Of the 348 animals testing positive for rabies in Virginia in 2016, raccoons accounted for almost half (46%) of all positive results, followed by skunks (26%), and foxes (8%). Cattle accounted for the largest number (12) of livestock testing positive for rabies, while donkeys accounted for the highest percentage (50%) of livestock testing positive. All small rodents submitted for testing were negative. Cats remain the domestic animal most commonly diagnosed with rabies, and raccoons remain the most common wildlife species diagnosed with rabies; these trends have been consistent for over 10 years.

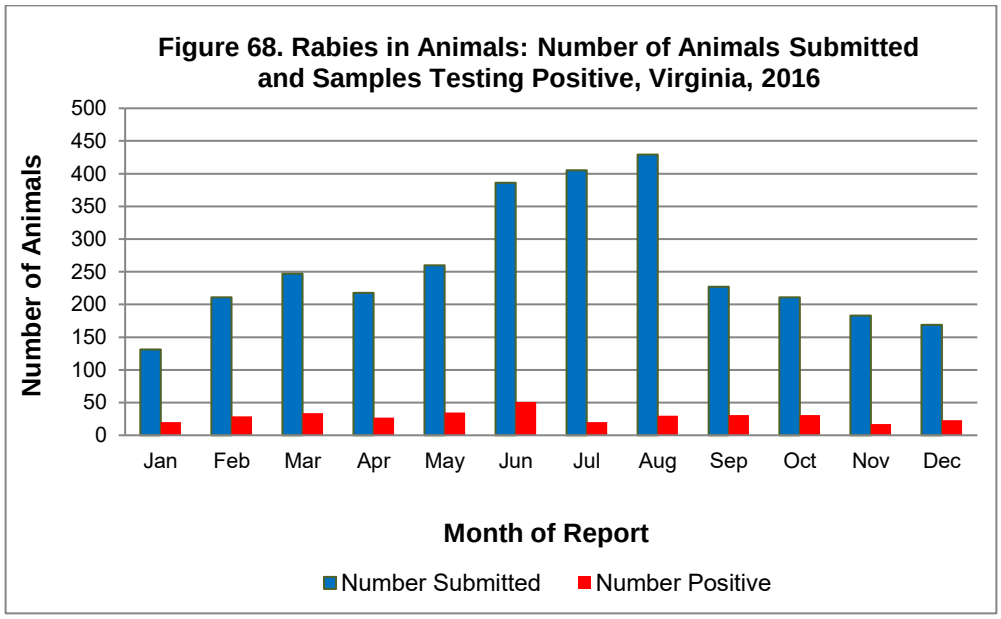
Table 13. Animals Testing Positive for Rabies by Species, Virginia, 2016

Animal Species	Number of Animals Tested	Positive	
		Number	Percent
African Serval	1	0	0%
Alpaca	7	2	29%
Bat	668	16	2%
Beaver	1	0	0%
Bobcat	1	1	100%
Cat	803	27	3%
Chipmunk	4	0	0%
Cow	80	12	15%
Coyote	5	2	40%
Deer	5	0	0%
Dog	465	4	<1%
Donkey	2	1	50%
Fox	101	27	27%
Goat	36	2	6%
Groundhog	85	2	2%
Horse	17	0	0%
Llama	1	0	0%
Mink	1	0	0%
Mole	1	0	0%
Mouse	10	0	0%
Muskrat	2	0	0%
Opossum	128	0	0%
Otter	2	0	0%
Pig	4	0	0%
Rabbit	6	0	0%

Table 13. Animals Testing Positive for Rabies by Species, Virginia, 2016 (cont.)

Animal Species	Number of Animals Tested	Positive	
		Number	Percent
Raccoon	441	161	37%
Rat	2	0	0%
Rodent	1	0	0%
Sheep	5	0	0%
Skunk	148	91	61%
Squirrel	39	0	0%
Vole	3	0	0%
Total for 2016	**3075**	**348**	**11%**

The largest number of animals submitted for rabies testing occurred during the late spring and summer months, while the fewest number of animals were submitted for testing during the winter months (Figure 68). This seasonal pattern is likely a result of increased domestic animal and human interaction with wildlife during warmer months. No particularly strong seasonal pattern was observed in the number of animals testing positive for rabies, but June had the highest number of any month, with 51 animals testing positive, while November saw the fewest number (17) of animals testing positive.



Rubella

Agent: Rubella virus
Mode of Transmission: Person-to-person transmission through contact with nose and throat secretions from infected people. The virus may also be transmitted from mother to child during pregnancy, causing congenital rubella syndrome (CRS) in the infant.
Signs/Symptoms: Fever and rash, with frequent occurrences of joint pain, arthritis, and swelling of the lymph nodes.
Prevention: Vaccination, administered as MMR vaccine, should begin at 12 months of age.
Other Important Information: In 2004, rubella was declared to no longer be endemic in the United States, although a small number of cases continue to be imported.

No cases of rubella were reported in Virginia during 2016. The most recent cases reported in Virginia occurred in 2010 in two unvaccinated individuals. Prior to 2010, the last reported case occurred in 2001. Nationally, one case of rubella and two cases of congenital rubella syndrome were reported in 2016. Five cases of rubella and one case of congenital rubella syndrome were reported in the U.S. in 2015.

While rubella elimination has been maintained in the U.S., it is important to sustain high vaccination rates because rubella is endemic and remains a problem in other parts of the world. Since 2012, all rubella cases in the U.S. had evidence that infection occurred while living or traveling outside the country. It is important that all children and women of childbearing age be vaccinated against rubella as evidenced by the more than 100,000 babies born worldwide with CRS every year.

Salmonellosis

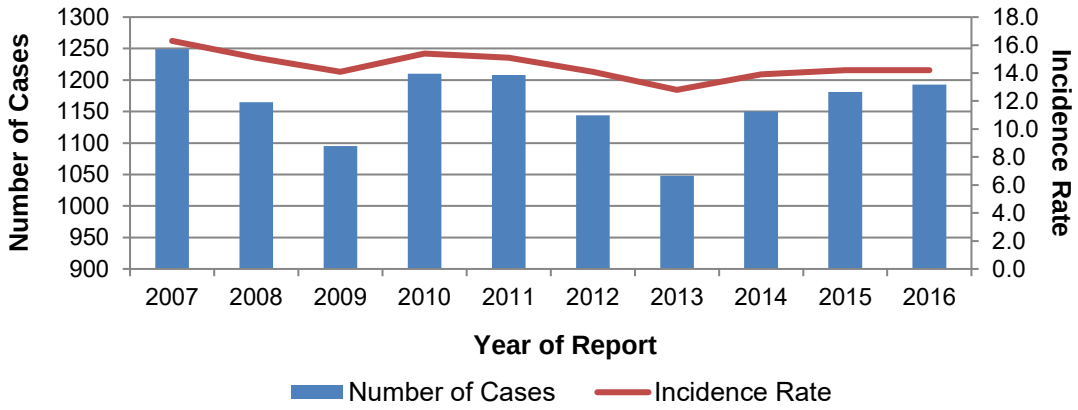
Agent: *Salmonella* (bacteria)
Mode of Transmission: Ingestion of contaminated foods (e.g., eggs and poultry products; fruit; vegetables) that have not been cooked enough to kill the germs, or by drinking contaminated water or milk. Infection can also occur after eating, smoking, or touching your mouth if hands are contaminated with the bacteria. Infected persons can also spread the bacteria if they do not wash their hands well after going to the bathroom and then handle food that other people eat. People can also be infected with *Salmonella* after contact with infected animals (especially poultry, pigs, cows, rodents, and pets such as lizards, turtles, chicks, ducklings, dogs, and cats).
Signs/Symptoms: Sudden onset of abdominal pain, diarrhea, fever, headache and sometimes vomiting. Dehydration, especially in older adults and young children, can be a severe complication.
Prevention: Preventive measures should include following proper sanitation methods for food preparation and water supplies, including preventing cross-contamination of food preparation surfaces; maintaining sanitary sewage disposal; excluding infected people from handling food or providing healthcare; prohibiting the sale of small turtles; and avoiding chicks, ducklings, turtles, and other reptiles as pets for small children. Proper hand hygiene should be practiced, including washing hands after toileting or diapering, before and after handling food, and after handling animals or their feces. Eggs and other animal food products should be cooked thoroughly.
Other Important Information: With approximately 42,000 salmonellosis cases reported each year in the United States, *Salmonella* is one of the leading pathogens that cause foodborne illnesses, many of which result in hospital admissions. Incidence rates are highest among infants and young children. Mortality rates are higher in infants, older adults and people with weakened immune systems.
Special Note about Salmonellosis: While more than 2,500 serotypes of *Salmonella* can cause human illness, two specific *Salmonella* serotypes (*S.* ser Typhi and *S.* ser Paratyphi*) can lead to typhoidal illness (i.e., typhoid fever and paratyphoid fever, respectively). Typhoidal illness is found only in humans and often results in more serious infections than those seen in other *Salmonella* serotypes; up to 10% of people who are untreated for typhoidal illness may die. Cases of typhoid fever and paratyphoid fever are usually associated with foreign travel and are alike in regard to clinical features and measures necessary to control the spread of infection. However, despite their similarities, paratyphoid fever tends to be milder than typhoid fever, with a lower mortality rate. Due to its severity, typhoid fever is reported as a separate condition in Virginia (see the Typhoid Fever section of this report for more information), while cases of paratyphoid fever are included in the general salmonellosis report.

* Paratyphoid fever can be caused by any of three separate strains of *S.* ser Paratyphi: *S.* ser Paratyphi A, *S.* ser schottmuelleri (also called *S.* ser Paratyphi B), or *S.* ser hirschfeldii (also called *S.* ser Paratyphi C). A separate strain of *S.* ser Paratyphi B (i.e., *S.* ser Paratyphi B var. L[+] tartrate [+]) causes illness that resembles non-typhoidal salmonellosis; these cases are treated as general salmonellosis and are not considered to be paratyphoid fever.

Salmonellosis: 2016 Data Summary	
Number of Cases:	1,193
5-Year Average Number of Cases:	1,146.2
% Change from 5-Year Average:	+4%
Incidence Rate per 100,000:	14.2

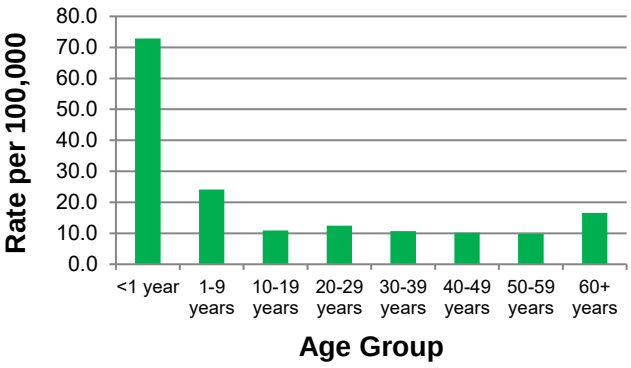
During 2016, 1,193 cases of salmonellosis were reported in Virginia. This is slightly higher than the 1,181 cases reported in 2015 and the five-year average of 1,146.2 cases per year (Figure 69).

Figure 69. Salmonellosis: Ten-Year Trend for Number of Cases and Incidence Rate, Virginia, 2007-2016



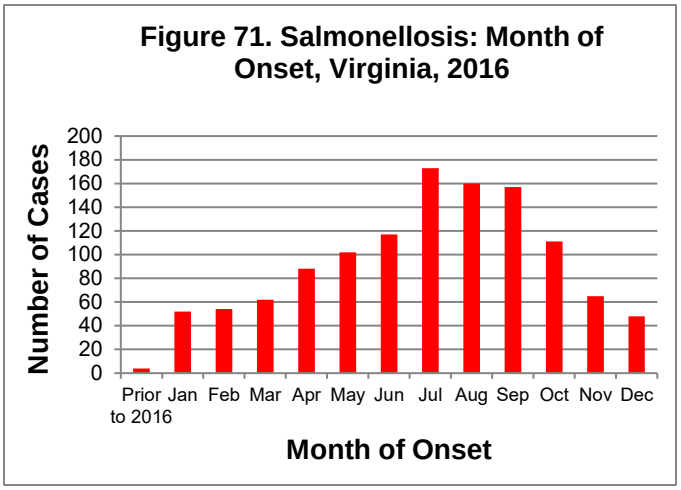
According to the CDC, infants and young children are most likely to be infected with *Salmonella*. This was observed in Virginia in 2016, with an incidence rate among infants of 72.9 per 100,000, which was considerably higher than any other age group (Figure 70). The incidence rate among children 1-9 years of age was 24.1 per 100,000 while rates in all other age groups ranged from 9.8 to 16.6 per 100,000. Race information was not reported for 38% of cases. Among those with a known race, incidence was higher in the white population (9.4 per 100,000) than the black and "other" race populations (7.7 and 6.6 per 100,000, respectively). By sex, incidence rates were higher among females than males (14.7 and 13.7 per 100,000, respectively).

Figure 70. Salmonellosis: Rate by Age Group, Virginia, 2016



The northwest region had the highest incidence rate (17.6 per 100,000), followed by the central region with 15.4 per 100,000. The remaining regions had rates ranging from 14.4 to 12.1 per 100,000, respectively. For incidence rates by locality, please see the map below. While *Salmonella* infections were reported in every quarter of the year, 41% of cases occurred during

the third quarter, peaking in July (Figure 71). One death, in a female over 60 years of age, was attributed to salmonellosis during 2016.



In 2016, twelve confirmed salmonellosis outbreaks were reported, nine of which were multistate outbreaks. Of the twelve outbreaks reported, six were foodborne and two were zoonotic. Transmission type was not confirmed in four of the twelve outbreaks. The number of Virginia residents affected during each outbreak ranged from 1 to 35. Of the foodborne outbreaks, one was linked to pistachios from California, two were associated with sprouts (bean and alfalfa), two were associated with leafy greens (salad mix), and one was associated with a restaurant outbreak. The two zoonotic outbreaks were attributed to contact with turtles and live poultry.

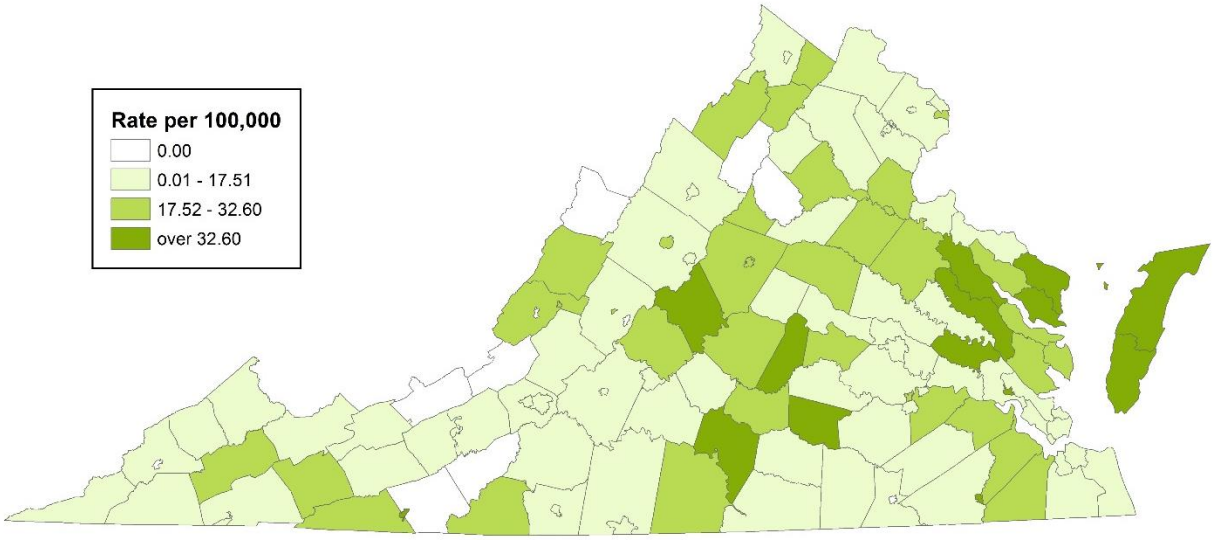
Salmonellosis cases identified in outbreaks and sporadic illness during 2016 were attributed to several *Salmonella* serotypes. The serotypes involved in the outbreaks included Montevideo, Muenchen, Enteritidis, Braenderup, Heidelberg, Typhimurium, and Saintpaul. Several different serotypes were identified and included in the zoonotic outbreaks. *Salmonella* ser. Enteritidis, Hadar, Indiana, Infantis, and Mbandaka were involved in the outbreak linked to live poultry, and Poona, Berta, Pomona, Litchfield, Agbeni, and Paratyphi B var. L[+] tartrate [+] were involved in the outbreak linked to turtles. For all salmonellosis infections in 2016, including sporadic cases among Virginia residents, the most common serotypes were *Salmonella* ser. Enteritidis and *Salmonella* ser. Typhimurium (Table 14).

Table 14. Top Ten *Salmonella* Serotypes Reported to the CDC PulseNet System by the Division of Consolidated Laboratory Services, Virginia, 2016

Rank	Serotype Causing Infection	Number		Rank	Serotype Causing Infection	Number
1	*S.* ser Enteritidis	225		6	*S.* ser Infantis	41
2	*S.* ser Typhimurium	194		7	*S.* ser Bareilly	33
3	*S.* ser Newport	151		8	*S.* ser I 4, 12:I:-	32
4	*S.* ser Javiana	96		9	*S.* ser Saintpaul	27
5	*S.* ser Braenderup	42		10	*S.* ser Heidelberg	27

Five cases of paratyphoid fever (*S.* ser Paratyphi A) were reported in Virginia during 2016. Four of the five affected individuals reported traveling internationally in the month prior to illness onset; countries visited by infected persons included Pakistan and Bangladesh.

Salmonellosis Incidence Rate by Locality
Virginia, 2016



Severe Acute Respiratory Syndrome (SARS)

Agent: Severe acute respiratory syndrome-associated coronavirus (SARS-CoV)
Mode of Transmission: Most likely transmitted from person to person through respiratory droplets released during coughing and sneezing; transmission can also occur by touching a contaminated surface or object and then touching the mouth, nose, or eyes. It is possible that SARS-CoV might be spread more broadly through the air or by other routes that are not yet known.
Signs/Symptoms: Fever, chills, headache, body aches, followed by respiratory symptoms, such as cough, shortness of breath, or difficulty breathing. Diarrhea may occur.
Prevention: Factors that may reduce transmission include frequent hand washing, avoidance of touching the eyes, nose, and mouth with contaminated hands, and covering the nose and mouth with a tissue when coughing or sneezing.
Other Important Information: Major outbreaks of SARS occurred between November 2002 and July 2003 in Canada, China, Singapore and Vietnam. In the United States, eight people had laboratory evidence of SARS-CoV infection. SARS is thought to have originated in China. In 2012, the National Select Agent Registry program published a final rule declaring SARS coronavirus a select agent because of its potential to pose a severe threat to public health and safety.

No cases of SARS were reported in Virginia during 2016. The last case of SARS in Virginia was reported in 2003 during the international outbreaks. The case occurred in an adult female who had traveled to several Asian countries in the four weeks before she developed symptoms. Her exposure most likely took place in a Singapore hospital where she had direct contact with patients being treated for SARS.

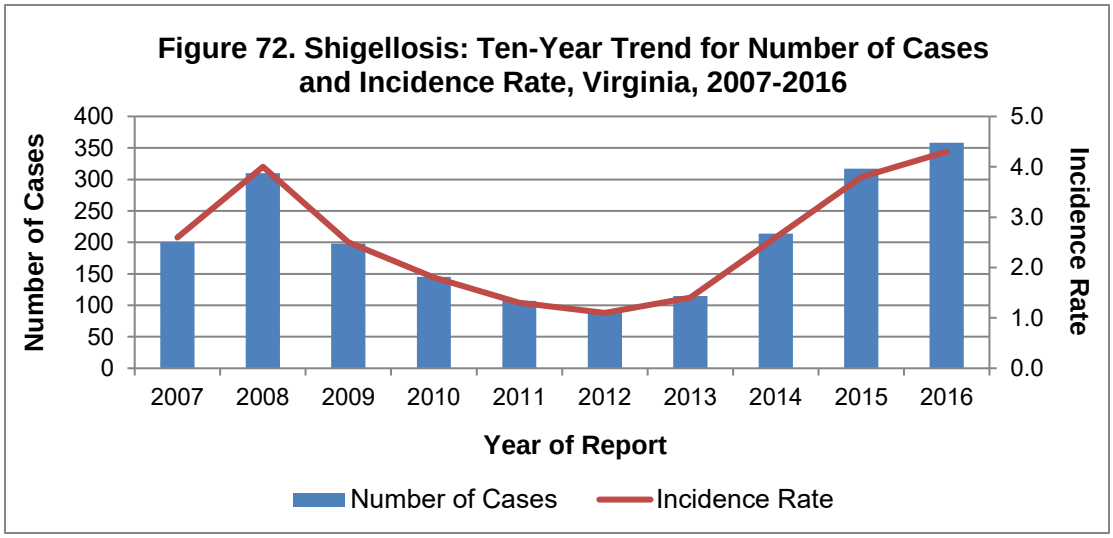
The last reported case of SARS was detected through active global surveillance and occurred in China in April 2004. Since then, there has been no evidence of SARS circulating in the human population.

Shigellosis

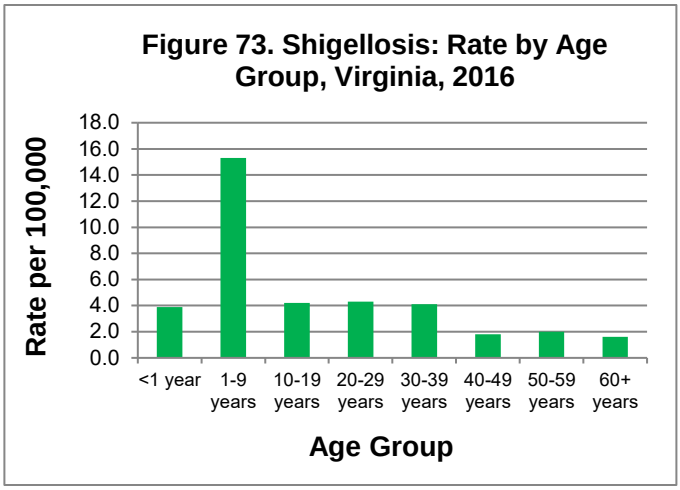
Agent: *Shigella* (bacteria)
Mode of Transmission: Primarily person-to-person transmission when the bacteria are passed from the stool of an infected person to another person through direct contact. Additionally, contact with contaminated surfaces or objects (such as changing tables, diaper pails, toys), ingestion of contaminated food or water, and exposure to feces through sexual contact may spread the disease.
Signs/Symptoms: Diarrhea ranging from watery and loose to mucoid with or without blood; fever, and sometimes nausea, vomiting, abdominal cramps and painful straining while defecating. Mild and asymptomatic infections can also occur.
Prevention: Proper hand hygiene is essential to limit transmission. Additional control measures include improved sanitation, chlorination of drinking water, proper cooking and storage of food, and measures to decrease contamination of food by houseflies. Cases of shigellosis in food handlers, childcare center attendees or workers, or in healthcare personnel providing direct patient/resident care require public health evaluation and intervention to prevent the spread of disease.
Other Important Information: *Shigella sonnei*, (also known as "group D" *Shigella)*, accounts for over two-thirds of shigellosis in the United States, while *Shigella flexneri* (also known as "group B" *Shigella)* accounts for almost all the rest. Resistance to some antibiotics used to treat shigellosis is increasing worldwide.

Shigellosis: 2016 Data Summary	
Number of Cases:	358
5-Year Average Number of Cases:	168.8
% Change from 5-Year Average:	+112%
Incidence Rate per 100,000:	4.3

During 2016, 358 cases of shigellosis were reported in Virginia. This represents a 13% increase from the 317 cases reported in 2015, and is more than double the five-year average of 168.8 cases per year (Figure 72). *Shigella* spp. are estimated to cause almost



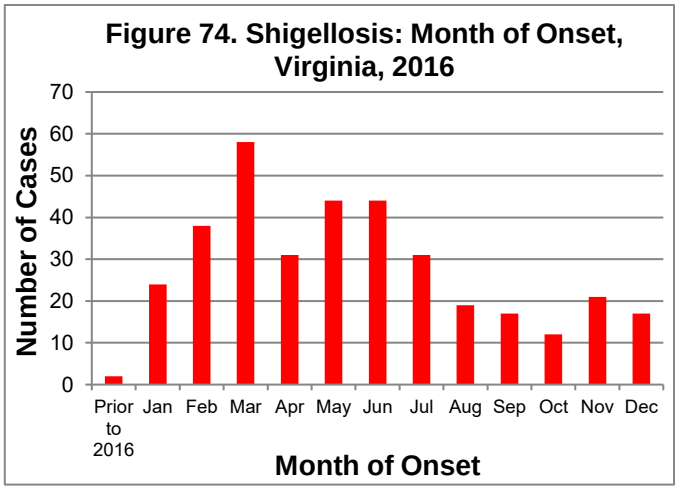
500,000 illnesses each year in the U.S, although the number of laboratory-confirmed cases is much lower (CDC). The incidence of shigellosis cases is cyclical with peaks approximately every 10 years.



Historically in Virginia, the 1-9 year age group has had the highest number of cases reported and the highest incidence rate. The incidence rate in the 1-9 year age group increased from 14.1 per 100,000 in 2015 to 15.3 in 2016 (Figure 73). High incidence in this age group is expected because toddlers, age 2 to 4 years, are more likely to be exposed to shigellosis in child care and home settings where other young children may not routinely wash their hands after using the toilet. Incidence among the other age groups ranged from 1.6 to 4.3 per 100,000.

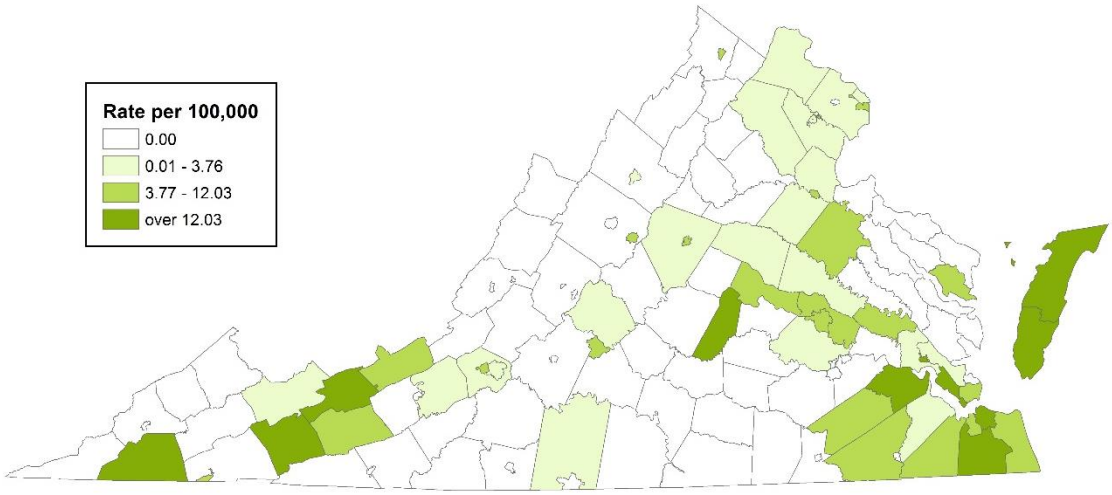
Race information was not reported for 26% of cases. Among those where race was known, incidence rates were highest in the black population (7.8 per 100,000), followed by the white and "other" populations (2.0 and 1.2 per 100,000, respectively). Incidence was slightly higher among females compared to males (4.5 and 4.0 per 100,000, respectively).

Geographically, the eastern region accounted for 48% of all cases in Virginia during 2016; as a result, the eastern region had the highest incidence rate overall (9.3 per 100,000), followed by the central and southwest regions (with rates of 4.4 and 3.4 per 100,000, respectively). The northern and northwest regions had incidence rates of 2.3 and 1.5 per 100,000, respectively (see map below for incidence by locality). Transmission occurred throughout the year, with the majority of cases occurring in the late winter to mid-summer, peaking in March (Figure 74).



Five confirmed shigellosis outbreaks were reported in 2016. These outbreaks ranged in size from 2 to 8 persons and occurred in a variety of settings, with 4 of the 5 outbreaks occurring in daycare centers or schools. Two outbreaks occurred early in the first three months of the year and the remaining three occurred after school was back in session in the autumn.

Shigellosis Incidence Rate by Locality
Virginia, 2016



Smallpox

Agent: Variola virus
Mode of Transmission: Person-to-person transmission through contact with respiratory droplets, airborne particles (rare), and skin lesions of an infected person. Smallpox can also be transmitted through contact with contaminated clothing or bedding.
Signs/Symptoms: Sudden onset of fever, headache, weakness and exhaustion followed by development of a rash that first appears on the face and extremities.
Prevention: Preventive measures include vaccination with the genetically distinct vaccinia virus. Routine vaccination of the American public stopped in 1972. At this time, vaccine is available only to members of emergency response teams and some military personnel.
Other Important Information: The last case of smallpox in the United States was in 1949; the last naturally occurring case in the world was in Somalia in 1977. Although the disease was declared eradicated in 1980 after worldwide vaccination programs, smallpox is considered to be one of the agents that could be used for bioterrorism because the disease can be spread from person to person and would cause increased illness and death in the population if used as a weapon.

The last case of smallpox in Virginia occurred in 1944.

Spotted Fever Rickettsiosis, including Rocky Mountain Spotted Fever

Agent: Tick-borne species of *Rickettsia* (bacteria). Spotted fever rickettsiosis (SFR) may be caused by several different tick-borne disease agents, including *Rickettsia rickettsii*, the cause of Rocky Mountain spotted fever (RMSF), and *Rickettsia parkeri*, the cause of Tidewater spotted fever. RMSF positive laboratory results may also be caused by exposure to other tick-borne species of *Rickettsia* that commonly occur in Virginia's ticks such as R. *amnblyomii* (a non-pathogenic agent carried by more than 55% of lone star ticks), and *R. montanensis* (a non-pathogenic agent carried by 10% of American Dog Ticks).

Mode of Transmission: Transmitted to humans by the bite of an infected tick. Ticks generally must be attached for 10 to 20 hours to transmit the bacterium.

Signs/Symptoms: Persons with spotted fever rickettsiosis may have a sudden onset of fever, severe headache, muscle pain, nausea and vomiting and a rash. In the case of RMSF, a rash may develop three to five days after onset of illness. This rash starts on the wrists and ankles, and spreads to the rest of the body, and is seen in about 90% of RMSF cases.

Prevention: RMSF, the most serious SFR, may be transmitted by either the brown dog tick (*Rhipicephalus sanguinius*) or the American dog tick (*Dermacentor variabilis*). Although brown dog ticks are uncommon, they are a much more important RMSF vector than the American dog tick. Bites by brown dog ticks can be avoided by vigilance for ticks when exposed to the bedding, floors or walls of kennels, dog houses or buildings where dogs live. Bites by the American dog tick can be prevented by avoiding tick-prone habitats such as leaf litter or low vegetation in forests, old fields with early succession forest growth, or open fields with tall brush and weeds. When in tick-prone habitats, the most effective tick prevention method is to wear pants, socks and shoes that are treated with a Permethrin clothing treatment. Pants legs should be tucked into socks and shirts tucked into pants. Light-colored clothing should be worn to make ticks more visible. If treated clothing is not worn, repellents containing DEET, Picaridin, BioUD, IR3535, or oil of lemon eucalyptus as active ingredients are effective against ticks and should be applied to exposed areas of skin before entering tick habitats. After visiting tick habitats, a person should thoroughly check all body surfaces for ticks and, if found, attached ticks should be removed with tweezers as soon as possible.

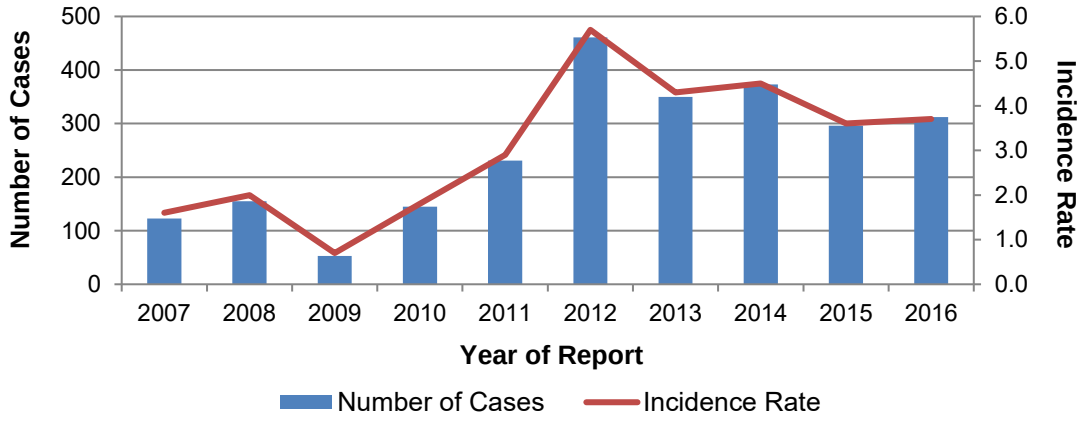
Other Important Information: Although the severity of infections attributable to spotted fever rickettsiosis varies greatly depending on the causative agent, all suspect patients should be treated as if they have RMSF. RMSF can be a serious illness, particularly in untreated patients or patients treated late in the course of illness. About 25% of all untreated RMSF cases are fatal and up to 3% of hospitalized patients die because treatment was provided too late in the course of illness. If tick exposure is noted or RMSF is suspected, treatment should be started based on suspicion of infection and not delayed pending the outcome of diagnostic tests. While SFR case numbers have increased dramatically in recent years, case-fatality rates have declined to less than 1% of reported cases. One possible explanation is prompt disease recognition and increased availability and appropriate use of effective antibiotics. Another explanation is the increasing prevalence of other spotted fever group *Rickettsia* (SFGR) species in Virginia's ticks. These other SFGR species may not cause illness in people, or may cause only a mild illness, but exposure to any SFGR causes cross-reactive positive results on blood tests for RMSF. Therefore, it is possible that most reported RMSF cases in recent years are actually due to exposure to non-pathogenic or mildly pathogenic SFGR, and/or to other Rickettsial illnesses such as ehrlichiosis, which cause acute symptoms similar to those of RMSF. Lone star ticks are the most common cause of tick bites in Virginia, and tick surveys have shown that the majority

of lone star ticks in Virginia carry a non-pathogenic SFGR, as well as several agents of ehrlichiosis, but do not carry RMSF. No cases of Tidewater Spotted Fever, an emerging illness caused by *Rickettsia parkeri*, were identified in 2016. *Rickettsia parkeri* is a species of *Rickettsia* transmitted to humans by the Gulf Coast tick (*Amblyomma maculatum)* and occasionally by the lone star tick.

Spotted Fever Rickettsiosis: 2016 Data Summary	
Number of Cases:	312
5-Year Average Number of Cases:	342.2
% Change from 5-Year Average:	-9%
Incidence Rate per 100,000:	3.7

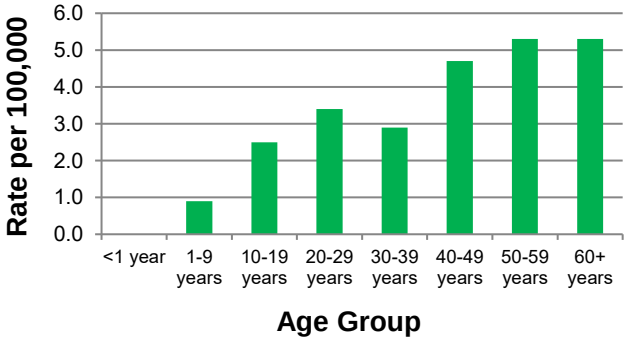
In 2016, 312 cases of spotted fever rickettsiosis were reported in Virginia. While this represents a 5% increase from the 296 cases reported in 2015, the 312 cases are a 9% decrease from the five-year average of 342.2 cases per year (Figure 75).

Figure 75. Spotted Fever Rickettsiosis (including RMSF): Ten-Year Trend for Number of Cases and Incidence Rate, Virginia, 2007-2016



For 2016, in general, the rate of SFR tended to increase with increasing age (Figure 76). No cases were reported in children less than one year of age, while the age groups of 60 years and older and 50-59 years both had an incidence rate of 5.3 per 100,000. The 30-39 year age group was the only group not falling within the rising trend pattern with an incidence rate of 2.9 per 100,000. This general pattern of increasing incidence with increasing age groups has been observed in Virginia since 2004, and is consistent with the age distribution of Rickettsial diseases other than RMSF, such as ehrlichiosis or anaplasmosis.

Figure 76. Spotted Fever Rickettsiosis (including RMSF): Rate by Age Group, Virginia, 2016



Race information was not provided for 56% of cases. Among those with a known race, the incidence rate for the white population was highest with 2.0 cases per 100,000. Incidence in the black population was 0.7 cases per 100,000, while the "other" race category had an incidence rate of 0.5 per 100,000. Males had nearly double the incidence rate of females with a rate of 4.9 per 100,000 compared to 2.5 per 100,000 for females.

The southwest region had the highest incidence rate at 7.1 cases per 100,000. The central region had the second highest incident rate with 5.6 per 100,000 followed closely by the northwest region with 5.0 cases per 100,000. Incidence rates in the remaining two regions were 1.9 and 1.4 per 100,000, respectively. The northwest and central regions have had high incidence rates since 2009, but the incidence rate in the southwest region increased substantially during 2012, and has remained the region with the highest incidence rate since 2013. Incidence rates by locality can be viewed in the map below.

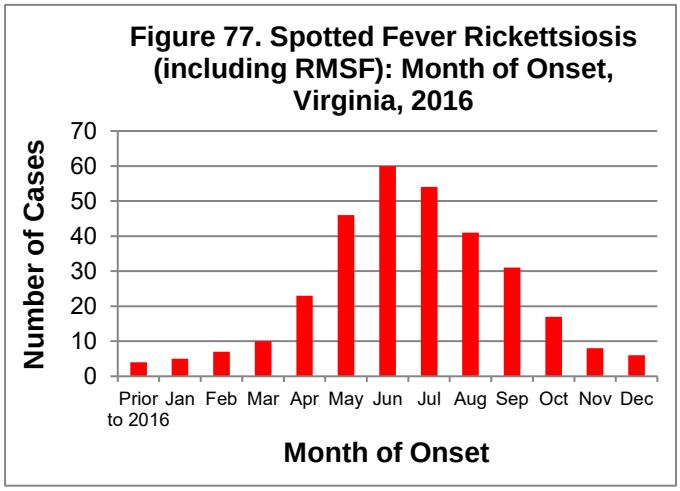
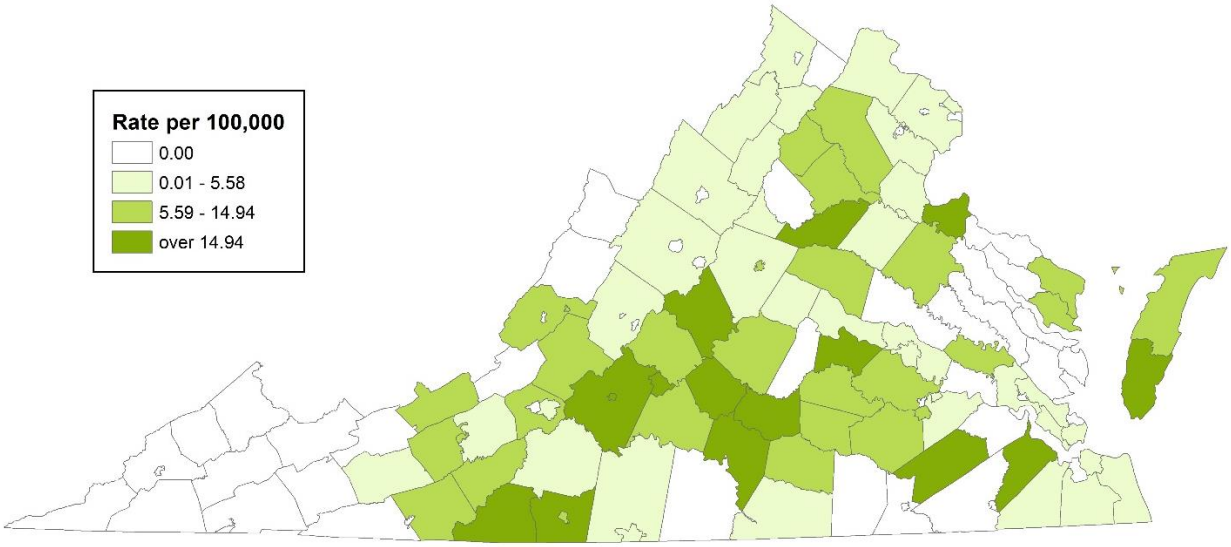


Figure 77. Spotted Fever Rickettsiosis (including RMSF): Month of Onset, Virginia, 2016

Spotted fever rickettsiosis displays a distinctly seasonal pattern. For 80% of cases, symptom onset occurred from May through August, with a peak in June and July (Figure 77). This is consistent with the peak activity periods for the most common human-biting tick species in Virginia.

Spotted Fever Rickettsiosis, including RMSF, Incidence Rate by Locality, Virginia, 2016



Staphylococcus aureus Infection, Invasive, Methicillin-Resistant (MRSA)

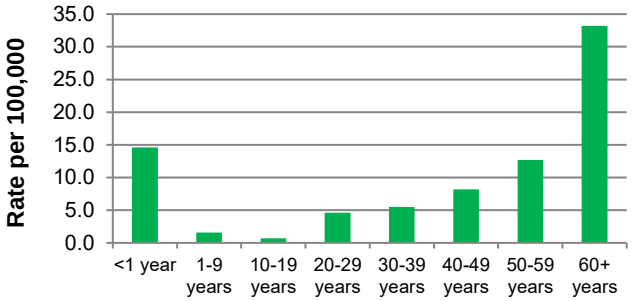
Agent: *Staphylococcus aureus* (bacteria) that have developed resistance to the class of beta-lactam antibiotics, including penicillin, cloxacillin, oxacillin, nafcillin, and methicillin, as well as cephalosporins and carbapenems.
Mode of Transmission: Person-to-person transmission via direct contact with colonized skin or skin lesions of an infected person, or by indirect contact with contaminated personal items or surfaces. Invasive infections occur when the bacteria penetrate normally sterile sites.
Signs/Symptoms: Invasive infections may affect the blood, bone, lung, and lining of the brain and spinal cord and may cause fever, difficulty breathing, chills, pain and other syndrome-specific signs and symptoms. Non-invasive skin and soft tissue infections commonly cause swelling, tenderness, and redness and can manifest as abscesses, boils, or pustules.
Prevention: In the community, preventive measures include practicing proper hygiene and wound care and cleaning hands regularly and thoroughly with soap and water or alcohol-based hand sanitizer. In healthcare settings, control measures include adhering to appropriate infection prevention practices, including management of catheters or other medical equipment, and practicing prudent use of antibiotics.
Other Important Information: Only invasive MRSA infections are required to be reported in Virginia and only laboratories are required to report these infections. Asymptomatic colonization and infections from non-sterile sites (e.g., skin and soft tissue) do not have to be reported to the health department. Reporting of this condition became effective in Virginia on October 26, 2007. On October 20, 2016 the Virginia Regulations for Disease Reporting and Control were updated and MRSA was removed from the reportable disease list. As of September 25, 2015, hospitals are required to provide information to VDH on MRSA bacteremia laboratory-identified events via the CDC's National Healthcare Safety Network. State aggregate data on MRSA bacteremia laboratory-identified events are available in the Healthcare-Associated Infections chapter of this report.

***Staphylococcus aureus* Infection, Invasive, Methicillin-Resistant (MRSA): 2016 Data Summary**	
Number of Cases:	951
5-Year Average Number of Cases:	1,224.2
% Change from 5-Year Average:	-22%
Incidence Rate per 100,000:	11.3

In Virginia, 951 cases of invasive MRSA infection were reported during 2016. This represents a noticeable decrease from the 1,142 cases reported in 2015, and a 22% decrease from the 5-year average of 1,224.2 cases per year. The decrease was likely due to the change in reporting regulations.

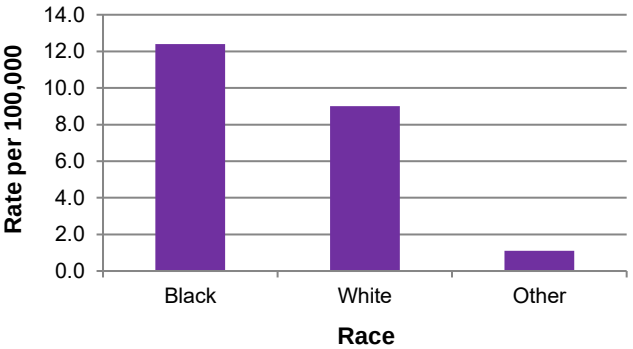
In 2016, with the exception of infants, incidence rates generally increased as age increased (Figure 78). Consistent with previous years, persons 60 years and older experienced the highest number of invasive MRSA cases and incidence rate (557 cases, 33.2 per 100,000). With 15 cases, infants had an incidence rate of 14.6 per 100,000 followed by the 50-59 year age group (149 cases, 12.7 per 100,000). Persons 10-19 years of age had the lowest number of cases and lowest incidence of all age groups in 2016 (7 cases, 0.7 per 100,000).

Figure 78. *Staphylococcus aureus* Infection, Invasive, Methicillin-Resistant (MRSA): Rate by Age Group, Virginia, 2016



Race was not provided for 187 (20%) of invasive MRSA cases. Among cases with a known race, the incidence rate in the black population (12.4 per 100,000) was higher than the incidence in the white population (9.0 per 100,000) (Figure 79). This represents a change from the past three years when incidence among the black population was not substantially higher than incidence among the white population. Racial disparities in invasive MRSA have been noted nationally, with the black population having two-fold the incidence rate of the white population. In Virginia, incidence was higher in males compared to females (13.5 and 9.2 per 100,000, respectively).

Figure 79. *Staphylococcus aureus* Infection, Invasive, Methicillin-Resistant (MRSA): Rate by Race, Virginia, 2016

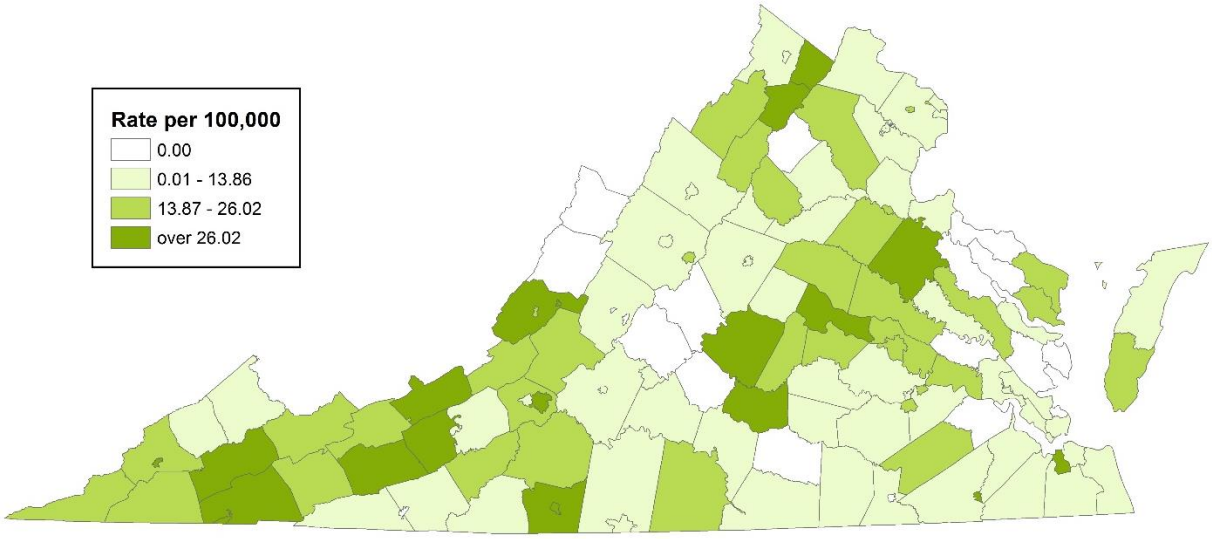


The southwest region had the highest incidence rate (17.3 per 100,000) and the northern region had the lowest (6.9 per 100,000). Incidence is typically higher in the western half of the state. Incidence rates by locality can be viewed in the map below. In general, invasive MRSA infections occur throughout the year with little seasonal variation. However, there were fewer cases in the fourth quarter of 2016 compared to the rest of the year due to the change in reporting regulations.

Four MRSA outbreaks were reported in 2016. All four outbreaks occurred in the central region, two caused invasive infections in hospitals, one caused skin infections at a university, and one caused skin infections among a sports team at a secondary school. In all situations, the facilities instituted numerous control measures that prevented additional cases. In 2016, 42 (4.4%) persons with invasive MRSA infections died. The case-fatality rate was slightly higher in males than females.

According to the most recently published Virginia Reportable Disease List which became effective October 20, 2016, invasive MRSA infection is no longer a reportable condition in Virginia and will no longer be included in the annual surveillance reports.

Staphylococcus aureaus Infection, Invasive, Methicillin-Resistant (MRSA), Incidence Rate by Locality, Virginia, 2016



Staphylococcus aureus **Infection, Vancomycin-Intermediate (VISA) or Vancomycin-Resistant (VRSA)**

Agent: *Staphylococcus aureus* (bacteria) that have developed intermediate or complete resistance to the antibiotic vancomycin, based on susceptibility testing.
Mode of Transmission: Person-to-person spread through direct contact or through contact with contaminated materials or surfaces.
Signs/Symptoms: Dependent on site of infection (e.g., skin, bone, urinary or respiratory tract). VISA or VRSA infections can cause a range of symptoms including skin infections, abscesses, pneumonia, and infection of the heart valves, bones, or blood. Infection may develop into toxic shock syndrome. Asymptomatic colonization can occur.
Prevention: Preventive measures include appropriate use of antibiotics to treat infections, good hand hygiene, and proper cleaning and disinfecting of contaminated surfaces.
Other Important Information: While VRSA infection became a reportable condition in 1999, VISA infection was not added to the reportable list of conditions until 2007.

In 2016, one case of VISA infection was reported in Virginia. The infection occurred in a male in the 60 year and older age group from the southwest region. The individual had a previous MRSA infection and other comorbidities. Fourteen VISA cases have been reported in Virginia since surveillance was initiated in 1999. Of note, nine of the 14 VISA cases have occurred in the black population.

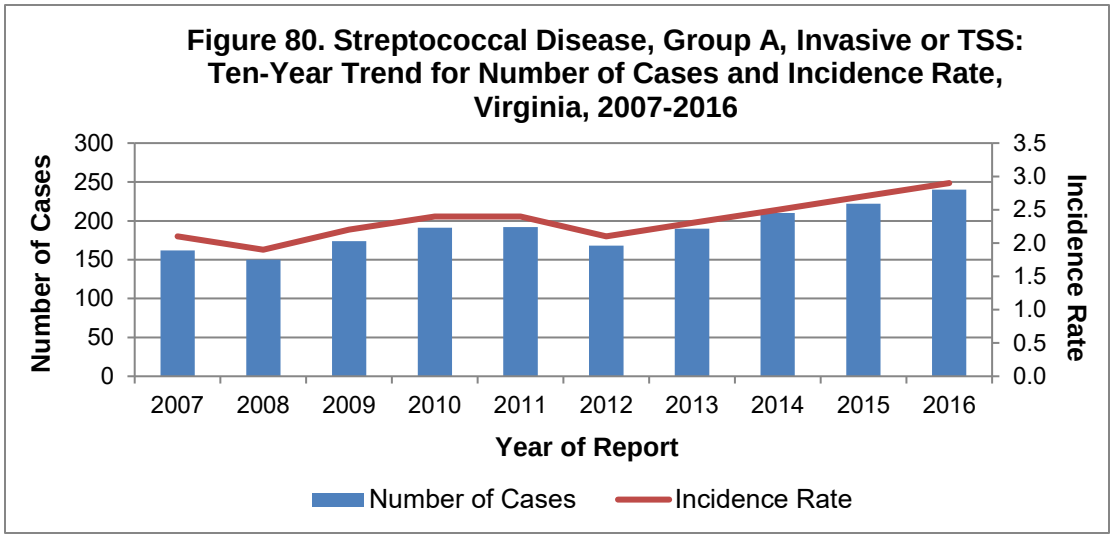
No cases of VRSA have ever been reported in a Virginia resident.

Streptococcal Disease, Group A, Invasive or Toxic Shock Syndrome

Agent: *Streptococcus pyogenes* (bacteria)
Mode of Transmission: Person-to-person transmission through respiratory droplets, contact with infected wounds or sores, or (rarely) through indirect contact with objects contaminated with the body fluids of infected persons.
Signs/Symptoms: People may carry group A streptococci (Group A Strep) in the throat or on the skin and have no symptoms of illness. Most Group A Strep infections are relatively mild, such as "strep throat", scarlet fever or impetigo (a skin infection). Rarely, the bacteria can lead to severe invasive infections of the blood or other internal body fluids if they enter a normally sterile site. Invasive infections often require hospitalization and may cause death.
Prevention: The spread of all types of Group A Strep infection can be reduced by careful attention to hand washing, especially after coughing or sneezing. Other preventive measures include prompt identification and treatment of non-invasive cases (such as strep throat) and temporary exclusion of infected persons from work, school or daycare until 24 hours after taking an appropriate antibiotic. Wounds should be kept clean, and medical care should be sought at the first signs of infection.
Other Important Information: Most people who come into contact with Group A Strep will not develop invasive disease. Persons at higher risk for developing invasive Group A Strep infections include older persons, immunocompromised persons, and those with chronic, underlying conditions (such as diabetes). The two most severe, but least common, forms of invasive Group A Strep infections are necrotizing fasciitis (NF) and streptococcal toxic shock syndrome (TSS). NF infections present with severe pain and rapid destruction of muscles, fat, and skin tissue. Streptococcal TSS infections are characterized by shock and rapid organ failure.

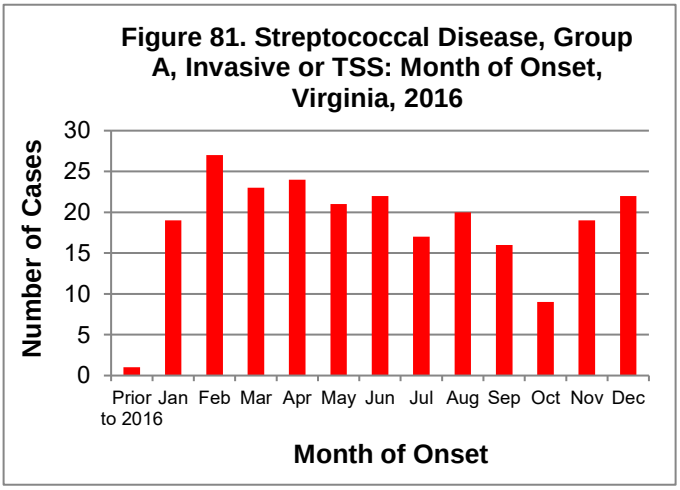
Streptococcal Disease, Group A, Invasive or TSS: 2016 Data Summary	
Number of Cases:	240
5-Year Average Number of Cases:	196.4
% Change from 5-Year Average:	+22%
Incidence Rate per 100,000:	2.9

During 2016, 240 cases of invasive Group A Strep infection were reported in Virginia. This represents an 8% increase from the 222 cases reported in 2015, and a 22% increase from the five-year average of 196.4 cases per year. This is the fourth consecutive year that the number of cases of invasive Group A Strep reported in Virginia has increased (Figure 80). Among the 240 cases, 233 persons were reported with invasive Group A Strep infections (age range: less than one to 98 years), and 7 persons were reported with streptococcal toxic shock syndrome (age range: 29 to 72 years).



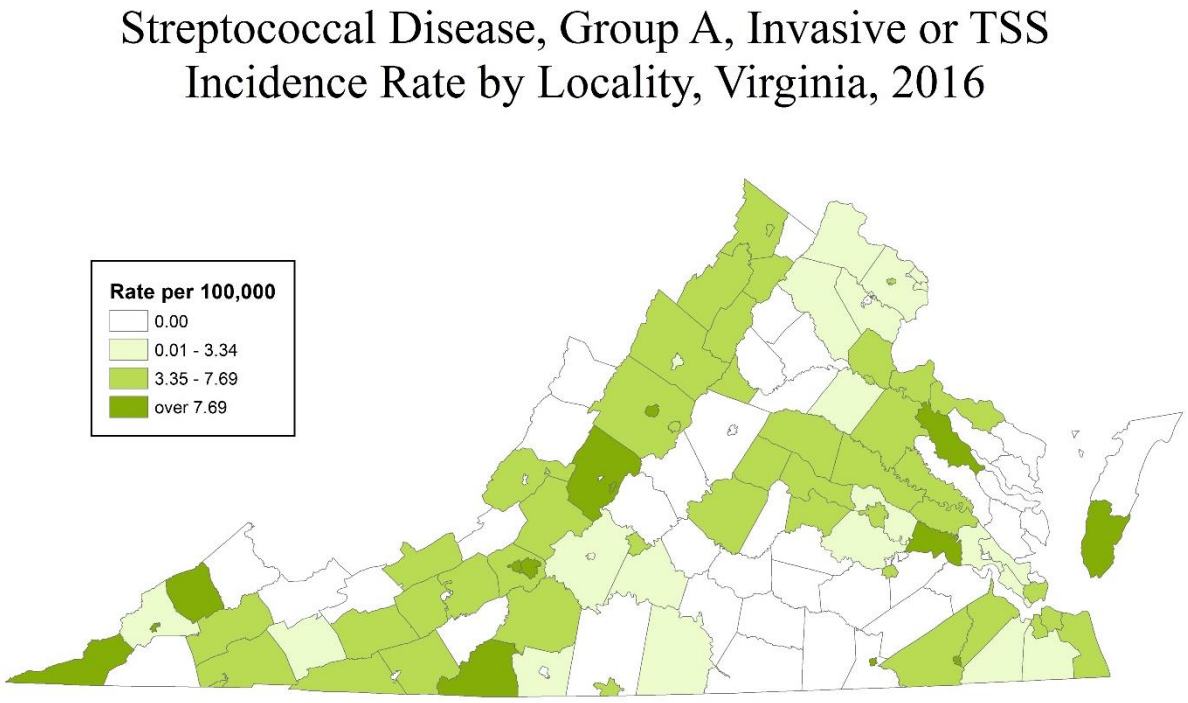
The highest number of cases and incidence rate for invasive Group A Strep infections both occurred in the 60 year and older age group (114 cases, 6.8 per 100,000). This was followed by the 50-59 year age group and infants, with incidence rates of 3.1 and 2.9 per 100,000, respectively. The other age groups had rates between 0.2 and 2.6 per 100,000. Information on race was provided for 81% of reported cases. Incidence was the same for the black and white race populations, both with an incidence rate of 2.5 per 100,000. Incidence among males (3.0 per 100,000) was slightly higher than the rate among females (2.7 per 100,000). Geographically, incidence was highest in the southwest region (4.1 per 100,000), followed by the eastern region (3.2 per 100,000), with these same two regions having the highest two rates in 2015. Rates in the other regions ranged from 2.0 to 3.0 per 100,000. Information on incidence rates for individual localities is presented in the map below.

Cases were consistently reported throughout the year with no obvious seasonal pattern (Figure 81). Among the 240 cases reported in 2016, 21 persons died as a result of invasive Group A Strep infection (age range: 5 to 94 years), and two died from streptococcal toxic shock syndrome (both greater than 50 years). Of these 23 total deaths, 57% occurred in individuals aged 60 years and older.



Two invasive Group A Strep outbreaks were reported in 2016; both occurred in nursing homes. One invasive Group A Strep outbreak occurred in the southwest region and one occurred in the central region. Additionally, eleven non-invasive Group A Strep outbreaks were reported in 2016. Non-invasive Group A Strep outbreaks typically cause respiratory or rash illnesses, primarily presenting as “strep throat”. All eleven non-invasive Group A Strep outbreaks occurred in a school (K-12) setting. Five of these outbreaks due to

non-invasive Strep infections were reported from the northern region, four from the northwest region, and two from the central region.

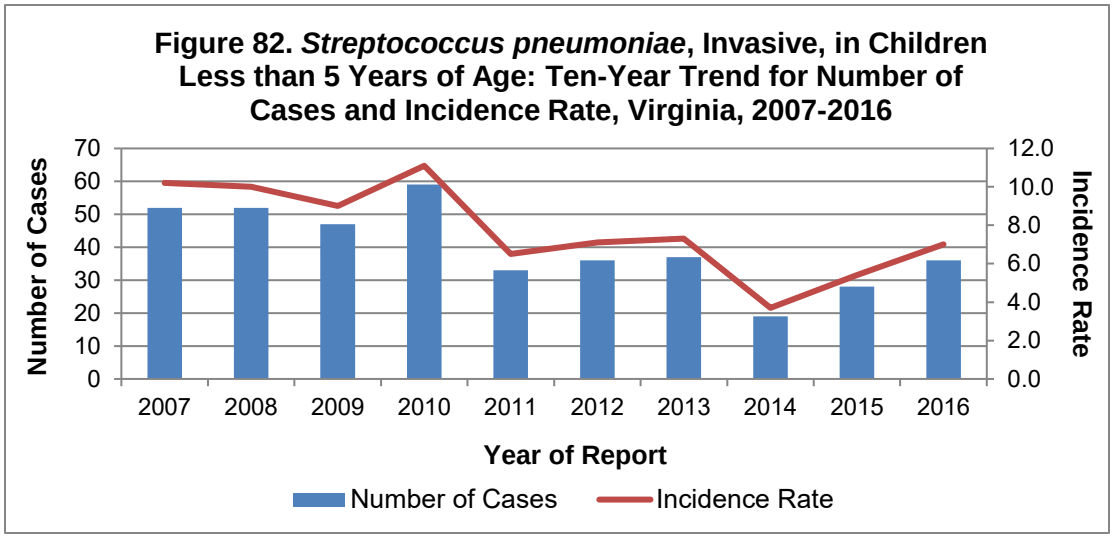


Streptococcus pneumoniae, Invasive, in Children Less than 5 Years of Age

Agent: *Streptococcus pneumoniae* (bacteria)
Mode of Transmission: Person-to-person transmission via respiratory droplets or direct contact with respiratory secretions from persons carrying the bacteria in their upper respiratory tract.
Signs/Symptoms: Invasive pneumococcal disease (IPD) may affect the blood, lung, and lining of the brain and spinal cord and may cause fever, chills, and irritability. Headache, stiff neck, confusion, sleepiness, vomiting, and poor feeding can occur with meningitis.
Prevention: Routine immunization with pneumococcal conjugate vaccine as a 4-dose series is recommended for infants at 2, 4, 6, and 12 to 15 months of age. IPD can be hard to treat because of antibiotic resistance, thus making prevention through vaccination even more important. The 7-valent conjugate vaccine was first licensed in the U.S. in 2000 and was replaced with a 13-valent vaccine that was licensed in 2012. Following the introduction of the 13-valent vaccine, clients that completed the immunization series were recommended to receive a booster dose for protection against the additional strains. Clients two years of age and over with certain high-risk conditions are also recommended to receive one dose of a 23-valent polysaccharide vaccine following series completion with pneumococcal conjugate vaccine. Vaccination with 13-valent followed by 23-valent polysaccharide vaccine is also recommended for adults aged 65 years or older, and other persons at increased risk for infection.
Other Important Information: There are more than 90 known serotypes of *S. pneumoniae*. Although all serotypes can cause serious disease, a relatively limited number of serotypes cause the majority of invasive infections. From 1998 (two years before implementation of routine immunization of infants with 7-valent pneumococcal conjugate vaccine) through 2007, incidence of vaccine-type invasive pneumococcal infections decreased by 99% in children less than 5 years of age, and the incidence for all pneumococcal infections decreased by 76%. Today, *S. pneumoniae* continues to be the leading cause of bacterial meningitis among children less than 5 years of age in the United States.

***Streptococcus pneumoniae*, Invasive, in Children Less than 5 Years of Age: 2016 Data Summary**	
Number of Cases:	36
5-Year Average Number of Cases:	30.6
% Change from 5-Year Average:	+18%
Incidence Rate per 100,000:	7.0

Thirty-six cases of invasive *S. pneumoniae* were reported in children less than five years of age in Virginia during 2016. This represents an 18% increase from the five-year average of 30.6 cases per year. This increase may be part of a cyclical trend as seen from 2011 to 2013 (Figure 82). Statewide, the incidence rate for invasive *S. pneumoniae* in children less than five years of age for 2016 was 7.0 cases per 100,000 population.*****



Incidence rates were higher in children aged less than one year (16.5 cases per 100,000) compared to those aged 1-4 years (4.6 cases per 100,000). Race information was not reported for 25% of cases. Among those with a known race, the highest incidence rate was observed in the black population with 6.6 cases per 100,000, followed by the white population (4.8 cases per 100,000) and "other" population (4.7 cases per 100,000). Males had a higher incidence rate than females (7.6 and 6.4 cases per 100,000, respectively).

Two regions were at or above the statewide incidence rate of 7.0 per 100,000. The northwest region had an incidence rate more than double the statewide rate with 14.7 cases per 100,000, while the southwest region had an incidence rate of 7.2 cases per 100,000. The remaining three regions had incidence rates ranging from 6.4 to 3.7 cases per 100,000. Cases followed a seasonal trend of occurring in colder months with 33% of cases occuring in the fourth quarter and 28% of cases occuring in the first quarter of the year. Remaining cases were evenly split at 19% each in the second and third quarters. No deaths were directly attributed to *S. pneumoniae* during 2016. Hospitalization was common as 28 cases (78%) were hospitalized in 2016.

*** All incidence rates have been adjusted to reflect the population less than five years of age.**

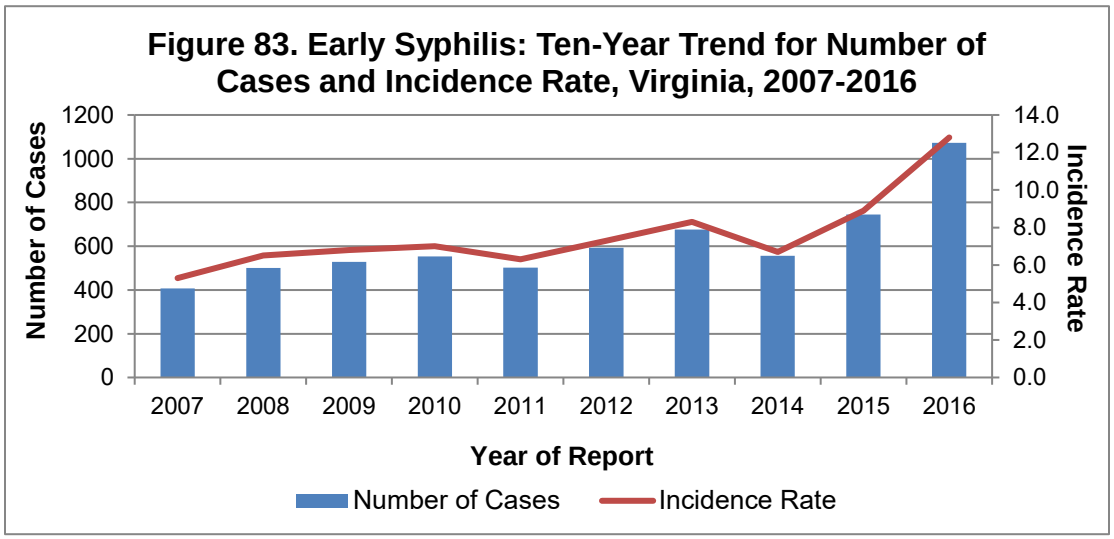
Syphilis

Agent: *Treponema pallidum* (bacteria)
Mode of Transmission: Through sexual intercourse, from mother to child through the placenta or during birth, and via blood transfusion from an infected donor in the early stage of disease.
Signs/Symptoms: The primary stage is characterized by a painless sore (chancre). The secondary stage includes a skin rash and/or lesions of the mucous membranes. A latent period follows with no clinical symptoms. If left untreated, late latent syphilis occurs. The central nervous system, skin, bones, eyes, and heart may become sufficiently damaged, causing disability or death. Disturbances in vision should be addressed immediately, as vision change or blindness related to syphilis may progress rapidly and is irreversible. Ocular syphilis may occur at any stage of disease.
Prevention: Preventive measures include safe sexual practices, screening of all women during early pregnancy to prevent infection of infants, and treatment of exposed partners.
Other Important Information: In 2016, there was a 74% increase in reported early syphilis in Virginia compared to the prior five-year average. Nationwide, early syphilis is on the rise; while cases are still disproportionately diagnosed among men who have sex with men (MSM), diagnoses among women of childbearing age (and, subsequently, congenital syphilis diagnoses among infants) have been increasing as well.

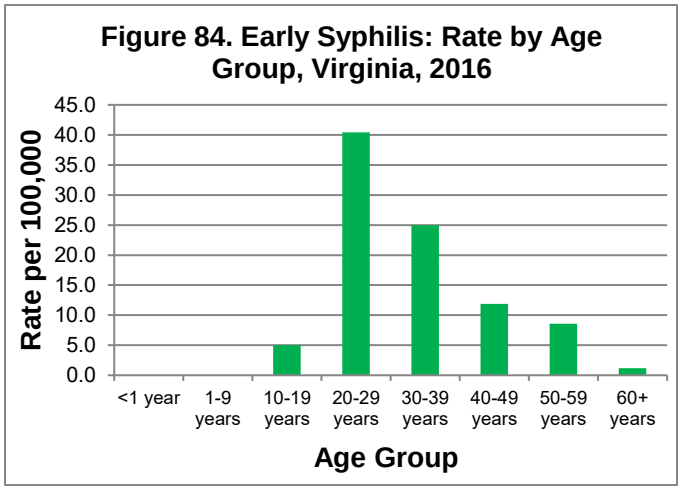
Early Syphilis: 2016 Data Summary	
Number of Cases:	1,072
5-Year Average Number of Cases:	614.4
% Change from 5-Year Average:	+74%
Incidence Rate per 100,000:	12.8

Early Syphilis

Early syphilis refers to the symptomatic primary and secondary stages of syphilis, as well as asymptomatic early latent syphilis. In 2016, 1,072 early syphilis cases were reported in Virginia. This is a 74% increase from the prior five-year average of 614.4 cases (Figure 83). It is also the most cases reported in any year since 1995.



The highest incidence rate of early syphilis continues to occur in the 20-29 year age group (40.4 per 100,000), followed by the 30-39 year age group (25.0 per 100,000) (Figure 84). The incidence rate in the black population (35.4 per 100,000) was more than seven times the incidence rate observed in the white population (4.6 per 100,000). The incidence rate among males (22.2 per 100,000) was more than six times that of the rate observed in females (3.6 per 100,000). Most early syphilis cases are diagnosed in males, and particularly in men who have sex with men (MSM). In 2016, 71% of males diagnosed with early syphilis occurred among MSM. While 85% of all cases were diagnosed in males, the early syphilis rate for females increased more rapidly than for males in 2016. The highest incidence of early syphilis occurred in the eastern region (24.7 cases per 100,000), followed by the central region (20.1 cases per 100,000), northern region (9.9 cases per 100,000), southwest region (3.2 cases per 100,000) and northwest region (3.2 cases per 100,000). For incidence rates by locality, please see the map below.



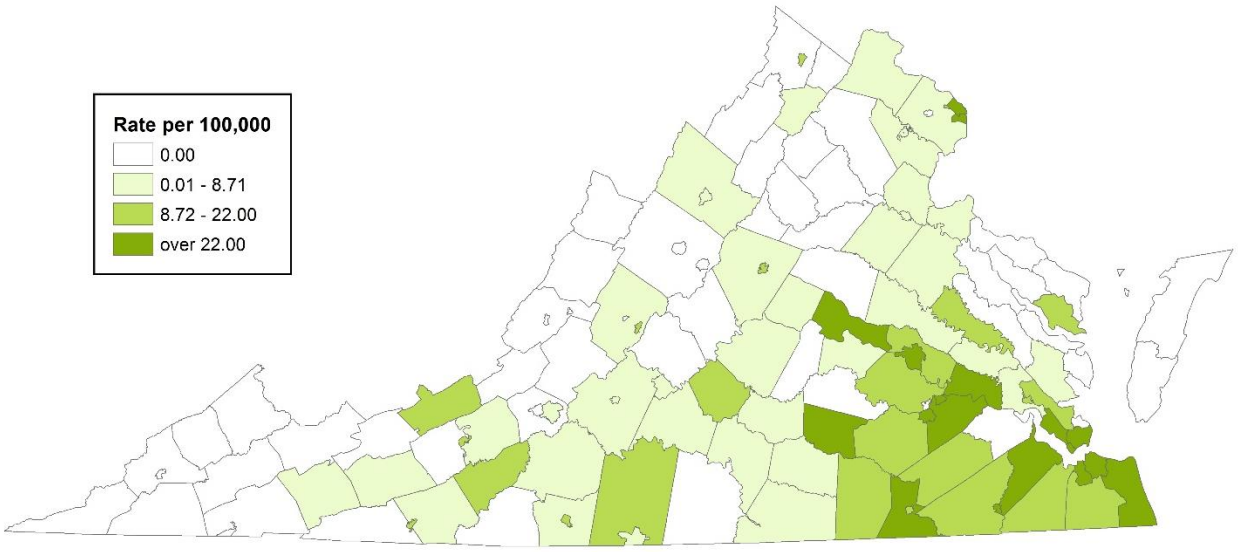
Congenital Syphilis

Congenital syphilis is a condition affecting an infant whose mother had untreated or inadequately treated syphilis at delivery. Congenital syphilis may also be diagnosed after a mother with untreated syphilis experiences a miscarriage or stillbirth. Diagnosis is based on maternal serologic testing and treatment; an infant who shows no clinical symptoms of congenital syphilis whose mother was not sufficiently treated in the CDC-designated timeline is counted as a case. Seven cases of congenital syphilis were reported in Virginia in 2016. Two to three cases per year were reported from 2013-2015, before which there had not been more than one case reported per year since 2009. The recent increase in early syphilis diagnoses in women of reproductive age, and subsequent increase in congenital syphilis, is alarming. Follow-up for women of reproductive age who have sex with men is extremely important in preventing congenital syphilis. Partner services for men who have sex with women also play an important role in congenital syphilis prevention. The Centers for Disease Control and Prevention considers each case of congenital syphilis in the U.S. to be a sentinel event representing a public health failure.

Late Latent Syphilis

Late latent syphilis is diagnosed when the patient has no symptoms of primary or secondary syphilis and no evidence that infection was acquired within the preceding 12 months. During the late latent stage of syphilis, the patient is typically no longer infectious but may develop serious sequelae, including serious neurological symptoms, irreversible vision change or blindness, and progression of infection to the heart or other vital organs. In 2016, 287 cases of late latent syphilis were reported in Virginia.

Syphilis, Early Stage, Incidence Rate by Locality
Virginia, 2016



Tetanus

Agent: Toxin secreted by the bacteria *Clostridium tetani*
Mode of Transmission: The bacteria enter the body through a break in the skin, usually when a wound, either major or minor, is infected by contaminated soil, dust, or animal or human feces. Person-to-person transmission does not occur.
Signs/Symptoms: A descending pattern of painful muscle contractions, particularly of the neck muscles, difficulty swallowing and abdominal rigidity.
Prevention: Tetanus vaccine is available as part of the diphtheria/tetanus/pertussis (DTaP) vaccine for children and the combination tetanus/diphtheria/pertussis (Tdap) vaccine for adolescents and adults. One dose of Tdap should be given at 11 to 12 years of age with booster doses of tetanus/diphtheria (Td) every ten years thereafter.
Other Important Information: Tetanus was made nationally notifiable in 1947. Since then, incidence of tetanus has declined over 95% and tetanus-related deaths have declined over 99%. Production of tetanus toxoid (TT) began in 1924 and was initially used for armed services personnel during World War II. It was included in the routine childhood immunization schedule in the late 1940s. Universal vaccination, including boosters for adolescents and adults, along with use of tetanus antitoxin for wound management, is primarily responsible for the decline of cases and death from tetanus. The case-fatality rate of tetanus ranges from 10% to over 80% and depends on patient age, length of incubation period, and quality of and access to care, especially access to intensive care unit resources and tetanus immune globulin. Sporadic cases of tetanus continue to occur in adults, especially in people who were never vaccinated or did not receive ten-year booster shots. Proper wound management is necessary for all wounds, even wounds that appear to be minor, as a higher proportion of patients with tetanus in recent years had minor wounds.

In 2016, one case of tetanus was reported in Virginia. The case occurred in a male child from the 1-9 year age group who had not been fully vaccinated. Previously, two cases were reported in Virginia in 2013 and one case was reported in 2012. The five-year average for tetanus is less than one case per year.

Toxic Substance-Related Illness

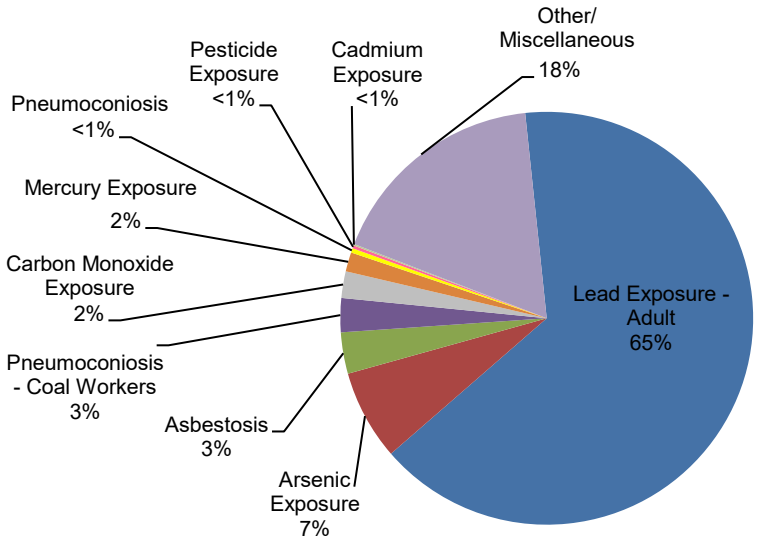
Agent: Multiple agents, including heavy metals (e.g., lead, cadmium, mercury, arsenic), occupational dusts or fibers (e.g., coal, silica, asbestos), gases (e.g., carbon monoxide, methane), pesticides, or radioactive materials.
Mode of Transmission: Varies depending on agent; can include absorption through skin, ingestion, or inhalation.
Signs/Symptoms: Varies depending on agent, route, dose and duration of exposure. Chronic occupational dust or fiber exposure may increase the risk of lung cancer, mesothelioma and nonmalignant lung disorders. Heavy metals, gases and pesticides may damage nervous, hepatic (liver), digestive, or reproductive systems.
Prevention: Eating, drinking, or smoking should not occur in contaminated work areas. Hands and face should be washed with soap and water after contact with toxic materials. After working with potential toxic substances, showering and changing clothes should occur at the worksite, if possible. Preventive measures include strict adherence to safety guidelines and requirements.
Other Important Information: Beginning in 2016, physicians and laboratories were required to report to the Virginia Department of Health any person, age 16 years and older, with a blood lead level of 5 μg/dL or higher. For prior years, reporting was required only for blood lead levels greater than or equal to 25 μg/dL.

Toxic Substance-related Illness: 2016 Data Summary	
Number of Cases:	864
5-Year Average Number of Cases:	326.4
% Change from 5-Year Average:	165%
Incidence Rate per 100,000:	10.3

In 2016, 864 cases of toxic substance-related illness were reported in Virginia. This is a 127% increase from the 381 cases reported in 2015, and a 165% increase from the five-year average of 326.4 cases per year. This increase is attributed to the change in blood lead levels used for surveillance purposes, as described above. Of these newly reported cases in 2016, 89% represent blood lead levels ranging from 5-24 μg/dL, which were not captured in previous years.

A determination of illness is based upon a physician's diagnosis, a laboratory finding outside an occupational standard, or when no standard exists, outside expected normal values. Toxic substance exposures are identified by public health professionals from electronic laboratory reports, death certificates, morbidity reports, and through claims by exposed persons to the Virginia Workers' Compensation Commission (WCC). The two most frequently reported toxic substance-related conditions in 2016 were adult lead exposure and arsenic exposure. These were followed by asbestosis, coal worker's pneumoconiosis, carbon monoxide exposure, mercury exposure, pneumoconiosis, pesticide exposure, and cadmium exposure (Figure 85). Illnesses from exposure to rarely reported substances are also reported and are captured under the general heading of other/miscellaneous reports.

Figure 85: Reported Toxic Substance-Related Illness, by Illness or Exposure Type, Virginia, 2016



While the occurrence of most types of toxic substance exposure or illness has remained relatively similar in recent years, more adult lead exposures were captured in 2016 when compared to previous years. As a result of the change in reportable levels, this increase in reports of adult lead exposures was expected. In 2016, 564 cases of elevated blood lead levels in adults were reported compared to the 28 cases in 2015 and 181 cases from a decade earlier in 2006. Of the 564 reported cases in 2016, 88% occurred in males and over half (52%) were reported from the eastern and central regions. The majority of reported cases with elevated lead exposure did not include information on occupation or industry. Among those with workplace information, lead removal, construction, shipping, steel working, and manufacturing were the most common industries listed. Greater enforcement of workplace lead safety and awareness of the dangers of lead exposure has contributed to the decrease in reported exposures in previous years. However, an increase in screening criteria and awareness of the dangers of lead may have also contributed to an increase in the number of individuals tested. Lead exposures among children aged 15 years or younger are discussed in the "Lead - Elevated Blood Levels in Children" section of this report.

Arsenic exposure has continued to be one of the most frequently reported toxic substance exposures in Virginia, due in part to the presence of arsenic in various foods, particularly fish and shellfish. Since the 2012 spike of 92 cases, arsenic trends have been declining and are showing proof of stabilization including the 66 exposures reported in 2013, 57 exposures in 2014, 59 exposures in 2015, and the 61 exposures in 2016. The 2012 spike was due to a more thorough and comprehensive reporting approach through utilization of electronic laboratory reporting. For 2016, individuals reported with arsenic exposure ranged in age from 21 to 88 years, and 61% of the cases were reported from the northern and eastern regions. Of the 61 arsenic exposures in 2016, 14 cases were confirmed and 47 were probable. Confirmed cases are characterized by clinical symptoms, which include headache, nausea, vomiting, diarrhea, abdominal pain, hypotension, fever, rupture of blood cells, seizures, and mental status changes, among other more severe complications. These symptoms are characteristic of inorganic arsenic poisoning. Exposure to inorganic arsenic poisoning can occur through contaminated drinking water and occupational exposures (primarily smelting of zinc and copper ores). For the 47 probable cases, exposure to the non-toxic organic form of arsenic or the toxic inorganic form of arsenic cannot be determined.

The number of reported asbestos exposures has remained relatively stable over the past decade, with a slight decrease for the current year. In 2016, 28 persons were reported with asbestos exposure in Virginia, compared to the 35 reported in 2015. The age of reported individuals ranged from 38-105 years, with a mean of 77 years. The majority of cases (82%) were 70 years or older, which reflects current illness from exposures that occurred before regulatory standards and guidelines went into effect. Of those reporting exposure, 93% were male and 75% were white. Of the 28 cases reported in 2016, 61% were reported from the eastern region. This area of the state is home to the shipbuilding industry, which has historically been the major source of exposure. Exposures were mostly reported through death certificates (82%) as asbestosis, the asbestos condition that results from previous exposure to asbestos fibers. The remaining cases were reported through the Worker's Compensation Commission as exposures in occupational settings.

Coal workers' pneumoconiosis, also referred to as black lung disease, is an industrial disease that is the result of breathing in dust from coal, graphite, or manufactured carbon over a period of years. The dust particles reside in the lungs following inhalation and build up over time. This creates chronic exposure due to the lungs not being able to excrete the dust. This continued exposure causes inflammation, fibrosis, and necrosis. Although rates of pneumoconiosis have declined since the Federal Coal Mine Health and Safety Act of 1969, new cases appear each year in Virginia. In 2016, 23 cases of coal workers' pneumoconiosis were reported. Nearly all were associated with working in the coal mining industry, and were mostly identified through surveillance of death certificates. Among the individuals reported with coal workers' pneumoconiosis, all were male, ranging in age from 52 to 91 years, and 87% were reported from the white population. Twenty-one cases (91%) occurred in the southwest region, which is home to the coal mining industry in Virginia. The 51% decrease in cases from the 47 cases reported in 2015 is likely due to the delayed reporting of death certificate data. Some death certificates of persons who died in 2014 as a result of coal workers' pneumoconiosis were not received until 2015. As a result, these deaths were counted as 2015 cases. This may have artificially increased the number for 2015, and continued delayed reporting may have reduced the case count for 2016.

In 2016, 18 carbon monoxide exposures were reported in Virginia compared to 27 reported exposures in 2015. The 18 individuals ranged in age from 13 to 85 years, with 67% being male. The cases reported in 2016 involved individuals who worked in various industries including automobile, construction, and law enforcement. Twelve exposures were reported through death certificates, and six cases were reported through the WCC. The majority of exposures were occupational, while most deaths were a result of accidental poisonings due to smoke inhalation from house fires.

A declining trend has been seen in the reporting of mercury and cadmium exposures over the last several years. Only 13 exposures to mercury were reported in 2016, as compared to the 48 cases reported in 2010. Mercury accounted for 2% of all reported toxic substance exposures in 2016. The two reported cases of cadmium in 2016 also dropped from the eight cases reported in 2010, and cadmium now accounts for less than 1% of all reported toxic substance-related exposures. Additionally, pneumoconiosis and pesticide exposure each accounted for less than 1% of exposures.

An additional 151 cases of toxic substance exposures were reported, with 72% received from the WCC and 28% reported through death certificates. These reports included unintentional workplace exposures to aerosol cleaners, solvents, exhaust fumes, and methane, or other illness or injury sustained during a toxic substance or chemical release. Inhalation was the most common route of exposure, followed by dermal contact and ingestion.

The overall incidence rate for toxic substance-related illness in Virginia in 2016 was 10.3 per 100,000. By age group, the incidence rate was highest in the 30-39 year age group (15.4 per 100,000), followed by the 40-49 year age group (15.2 per 100,000). The lowest incidence rate occurred among those 1-9 years of age (0.4 per 100,000). No infants were reported with a toxic substance-related illness. Adults in age groups from 20-59 years represented 77% of all reported cases. Race information was not reported for 56% of toxic substance-related cases. As such, no statement can be made about the distribution of toxic substance exposures by race. Males accounted for 80% of all cases. The incidence rate among males was more than four times the rate of females (16.6 and 4.1 per 100,000, respectively). The central region had the highest incidence rate at 15.2 per 100,000. Rates in other regions ranged from 7.5 to 15.1 per 100,000.

Trichinosis

Agent: Roundworms of genus *Trichinella; T. spiralis* is the most common cause of human infections.
Mode of Transmission: Eating raw or undercooked contaminated meat, including bear, pork, wild feline (such as cougar), fox, dog, wolf, horse, seal, or walrus. Trichinosis is not transmitted from person to person.
Signs/Symptoms: Usually occur in 1-2 days after consuming contaminated meat and may include nausea, diarrhea, vomiting, fatigue, fever, and abdominal discomfort. Headaches, fever, chills, cough, eye swelling, aching joints and muscle pains, itchy skin, diarrhea, or constipation may follow. Individuals may be asymptomatic, but severe or even fatal infections can occur.
Prevention: All meat should be cooked to safe temperatures and a meat thermometer should be used to measure the internal temperature of cooked meat. Whole cuts of meat (excluding poultry and wild game) should be cooked to at least 145 degrees Fahrenheit. Ground meat (excluding poultry) and wild game (both whole cuts and ground) should be cooked to at least 160 degrees Fahrenheit. All poultry products should be cooked to at least 165 degrees Fahrenheit. Meat grinders should be cleaned thoroughly after each use.
Other Important Information: Trichinosis used to be more common in the United States, but has decreased dramatically in the past forty years. Consumption of raw or undercooked pork products was the most common risk factor. Now, more cases in the United States are associated with consuming raw or undercooked wild game meats than with pork products. Curing, drying, smoking or microwaving meat alone does not always kill infective worms. Homemade jerky and sausage have reportedly been the cause of many cases in recent years.

No cases of trichinosis were reported in Virginia in 2016. The last case was reported in 2014. The five-year average number of cases of trichinosis in Virginia is 1.4 cases per year.

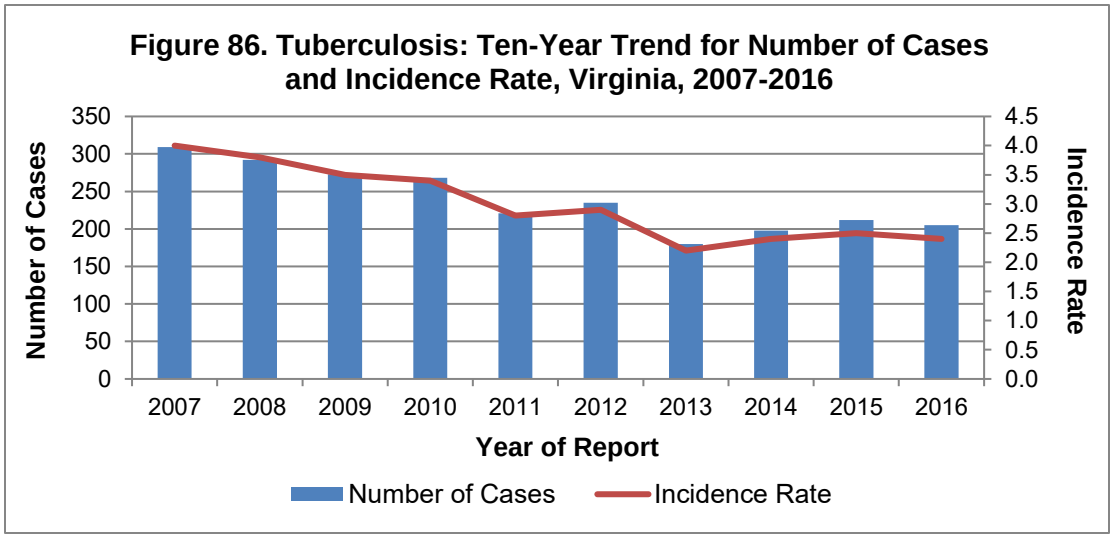
Tuberculosis

Agent: *Mycobacterium tuberculosis* (bacteria)
Mode of Transmission: Inhalation of tubercle bacilli via airborne droplets produced when patients with pulmonary or respiratory tract tuberculosis (TB) exhale the bacilli through coughing, singing, or sneezing.
Signs/Symptoms: Dependent on the organ(s) affected. General systemic signs and symptoms include fever, chills, night sweats, weight loss and fatigue. Symptoms of pulmonary tuberculosis may also include a prolonged (i.e., greater than 3 weeks) productive cough and coughing up blood.
Prevention: Control measures include the prompt identification, diagnosis and treatment of persons with infectious tuberculosis, followed by timely contact investigations to identify and treat additional persons with active tuberculosis disease and persons with latent tuberculosis infection. Special infection control measures should be practiced in high-risk settings.
Other Important Information: Persons with latent tuberculosis infection do not have any signs or symptoms of disease. These persons do not spread tuberculosis bacteria. Approximately 10% of those infected with tuberculosis will develop active disease during their lifetime, with the greatest risk for disease progression during the two years following infection. Co-infection with HIV and other immune suppressing conditions represent the greatest risks for progression to active disease.

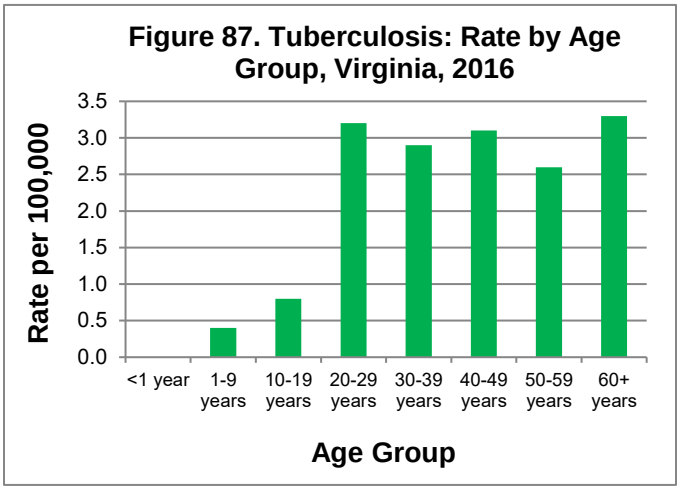
Tuberculosis: 2016 Data Summary	
Number of Cases:	205
5-Year Average Number of Cases:	209.2
% Change from 5-Year Average:	-2%
Incidence Rate per 100,000:	2.4

In 2016, 205 cases of tuberculosis were reported in Virginia. This is less than the 5-year average of 209.2 cases per year, and represents a 3% decrease in reported cases compared to 2015. This may signify a leveling of cases in Virginia, as seen in Figure 86. Nationally, CDC reported 9,287 TB cases, a new historic low, for an incidence rate of 2.9 per 100,000 population. Virginia ranked tenth in the U.S. for reported TB cases, with an incidence rate of 2.4 per 100,000 population.

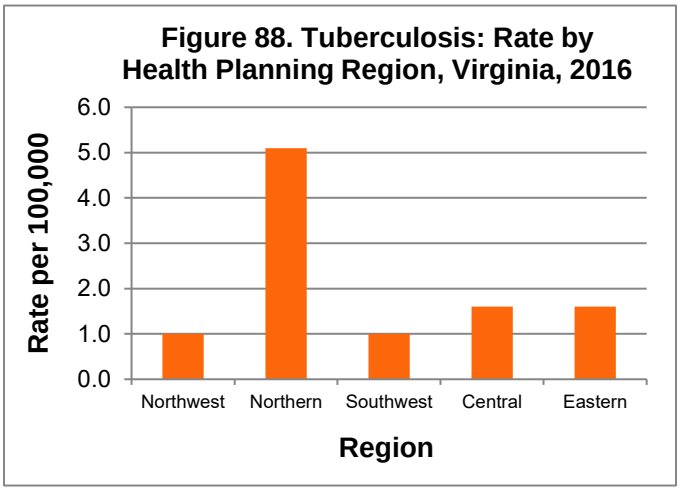
The decrease in reported cases of tuberculosis in Virginia in 2016 can largely be attributed to a 13% decrease in cases among U.S.-born persons, from 45 in 2015 to 39 in 2016. The number of foreign-born cases remained consistent with 166 cases reported in 2016 compared to 167 cases reported in 2015. In 2016, among persons with TB born outside the U.S., the five most common countries of origin were India, the Philippines, Viet Nam, Ethiopia, and El Salvador.



Incidence rates were higher in adults compared to children and adolescents. The highest incidence occurred among those in the 60 year and older age group (3.3 cases per 100,000), followed closely by those aged 20-29 years (3.2 per 100,000) (Figure 87). Incidence among other adult age groups ranged from 2.6 to 3.1 cases per 100,000. Incidence among children ranged from 0.4 per 100,000 in the 1-9 year age group to 0.8 per 100,000 in the 10-19 year age group. No cases occurred among infants in 2016. Information on race was available for all cases. The highest incidence was observed in the "other" race population (14.3 per 100,000); while incidence was substantially lower in the black and white populations (2.9 and 1.0 per 100,000, respectively). No difference was observed in the incidence rates for males (2.5 per 100,000) and females (2.4 per 100,000)

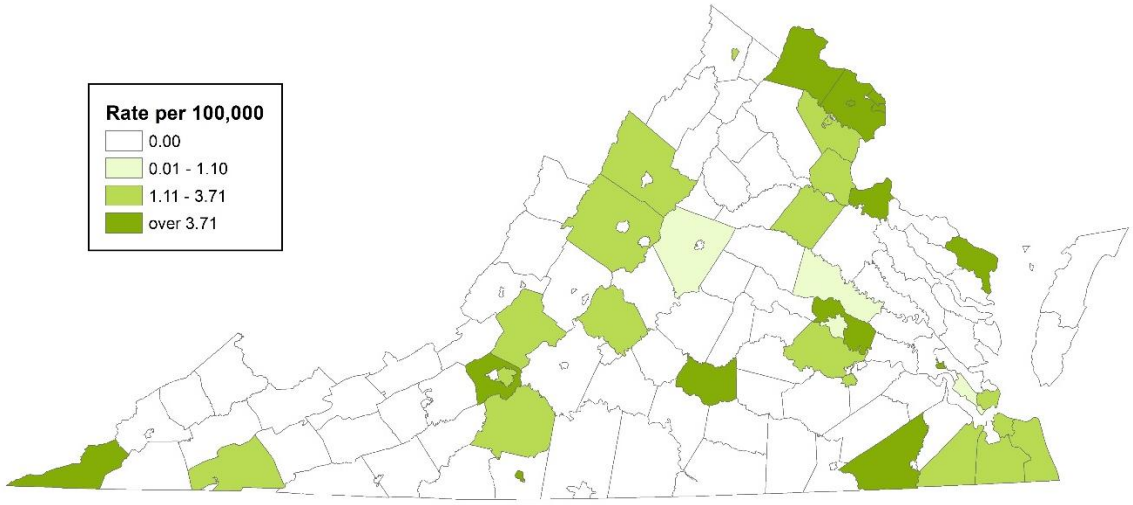


The highest number of cases and incidence rate (126 cases, 5.1 per 100,000) both occurred in the northern region (Figure 88), where 70% of the foreign-born TB cases were reported. Incidence in the other regions ranged from 1.0 to 1.6 per 100,000. Incidence by locality can be seen in the map below.



During 2016, drug susceptibility testing was performed for 167 culture-positive cases. Of these, 21 (13%) were found to be drug-resistant to one or more first-line drugs, most frequently the drug isoniazid. In addition, one (1%) was found to be multidrug-resistant (resistant to isoniazid and rifampin). For treatment outcomes, 2015 is the most recent year for complete data. In 2015, 92% of the drug-susceptible cases completed therapy within 12 months. No outbreaks were attributed to TB during 2016. One death, in an adult male older than 60 years of age, was attributed to tuberculosis during 2016.

Tuberculosis Incidence Rate by Locality
Virginia, 2016



Tularemia

Agent: *Francisella tularensis* (bacteria)
Mode of Transmission: The most common form of tularemia reported in the United States occurs following a tick or deer fly bite or after handling of an infected animal. Ticks found in Virginia that can transmit tularemia include the American dog tick and the lone star tick. Hunters can contract the disease while cleaning infected game or when eating infected meat that is raw or undercooked. Humans can also become infected by drinking water contaminated by infected animals, by contaminating their eyes with infected material, or by breathing *F. tularensis* spores from the dried carcasses or pelts of animals that died from tularemia. Cases have also been associated with cat and hamster bites. Because *F. tularensis* is highly infectious when grown in culture, laboratorians who work with the bacteria can became infected with the bacteria through wound contamination, or inhalation of aerosolized material. The bacteria are not transmitted directly from person to person.
Signs/Symptoms: Symptoms vary depending on the mode of transmission, but usually include sudden onset of high fever, chills, fatigue, general body aches, headache and nausea. An ulcer can occur at the site of infectious bites or wounds, and proximate lymph nodes can become swollen and painful. Ingestion can result in painful pharyngitis, abdominal pain, diarrhea and vomiting. Pulmonary infection can result in pneumonia and requires prompt identification and treatment to prevent development of life-threatening illness.
Prevention: Preventive measures include minimizing the risk of tick bites by the use of both appropriate dress and insect repellants when recreating or working in tick habitats, and avoiding the consumption of untreated water. Impervious protective gloves should be used when skinning rabbits and other wild game. Utensils used for preparing meat from game should not be used to prepare other food items. Undercooked meat should not be consumed. Mowing over dead animals should be avoided to lower the risk of aerosolizing infectious particles.
Other Important Information: Wild animals are the reservoir for *F. tularensis* with rabbits, hares, and rodents being especially susceptible to infection. Tularemia is classified as a potential bioweapon because its spores are relatively easy to disseminate as a breathable aerosol or as a food and water contaminant. Most tularemia infections can be successfully treated with antibiotics.

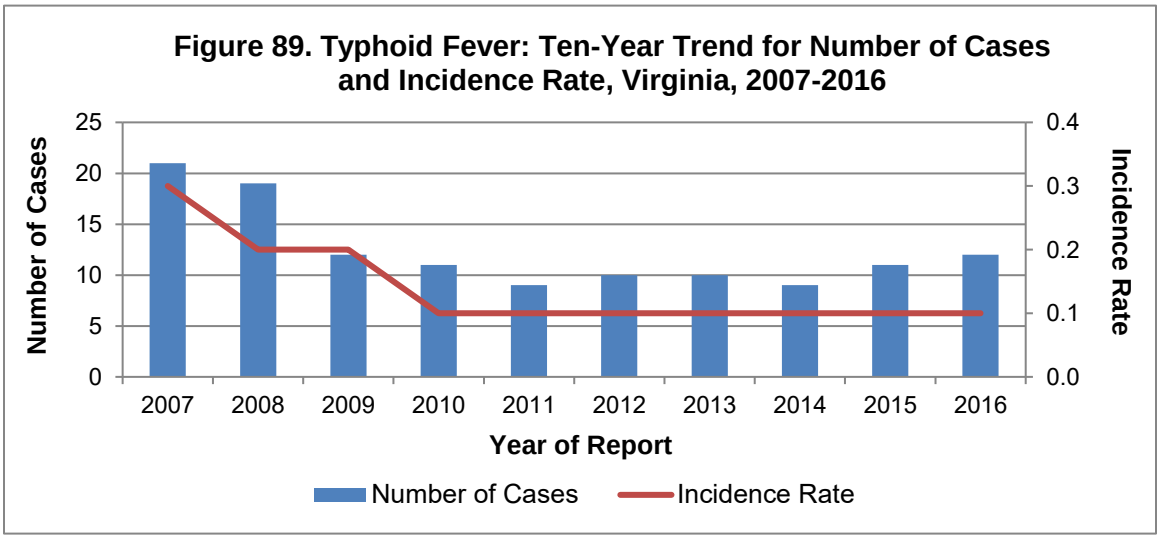
In 2016, two cases (one confirmed and one probable) of tularemia were reported in Virginia. The source of infection for the confirmed case was thought to be a fly or a tick bite. A source of infection for the probable case could not be determined. Both cases were reported in adults from the central region. The five-year average number of tularemia cases in Virginia is 2.8 cases per year.

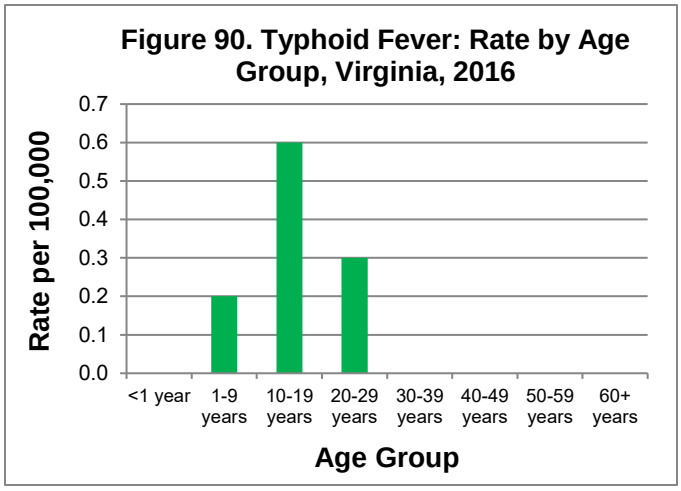
Typhoid Fever

Agent: *Salmonella* ser. Typhi (bacteria)
Mode of Transmission: Ingestion of food or water contaminated by feces or urine of infected persons. The bacteria live only in humans.
Signs/Symptoms: Include sustained fever, headache, malaise, altered mental status, lethargy, loss of appetite, fast heart rate, enlarged spleen, a non-productive cough and constipation.
Prevention: Access to safe water and proper sanitation, and following safe food handling and hand hygiene practices are essential. Travelers to countries where the disease is common should get vaccinated and avoid consuming risky foods and drinks.
Other Important Information: According to the CDC, most cases (up to 75%) of typhoid fever in the U.S. are acquired while traveling internationally. The condition is very common in the developing world, where it affects more than 20 million persons annually. Approximately 200,000 deaths are attributed to typhoid fever worldwide each year.

Typhoid Fever: 2016 Data Summary	
Number of Cases:	12
5-Year Average Number of Cases:	9.8
% Change from 5-Year Average:	+22%
Incidence Rate per 100,000:	0.1

During 2016, 12 cases of typhoid fever were reported in Virginia. This is a slight increase from the 11 cases reported in 2015, and represents a 22% increase from the five-year average of 9.8 cases per year (Figure 89). All 12 cases reported travel outside the U.S. in the 30 days prior to illness onset. Countries traveled to include India (7 persons), Pakistan (2 persons), Tanzania, Bangladesh, Turkey, Greece, and Nepal (1 person each). One person reported travel to more than one country.





Among all age groups, the highest number of cases and incidence rate were both seen in the 10-19 year age group (6 cases, 0.6 per 100,000) (Figure 90). Four cases occurred in the 20-29 year age group (0.3 per 100,000), while two cases occurred in the 1-9 year age group (0.2 per 100,000). No cases were reported from the remaining age groups. Race information was reported for all cases. The highest incidence rate was observed in persons in the "other" race population (1.5 cases per 100,000). One case each was reported from the white population and black population. Males and females had similar incidence rates (0.1 per 100,000, respectively). With eight cases being reported, incidence was highest in the northern region (0.3 per 100,000). The southwest, central, and eastern regions had similar rates (0.1 per 100,000, each). No cases were reported from the northwest region.

Onset of illness occurred in the first three quarters of the year with the highest percentage of cases reported during the third quarter (67%). However, because most cases are acquired outside the U.S., any seasonal pattern would most likely be related to travel patterns. During 2016, no deaths were attributed to typhoid fever in Virginia.

Vaccinia, Disease or Adverse Event

Agent: Vaccinia virus, which is used in the smallpox vaccine. The virus also occurs in some bovine (cattle) populations, primarily in Brazil.
Mode of Transmission: Through injection with the smallpox vaccine, or through direct contact with contaminated materials, or by inadvertent inoculation by contact with the vaccination site before it has healed. Outbreaks among dairy cattle in Brazil have led to transmission of the virus to their human handlers, primarily farmers and ranchers.
Signs/Symptoms: Includes rash, fever and head and body aches. Some individuals, especially those with certain skin conditions or weakened immune systems, may experience more serious effects, such as a toxic or allergic reaction at the vaccination site or spread of the virus to other parts of the body.
Prevention: When smallpox is not circulating, and to prevent serious reaction to the vaccine, administration of the smallpox vaccine should be limited to laboratory workers who handle smallpox and similar viruses and certain healthcare workers. The vaccine is currently available only to members of emergency response teams and some military personnel.
Other Important Information: Routine vaccination against smallpox ceased in 1972 when smallpox was eradicated in the U.S. The U.S. government has enough smallpox vaccine to vaccinate every person in the country in the event of a smallpox emergency. Vaccinia became a reportable condition in Virginia in 2003. It is not a nationally notifiable condition and U.S. totals are not available.

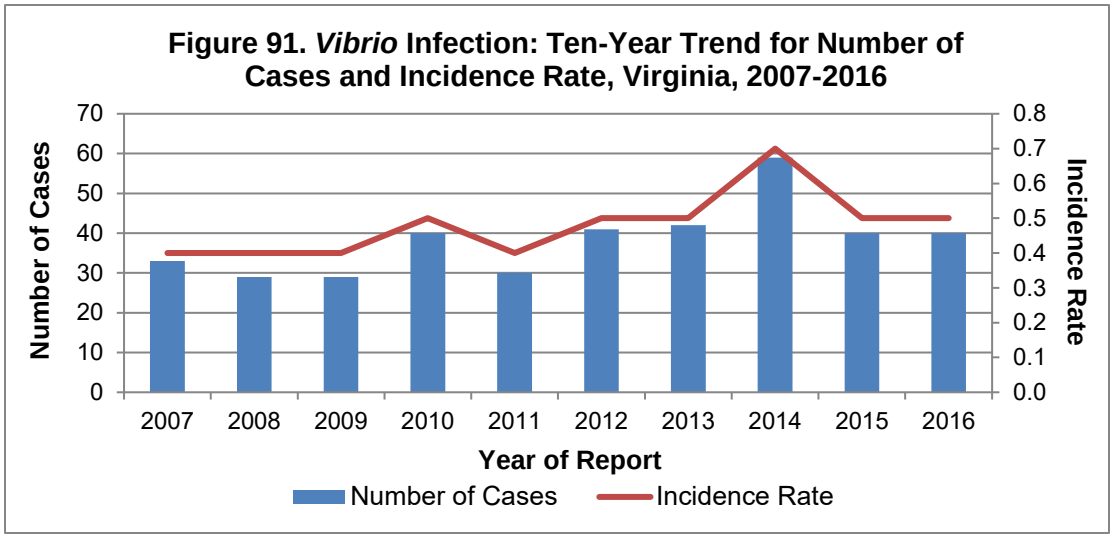
Reports of vaccinia from inadvertent transmission of the vaccine virus in recipients remain rare. In 2016, no cases of vaccinia were reported in Virginia. The five-year average is 0.2 cases per 100,000 population. Two cases of vaccinia have been reported in Virginia. The first reported case occurred in 2008 in a laboratory worker who handled vaccinia-infected mice. The second case was reported in 2013 and occurred in a vaccinated member of the military. The use of smallpox vaccine remains limited to a small population, primarily those who work with smallpox and similar viruses.

Vibrio Infection

Agent: *Vibrio* (bacteria)
Mode of Transmission: Gastroenteritis caused by *Vibrio* is usually related to the consumption of raw or undercooked seafood, particularly shellfish. Wound infections occur when saltwater carrying the *Vibrio* bacteria enters the body through a break in the skin, usually from brackish (i.e., somewhat salty) waters or from occupational injuries (e.g., among fishermen).
Signs/Symptoms: Symptoms associated with *Vibrio* infection include diarrhea (gastrointestinal infection), wound infection, and septicemia (bloodstream infection). Diarrheal illness is most common and includes watery stools and abdominal cramping. Low-grade fever, headache, and chills are seen in half of those ill with diarrheal illness, while 30% of those with diarrheal illness will experience vomiting. Wound infection is usually severe in those who have liver disease or weakened immune systems. Among those infected with *V. vulnificus*, approximately 50% of patients with primary septicemia die from the infection.
Prevention: Seafood should be cooked adequately and should be refrigerated. Avoid exposing open wounds to salt or brackish water. Abrasions suffered by those swimming in salt or brackish water should be washed with soap and clean water. Most people are considered susceptible, especially those with liver disease, decreased gastric acidity, diabetes, peptic ulcers, or weakened immune systems. People in high risk groups should refrain from eating raw or undercooked seafood.
Other Important Information: Marine coastal areas are the natural habitat of *Vibrio*. During the cold season, organisms are found in marine silt; during the warm season, they are found free in coastal waters and in fish and shellfish. Most *Vibrio* infections occur during summer and fall months, when levels of bacteria in brackish waters and estuaries are highest.

***Vibrio* Infection: 2016 Data Summary**	
Number of Cases:	40
5-Year Average Number of Cases:	42.4
% Change from 5-Year Average:	-6%
Incidence Rate per 100,000:	0.5

During 2016, 40 cases of *Vibrio* infection were reported in Virginia. This is the same number of cases that were reported in 2015, and is slightly lower than the five-year average of 42.4 cases per year (Figure 91). The statewide incidence rate of *Vibrio* infection in 2016 was 0.5 per 100,000.



Species were identified for all but one *Vibrio* infection in 2016. *V. vulnificus* accounted for 43% of infections, making it the most commonly identified species in 2016. In a change from previous years, more wound infections (14 cases) than gastrointestinal illnesss (12 cases) occurred for all species. Other illnesses included 4 ear infections, 9 bloodstream infections, and 1 urinary tract infection (Table 15).

Table 15. *Vibrio* Infections by Species and Specimen Source, Virginia, 2016

***Vibrio* species (number of cases)**	***Vibrio* Specimen Source***				
	Wound	**Stool**	**Ear**	**Blood**	**Urine**
V. vulnificus (17)	8	0	1	7	1
V. parahaemolyticus (14)	4	8	1	1	0
V. alginolyticus (3)	1	0	2	0	0
V. mimicus (2)	0	1	0	1	0
Vibrio cholerae, non-O1, non-O139 (2)	1	1	0	0	0
V. fluvialis (1)	0	1	0	0	0
Vibrio, unspeciated (1)	0	1	0	0	0

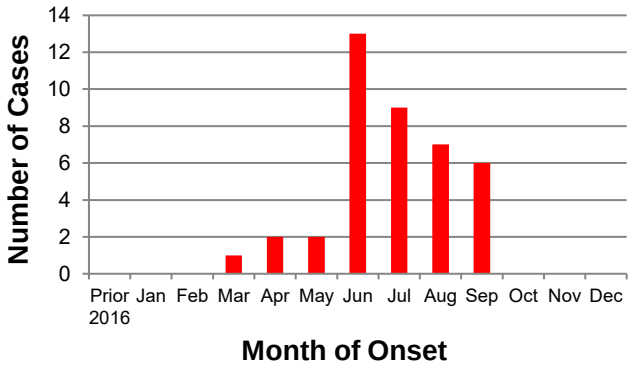
*The total number of positive specimens is larger than the total number of *Vibrio* cases because multiple specimen types have been collected from a single patient.

The largest number of *Vibrio* infections (18 cases) occurred among persons aged 60 years and older, with an incidence rate of 1.1 per 100,000. This was followed by the 50-59 year age group (8 cases, 0.7 per 100,000) and 40-49 year age group (6 cases, 0.5 per 100,000). Few cases were reported in the 20-29 year (2 cases), and 30-39 year (1 case) age groups. Among children, the highest number of cases was seen in the 1-9 year age group, with 5 cases. No cases were reported in the 10-19 year age group or among infants.

Race information was not available for 32% of cases. Among those with a known race, the number of cases was higher among the white population compared to the black population; however, both groups had similar incidence rates of 0.3 per 100,000. In Virginia, *Vibrio* infections typically affect males more often than females. This was unchanged in 2016, with 75% of cases reported among males.

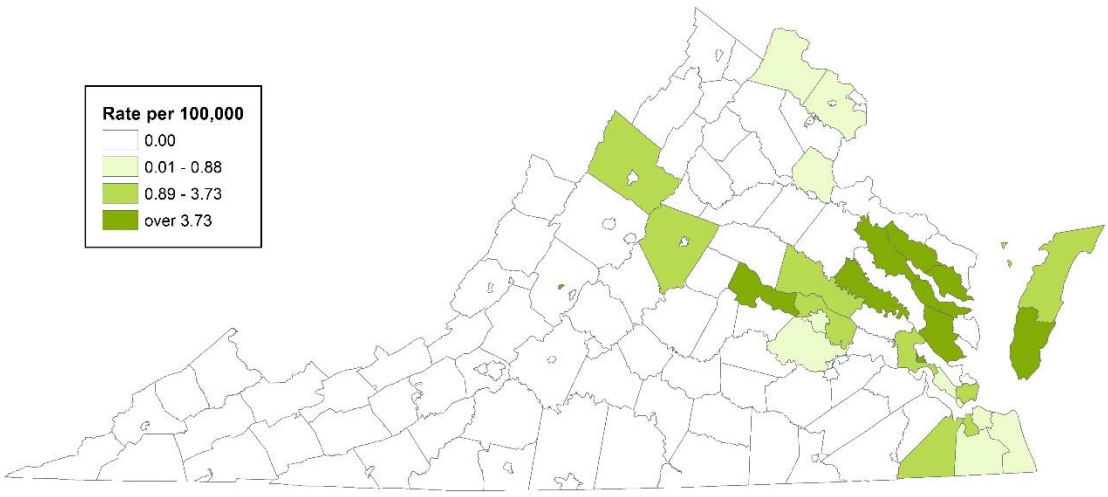
As in previous years, the eastern region had both the highest number of cases and the highest incidence rate (23 cases, 1.2 per 100,000). The central region had the second highest incidence rate (10 cases, 0.7 per 100,000), while the northwest region had the third highest incidence rate (4 cases, 0.3 per 100,000). The northern region had three cases, and no cases were reported in the southwest region. The map below illustrates the clustering of reported cases along Virginia's coastal region and major rivers. Occurrence of illness showed a seasonal pattern, with onset being reported in warmer months (Figure 92). Onset peaked in June with 13 reported cases.

Figure 92. Vibrio Infection: Month of Onset, Virginia, 2016



During 2016, 18 (45%) *Vibrio* infections required hospitalization and one person died as a result of the infection. The death occurred in an adult male infected with *Vibrio vulnificus*. No outbreaks attributed to *Vibrio* infection were reported in Virginia in 2016.

Vibrio Infection, Incidence Rate by Locality Virginia, 2016



Viral Hemorrhagic Fever

Agent(s): Viruses of four distinct families including *Arenaviridae* (Argentine, Bolivian, Venezuelan, Brazilian, Chapare and Lujo hemorrhagic fevers, and Lassa fever), *Filoviridae* (Ebola and Marburg hemorrhagic fevers), *Bunyaviridae* (Crimean-Congo hemorrhagic fever, Rift Valley fever, and hemorrhagic fever with renal syndrome [HFRS]), and *Flaviviridae* (dengue hemorrhagic fever, yellow fever, Omsk hemorrhagic fever, and Kyasansur Forest disease). Historically, among the viral hemorrhagic fevers, only dengue hemorrhagic fever has been found to be endemic to North America.
Mode of Transmission: Varies by agent. Arenaviruses are carried by rodents and are contracted by breathing dust contaminated with saliva, feces or urine of infected rodents, but may also be transmitted person-to-person by infected patients. Filovirus hemorrhagic fevers are contracted through direct contact with blood or body fluids from infected animals or persons. Bunyaviruses are typically transmitted by the bites of arthropods but may also be contracted through contact with the blood and body fluids of infected livestock or people, or in the case of HFRS may be contracted through exposure to dust contaminated with saliva, feces or urine of infected rodents. Hemorrhagic fevers caused by Flaviviruses are typically transmitted by the bites of arthropods (mosquitoes or ticks).
Signs/Symptoms: Vary by type, including but not limited to, malaise, headache, fever, bleeding from the nose and gums, rash, appearance of blood in the eyes, or vomiting. Case-fatality rates can range from 1% (dengue) to 90% (Ebola).
Prevention: Depending on the agent, exposure to hemorrhagic diseases can be reduced by rodent control in and around the home in endemic areas, by isolation of infected persons during their febrile period, by preventing contact with blood or body fluids of sick or dead humans or animals, and by avoiding the bites of mosquito or tick vectors.
Other Important Information: Viral hemorrhagic fevers are classified as potential bioweapons because they could cause high mortality, public panic, or social disruption. For surveillance purposes, cases of dengue fever are counted in the Arboviral Infection section of this report, while cases of yellow fever are counted in the Yellow Fever section. Therefore, any cases of dengue fever or yellow fever, including those with hemorrhagic signs, will be discussed in their respective sections of this surveillance report.

No cases of viral hemorrhagic fever were reported in Virginia in 2016. The last case of viral hemorrhagic fever was a dengue hemorrhagic fever that was reported in 2011. Information on this case is available in the Arboviral Infection section of the 2011 edition of *Reportable Disease Surveillance in Virginia*.

Yellow Fever

Agent: Yellow fever virus (YFV)
Mode of Transmission: Transmitted through the bites of several species of infected *Aedes* mosquitoes, most notably the yellow fever mosquito (*Aedes aegypti*), which breeds in containers of water occurring around human habitats. Yellow fever mosquitoes are occasionally found in Virginia but are relatively rare. The closely related Asian tiger mosquito (*Aedes albopictus*) has become very common throughout Virginia and is also a potential vector of the yellow fever virus. Although the Asian tiger mosquito's competence as a yellow fever vector has been proven in laboratory studies, there are currently no records of this mosquito having transmitted yellow fever in nature.
Signs/Symptoms: Varying levels of severity. Most infected people are believed to be asymptomatic or have a mild disease, but symptoms could include a sudden onset of fever, chills, headache, backache, generalized muscle pain, prostration, nausea, vomiting and jaundice. Jaundice is usually mild in early disease, but intensifies later. Among cases with jaundice, the case-fatality rates are 20% to 50%.
Prevention: Vaccination against the yellow fever virus before traveling to yellow fever endemic regions of the world and avoidance of mosquito bites while traveling in these regions.

No cases of yellow fever have been reported in Virginia since the nineteenth century.

Yersiniosis

Agent: *Yersinia* species (bacteria)
Mode of Transmission: Ingestion of contaminated foods, particularly raw or incompletely cooked pork products and unpasteurized milk, contaminated surface or well water, or by direct or indirect contact with infected people or animals.
Signs/Symptoms: Vary depending on age, but may include fever, abdominal pain, and bloody diarrhea.
Prevention: Preventive measures include safe food preparation and pasteurization of dairy products. People handling pork intestines should wash their hands and environmental surfaces thoroughly after contact with raw meat, and should not handle infants or young children or their toys, bottles, or pacifiers until hands are washed thoroughly.
Other Important Information: Infection most often occurs from eating contaminated food, especially raw or undercooked pork products, including pork intestines (chitterlings). Children are infected more often than adults.

Yersiniosis: 2016 Data Summary	
Number of Cases:	23
5-Year Average Number of Cases:	13.4
% Change from 5-Year Average:	+72%
Incidence Rate per 100,000:	0.3

In 2016, 23 cases of yersiniosis were reported in Virginia. This is a 35% increase over the 17 cases reported in 2015, and a 72% increase from the five-year average of 13.4 cases per year.

Four (17%) cases occurred in persons less than one year of age, for a rate of 17.4 cases per 100,000 population. Six cases (26%) were reported among children 1-9 years of age. Thus, 44% of cases occurred in persons 0-9 years of age. This is a change from what was noted in 2015 cases, when 12% of cases occurred among 0-9 year olds and no cases in persons less than one year of age. In 2016, an average of one to four cases was reported in each of the other age groups. Race information was not available for 37% of cases. Among those with a known race, eleven were in the white population, three in the black population, and one in the "other" race population. Thirteen cases were in males and ten were in females.

Seven cases were reported from the southwest region, six from the northwest region, five from the northern region, four from the eastern region, and one from the central region. Cases occurred in every month of the year, with the most (8 cases, 35%) occurring in April and May. No risk factor patterns were noted related to travel, food, or other exposures among cases.

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Amebiasis REPORTED CASES	Amebiasis RATE PER 100,000	Campylobacteriosis REPORTED CASES	Campylobacteriosis RATE PER 100,000	Chickenpox REPORTED CASES	Chickenpox RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39	0.5	1,580	18.8	284	3.4
LOCALITY							
Accomack County	32,973	0	0.0	17	51.6	0	0.0
Albemarle County	105,703	1	0.9	19	18.0	5	4.7
Alleghany County	15,677	0	0.0	1	6.4	0	0.0
Amelia County	12,903	0	0.0	1	7.8	0	0.0
Amherst County	31,914	0	0.0	8	25.1	1	3.1
Appomattox County	15,414	0	0.0	1	6.5	0	0.0
Arlington County	229,164	2	0.9	53	23.1	13	5.7
Augusta County	74,314	0	0.0	28	37.7	0	0.0
Bath County	4,470	0	0.0	2	44.7	0	0.0
Bedford County	77,724	0	0.0	7	9.0	1	1.3
Bland County	6,561	0	0.0	0	0.0	0	0.0
Botetourt County	33,347	0	0.0	1	3.0	1	3.0
Brunswick County	16,698	0	0.0	2	12.0	0	0.0
Buchanan County	22,776	0	0.0	2	8.8	0	0.0
Buckingham County	17,032	0	0.0	2	11.7	0	0.0
Campbell County	55,086	0	0.0	5	9.1	0	0.0
Caroline County	29,984	0	0.0	7	23.3	0	0.0
Carroll County	29,724	1	3.4	1	3.4	0	0.0
Charles City County	7,040	0	0.0	1	14.2	0	0.0
Charlotte County	12,201	0	0.0	3	24.6	0	0.0
Chesterfield County	335,687	3	0.9	40	11.9	3	0.9
Clarke County	14,363	0	0.0	2	13.9	0	0.0
Craig County	5,211	0	0.0	1	19.2	0	0.0
Culpeper County	49,432	0	0.0	5	10.1	0	0.0
Cumberland County	9,719	0	0.0	3	30.9	0	0.0
Dickenson County	15,115	0	0.0	4	26.5	0	0.0
Dinwiddie County	27,852	0	0.0	8	28.7	0	0.0
Essex County	11,130	0	0.0	2	18.0	0	0.0
Fairfax County	1,142,234	11	1.0	257	22.5	74	6.5
Fauquier County	68,782	0	0.0	13	18.9	2	2.9
Floyd County	15,651	0	0.0	3	19.2	1	6.4
Fluvanna County	26,235	0	0.0	8	30.5	0	0.0
Franklin County	56,264	0	0.0	9	16.0	5	8.9
Frederick County	83,199	0	0.0	21	25.2	2	2.4
Giles County	16,708	1	6.0	2	12.0	1	6.0
Gloucester County	37,143	1	2.7	3	8.1	0	0.0
Goochland County	22,253	0	0.0	6	27.0	0	0.0
Grayson County	16,012	0	0.0	0	0.0	5	31.2
Greene County	19,162	0	0.0	6	31.3	2	10.4
Greensville County	11,885	0	0.0	2	16.8	1	8.4
Halifax County	35,125	0	0.0	4	11.4	1	2.8
Hanover County	103,227	1	1.0	13	12.6	0	0.0
Henrico County	325,155	0	0.0	47	14.5	19	5.8
Henry County	51,881	0	0.0	10	19.3	0	0.0
Highland County	2,214	0	0.0	2	90.3	0	0.0
Isle of Wight County	36,314	0	0.0	1	2.8	0	0.0
James City County	73,147	0	0.0	9	12.3	2	2.7

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Amebiasis REPORTED CASES	Amebiasis RATE PER 100,000	Campylobacteriosis REPORTED CASES	Campylobacteriosis RATE PER 100,000	Chickenpox REPORTED CASES	Chickenpox RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39	0.5	1,580	18.8	284	3.4
LOCALITY							
King and Queen County	7,158	0	0.0	1	14.0	0	0.0
King George County	25,515	0	0.0	3	11.8	4	15.7
King William County	16,269	0	0.0	3	18.4	0	0.0
Lancaster County	10,965	0	0.0	2	18.2	0	0.0
Lee County	24,742	0	0.0	3	12.1	1	4.0
Loudoun County	375,629	4	1.1	101	26.9	16	4.3
Louisa County	34,602	0	0.0	12	34.7	4	11.6
Lunenburg County	12,299	0	0.0	3	24.4	0	0.0
Madison County	13,134	0	0.0	2	15.2	0	0.0
Mathews County	8,862	0	0.0	0	0.0	0	0.0
Mecklenburg County	31,081	0	0.0	4	12.9	1	3.2
Middlesex County	10,606	0	0.0	1	9.4	0	0.0
Montgomery County	97,653	0	0.0	9	9.2	4	4.1
Nelson County	14,785	0	0.0	0	0.0	1	6.8
New Kent County	20,392	0	0.0	5	24.5	0	0.0
Northampton County	12,155	0	0.0	15	123.4	0	0.0
Northumberland County	12,232	0	0.0	2	16.4	0	0.0
Nottoway County	15,673	0	0.0	3	19.1	1	6.4
Orange County	35,385	0	0.0	9	25.4	4	11.3
Page County	23,726	0	0.0	13	54.8	0	0.0
Patrick County	18,045	0	0.0	4	22.2	0	0.0
Pittsylvania County	62,194	0	0.0	7	11.3	0	0.0
Powhatan County	28,031	0	0.0	6	21.4	0	0.0
Prince Edward County	22,952	0	0.0	1	4.4	5	21.8
Prince George County	37,862	0	0.0	2	5.3	1	2.6
Prince William County	451,721	6	1.3	57	12.6	28	6.2
Pulaski County	34,332	0	0.0	6	17.5	2	5.8
Rappahannock County	7,378	0	0.0	0	0.0	0	0.0
Richmond County	8,908	0	0.0	1	11.2	0	0.0
Roanoke County	94,409	0	0.0	4	4.2	1	1.1
Rockbridge County	22,354	0	0.0	8	35.8	1	4.5
Rockingham County	78,593	0	0.0	96	122.1	6	7.6
Russell County	27,891	0	0.0	12	43.0	0	0.0
Scott County	22,126	0	0.0	10	45.2	0	0.0
Shenandoah County	43,190	0	0.0	31	71.8	0	0.0
Smyth County	31,470	0	0.0	18	57.2	0	0.0
Southampton County	18,109	0	0.0	3	16.6	0	0.0
Spotsylvania County	130,475	0	0.0	26	19.9	2	1.5
Stafford County	142,003	0	0.0	52	36.6	0	0.0
Surry County	6,709	0	0.0	4	59.6	0	0.0
Sussex County	11,715	0	0.0	2	17.1	0	0.0
Tazewell County	42,899	0	0.0	7	16.3	3	7.0
Warren County	39,083	0	0.0	6	15.4	0	0.0
Washington County	54,591	0	0.0	15	27.5	1	1.8
Westmoreland County	17,629	0	0.0	3	17.0	0	0.0
Wise County	39,718	0	0.0	6	15.1	0	0.0
Wythe County	29,119	0	0.0	1	3.4	0	0.0
York County	67,837	0	0.0	3	4.4	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Amebiasis REPORTED CASES	Amebiasis RATE PER 100,000	Campylobacteriosis REPORTED CASES	Campylobacteriosis RATE PER 100,000	Chickenpox REPORTED CASES	Chickenpox RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39	0.5	1,580	18.8	284	3.4
LOCALITY							
Alexandria	153,511	1	0.7	62	40.4	15	9.8
Bristol	17,141	0	0.0	2	11.7	0	0.0
Buena Vista	6,618	0	0.0	2	30.2	0	0.0
Charlottesville	46,597	0	0.0	6	12.9	5	10.7
Chesapeake	235,429	0	0.0	31	13.2	7	3.0
Colonial Heights	17,820	0	0.0	0	0.0	0	0.0
Covington	5,658	0	0.0	1	17.7	0	0.0
Danville	42,082	0	0.0	2	4.8	0	0.0
Emporia	5,496	0	0.0	0	0.0	1	18.2
Fairfax City	24,013	0	0.0	7	29.2	0	0.0
Falls Church	13,892	0	0.0	0	0.0	0	0.0
Franklin City	8,490	0	0.0	5	58.9	0	0.0
Fredericksburg	28,118	1	3.6	7	24.9	0	0.0
Galax	6,914	0	0.0	0	0.0	0	0.0
Hampton	136,454	0	0.0	11	8.1	3	2.2
Harrisonburg	52,538	1	1.9	23	43.8	3	5.7
Hopewell	22,378	0	0.0	2	8.9	0	0.0
Lexington	7,262	0	0.0	0	0.0	0	0.0
Lynchburg	79,812	0	0.0	5	6.3	2	2.5
Manassas	41,764	0	0.0	7	16.8	2	4.8
Manassas Park	15,726	0	0.0	2	12.7	0	0.0
Martinsville	13,645	0	0.0	1	7.3	1	7.3
Newport News	182,385	0	0.0	7	3.8	2	1.1
Norfolk	246,393	1	0.4	18	7.3	3	1.2
Norton	3,939	0	0.0	1	25.4	0	0.0
Petersburg	32,477	0	0.0	1	3.1	0	0.0
Poquoson	12,059	0	0.0	2	16.6	0	0.0
Portsmouth	96,201	0	0.0	6	6.2	1	1.0
Radford	17,403	0	0.0	1	5.7	0	0.0
Richmond City	220,289	0	0.0	31	14.1	3	1.4
Roanoke City	99,897	0	0.0	5	5.0	1	1.0
Salem	25,432	0	0.0	0	0.0	0	0.0
Staunton	24,416	0	0.0	9	36.9	4	16.4
Suffolk	88,161	0	0.0	8	9.1	0	0.0
Virginia Beach	452,745	3	0.7	57	12.6	6	1.3
Waynesboro	21,491	0	0.0	14	65.1	0	0.0
Williamsburg	15,052	0	0.0	11	73.1	0	0.0
Winchester	27,284	1	3.7	9	33.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Amebiasis REPORTED CASES	Amebiasis RATE PER 100,000	Campylobacteriosis REPORTED CASES	Campylobacteriosis RATE PER 100,000	Chickenpox REPORTED CASES	Chickenpox RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39	0.5	1,580	18.8	284	3.4
DISTRICT/REGION							

Central Shenandoah	294,270	1	0.3	184	62.5	14	4.8
Lord Fairfax	230,845	1	0.4	82	35.5	2	0.9
Rappahannock	356,095	1	0.3	95	26.7	6	1.7
Rappahannock/Rapidan	174,111	0	0.0	29	16.7	6	3.4
Thomas Jefferson	247,084	1	0.4	51	20.6	17	6.9
Northwest Region	1,302,405	4	0.3	441	33.9	45	3.5

Alexandria	153,511	1	0.7	62	40.4	15	9.8
Arlington	229,164	2	0.9	53	23.1	13	5.7
Fairfax	1,180,139	11	0.9	264	22.4	74	6.3
Loudoun	375,629	4	1.1	101	26.9	16	4.3
Prince William	509,211	6	1.2	66	13.0	30	5.9
Northern Region	2,447,654	24	1.0	546	22.3	148	6.0

Alleghany	179,734	0	0.0	8	4.5	2	1.1
Central Virginia	259,950	0	0.0	26	10.0	4	1.5
Cumberland Plateau	108,681	0	0.0	25	23.0	3	2.8
Lenowisco	90,525	0	0.0	20	22.1	1	1.1
Mount Rogers	191,532	1	0.5	37	19.3	6	3.1
New River	181,747	1	0.6	21	11.6	8	4.4
Pittsylvania/Danville	104,276	0	0.0	9	8.6	0	0.0
Roanoke City	99,897	0	0.0	5	5.0	1	1.0
West Piedmont	139,835	0	0.0	24	17.2	6	4.3
Southwest Region	1,356,177	2	0.1	175	12.9	31	2.3

Chesterfield	381,538	3	0.8	46	12.1	3	0.8
Chickahominy	152,912	1	0.7	25	16.3	0	0.0
Crater	156,374	0	0.0	21	13.4	3	1.9
Henrico	325,155	0	0.0	47	14.5	19	5.8
Piedmont	102,779	0	0.0	16	15.6	6	5.8
Richmond City	220,289	0	0.0	31	14.1	3	1.4
Southside	82,904	0	0.0	10	12.1	2	2.4
Central Region	1,421,951	4	0.3	196	13.8	36	2.5

Chesapeake	235,429	0	0.0	31	13.2	7	3.0
Eastern Shore	45,128	0	0.0	32	70.9	0	0.0
Hampton	136,454	0	0.0	11	8.1	3	2.2
Norfolk	246,393	1	0.4	18	7.3	3	1.2
Peninsula	350,480	0	0.0	32	9.1	4	1.1
Portsmouth	96,201	0	0.0	6	6.2	1	1.0
Three Rivers	140,902	1	0.7	18	12.8	0	0.0
Virginia Beach	452,745	3	0.7	57	12.6	6	1.3
Western Tidewater	151,074	0	0.0	17	11.3	0	0.0
Eastern Region	1,854,806	5	0.3	222	12.0	24	1.3

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***Chlamydia trachomatis* Infection**		**Cryptosporidiosis**		**Ehrlichiosis/ Anaplasmosis**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39,535	471.6	244	2.9	115	1.4
LOCALITY							
Accomack County	32,973	246	746.1	1	3.0	3	9.1
Albemarle County	105,703	275	260.2	6	5.7	3	2.8
Alleghany County	15,677	36	229.6	0	0.0	0	0.0
Amelia County	12,903	33	255.8	2	15.5	1	7.8
Amherst County	31,914	112	350.9	0	0.0	3	9.4
Appomattox County	15,414	56	363.3	1	6.5	3	19.5
Arlington County	229,164	927	404.5	2	0.9	2	0.9
Augusta County	74,314	134	180.3	4	5.4	0	0.0
Bath County	4,470	5	111.9	0	0.0	0	0.0
Bedford County	77,724	137	176.3	1	1.3	6	7.7
Bland County	6,561	2	30.5	0	0.0	0	0.0
Botetourt County	33,347	59	176.9	0	0.0	1	3.0
Brunswick County	16,698	121	724.6	0	0.0	0	0.0
Buchanan County	22,776	15	65.9	0	0.0	0	0.0
Buckingham County	17,032	50	293.6	1	5.9	0	0.0
Campbell County	55,086	152	275.9	0	0.0	2	3.6
Caroline County	29,984	107	356.9	0	0.0	1	3.3
Carroll County	29,724	52	174.9	0	0.0	0	0.0
Charles City County	7,040	21	298.3	0	0.0	0	0.0
Charlotte County	12,201	37	303.3	0	0.0	5	41.0
Chesterfield County	335,687	1544	460.0	0	0.0	6	1.8
Clarke County	14,363	31	215.8	1	7.0	0	0.0
Craig County	5,211	5	96.0	0	0.0	0	0.0
Culpeper County	49,432	106	214.4	3	6.1	0	0.0
Cumberland County	9,719	45	463.0	0	0.0	0	0.0
Dickenson County	15,115	19	125.7	0	0.0	1	6.6
Dinwiddie County	27,852	168	603.2	0	0.0	1	3.6
Essex County	11,130	53	476.2	2	18.0	0	0.0
Fairfax County	1,142,234	2958	259.0	43	3.8	5	0.4
Fauquier County	68,782	149	216.6	1	1.5	3	4.4
Floyd County	15,651	10	63.9	0	0.0	0	0.0
Fluvanna County	26,235	41	156.3	2	7.6	2	7.6
Franklin County	56,264	124	220.4	3	5.3	1	1.8
Frederick County	83,199	195	234.4	5	6.0	0	0.0
Giles County	16,708	48	287.3	0	0.0	0	0.0
Gloucester County	37,143	98	263.8	2	5.4	0	0.0
Goochland County	22,253	65	292.1	0	0.0	0	0.0
Grayson County	16,012	21	131.2	1	6.2	0	0.0
Greene County	19,162	38	198.3	1	5.2	2	10.4
Greensville County	11,885	56	471.2	0	0.0	1	8.4
Halifax County	35,125	151	429.9	0	0.0	0	0.0
Hanover County	103,227	304	294.5	3	2.9	1	1.0
Henrico County	325,155	1898	583.7	5	1.5	1	0.3
Henry County	51,881	165	318.0	0	0.0	3	5.8
Highland County	2,214	3	135.5	0	0.0	0	0.0
Isle of Wight County	36,314	132	363.5	0	0.0	0	0.0
James City County	73,147	191	261.1	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***Chlamydia trachomatis* Infection**		**Cryptosporidiosis**		**Ehrlichiosis/ Anaplasmosis**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39,535	471.6	244	2.9	115	1.4
LOCALITY							
King and Queen County	7,158	28	391.2	0	0.0	0	0.0
King George County	25,515	87	341.0	0	0.0	0	0.0
King William County	16,269	71	436.4	0	0.0	0	0.0
Lancaster County	10,965	45	410.4	1	9.1	0	0.0
Lee County	24,742	24	97.0	1	4.0	0	0.0
Loudoun County	375,629	874	232.7	11	2.9	2	0.5
Louisa County	34,602	82	237.0	3	8.7	3	8.7
Lunenburg County	12,299	39	317.1	0	0.0	1	8.1
Madison County	13,134	31	236.0	0	0.0	0	0.0
Mathews County	8,862	10	112.8	0	0.0	0	0.0
Mecklenburg County	31,081	149	479.4	0	0.0	0	0.0
Middlesex County	10,606	22	207.4	0	0.0	0	0.0
Montgomery County	97,653	315	322.6	2	2.0	2	2.0
Nelson County	14,785	34	230.0	0	0.0	0	0.0
New Kent County	20,392	52	255.0	0	0.0	0	0.0
Northampton County	12,155	106	872.1	0	0.0	2	16.5
Northumberland County	12,232	48	392.4	0	0.0	0	0.0
Nottoway County	15,673	127	810.3	0	0.0	2	12.8
Orange County	35,385	104	293.9	1	2.8	2	5.7
Page County	23,726	23	96.9	0	0.0	0	0.0
Patrick County	18,045	29	160.7	0	0.0	1	5.5
Pittsylvania County	62,194	162	260.5	0	0.0	0	0.0
Powhatan County	28,031	66	235.5	0	0.0	3	10.7
Prince Edward County	22,952	140	610.0	0	0.0	2	8.7
Prince George County	37,862	307	810.8	5	13.2	2	5.3
Prince William County	451,721	1893	419.1	5	1.1	3	0.7
Pulaski County	34,332	94	273.8	0	0.0	0	0.0
Rappahannock County	7,378	17	230.4	0	0.0	0	0.0
Richmond County	8,908	27	303.1	1	11.2	0	0.0
Roanoke County	94,409	276	292.3	0	0.0	3	3.2
Rockbridge County	22,354	56	250.5	0	0.0	1	4.5
Rockingham County	78,593	148	188.3	1	1.3	2	2.5
Russell County	27,891	41	147.0	2	7.2	0	0.0
Scott County	22,126	40	180.8	0	0.0	0	0.0
Shenandoah County	43,190	84	194.5	1	2.3	0	0.0
Smyth County	31,470	82	260.6	5	15.9	0	0.0
Southampton County	18,109	85	469.4	0	0.0	2	11.0
Spotsylvania County	130,475	409	313.5	2	1.5	3	2.3
Stafford County	142,003	478	336.6	0	0.0	2	1.4
Surry County	6,709	39	581.3	0	0.0	0	0.0
Sussex County	11,715	76	648.7	0	0.0	1	8.5
Tazewell County	42,899	96	223.8	2	4.7	0	0.0
Warren County	39,083	114	291.7	1	2.6	1	2.6
Washington County	54,591	79	144.7	1	1.8	0	0.0
Westmoreland County	17,629	65	368.7	0	0.0	1	5.7
Wise County	39,718	104	261.8	0	0.0	0	0.0
Wythe County	29,119	62	212.9	1	3.4	0	0.0
York County	67,837	205	302.2	10	14.7	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***Chlamydia trachomatis* Infection**		**Cryptosporidiosis**		**Ehrlichiosis/ Anaplasmosis**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39,535	471.6	244	2.9	115	1.4
LOCALITY							
Alexandria	153,511	673	438.4	12	7.8	0	0.0
Bristol	17,141	72	420.0	0	0.0	0	0.0
Buena Vista	6,618	11	166.2	0	0.0	0	0.0
Charlottesville	46,597	211	452.8	5	10.7	3	6.4
Chesapeake	235,429	1391	590.8	11	4.7	4	1.7
Colonial Heights	17,820	91	510.7	0	0.0	0	0.0
Covington	5,658	23	406.5	0	0.0	0	0.0
Danville	42,082	293	696.3	0	0.0	1	2.4
Emporia	5,496	61	1,109.9	0	0.0	0	0.0
Fairfax City	24,013	62	258.2	1	4.2	0	0.0
Falls Church	13,892	37	266.3	0	0.0	0	0.0
Franklin City	8,490	87	1,024.7	0	0.0	0	0.0
Fredericksburg	28,118	187	665.1	2	7.1	0	0.0
Galax	6,914	27	390.5	0	0.0	0	0.0
Hampton	136,454	1416	1,037.7	8	5.9	0	0.0
Harrisonburg	52,538	300	571.0	0	0.0	0	0.0
Hopewell	22,378	261	1166.3	0	0.0	0	0.0
Lexington	7,262	4	55.1	0	0.0	0	0.0
Lynchburg	79,812	532	666.6	4	5.0	3	3.8
Manassas	41,764	188	450.1	4	9.6	0	0.0
Manassas Park	15,726	57	362.5	1	6.4	0	0.0
Martinsville	13,645	120	879.4	0	0.0	0	0.0
Newport News	182,385	1864	1022.0	14	7.7	1	0.5
Norfolk	246,393	3243	1,316.2	11	4.5	0	0.0
Norton	3,939	13	330.0	0	0.0	0	0.0
Petersburg	32,477	532	1,638.1	0	0.0	0	0.0
Poquoson	12,059	19	157.6	1	8.3	0	0.0
Portsmouth	96,201	1122	1,166.3	2	2.1	1	1.0
Radford	17,403	179	1,028.6	0	0.0	0	0.0
Richmond City	220,289	2992	1,358.2	2	0.9	1	0.5
Roanoke City	99,897	938	939.0	0	0.0	2	2.0
Salem	25,432	76	298.8	0	0.0	0	0.0
Staunton	24,416	83	339.9	3	12.3	0	0.0
Suffolk	88,161	603	684.0	0	0.0	0	0.0
Virginia Beach	452,745	2737	604.5	12	2.7	0	0.0
Waynesboro	21,491	74	344.3	3	14.0	0	0.0
Williamsburg	15,052	82	544.8	2	13.3	1	6.6
Winchester	27,284	134	491.1	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***Chlamydia trachomatis* Infection**		**Cryptosporidiosis**		**Ehrlichiosis/ Anaplasmosis**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	39,535	471.6	244	2.9	115	1.4
DISTRICT/REGION							

Central Shenandoah	294,270	818	278.0	11	3.7	3	1.0
Lord Fairfax	230,845	581	251.7	8	3.5	1	0.4
Rappahannock	356,095	1,268	356.1	4	1.1	6	1.7
Rappahannock/Rapidan	174,111	407	233.8	5	2.9	5	2.9
Thomas Jefferson	247,084	681	275.6	17	6.9	13	5.3
Northwest Region	1,302,405	3,755	288.3	45	3.5	28	2.1

Alexandria	153,511	673	438.4	12	7.8	0	0.0
Arlington	229,164	927	404.5	2	0.9	2	0.9
Fairfax	1,180,139	3,057	259.0	44	3.7	5	0.4
Loudoun	375,629	874	232.7	11	2.9	2	0.5
Prince William	509,211	2,138	419.9	10	2.0	3	0.6
Northern Region	2,447,654	7,669	313.3	79	3.2	12	0.5

Alleghany	179,734	475	264.3	0	0.0	4	2.2
Central Virginia	259,950	989	380.5	6	2.3	17	6.5
Cumberland Plateau	108,681	171	157.3	4	3.7	1	0.9
Lenowisco	90,525	181	199.9	1	1.1	0	0.0
Mount Rogers	191,532	397	207.3	8	4.2	0	0.0
New River	181,747	646	355.4	2	1.1	2	1.1
Pittsylvania/Danville	104,276	455	436.3	0	0.0	1	1.0
Roanoke City	99,897	938	939.0	0	0.0	2	2.0
West Piedmont	139,835	438	313.2	3	2.1	5	3.6
Southwest Region	1,356,177	4,690	345.8	24	1.8	32	2.4

Chesterfield	381,538	1,701	445.8	0	0.0	9	2.4
Chickahominy	152,912	442	289.1	3	2.0	1	0.7
Crater	156,374	1,500	959.2	5	3.2	5	3.2
Henrico	325,155	1,898	583.7	5	1.5	1	0.3
Piedmont	102,779	471	458.3	3	2.9	11	10.7
Richmond City	220,289	2,992	1,358.2	2	0.9	1	0.5
Southside	82,904	421	507.8	0	0.0	0	0.0
Central Region	1,421,951	9,425	662.8	18	1.3	28	2.0

Chesapeake	235,429	1,391	590.8	11	4.7	4	1.7
Eastern Shore	45,128	352	780.0	1	2.2	5	11.1
Hampton	136,454	1,416	1,037.7	8	5.9	0	0.0
Norfolk	246,393	3,243	1,316.2	11	4.5	0	0.0
Peninsula	350,480	2,361	673.6	27	7.7	2	0.6
Portsmouth	96,201	1,122	1,166.3	2	2.1	1	1.0
Three Rivers	140,902	467	331.4	6	4.3	1	0.7
Virginia Beach	452,745	2,737	604.5	12	2.7	0	0.0
Western Tidewater	151,074	907	600.4	0	0.0	2	1.3
Eastern Region	1,854,806	13,996	754.6	78	4.2	15	0.8

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***Escherichia coli* Infection, Shiga Toxin-Producing**		**Giardiasis**		**Gonorrhea**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	139	1.7	317	3.8	11,046	131.8
LOCALITY							
Accomack County	32,973	0	0.0	2	6.1	30	91.0
Albemarle County	105,703	4	3.8	5	4.7	35	33.1
Alleghany County	15,677	0	0.0	0	0.0	3	19.1
Amelia County	12,903	0	0.0	0	0.0	11	85.3
Amherst County	31,914	0	0.0	0	0.0	22	68.9
Appomattox County	15,414	1	6.5	1	6.5	12	77.9
Arlington County	229,164	7	3.1	24	10.5	181	79.0
Augusta County	74,314	5	6.7	5	6.7	5	6.7
Bath County	4,470	1	22.4	0	0.0	1	22.4
Bedford County	77,724	0	0.0	1	1.3	39	50.2
Bland County	6,561	0	0.0	0	0.0	0	0.0
Botetourt County	33,347	1	3.0	0	0.0	12	36.0
Brunswick County	16,698	0	0.0	0	0.0	26	155.7
Buchanan County	22,776	0	0.0	0	0.0	0	0.0
Buckingham County	17,032	0	0.0	0	0.0	6	35.2
Campbell County	55,086	0	0.0	3	5.4	34	61.7
Caroline County	29,984	0	0.0	0	0.0	23	76.7
Carroll County	29,724	0	0.0	1	3.4	4	13.5
Charles City County	7,040	0	0.0	0	0.0	11	156.3
Charlotte County	12,201	0	0.0	1	8.2	9	73.8
Chesterfield County	335,687	1	0.3	7	2.1	443	132.0
Clarke County	14,363	1	7.0	0	0.0	1	7.0
Craig County	5,211	0	0.0	0	0.0	1	19.2
Culpeper County	49,432	1	2.0	0	0.0	12	24.3
Cumberland County	9,719	0	0.0	0	0.0	15	154.3
Dickenson County	15,115	4	26.5	0	0.0	0	0.0
Dinwiddie County	27,852	0	0.0	0	0.0	39	140.0
Essex County	11,130	0	0.0	0	0.0	14	125.8
Fairfax County	1,142,234	29	2.5	64	5.6	528	46.2
Fauquier County	68,782	2	2.9	0	0.0	15	21.8
Floyd County	15,651	3	19.2	1	6.4	1	6.4
Fluvanna County	26,235	0	0.0	0	0.0	9	34.3
Franklin County	56,264	1	1.8	0	0.0	51	90.6
Frederick County	83,199	5	6.0	2	2.4	17	20.4
Giles County	16,708	1	6.0	1	6.0	3	18.0
Gloucester County	37,143	0	0.0	1	2.7	22	59.2
Goochland County	22,253	0	0.0	0	0.0	17	76.4
Grayson County	16,012	0	0.0	2	12.5	4	25.0
Greene County	19,162	1	5.2	0	0.0	4	20.9
Greensville County	11,885	0	0.0	0	0.0	15	126.2
Halifax County	35,125	0	0.0	0	0.0	57	162.3
Hanover County	103,227	0	0.0	8	7.7	73	70.7
Henrico County	325,155	3	0.9	8	2.5	698	214.7
Henry County	51,881	0	0.0	1	1.9	62	119.5
Highland County	2,214	0	0.0	1	45.2	0	0.0
Isle of Wight County	36,314	0	0.0	0	0.0	42	115.7
James City County	73,147	2	2.7	2	2.7	54	73.8

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***Escherichia coli* Infection, Shiga Toxin-Producing**		**Giardiasis**		**Gonorrhea**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	139	1.7	317	3.8	11,046	131.8
LOCALITY							
King and Queen County	7,158	0	0.0	0	0.0	0	0.0
King George County	25,515	0	0.0	2	7.8	17	66.6
King William County	16,269	0	0.0	0	0.0	9	55.3
Lancaster County	10,965	0	0.0	0	0.0	11	100.3
Lee County	24,742	2	8.1	1	4.0	0	0.0
Loudoun County	375,629	7	1.9	29	7.7	97	25.8
Louisa County	34,602	0	0.0	0	0.0	21	60.7
Lunenburg County	12,299	0	0.0	0	0.0	8	65.0
Madison County	13,134	0	0.0	1	7.6	2	15.2
Mathews County	8,862	0	0.0	0	0.0	2	22.6
Mecklenburg County	31,081	0	0.0	0	0.0	32	103.0
Middlesex County	10,606	0	0.0	1	9.4	3	28.3
Montgomery County	97,653	1	1.0	3	3.1	31	31.7
Nelson County	14,785	1	6.8	0	0.0	2	13.5
New Kent County	20,392	0	0.0	0	0.0	16	78.5
Northampton County	12,155	0	0.0	0	0.0	9	74.0
Northumberland County	12,232	0	0.0	0	0.0	6	49.1
Nottoway County	15,673	1	6.4	1	6.4	9	57.4
Orange County	35,385	2	5.7	1	2.8	10	28.3
Page County	23,726	0	0.0	0	0.0	2	8.4
Patrick County	18,045	0	0.0	1	5.5	1	5.5
Pittsylvania County	62,194	1	1.6	0	0.0	38	61.1
Powhatan County	28,031	0	0.0	0	0.0	11	39.2
Prince Edward County	22,952	0	0.0	0	0.0	31	135.1
Prince George County	37,862	0	0.0	1	2.6	64	169.0
Prince William County	451,721	8	1.8	20	4.4	318	70.4
Pulaski County	34,332	0	0.0	0	0.0	9	26.2
Rappahannock County	7,378	1	13.6	0	0.0	4	54.2
Richmond County	8,908	0	0.0	0	0.0	4	44.9
Roanoke County	94,409	2	2.1	1	1.1	80	84.7
Rockbridge County	22,354	2	8.9	0	0.0	2	8.9
Rockingham County	78,593	3	3.8	3	3.8	16	20.4
Russell County	27,891	2	7.2	1	3.6	1	3.6
Scott County	22,126	1	4.5	0	0.0	2	9.0
Shenandoah County	43,190	2	4.6	1	2.3	22	50.9
Smyth County	31,470	0	0.0	0	0.0	16	50.8
Southampton County	18,109	0	0.0	0	0.0	16	88.4
Spotsylvania County	130,475	1	0.8	4	3.1	68	52.1
Stafford County	142,003	3	2.1	10	7.0	89	62.7
Surry County	6,709	0	0.0	0	0.0	8	119.2
Sussex County	11,715	0	0.0	0	0.0	21	179.3
Tazewell County	42,899	1	2.3	2	4.7	6	14.0
Warren County	39,083	2	5.1	1	2.6	19	48.6
Washington County	54,591	3	5.5	1	1.8	13	23.8
Westmoreland County	17,629	0	0.0	1	5.7	14	79.4
Wise County	39,718	1	2.5	1	2.5	11	27.7
Wythe County	29,119	0	0.0	1	3.4	5	17.2
York County	67,837	0	0.0	2	2.9	35	51.6

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	***Escherichia coli* Infection, Shiga Toxin-Producing** REPORTED CASES	RATE PER 100,000	**Giardiasis** REPORTED CASES	RATE PER 100,000	**Gonorrhea** REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	139	1.7	317	3.8	11,046	131.8
LOCALITY							
Alexandria	153,511	2	1.3	13	8.5	195	127.0
Bristol	17,141	0	0.0	0	0.0	7	40.8
Buena Vista	6,618	0	0.0	0	0.0	2	30.2
Charlottesville	46,597	0	0.0	5	10.7	45	96.6
Chesapeake	235,429	1	0.4	5	2.1	386	164.0
Colonial Heights	17,820	1	5.6	1	5.6	34	190.8
Covington	5,658	0	0.0	0	0.0	1	17.7
Danville	42,082	0	0.0	3	7.1	142	337.4
Emporia	5,496	0	0.0	0	0.0	19	345.7
Fairfax City	24,013	1	4.2	0	0.0	8	33.3
Falls Church	13,892	0	0.0	0	0.0	13	93.6
Franklin City	8,490	0	0.0	0	0.0	17	200.2
Fredericksburg	28,118	1	3.6	2	7.1	40	142.3
Galax	6,914	0	0.0	0	0.0	4	57.9
Hampton	136,454	1	0.7	1	0.7	489	358.4
Harrisonburg	52,538	0	0.0	2	3.8	24	45.7
Hopewell	22,378	0	0.0	0	0.0	109	487.1
Lexington	7,262	0	0.0	0	0.0	1	13.8
Lynchburg	79,812	0	0.0	1	1.3	154	193.0
Manassas	41,764	4	9.6	0	0.0	22	52.7
Manassas Park	15,726	0	0.0	1	6.4	2	12.7
Martinsville	13,645	0	0.0	0	0.0	48	351.8
Newport News	182,385	0	0.0	5	2.7	722	395.9
Norfolk	246,393	2	0.8	8	3.2	1049	425.7
Norton	3,939	0	0.0	0	0.0	0	0.0
Petersburg	32,477	0	0.0	0	0.0	237	729.7
Poquoson	12,059	0	0.0	0	0.0	1	8.3
Portsmouth	96,201	0	0.0	2	2.1	498	517.7
Radford	17,403	0	0.0	0	0.0	21	120.7
Richmond City	220,289	1	0.5	5	2.3	1383	627.8
Roanoke City	99,897	1	1.0	3	3.0	456	456.5
Salem	25,432	0	0.0	0	0.0	23	90.4
Staunton	24,416	1	4.1	0	0.0	9	36.9
Suffolk	88,161	1	1.1	1	1.1	233	264.3
Virginia Beach	452,745	0	0.0	24	5.3	735	162.3
Waynesboro	21,491	0	0.0	2	9.3	11	51.2
Williamsburg	15,052	0	0.0	1	6.6	20	132.9
Winchester	27,284	2	7.3	1	3.7	14	51.3

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***Escherichia coli* Infection, Shiga Toxin-Producing**		**Giardiasis**		**Gonorrhea**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	139	1.7	317	3.8	11,046	131.8
DISTRICT/REGION							

Central Shenandoah	294,270	12	4.1	13	4.4	71	24.1
Lord Fairfax	230,845	12	5.2	5	2.2	75	32.5
Rappahannock	356,095	5	1.4	18	5.1	237	66.6
Rappahannock/Rapidan	174,111	6	3.4	2	1.1	43	24.7
Thomas Jefferson	247,084	6	2.4	10	4.0	116	46.9
Northwest Region	1,302,405	41	3.1	48	3.7	542	41.6

Alexandria	153,511	2	1.3	13	8.5	195	127.0
Arlington	229,164	7	3.1	24	10.5	181	79.0
Fairfax	1,180,139	30	2.5	64	5.4	549	46.5
Loudoun	375,629	7	1.9	29	7.7	97	25.8
Prince William	509,211	12	2.4	21	4.1	342	67.2
Northern Region	2,447,654	58	2.4	151	6.2	1364	55.7

Alleghany	179,734	3	1.7	1	0.6	120	66.8
Central Virginia	259,950	1	0.4	6	2.3	261	100.4
Cumberland Plateau	108,681	7	6.4	3	2.8	7	6.4
Lenowisco	90,525	4	4.4	2	2.2	13	14.4
Mount Rogers	191,532	3	1.6	5	2.6	53	27.7
New River	181,747	5	2.8	5	2.8	65	35.8
Pittsylvania/Danville	104,276	1	1.0	3	2.9	180	172.6
Roanoke City	99,897	1	1.0	3	3.0	456	456.5
West Piedmont	139,835	1	0.7	2	1.4	162	115.9
Southwest Region	1,356,177	26	1.9	30	2.2	1,317	97.1

Chesterfield	381,538	2	0.5	8	2.1	488	127.9
Chickahominy	152,912	0	0.0	8	5.2	117	76.5
Crater	156,374	0	0.0	1	0.6	512	327.4
Henrico	325,155	3	0.9	8	2.5	698	214.7
Piedmont	102,779	1	1.0	2	1.9	89	86.6
Richmond City	220,289	1	0.5	5	2.3	1,383	627.8
Southside	82,904	0	0.0	0	0.0	115	138.7
Central Region	1,421,951	7	0.5	32	2.3	3,402	239.2

Chesapeake	235,429	1	0.4	5	2.1	386	164.0
Eastern Shore	45,128	0	0.0	2	4.4	39	86.4
Hampton	136,454	1	0.7	1	0.7	489	358.4
Norfolk	246,393	2	0.8	8	3.2	1049	425.7
Peninsula	350,480	2	0.6	10	2.9	832	237.4
Portsmouth	96,201	0	0.0	2	2.1	498	517.7
Three Rivers	140,902	0	0.0	3	2.1	85	60.3
Virginia Beach	452,745	0	0.0	24	5.3	735	162.3
Western Tidewater	151,074	1	0.7	1	0.7	308	203.9
Eastern Region	1,854,806	7	0.4	56	3.0	4,421	238.4

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	***H. influenzae* Infection, Invasive** REPORTED CASES	RATE PER 100,000	**Hepatitis A** REPORTED CASES	RATE PER 100,000	**Hepatitis B, Acute** REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	142	1.7	190	2.3	56	0.7
LOCALITY							
Accomack County	32,973	1	3.0	0	0.0	0	0.0
Albemarle County	105,703	0	0.0	3	2.8	0	0.0
Alleghany County	15,677	0	0.0	0	0.0	0	0.0
Amelia County	12,903	0	0.0	0	0.0	1	7.8
Amherst County	31,914	1	3.1	0	0.0	0	0.0
Appomattox County	15,414	0	0.0	0	0.0	0	0.0
Arlington County	229,164	1	0.4	1	0.4	0	0.0
Augusta County	74,314	1	1.3	12	16.1	0	0.0
Bath County	4,470	0	0.0	1	22.4	0	0.0
Bedford County	77,724	2	2.6	1	1.3	1	1.3
Bland County	6,561	0	0.0	0	0.0	0	0.0
Botetourt County	33,347	0	0.0	0	0.0	0	0.0
Brunswick County	16,698	1	6.0	0	0.0	0	0.0
Buchanan County	22,776	0	0.0	0	0.0	1	4.4
Buckingham County	17,032	1	5.9	0	0.0	0	0.0
Campbell County	55,086	0	0.0	0	0.0	0	0.0
Caroline County	29,984	2	6.7	1	3.3	0	0.0
Carroll County	29,724	0	0.0	0	0.0	0	0.0
Charles City County	7,040	0	0.0	0	0.0	0	0.0
Charlotte County	12,201	0	0.0	0	0.0	0	0.0
Chesterfield County	335,687	6	1.8	8	2.4	1	0.3
Clarke County	14,363	0	0.0	0	0.0	0	0.0
Craig County	5,211	0	0.0	0	0.0	0	0.0
Culpeper County	49,432	1	2.0	1	2.0	1	2.0
Cumberland County	9,719	0	0.0	0	0.0	0	0.0
Dickenson County	15,115	0	0.0	0	0.0	1	6.6
Dinwiddie County	27,852	0	0.0	0	0.0	0	0.0
Essex County	11,130	0	0.0	0	0.0	0	0.0
Fairfax County	1,142,234	12	1.1	26	2.3	1	0.1
Fauquier County	68,782	0	0.0	7	10.2	0	0.0
Floyd County	15,651	0	0.0	0	0.0	0	0.0
Fluvanna County	26,235	0	0.0	0	0.0	0	0.0
Franklin County	56,264	3	5.3	1	1.8	0	0.0
Frederick County	83,199	1	1.2	0	0.0	1	1.2
Giles County	16,708	1	6.0	1	6.0	1	6.0
Gloucester County	37,143	0	0.0	0	0.0	0	0.0
Goochland County	22,253	1	4.5	0	0.0	0	0.0
Grayson County	16,012	1	6.2	0	0.0	0	0.0
Greene County	19,162	1	5.2	0	0.0	0	0.0
Greensville County	11,885	0	0.0	0	0.0	1	8.4
Halifax County	35,125	0	0.0	0	0.0	0	0.0
Hanover County	103,227	1	1.0	2	1.9	0	0.0
Henrico County	325,155	7	2.2	4	1.2	4	1.2
Henry County	51,881	0	0.0	0	0.0	1	1.9
Highland County	2,214	0	0.0	0	0.0	0	0.0
Isle of Wight County	36,314	1	2.8	1	2.8	0	0.0
James City County	73,147	0	0.0	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	***H. influenzae* Infection, Invasive** REPORTED CASES	***H. influenzae* Infection, Invasive** RATE PER 100,000	**Hepatitis A** REPORTED CASES	**Hepatitis A** RATE PER 100,000	**Hepatitis B, Acute** REPORTED CASES	**Hepatitis B, Acute** RATE PER 100,000
VIRGINIA TOTAL	8,382,993	142	1.7	190	2.3	56	0.7
LOCALITY							
King and Queen County	7,158	0	0.0	0	0.0	0	0.0
King George County	25,515	0	0.0	1	3.9	0	0.0
King William County	16,269	0	0.0	0	0.0	0	0.0
Lancaster County	10,965	0	0.0	0	0.0	0	0.0
Lee County	24,742	1	4.0	0	0.0	2	8.1
Loudoun County	375,629	4	1.1	22	5.9	0	0.0
Louisa County	34,602	2	5.8	0	0.0	0	0.0
Lunenburg County	12,299	0	0.0	0	0.0	0	0.0
Madison County	13,134	0	0.0	0	0.0	0	0.0
Mathews County	8,862	0	0.0	0	0.0	0	0.0
Mecklenburg County	31,081	1	3.2	0	0.0	0	0.0
Middlesex County	10,606	0	0.0	0	0.0	0	0.0
Montgomery County	97,653	3	3.1	2	2.0	1	1.0
Nelson County	14,785	0	0.0	1	6.8	0	0.0
New Kent County	20,392	1	4.9	1	4.9	0	0.0
Northampton County	12,155	0	0.0	0	0.0	0	0.0
Northumberland County	12,232	0	0.0	0	0.0	0	0.0
Nottoway County	15,673	0	0.0	0	0.0	1	6.4
Orange County	35,385	2	5.7	1	2.8	0	0.0
Page County	23,726	0	0.0	6	25.3	0	0.0
Patrick County	18,045	0	0.0	0	0.0	0	0.0
Pittsylvania County	62,194	1	1.6	0	0.0	0	0.0
Powhatan County	28,031	1	3.6	0	0.0	1	3.6
Prince Edward County	22,952	0	0.0	0	0.0	1	4.4
Prince George County	37,862	0	0.0	0	0.0	0	0.0
Prince William County	451,721	5	1.1	26	5.8	0	0.0
Pulaski County	34,332	1	2.9	1	2.9	0	0.0
Rappahannock County	7,378	0	0.0	0	0.0	0	0.0
Richmond County	8,908	0	0.0	0	0.0	0	0.0
Roanoke County	94,409	1	1.1	0	0.0	0	0.0
Rockbridge County	22,354	1	4.5	3	13.4	0	0.0
Rockingham County	78,593	3	3.8	2	2.5	1	1.3
Russell County	27,891	0	0.0	1	3.6	3	10.8
Scott County	22,126	0	0.0	0	0.0	2	9.0
Shenandoah County	43,190	2	4.6	0	0.0	0	0.0
Smyth County	31,470	1	3.2	0	0.0	0	0.0
Southampton County	18,109	0	0.0	0	0.0	0	0.0
Spotsylvania County	130,475	3	2.3	6	4.6	0	0.0
Stafford County	142,003	4	2.8	2	1.4	0	0.0
Surry County	6,709	0	0.0	0	0.0	1	14.9
Sussex County	11,715	0	0.0	0	0.0	0	0.0
Tazewell County	42,899	3	7.0	1	2.3	1	2.3
Warren County	39,083	2	5.1	1	2.6	1	2.6
Washington County	54,591	2	3.7	0	0.0	0	0.0
Westmoreland County	17,629	1	5.7	0	0.0	0	0.0
Wise County	39,718	0	0.0	1	2.5	3	7.6
Wythe County	29,119	0	0.0	0	0.0	2	6.9
York County	67,837	0	0.0	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		***H. influenzae* Infection, Invasive**		**Hepatitis A**		**Hepatitis B, Acute**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	142	1.7	190	2.3	56	0.7
LOCALITY							
Alexandria	153,511	3	2.0	0	0.0	2	1.3
Bristol	17,141	1	5.8	0	0.0	0	0.0
Buena Vista	6,618	0	0.0	0	0.0	0	0.0
Charlottesville	46,597	1	2.1	1	2.1	0	0.0
Chesapeake	235,429	3	1.3	1	0.4	2	0.8
Colonial Heights	17,820	0	0.0	0	0.0	0	0.0
Covington	5,658	1	17.7	0	0.0	0	0.0
Danville	42,082	1	2.4	0	0.0	1	2.4
Emporia	5,496	2	36.4	0	0.0	0	0.0
Fairfax City	24,013	1	4.2	1	4.2	0	0.0
Falls Church	13,892	0	0.0	0	0.0	0	0.0
Franklin City	8,490	0	0.0	0	0.0	0	0.0
Fredericksburg	28,118	0	0.0	1	3.6	0	0.0
Galax	6,914	0	0.0	0	0.0	0	0.0
Hampton	136,454	5	3.7	3	2.2	2	1.5
Harrisonburg	52,538	0	0.0	1	1.9	0	0.0
Hopewell	22,378	1	4.5	0	0.0	0	0.0
Lexington	7,262	1	13.8	0	0.0	0	0.0
Lynchburg	79,812	4	5.0	1	1.3	0	0.0
Manassas	41,764	0	0.0	0	0.0	0	0.0
Manassas Park	15,726	0	0.0	0	0.0	0	0.0
Martinsville	13,645	0	0.0	0	0.0	0	0.0
Newport News	182,385	1	0.5	4	2.2	0	0.0
Norfolk	246,393	8	3.2	5	2.0	3	1.2
Norton	3,939	0	0.0	0	0.0	0	0.0
Petersburg	32,477	0	0.0	0	0.0	1	3.1
Poquoson	12,059	0	0.0	0	0.0	0	0.0
Portsmouth	96,201	1	1.0	1	1.0	0	0.0
Radford	17,403	1	5.7	0	0.0	0	0.0
Richmond City	220,289	8	3.6	2	0.9	7	3.2
Roanoke City	99,897	0	0.0	2	2.0	1	1.0
Salem	25,432	0	0.0	0	0.0	0	0.0
Staunton	24,416	0	0.0	6	24.6	0	0.0
Suffolk	88,161	1	1.1	0	0.0	0	0.0
Virginia Beach	452,745	5	1.1	11	2.4	2	0.4
Waynesboro	21,491	0	0.0	1	4.7	0	0.0
Williamsburg	15,052	1	6.6	1	6.6	0	0.0
Winchester	27,284	1	3.7	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	***H. influenzae* Infection, Invasive** REPORTED CASES	***H. influenzae* Infection, Invasive** RATE PER 100,000	**Hepatitis A** REPORTED CASES	**Hepatitis A** RATE PER 100,000	**Hepatitis B, Acute** REPORTED CASES	**Hepatitis B, Acute** RATE PER 100,000
VIRGINIA TOTAL	8,382,993	142	1.7	190	2.3	56	0.7
DISTRICT/REGION							

Central Shenandoah	294,270	6	2.0	26	8.8	1	0.3
Lord Fairfax	230,845	6	2.6	7	3.0	2	0.9
Rappahannock	356,095	9	2.5	11	3.1	0	0.0
Rappahannock/Rapidan	174,111	3	1.7	9	5.2	1	0.6
Thomas Jefferson	247,084	4	1.6	5	2.0	0	0.0
Northwest Region	1,302,405	28	2.1	58	4.5	4	0.3

Alexandria	153,511	3	2.0	0	0.0	2	1.3
Arlington	229,164	1	0.4	1	0.4	0	0.0
Fairfax	1,180,139	13	1.1	27	2.3	1	0.1
Loudoun	375,629	4	1.1	22	5.9	0	0.0
Prince William	509,211	5	1.0	26	5.1	0	0.0
Northern Region	2,447,654	26	1.1	76	3.1	3	0.1

Alleghany	179,734	2	1.1	0	0.0	0	0.0
Central Virginia	259,950	7	2.7	2	0.8	1	0.4
Cumberland Plateau	108,681	3	2.8	2	1.8	6	5.5
Lenowisco	90,525	1	1.1	1	1.1	7	7.7
Mount Rogers	191,532	5	2.6	0	0.0	2	1.0
New River	181,747	6	3.3	4	2.2	2	1.1
Pittsylvania/Danville	104,276	2	1.9	0	0.0	1	1.0
Roanoke City	99,897	0	0.0	2	2.0	1	1.0
West Piedmont	139,835	3	2.1	1	0.7	1	0.7
Southwest Region	1,356,177	29	2.1	12	0.9	21	1.5

Chesterfield	381,538	7	1.8	8	2.1	2	0.5
Chickahominy	152,912	3	2.0	3	2.0	0	0.0
Crater	156,374	3	1.9	0	0.0	3	1.9
Henrico	325,155	7	2.2	4	1.2	4	1.2
Piedmont	102,779	1	1.0	0	0.0	3	2.9
Richmond City	220,289	8	3.6	2	0.9	7	3.2
Southside	82,904	2	2.4	0	0.0	0	0.0
Central Region	1,421,951	31	2.2	17	1.2	19	1.3

Chesapeake	235,429	3	1.3	1	0.4	2	0.8
Eastern Shore	45,128	1	2.2	0	0.0	0	0.0
Hampton	136,454	5	3.7	3	2.2	2	1.5
Norfolk	246,393	8	3.2	5	2.0	3	1.2
Peninsula	350,480	2	0.6	5	1.4	0	0.0
Portsmouth	96,201	1	1.0	1	1.0	0	0.0
Three Rivers	140,902	1	0.7	0	0.0	0	0.0
Virginia Beach	452,745	5	1.1	11	2.4	2	0.4
Western Tidewater	151,074	2	1.3	1	0.7	0	0.0
Eastern Region	1,854,806	28	1.5	27	1.5	9	0.5

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Hepatitis C, Acute: REPORTED CASES	Hepatitis C, Acute: RATE PER 100,000	HIV Disease*: REPORTED CASES	HIV Disease*: RATE PER 100,000	Lead-Elevated Blood Levels in Children Age 0-15 years**: REPORTED CASES	Lead-Elevated Blood Levels in Children Age 0-15 years**: RATE PER 100,000
VIRGINIA TOTAL	8,382,993	73	0.9	918	11.0	955	57.5
LOCALITY							
Accomack County	32,973	0	0.0	2	6.1	23	375.5
Albemarle County	105,703	3	2.8	3	2.8	8	41.6
Alleghany County	15,677	0	0.0	1	6.4	0	0.0
Amelia County	12,903	0	0.0	1	7.8	0	0.0
Amherst County	31,914	0	0.0	2	6.3	0	0.0
Appomattox County	15,414	0	0.0	0	0.0	1	33.9
Arlington County	229,164	0	0.0	36	15.7	15	40.8
Augusta County	74,314	0	0.0	3	4.0	6	47.3
Bath County	4,470	0	0.0	0	0.0	0	0.0
Bedford County	77,724	0	0.0	2	2.6	1	7.2
Bland County	6,561	0	0.0	0	0.0	1	107.5
Botetourt County	33,347	0	0.0	1	3.0	1	17.7
Brunswick County	16,698	0	0.0	2	12.0	1	40.2
Buchanan County	22,776	1	4.4	0	0.0	1	28.3
Buckingham County	17,032	0	0.0	4	23.5	1	35.4
Campbell County	55,086	0	0.0	1	1.8	7	73.0
Caroline County	29,984	2	6.7	1	3.3	1	15.6
Carroll County	29,724	0	0.0	0	0.0	0	0.0
Charles City County	7,040	0	0.0	1	14.2	0	0.0
Charlotte County	12,201	0	0.0	1	8.2	4	178.8
Chesterfield County	335,687	3	0.9	46	13.7	15	21.0
Clarke County	14,363	2	13.9	2	13.9	1	37.7
Craig County	5,211	0	0.0	0	0.0	0	0.0
Culpeper County	49,432	0	0.0	4	8.1	8	72.3
Cumberland County	9,719	1	10.3	1	10.3	0	0.0
Dickenson County	15,115	0	0.0	1	6.6	1	36.7
Dinwiddie County	27,852	1	3.6	2	7.2	1	20.4
Essex County	11,130	0	0.0	2	18.0	0	0.0
Fairfax County	1,142,234	0	0.0	109	9.5	113	46.8
Fauquier County	68,782	0	0.0	6	8.7	3	21.1
Floyd County	15,651	0	0.0	1	6.4	2	70.6
Fluvanna County	26,235	0	0.0	0	0.0	0	0.0
Franklin County	56,264	1	1.8	1	1.8	2	20.9
Frederick County	83,199	1	1.2	2	2.4	1	5.8
Giles County	16,708	1	6.0	0	0.0	1	33.7
Gloucester County	37,143	0	0.0	0	0.0	2	30.2
Goochland County	22,253	0	0.0	1	4.5	0	0.0
Grayson County	16,012	0	0.0	0	0.0	3	122.9
Greene County	19,162	0	0.0	0	0.0	1	24.4
Greensville County	11,885	0	0.0	1	8.4	0	0.0
Halifax County	35,125	0	0.0	7	19.9	6	93.9
Hanover County	103,227	0	0.0	7	6.8	7	35.1
Henrico County	325,155	3	0.9	44	13.5	87	129.8
Henry County	51,881	1	1.9	1	1.9	3	32.9
Highland County	2,214	0	0.0	0	0.0	0	0.0
Isle of Wight County	36,314	0	0.0	1	2.8	2	30.1
James City County	73,147	0	0.0	6	8.2	2	15.4

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Hepatitis C, Acute: REPORTED CASES	Hepatitis C, Acute: RATE PER 100,000	HIV Disease*: REPORTED CASES	HIV Disease*: RATE PER 100,000	Lead-Elevated Blood Levels in Children Age 0-15 years**: REPORTED CASES	Lead-Elevated Blood Levels in Children Age 0-15 years**: RATE PER 100,000
VIRGINIA TOTAL	8,382,993	73	0.9	918	11.0	955	57.5
LOCALITY							
King and Queen County	7,158	0	0.0	1	14.0	0	0.0
King George County	25,515	0	0.0	2	7.8	3	51.6
King William County	16,269	0	0.0	0	0.0	1	29.4
Lancaster County	10,965	0	0.0	0	0.0	0	0.0
Lee County	24,742	2	8.1	0	0.0	3	73.0
Loudoun County	375,629	4	1.1	19	5.1	29	29.5
Louisa County	34,602	0	0.0	0	0.0	4	62.2
Lunenburg County	12,299	0	0.0	2	16.3	0	0.0
Madison County	13,134	0	0.0	0	0.0	2	83.1
Mathews County	8,862	0	0.0	0	0.0	0	0.0
Mecklenburg County	31,081	0	0.0	1	3.2	6	117.3
Middlesex County	10,606	0	0.0	0	0.0	1	68.8
Montgomery County	97,653	1	1.0	4	4.1	2	14.4
Nelson County	14,785	0	0.0	1	6.8	2	82.3
New Kent County	20,392	0	0.0	1	4.9	0	0.0
Northampton County	12,155	0	0.0	0	0.0	12	548.7
Northumberland County	12,232	0	0.0	0	0.0	0	0.0
Nottoway County	15,673	0	0.0	6	38.3	10	360.8
Orange County	35,385	1	2.8	3	8.5	4	58.8
Page County	23,726	0	0.0	1	4.2	1	23.6
Patrick County	18,045	1	5.5	0	0.0	3	107.5
Pittsylvania County	62,194	0	0.0	4	6.4	5	46.5
Powhatan County	28,031	0	0.0	4	14.3	1	22.0
Prince Edward County	22,952	0	0.0	2	8.7	6	183.7
Prince George County	37,862	0	0.0	2	5.3	2	28.1
Prince William County	451,721	0	0.0	43	9.5	87	77.3
Pulaski County	34,332	5	14.6	1	2.9	1	18.2
Rappahannock County	7,378	0	0.0	0	0.0	2	180.7
Richmond County	8,908	0	0.0	5	56.1	0	0.0
Roanoke County	94,409	1	1.1	3	3.2	1	5.9
Rockbridge County	22,354	0	0.0	0	0.0	2	58.9
Rockingham County	78,593	0	0.0	5	6.4	8	52.1
Russell County	27,891	1	3.6	0	0.0	0	0.0
Scott County	22,126	1	4.5	1	4.5	1	27.5
Shenandoah County	43,190	0	0.0	1	2.3	6	73.9
Smyth County	31,470	0	0.0	2	6.4	2	36.4
Southampton County	18,109	0	0.0	3	16.6	0	0.0
Spotsylvania County	130,475	4	3.1	6	4.6	1	3.5
Stafford County	142,003	10	7.0	13	9.2	22	66.9
Surry County	6,709	0	0.0	1	14.9	1	92.3
Sussex County	11,715	0	0.0	2	17.1	1	59.6
Tazewell County	42,899	1	2.3	0	0.0	5	68.4
Warren County	39,083	3	7.7	2	5.1	0	0.0
Washington County	54,591	1	1.8	2	3.7	3	32.8
Westmoreland County	17,629	0	0.0	3	17.0	0	0.0
Wise County	39,718	0	0.0	0	0.0	0	0.0
Wythe County	29,119	0	0.0	4	13.7	2	38.7
York County	67,837	0	0.0	3	4.4	1	6.9

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Hepatitis C, Acute: REPORTED CASES	Hepatitis C, Acute: RATE PER 100,000	HIV Disease*: REPORTED CASES	HIV Disease*: RATE PER 100,000	Lead-Elevated Blood Levels in Children Age 0-15 years**: REPORTED CASES	Lead-Elevated Blood Levels in Children Age 0-15 years**: RATE PER 100,000
VIRGINIA TOTAL	8,382,993	73	0.9	918	11.0	955	57.5
LOCALITY							
Alexandria	153,511	0	0.0	39	25.4	75	295.6
Bristol	17,141	0	0.0	1	5.8	2	67.5
Buena Vista	6,618	0	0.0	0	0.0	1	80.7
Charlottesville	46,597	0	0.0	2	4.3	10	149.5
Chesapeake	235,429	1	0.4	33	14.0	3	6.0
Colonial Heights	17,820	0	0.0	1	5.6	1	27.2
Covington	5,658	0	0.0	0	0.0	1	93.6
Danville	42,082	0	0.0	8	19.0	21	253.1
Emporia	5,496	0	0.0	0	0.0	0	0.0
Fairfax City	24,013	0	0.0	1	4.2	1	20.9
Falls Church	13,892	0	0.0	1	7.2	0	0.0
Franklin City	8,490	0	0.0	1	11.8	1	50.6
Fredericksburg	28,118	1	3.6	3	10.7	14	263.4
Galax	6,914	0	0.0	1	14.5	0	0.0
Hampton	136,454	0	0.0	49	35.9	11	41.9
Harrisonburg	52,538	1	1.9	1	1.9	4	52.0
Hopewell	22,378	0	0.0	5	22.3	4	77.9
Lexington	7,262	0	0.0	0	0.0	0	0.0
Lynchburg	79,812	0	0.0	8	10.0	15	107.7
Manassas	41,764	1	2.4	2	4.8	6	59.4
Manassas Park	15,726	0	0.0	1	6.4	3	82.6
Martinsville	13,645	1	7.3	1	7.3	0	0.0
Newport News	182,385	0	0.0	31	17.0	36	93.9
Norfolk	246,393	3	1.2	78	31.7	21	46.6
Norton	3,939	2	50.8	0	0.0	1	129.9
Petersburg	32,477	0	0.0	11	33.9	9	139.6
Poquoson	12,059	0	0.0	0	0.0	0	0.0
Portsmouth	96,201	0	0.0	25	26.0	11	53.4
Radford	17,403	2	11.5	1	5.7	0	0.0
Richmond City	220,289	3	1.4	61	27.7	58	159.4
Roanoke City	99,897	0	0.0	6	6.0	40	198.8
Salem	25,432	0	0.0	1	3.9	7	162.5
Staunton	24,416	0	0.0	2	8.2	2	49.5
Suffolk	88,161	0	0.0	14	15.9	8	41.2
Virginia Beach	452,745	0	0.0	67	14.8	8	8.8
Waynesboro	21,491	1	4.7	1	4.7	4	88.3
Williamsburg	15,052	0	0.0	1	6.6	2	139.0
Winchester	27,284	1	3.7	2	7.3	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Hepatitis C, Acute REPORTED CASES	Hepatitis C, Acute RATE PER 100,000	HIV Disease* REPORTED CASES	HIV Disease* RATE PER 100,000	Lead-Elevated Blood Levels in Children Age 0-15 years** REPORTED CASES	Lead-Elevated Blood Levels in Children Age 0-15 years** RATE PER 100,000
VIRGINIA TOTAL	8,382,993	73	0.9	918	11.0	955	57.5
DISTRICT/REGION							

Central Shenandoah	294,270	2	0.7	12	4.1	27	53.5
Lord Fairfax	230,845	7	3.0	10	4.3	9	19.8
Rappahannock	356,095	17	4.8	25	7.0	41	51.7
Rappahannock/Rapidan	174,111	1	0.6	13	7.5	19	53.3
Thomas Jefferson	247,084	3	1.2	6	2.4	25	57.2
Northwest Region	1,302,405	30	2.3	66	5.1	121	47.5

Alexandria	153,511	0	0.0	39	25.4	75	295.6
Arlington	229,164	0	0.0	36	15.7	15	40.8
Fairfax	1,180,139	0	0.0	111	9.4	114	45.7
Loudoun	375,629	4	1.1	19	5.1	29	29.5
Prince William	509,211	1	0.2	46	9.0	96	76.0
Northern Region	2,447,654	5	0.2	251	10.3	329	61.4

Alleghany	179,734	1	0.6	6	3.3	10	31.8
Central Virginia	259,950	0	0.0	13	5.0	24	52.4
Cumberland Plateau	108,681	3	2.8	1	0.9	7	38.0
Lenowisco	90,525	5	5.5	1	1.1	5	32.2
Mount Rogers	191,532	1	0.5	10	5.2	13	40.0
New River	181,747	9	5.0	7	3.9	6	22.1
Pittsylvania/Danville	104,276	0	0.0	12	11.5	26	136.5
Roanoke City	99,897	0	0.0	6	6.0	40	198.8
West Piedmont	139,835	4	2.9	3	2.1	8	32.9
Southwest Region	1,356,177	23	1.7	59	4.4	139	59.3

Chesterfield	381,538	3	0.8	51	13.4	17	21.4
Chickahominy	152,912	0	0.0	10	6.5	7	24.9
Crater	156,374	1	0.6	24	15.3	18	61.4
Henrico	325,155	3	0.9	44	13.5	87	129.8
Piedmont	102,779	1	1.0	17	16.5	21	121.5
Richmond City	220,289	3	1.4	61	27.7	58	159.4
Southside	82,904	0	0.0	10	12.1	13	92.9
Central Region	1,421,951	11	0.8	217	15.3	221	81.4

Chesapeake	235,429	1	0.4	33	14.0	3	6.0
Eastern Shore	45,128	0	0.0	2	4.4	35	421.1
Hampton	136,454	0	0.0	49	35.9	11	41.9
Norfolk	246,393	3	1.2	78	31.7	21	46.6
Peninsula	350,480	0	0.0	41	11.7	41	59.1
Portsmouth	96,201	0	0.0	25	26.0	11	53.4
Three Rivers	140,902	0	0.0	11	7.8	4	17.3
Virginia Beach	452,745	0	0.0	67	14.8	8	8.8
Western Tidewater	151,074	0	0.0	19	12.6	11	35.4
Eastern Region	1,854,806	4	0.2	325	17.5	145	39.7

---

* Beginning in 2009, HIV infection and AIDS data, formerly presented separately, are presented together as HIV disease. This category encompasses persons newly reported to VDH with HIV infection regardless of disease progression, including those with an AIDS-defining condition at first report.

** Rates are based on population figures for ages 0-15 years only

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Legionellosis REPORTED CASES	Legionellosis RATE PER 100,000	Listeriosis REPORTED CASES	Listeriosis RATE PER 100,000	Lyme Disease REPORTED CASES	Lyme Disease RATE PER 100,000
VIRGINIA TOTAL	8,382,993	144	1.7	23	0.3	1,350	16.1
LOCALITY							
Accomack County	32,973	0	0.0	0	0.0	5	15.2
Albemarle County	105,703	3	2.8	0	0.0	26	24.6
Alleghany County	15,677	2	12.8	0	0.0	0	0.0
Amelia County	12,903	2	15.5	1	7.8	2	15.5
Amherst County	31,914	0	0.0	0	0.0	4	12.5
Appomattox County	15,414	0	0.0	0	0.0	0	0.0
Arlington County	229,164	3	1.3	3	1.3	5	2.2
Augusta County	74,314	3	4.0	1	1.3	15	20.2
Bath County	4,470	0	0.0	0	0.0	0	0.0
Bedford County	77,724	0	0.0	0	0.0	14	18.0
Bland County	6,561	1	15.2	1	15.2	2	30.5
Botetourt County	33,347	0	0.0	0	0.0	6	18.0
Brunswick County	16,698	1	6.0	0	0.0	0	0.0
Buchanan County	22,776	0	0.0	0	0.0	0	0.0
Buckingham County	17,032	2	11.7	0	0.0	1	5.9
Campbell County	55,086	0	0.0	0	0.0	3	5.4
Caroline County	29,984	0	0.0	0	0.0	6	20.0
Carroll County	29,724	2	6.7	0	0.0	39	131.2
Charles City County	7,040	0	0.0	0	0.0	0	0.0
Charlotte County	12,201	0	0.0	1	8.2	0	0.0
Chesterfield County	335,687	6	1.8	1	0.3	24	7.1
Clarke County	14,363	0	0.0	0	0.0	14	97.5
Craig County	5,211	0	0.0	0	0.0	0	0.0
Culpeper County	49,432	0	0.0	0	0.0	7	14.2
Cumberland County	9,719	0	0.0	0	0.0	1	10.3
Dickenson County	15,115	1	6.6	0	0.0	0	0.0
Dinwiddie County	27,852	2	7.2	0	0.0	2	7.2
Essex County	11,130	0	0.0	0	0.0	0	0.0
Fairfax County	1,142,234	9	0.8	1	0.1	213	18.6
Fauquier County	68,782	0	0.0	0	0.0	22	32.0
Floyd County	15,651	0	0.0	0	0.0	73	466.4
Fluvanna County	26,235	1	3.8	0	0.0	11	41.9
Franklin County	56,264	0	0.0	0	0.0	1	1.8
Frederick County	83,199	0	0.0	1	1.2	41	49.3
Giles County	16,708	0	0.0	1	6.0	21	125.7
Gloucester County	37,143	1	2.7	0	0.0	2	5.4
Goochland County	22,253	0	0.0	0	0.0	0	0.0
Grayson County	16,012	0	0.0	0	0.0	14	87.4
Greene County	19,162	0	0.0	0	0.0	9	47.0
Greensville County	11,885	0	0.0	1	8.4	0	0.0
Halifax County	35,125	0	0.0	0	0.0	0	0.0
Hanover County	103,227	1	1.0	1	1.0	4	3.9
Henrico County	325,155	12	3.7	1	0.3	9	2.8
Henry County	51,881	0	0.0	0	0.0	3	5.8
Highland County	2,214	0	0.0	0	0.0	0	0.0
Isle of Wight County	36,314	1	2.8	0	0.0	0	0.0
James City County	73,147	1	1.4	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Legionellosis REPORTED CASES	Legionellosis RATE PER 100,000	Listeriosis REPORTED CASES	Listeriosis RATE PER 100,000	Lyme Disease REPORTED CASES	Lyme Disease RATE PER 100,000
VIRGINIA TOTAL	8,382,993	144	1.7	23	0.3	1,350	16.1
LOCALITY							
King and Queen County	7,158	0	0.0	0	0.0	0	0.0
King George County	25,515	1	3.9	0	0.0	5	19.6
King William County	16,269	0	0.0	0	0.0	0	0.0
Lancaster County	10,965	0	0.0	0	0.0	0	0.0
Lee County	24,742	0	0.0	0	0.0	0	0.0
Loudoun County	375,629	1	0.3	1	0.3	179	47.7
Louisa County	34,602	2	5.8	0	0.0	6	17.3
Lunenburg County	12,299	1	8.1	0	0.0	0	0.0
Madison County	13,134	0	0.0	0	0.0	9	68.5
Mathews County	8,862	0	0.0	0	0.0	0	0.0
Mecklenburg County	31,081	0	0.0	0	0.0	0	0.0
Middlesex County	10,606	0	0.0	0	0.0	1	9.4
Montgomery County	97,653	2	2.0	0	0.0	98	100.4
Nelson County	14,785	0	0.0	0	0.0	4	27.1
New Kent County	20,392	0	0.0	0	0.0	0	0.0
Northampton County	12,155	0	0.0	0	0.0	2	16.5
Northumberland County	12,232	0	0.0	0	0.0	2	16.4
Nottoway County	15,673	3	19.1	0	0.0	3	19.1
Orange County	35,385	0	0.0	0	0.0	7	19.8
Page County	23,726	0	0.0	0	0.0	8	33.7
Patrick County	18,045	0	0.0	0	0.0	0	0.0
Pittsylvania County	62,194	3	4.8	0	0.0	0	0.0
Powhatan County	28,031	0	0.0	0	0.0	0	0.0
Prince Edward County	22,952	0	0.0	0	0.0	3	13.1
Prince George County	37,862	3	7.9	0	0.0	0	0.0
Prince William County	451,721	8	1.8	1	0.2	55	12.2
Pulaski County	34,332	0	0.0	0	0.0	67	195.2
Rappahannock County	7,378	0	0.0	0	0.0	4	54.2
Richmond County	8,908	0	0.0	0	0.0	1	11.2
Roanoke County	94,409	0	0.0	1	1.1	29	30.7
Rockbridge County	22,354	0	0.0	0	0.0	7	31.3
Rockingham County	78,593	3	3.8	1	1.3	12	15.3
Russell County	27,891	0	0.0	0	0.0	0	0.0
Scott County	22,126	2	9.0	0	0.0	2	9.0
Shenandoah County	43,190	0	0.0	0	0.0	15	34.7
Smyth County	31,470	1	3.2	0	0.0	0	0.0
Southampton County	18,109	0	0.0	0	0.0	0	0.0
Spotsylvania County	130,475	2	1.5	0	0.0	20	15.3
Stafford County	142,003	1	0.7	1	0.7	13	9.2
Surry County	6,709	0	0.0	0	0.0	0	0.0
Sussex County	11,715	0	0.0	0	0.0	0	0.0
Tazewell County	42,899	1	2.3	0	0.0	1	2.3
Warren County	39,083	0	0.0	0	0.0	22	56.3
Washington County	54,591	0	0.0	0	0.0	0	0.0
Westmoreland County	17,629	1	5.7	0	0.0	1	5.7
Wise County	39,718	4	10.1	0	0.0	0	0.0
Wythe County	29,119	0	0.0	0	0.0	24	82.4
York County	67,837	0	0.0	0	0.0	1	1.5

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Legionellosis REPORTED CASES	Legionellosis RATE PER 100,000	Listeriosis REPORTED CASES	Listeriosis RATE PER 100,000	Lyme Disease REPORTED CASES	Lyme Disease RATE PER 100,000
VIRGINIA TOTAL	8,382,993	144	1.7	23	0.3	1,350	16.1
LOCALITY							
Alexandria	153,511	2	1.3	0	0.0	7	4.6
Bristol	17,141	0	0.0	0	0.0	0	0.0
Buena Vista	6,618	0	0.0	0	0.0	0	0.0
Charlottesville	46,597	1	2.1	0	0.0	11	23.6
Chesapeake	235,429	6	2.5	0	0.0	1	0.4
Colonial Heights	17,820	1	5.6	0	0.0	1	5.6
Covington	5,658	0	0.0	0	0.0	0	0.0
Danville	42,082	5	11.9	0	0.0	0	0.0
Emporia	5,496	0	0.0	0	0.0	0	0.0
Fairfax City	24,013	0	0.0	0	0.0	1	4.2
Falls Church	13,892	0	0.0	0	0.0	0	0.0
Franklin City	8,490	0	0.0	0	0.0	0	0.0
Fredericksburg	28,118	0	0.0	0	0.0	5	17.8
Galax	6,914	0	0.0	0	0.0	13	188.0
Hampton	136,454	4	2.9	1	0.7	2	1.5
Harrisonburg	52,538	1	1.9	0	0.0	1	1.9
Hopewell	22,378	0	0.0	1	4.5	0	0.0
Lexington	7,262	0	0.0	0	0.0	1	13.8
Lynchburg	79,812	0	0.0	1	1.3	17	21.3
Manassas	41,764	0	0.0	0	0.0	5	12.0
Manassas Park	15,726	0	0.0	0	0.0	2	12.7
Martinsville	13,645	2	14.7	0	0.0	0	0.0
Newport News	182,385	0	0.0	0	0.0	2	1.1
Norfolk	246,393	10	4.1	0	0.0	3	1.2
Norton	3,939	0	0.0	0	0.0	0	0.0
Petersburg	32,477	2	6.2	0	0.0	1	3.1
Poquoson	12,059	0	0.0	0	0.0	1	8.3
Portsmouth	96,201	2	2.1	0	0.0	0	0.0
Radford	17,403	1	5.7	0	0.0	22	126.4
Richmond City	220,289	3	1.4	0	0.0	7	3.2
Roanoke City	99,897	1	1.0	0	0.0	15	15.0
Salem	25,432	1	3.9	0	0.0	2	7.9
Staunton	24,416	0	0.0	0	0.0	8	32.8
Suffolk	88,161	2	2.3	1	1.1	0	0.0
Virginia Beach	452,745	5	1.1	0	0.0	10	2.2
Waynesboro	21,491	0	0.0	0	0.0	3	14.0
Williamsburg	15,052	2	13.3	0	0.0	0	0.0
Winchester	27,284	0	0.0	0	0.0	9	33.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Legionellosis REPORTED CASES	Legionellosis RATE PER 100,000	Listeriosis REPORTED CASES	Listeriosis RATE PER 100,000	Lyme Disease REPORTED CASES	Lyme Disease RATE PER 100,000
VIRGINIA TOTAL	8,382,993	144	1.7	23	0.3	1,350	16.1
DISTRICT/REGION							

Central Shenandoah	294,270	7	2.4	2	0.7	47	16.0
Lord Fairfax	230,845	0	0.0	1	0.4	109	47.2
Rappahannock	356,095	4	1.1	1	0.3	49	13.8
Rappahannock/Rapidan	174,111	0	0.0	0	0.0	49	28.1
Thomas Jefferson	247,084	7	2.8	0	0.0	67	27.1
Northwest Region	1,302,405	18	1.4	4	0.3	321	24.6

Alexandria	153,511	2	1.3	0	0.0	7	4.6
Arlington	229,164	3	1.3	3	1.3	5	2.2
Fairfax	1,180,139	9	0.8	1	0.1	214	18.1
Loudoun	375,629	1	0.3	1	0.3	179	47.7
Prince William	509,211	8	1.6	1	0.2	62	12.2
Northern Region	2,447,654	23	0.9	6	0.2	467	19.1

Alleghany	179,734	3	1.7	1	0.6	37	20.6
Central Virginia	259,950	0	0.0	1	0.4	38	14.6
Cumberland Plateau	108,681	2	1.8	0	0.0	1	0.9
Lenowisco	90,525	6	6.6	0	0.0	2	2.2
Mount Rogers	191,532	4	2.1	1	0.5	92	48.0
New River	181,747	3	1.7	1	0.6	281	154.6
Pittsylvania/Danville	104,276	8	7.7	0	0.0	0	0.0
Roanoke City	99,897	1	1.0	0	0.0	15	15.0
West Piedmont	139,835	2	1.4	0	0.0	4	2.9
Southwest Region	1,356,177	29	2.1	4	0.3	470	34.7

Chesterfield	381,538	7	1.8	1	0.3	25	6.6
Chickahominy	152,912	1	0.7	1	0.7	4	2.6
Crater	156,374	7	4.5	2	1.3	3	1.9
Henrico	325,155	12	3.7	1	0.3	9	2.8
Piedmont	102,779	8	7.8	2	1.9	10	9.7
Richmond City	220,289	3	1.4	0	0.0	7	3.2
Southside	82,904	1	1.2	0	0.0	0	0.0
Central Region	1,421,951	39	2.7	7	0.5	58	4.1

Chesapeake	235,429	6	2.5	0	0.0	1	0.4
Eastern Shore	45,128	0	0.0	0	0.0	7	15.5
Hampton	136,454	4	2.9	1	0.7	2	1.5
Norfolk	246,393	10	4.1	0	0.0	3	1.2
Peninsula	350,480	3	0.9	0	0.0	4	1.1
Portsmouth	96,201	2	2.1	0	0.0	0	0.0
Three Rivers	140,902	2	1.4	0	0.0	7	5.0
Virginia Beach	452,745	5	1.1	0	0.0	10	2.2
Western Tidewater	151,074	3	2.0	1	0.7	0	0.0
Eastern Region	1,854,806	35	1.9	2	0.1	34	1.8

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Malaria REPORTED CASES	Malaria RATE PER 100,000	Meningococcal Disease REPORTED CASES	Meningococcal Disease RATE PER 100,000	Mumps REPORTED CASES	Mumps RATE PER 100,000
VIRGINIA TOTAL	8,382,993	74	0.9	10	0.1	17	0.2
LOCALITY							
Accomack County	32,973	0	0.0	0	0.0	0	0.0
Albemarle County	105,703	1	0.9	0	0.0	0	0.0
Alleghany County	15,677	0	0.0	0	0.0	0	0.0
Amelia County	12,903	0	0.0	0	0.0	0	0.0
Amherst County	31,914	0	0.0	0	0.0	0	0.0
Appomattox County	15,414	0	0.0	0	0.0	0	0.0
Arlington County	229,164	4	1.7	0	0.0	2	0.9
Augusta County	74,314	0	0.0	0	0.0	0	0.0
Bath County	4,470	0	0.0	0	0.0	0	0.0
Bedford County	77,724	0	0.0	0	0.0	0	0.0
Bland County	6,561	0	0.0	0	0.0	0	0.0
Botetourt County	33,347	0	0.0	0	0.0	0	0.0
Brunswick County	16,698	0	0.0	0	0.0	0	0.0
Buchanan County	22,776	0	0.0	0	0.0	0	0.0
Buckingham County	17,032	0	0.0	0	0.0	0	0.0
Campbell County	55,086	0	0.0	0	0.0	0	0.0
Caroline County	29,984	0	0.0	0	0.0	0	0.0
Carroll County	29,724	0	0.0	0	0.0	0	0.0
Charles City County	7,040	0	0.0	0	0.0	0	0.0
Charlotte County	12,201	0	0.0	0	0.0	0	0.0
Chesterfield County	335,687	0	0.0	0	0.0	2	0.6
Clarke County	14,363	0	0.0	0	0.0	0	0.0
Craig County	5,211	0	0.0	0	0.0	0	0.0
Culpeper County	49,432	1	2.0	0	0.0	0	0.0
Cumberland County	9,719	0	0.0	0	0.0	0	0.0
Dickenson County	15,115	0	0.0	0	0.0	0	0.0
Dinwiddie County	27,852	0	0.0	0	0.0	0	0.0
Essex County	11,130	0	0.0	0	0.0	0	0.0
Fairfax County	1,142,234	26	2.3	0	0.0	5	0.4
Fauquier County	68,782	0	0.0	0	0.0	0	0.0
Floyd County	15,651	0	0.0	0	0.0	0	0.0
Fluvanna County	26,235	0	0.0	0	0.0	0	0.0
Franklin County	56,264	0	0.0	0	0.0	0	0.0
Frederick County	83,199	0	0.0	0	0.0	0	0.0
Giles County	16,708	0	0.0	0	0.0	0	0.0
Gloucester County	37,143	0	0.0	0	0.0	0	0.0
Goochland County	22,253	0	0.0	0	0.0	0	0.0
Grayson County	16,012	0	0.0	0	0.0	0	0.0
Greene County	19,162	0	0.0	0	0.0	0	0.0
Greensville County	11,885	0	0.0	0	0.0	0	0.0
Halifax County	35,125	0	0.0	1	2.8	0	0.0
Hanover County	103,227	0	0.0	0	0.0	0	0.0
Henrico County	325,155	1	0.3	0	0.0	0	0.0
Henry County	51,881	0	0.0	0	0.0	0	0.0
Highland County	2,214	0	0.0	0	0.0	0	0.0
Isle of Wight County	36,314	0	0.0	0	0.0	0	0.0
James City County	73,147	0	0.0	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Malaria REPORTED CASES	Malaria RATE PER 100,000	Meningococcal Disease REPORTED CASES	Meningococcal Disease RATE PER 100,000	Mumps REPORTED CASES	Mumps RATE PER 100,000
VIRGINIA TOTAL	8,382,993	74	0.9	10	0.1	17	0.2
LOCALITY							
King and Queen County	7,158	0	0.0	0	0.0	0	0.0
King George County	25,515	0	0.0	0	0.0	0	0.0
King William County	16,269	0	0.0	0	0.0	0	0.0
Lancaster County	10,965	0	0.0	0	0.0	0	0.0
Lee County	24,742	0	0.0	0	0.0	0	0.0
Loudoun County	375,629	7	1.9	2	0.5	1	0.3
Louisa County	34,602	1	2.9	1	2.9	0	0.0
Lunenburg County	12,299	0	0.0	0	0.0	0	0.0
Madison County	13,134	0	0.0	0	0.0	0	0.0
Mathews County	8,862	0	0.0	0	0.0	0	0.0
Mecklenburg County	31,081	0	0.0	0	0.0	1	3.2
Middlesex County	10,606	1	9.4	0	0.0	0	0.0
Montgomery County	97,653	0	0.0	0	0.0	0	0.0
Nelson County	14,785	0	0.0	0	0.0	0	0.0
New Kent County	20,392	0	0.0	0	0.0	0	0.0
Northampton County	12,155	0	0.0	0	0.0	0	0.0
Northumberland County	12,232	0	0.0	0	0.0	0	0.0
Nottoway County	15,673	0	0.0	0	0.0	0	0.0
Orange County	35,385	0	0.0	0	0.0	0	0.0
Page County	23,726	0	0.0	0	0.0	0	0.0
Patrick County	18,045	0	0.0	0	0.0	0	0.0
Pittsylvania County	62,194	0	0.0	0	0.0	0	0.0
Powhatan County	28,031	0	0.0	0	0.0	0	0.0
Prince Edward County	22,952	0	0.0	0	0.0	0	0.0
Prince George County	37,862	1	2.6	0	0.0	0	0.0
Prince William County	451,721	8	1.8	0	0.0	3	0.7
Pulaski County	34,332	0	0.0	1	2.9	0	0.0
Rappahannock County	7,378	0	0.0	0	0.0	0	0.0
Richmond County	8,908	0	0.0	0	0.0	0	0.0
Roanoke County	94,409	0	0.0	0	0.0	0	0.0
Rockbridge County	22,354	0	0.0	0	0.0	0	0.0
Rockingham County	78,593	0	0.0	0	0.0	0	0.0
Russell County	27,891	0	0.0	0	0.0	0	0.0
Scott County	22,126	0	0.0	0	0.0	0	0.0
Shenandoah County	43,190	0	0.0	0	0.0	0	0.0
Smyth County	31,470	0	0.0	0	0.0	0	0.0
Southampton County	18,109	0	0.0	0	0.0	0	0.0
Spotsylvania County	130,475	1	0.8	0	0.0	0	0.0
Stafford County	142,003	0	0.0	0	0.0	0	0.0
Surry County	6,709	0	0.0	0	0.0	0	0.0
Sussex County	11,715	0	0.0	0	0.0	0	0.0
Tazewell County	42,899	0	0.0	0	0.0	0	0.0
Warren County	39,083	0	0.0	0	0.0	0	0.0
Washington County	54,591	0	0.0	0	0.0	1	1.8
Westmoreland County	17,629	0	0.0	0	0.0	0	0.0
Wise County	39,718	0	0.0	0	0.0	0	0.0
Wythe County	29,119	0	0.0	0	0.0	0	0.0
York County	67,837	0	0.0	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Malaria REPORTED CASES	Malaria RATE PER 100,000	Meningococcal Disease REPORTED CASES	Meningococcal Disease RATE PER 100,000	Mumps REPORTED CASES	Mumps RATE PER 100,000
VIRGINIA TOTAL	8,382,993	74	0.9	10	0.1	17	0.2
LOCALITY							
Alexandria	153,511	9	5.9	1	0.7	1	0.7
Bristol	17,141	0	0.0	0	0.0	0	0.0
Buena Vista	6,618	0	0.0	0	0.0	0	0.0
Charlottesville	46,597	1	2.1	0	0.0	1	2.1
Chesapeake	235,429	1	0.4	0	0.0	0	0.0
Colonial Heights	17,820	0	0.0	0	0.0	0	0.0
Covington	5,658	0	0.0	0	0.0	0	0.0
Danville	42,082	0	0.0	0	0.0	0	0.0
Emporia	5,496	0	0.0	0	0.0	0	0.0
Fairfax City	24,013	1	4.2	0	0.0	0	0.0
Falls Church	13,892	0	0.0	0	0.0	0	0.0
Franklin City	8,490	0	0.0	0	0.0	0	0.0
Fredericksburg	28,118	0	0.0	0	0.0	0	0.0
Galax	6,914	0	0.0	0	0.0	0	0.0
Hampton	136,454	2	1.5	0	0.0	0	0.0
Harrisonburg	52,538	1	1.9	1	1.9	0	0.0
Hopewell	22,378	0	0.0	0	0.0	0	0.0
Lexington	7,262	0	0.0	1	13.8	0	0.0
Lynchburg	79,812	0	0.0	0	0.0	0	0.0
Manassas	41,764	1	2.4	1	2.4	0	0.0
Manassas Park	15,726	1	6.4	0	0.0	0	0.0
Martinsville	13,645	0	0.0	0	0.0	0	0.0
Newport News	182,385	1	0.5	0	0.0	0	0.0
Norfolk	246,393	2	0.8	0	0.0	0	0.0
Norton	3,939	0	0.0	0	0.0	0	0.0
Petersburg	32,477	1	3.1	0	0.0	0	0.0
Poquoson	12,059	0	0.0	0	0.0	0	0.0
Portsmouth	96,201	0	0.0	0	0.0	0	0.0
Radford	17,403	0	0.0	0	0.0	0	0.0
Richmond City	220,289	0	0.0	0	0.0	0	0.0
Roanoke City	99,897	0	0.0	1	1.0	0	0.0
Salem	25,432	0	0.0	0	0.0	0	0.0
Staunton	24,416	0	0.0	0	0.0	0	0.0
Suffolk	88,161	0	0.0	0	0.0	0	0.0
Virginia Beach	452,745	1	0.2	0	0.0	0	0.0
Waynesboro	21,491	0	0.0	0	0.0	0	0.0
Williamsburg	15,052	0	0.0	0	0.0	0	0.0
Winchester	27,284	0	0.0	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Malaria REPORTED CASES	Malaria RATE PER 100,000	Meningococcal Disease REPORTED CASES	Meningococcal Disease RATE PER 100,000	Mumps REPORTED CASES	Mumps RATE PER 100,000
VIRGINIA TOTAL	8,382,993	74	0.9	10	0.1	17	0.2
DISTRICT/REGION							

Central Shenandoah	294,270	1	0.3	2	0.7	0	0.0
Lord Fairfax	230,845	0	0.0	0	0.0	0	0.0
Rappahannock	356,095	1	0.3	0	0.0	0	0.0
Rappahannock/Rapidan	174,111	1	0.6	0	0.0	0	0.0
Thomas Jefferson	247,084	3	1.2	1	0.4	1	0.4
Northwest Region	1,302,405	6	0.5	3	0.2	1	0.1

Alexandria	153,511	9	5.9	1	0.7	1	0.7
Arlington	229,164	4	1.7	0	0.0	2	0.9
Fairfax	1,180,139	27	2.3	0	0.0	5	0.4
Loudoun	375,629	7	1.9	2	0.5	1	0.3
Prince William	509,211	10	2.0	1	0.2	3	0.6
Northern Region	2,447,654	57	2.3	4	0.2	12	0.5

Alleghany	179,734	0	0.0	0	0.0	0	0.0
Central Virginia	259,950	0	0.0	0	0.0	0	0.0
Cumberland Plateau	108,681	0	0.0	0	0.0	0	0.0
Lenowisco	90,525	0	0.0	0	0.0	0	0.0
Mount Rogers	191,532	0	0.0	0	0.0	1	0.5
New River	181,747	0	0.0	1	0.6	0	0.0
Pittsylvania/Danville	104,276	0	0.0	0	0.0	0	0.0
Roanoke City	99,897	0	0.0	1	1.0	0	0.0
West Piedmont	139,835	0	0.0	0	0.0	0	0.0
Southwest Region	1,356,177	0	0.0	2	0.1	1	0.1

Chesterfield	381,538	0	0.0	0	0.0	2	0.5
Chickahominy	152,912	0	0.0	0	0.0	0	0.0
Crater	156,374	2	1.3	0	0.0	0	0.0
Henrico	325,155	1	0.3	0	0.0	0	0.0
Piedmont	102,779	0	0.0	0	0.0	0	0.0
Richmond City	220,289	0	0.0	0	0.0	0	0.0
Southside	82,904	0	0.0	1	1.2	1	1.2
Central Region	1,421,951	3	0.2	1	0.1	3	0.2

Chesapeake	235,429	1	0.4	0	0.0	0	0.0
Eastern Shore	45,128	0	0.0	0	0.0	0	0.0
Hampton	136,454	2	1.5	0	0.0	0	0.0
Norfolk	246,393	2	0.8	0	0.0	0	0.0
Peninsula	350,480	1	0.3	0	0.0	0	0.0
Portsmouth	96,201	0	0.0	0	0.0	0	0.0
Three Rivers	140,902	1	0.7	0	0.0	0	0.0
Virginia Beach	452,745	1	0.2	0	0.0	0	0.0
Western Tidewater	151,074	0	0.0	0	0.0	0	0.0
Eastern Region	1,854,806	8	0.4	0	0.0	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Pertussis REPORTED CASES	Pertussis RATE PER 100,000	Rabies in Animals* NUMBER POSITIVE	Rabies in Animals* NUMBER TESTED	Salmonellosis REPORTED CASES	Salmonellosis RATE PER 100,000
VIRGINIA TOTAL	8,382,993	225	2.7	348	3,075	1,193	14.2
LOCALITY							
Accomack County	32,973	0	0.0	7	46	17	51.6
Albemarle County	105,703	27	25.5	3	28	24	22.7
Alleghany County	15,677	3	19.1	0	10	3	19.1
Amelia County	12,903	1	7.8	0	5	1	7.8
Amherst County	31,914	3	9.4	3	17	6	18.8
Appomattox County	15,414	0	0.0	6	22	2	13.0
Arlington County	229,164	3	1.3	4	32	26	11.3
Augusta County	74,314	0	0.0	5	48	8	10.8
Bath County	4,470	0	0.0	0	2	1	22.4
Bedford County	77,724	1	1.3	7	42	13	16.7
Bland County	6,561	0	0.0	0	5	1	15.2
Botetourt County	33,347	0	0.0	2	23	4	12.0
Brunswick County	16,698	0	0.0	0	5	1	6.0
Buchanan County	22,776	0	0.0	0	7	2	8.8
Buckingham County	17,032	1	5.9	2	12	4	23.5
Campbell County	55,086	5	9.1	2	27	5	9.1
Caroline County	29,984	0	0.0	2	9	7	23.3
Carroll County	29,724	1	3.4	2	19	0	0.0
Charles City County	7,040	0	0.0	0	2	1	14.2
Charlotte County	12,201	0	0.0	2	9	7	57.4
Chesterfield County	335,687	7	2.1	3	104	52	15.5
Clarke County	14,363	0	0.0	7	22	4	27.8
Craig County	5,211	0	0.0	0	0	0	0.0
Culpeper County	49,432	6	12.1	6	29	12	24.3
Cumberland County	9,719	0	0.0	1	7	4	41.2
Dickenson County	15,115	1	6.6	0	7	2	13.2
Dinwiddie County	27,852	0	0.0	2	13	2	7.2
Essex County	11,130	0	0.0	0	2	4	35.9
Fairfax County	1,142,234	16	1.4	20	248	140	12.3
Fauquier County	68,782	0	0.0	14	95	12	17.4
Floyd County	15,651	11	70.3	0	8	0	0.0
Fluvanna County	26,235	0	0.0	3	11	1	3.8
Franklin County	56,264	9	16.0	6	27	7	12.4
Frederick County	83,199	1	1.2	10	67	11	13.2
Giles County	16,708	0	0.0	2	9	0	0.0
Gloucester County	37,143	0	0.0	2	14	7	18.8
Goochland County	22,253	0	0.0	1	21	3	13.5
Grayson County	16,012	0	0.0	0	3	3	18.7
Greene County	19,162	1	5.2	3	14	5	26.1
Greensville County	11,885	0	0.0	0	0	1	8.4
Halifax County	35,125	1	2.8	1	7	11	31.3
Hanover County	103,227	1	1.0	10	70	15	14.5
Henrico County	325,155	8	2.5	3	151	41	12.6
Henry County	51,881	0	0.0	3	17	7	13.5
Highland County	2,214	0	0.0	1	1	0	0.0
Isle of Wight County	36,314	0	0.0	5	19	8	22.0
James City County	73,147	1	1.4	1	16	4	5.5

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Pertussis REPORTED CASES	Pertussis RATE PER 100,000	Rabies in Animals* NUMBER POSITIVE	Rabies in Animals* NUMBER TESTED	Salmonellosis REPORTED CASES	Salmonellosis RATE PER 100,000
VIRGINIA TOTAL	8,382,993	225	2.7	348	3,075	1,193	14.2
LOCALITY							
King and Queen County	7,158	0	0.0	0	0	7	97.8
King George County	25,515	0	0.0	0	10	3	11.8
King William County	16,269	0	0.0	0	3	1	6.1
Lancaster County	10,965	0	0.0	1	7	4	36.5
Lee County	24,742	0	0.0	0	7	3	12.1
Loudoun County	375,629	3	0.8	19	146	57	15.2
Louisa County	34,602	0	0.0	2	13	9	26.0
Lunenburg County	12,299	0	0.0	2	9	2	16.3
Madison County	13,134	1	7.6	3	10	0	0.0
Mathews County	8,862	0	0.0	2	4	2	22.6
Mecklenburg County	31,081	0	0.0	2	11	4	12.9
Middlesex County	10,606	1	9.4	3	8	2	18.9
Montgomery County	97,653	3	3.1	13	79	17	17.4
Nelson County	14,785	2	13.5	6	15	5	33.8
New Kent County	20,392	0	0.0	0	9	9	44.1
Northampton County	12,155	0	0.0	6	20	8	65.8
Northumberland County	12,232	0	0.0	1	3	4	32.7
Nottoway County	15,673	0	0.0	1	5	6	38.3
Orange County	35,385	0	0.0	2	11	6	17.0
Page County	23,726	1	4.2	3	18	0	0.0
Patrick County	18,045	0	0.0	0	20	4	22.2
Pittsylvania County	62,194	2	3.2	5	26	8	12.9
Powhatan County	28,031	3	10.7	0	5	7	25.0
Prince Edward County	22,952	0	0.0	1	12	6	26.1
Prince George County	37,862	0	0.0	1	8	9	23.8
Prince William County	451,721	3	0.7	8	91	53	11.7
Pulaski County	34,332	3	8.7	2	15	1	2.9
Rappahannock County	7,378	0	0.0	2	11	1	13.6
Richmond County	8,908	0	0.0	2	4	2	22.5
Roanoke County	94,409	3	3.2	1	10	10	10.6
Rockbridge County	22,354	5	22.4	3	20	1	4.5
Rockingham County	78,593	7	8.9	5	26	9	11.5
Russell County	27,891	2	7.2	1	15	5	17.9
Scott County	22,126	1	4.5	0	8	3	13.6
Shenandoah County	43,190	0	0.0	6	22	8	18.5
Smyth County	31,470	2	6.4	1	18	7	22.2
Southampton County	18,109	0	0.0	1	9	2	11.0
Spotsylvania County	130,475	8	6.1	4	35	28	21.5
Stafford County	142,003	4	2.8	3	42	26	18.3
Surry County	6,709	0	0.0	0	1	2	29.8
Sussex County	11,715	0	0.0	0	0	1	8.5
Tazewell County	42,899	0	0.0	0	18	6	14.0
Warren County	39,083	0	0.0	3	29	10	25.6
Washington County	54,591	1	1.8	3	28	4	7.3
Westmoreland County	17,629	0	0.0	1	7	3	17.0
Wise County	39,718	0	0.0	0	12	4	10.1
Wythe County	29,119	1	3.4	7	29	3	10.3
York County	67,837	0	0.0	1	17	11	16.2

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Pertussis REPORTED CASES	Pertussis RATE PER 100,000	Rabies in Animals* NUMBER POSITIVE	Rabies in Animals* NUMBER TESTED	Salmonellosis REPORTED CASES	Salmonellosis RATE PER 100,000
VIRGINIA TOTAL	8,382,993	225	2.7	348	3,075	1,193	14.2
LOCALITY							
Alexandria	153,511	3	2.0	1	17	28	18.2
Bristol	17,141	0	0.0	0	1	2	11.7
Buena Vista	6,618	4	60.4	0	1	0	0.0
Charlottesville	46,597	7	15.0	4	33	12	25.8
Chesapeake	235,429	3	1.3	5	32	32	13.6
Colonial Heights	17,820	0	0.0	0	8	5	28.1
Covington	5,658	0	0.0	1	4	0	0.0
Danville	42,082	1	2.4	0	21	3	7.1
Emporia	5,496	0	0.0	1	1	0	0.0
Fairfax City	24,013	0	0.0	5	39	4	16.7
Falls Church	13,892	0	0.0	8	21	0	0.0
Franklin City	8,490	0	0.0	0	0	3	35.3
Fredericksburg	28,118	0	0.0	1	24	7	24.9
Galax	6,914	0	0.0	0	7	3	43.4
Hampton	136,454	1	0.7	2	33	7	5.1
Harrisonburg	52,538	2	3.8	1	8	5	9.5
Hopewell	22,378	0	0.0	1	9	1	4.5
Lexington	7,262	7	96.4	0	10	2	27.5
Lynchburg	79,812	9	11.3	2	73	7	8.8
Manassas	41,764	0	0.0	0	3	5	12.0
Manassas Park	15,726	0	0.0	0	0	1	6.4
Martinsville	13,645	0	0.0	0	5	2	14.7
Newport News	182,385	0	0.0	5	41	14	7.7
Norfolk	246,393	3	1.2	1	27	17	6.9
Norton	3,939	0	0.0	0	0	0	0.0
Petersburg	32,477	1	3.1	3	16	3	9.2
Poquoson	12,059	0	0.0	1	5	2	16.6
Portsmouth	96,201	1	1.0	1	15	11	11.4
Radford	17,403	1	5.7	0	0	2	11.5
Richmond City	220,289	7	3.2	3	127	21	9.5
Roanoke City	99,897	0	0.0	2	76	13	13.0
Salem	25,432	0	0.0	0	2	2	7.9
Staunton	24,416	1	4.1	1	17	6	24.6
Suffolk	88,161	0	0.0	5	37	17	19.3
Virginia Beach	452,745	9	2.0	12	61	64	14.1
Waynesboro	21,491	1	4.7	1	7	2	9.3
Williamsburg	15,052	0	0.0	2	9	14	93.0
Winchester	27,284	0	0.0	1	7	4	14.7

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Pertussis REPORTED CASES	Pertussis RATE PER 100,000	Rabies in Animals* NUMBER POSITIVE	Rabies in Animals* NUMBER TESTED	Salmonellosis REPORTED CASES	Salmonellosis RATE PER 100,000
VIRGINIA TOTAL	8,382,993	225	2.7	348	3,075	1,193	14.2
DISTRICT/REGION							

Central Shenandoah	294,270	27	9.2	17	140	34	11.6
Lord Fairfax	230,845	2	0.9	30	165	37	16.0
Rappahannock	356,095	12	3.4	10	120	71	19.9
Rappahannock/Rapidan	174,111	7	4.0	27	156	31	17.8
Thomas Jefferson	247,084	37	15.0	21	114	56	22.7
Northwest Region	1,302,405	85	6.5	105	695	229	17.6

Alexandria	153,511	3	2.0	1	17	28	18.2
Arlington	229,164	3	1.3	4	32	26	11.3
Fairfax	1,180,139	16	1.4	33	308	144	12.2
Loudoun	375,629	3	0.8	19	146	57	15.2
Prince William	509,211	3	0.6	8	94	59	11.6
Northern Region	2,447,654	28	1.1	65	597	314	12.8

Alleghany	179,734	6	3.3	4	49	19	10.6
Central Virginia	259,950	18	6.9	20	181	33	12.7
Cumberland Plateau	108,681	3	2.8	1	47	15	13.8
Lenowisco	90,525	1	1.1	0	27	10	11.0
Mount Rogers	191,532	5	2.6	13	110	23	12.0
New River	181,747	18	9.9	17	111	20	11.0
Pittsylvania/Danville	104,276	3	2.9	5	47	11	10.5
Roanoke City	99,897	0	0.0	2	76	13	13.0
West Piedmont	139,835	9	6.4	9	69	20	14.3
Southwest Region	1,356,177	63	4.6	71	717	164	12.1

Chesterfield	381,538	10	2.6	3	117	64	16.8
Chickahominy	152,912	1	0.7	11	102	28	18.3
Crater	156,374	1	0.6	8	48	19	12.2
Henrico	325,155	8	2.5	3	151	41	12.6
Piedmont	102,779	2	1.9	9	59	30	29.2
Richmond City	220,289	7	3.2	3	127	21	9.5
Southside	82,904	1	1.2	3	23	16	19.3
Central Region	1,421,951	30	2.1	40	627	219	15.4

Chesapeake	235,429	3	1.3	5	32	32	13.6
Eastern Shore	45,128	0	0.0	13	66	25	55.4
Hampton	136,454	1	0.7	2	33	7	5.1
Norfolk	246,393	3	1.2	1	27	17	6.9
Peninsula	350,480	1	0.3	10	88	45	12.8
Portsmouth	96,201	1	1.0	1	15	11	11.4
Three Rivers	140,902	1	0.7	12	52	36	25.5
Virginia Beach	452,745	9	2.0	12	61	64	14.1
Western Tidewater	151,074	0	0.0	11	65	30	19.9
Eastern Region	1,854,806	19	1.0	67	439	267	14.4

---

* Population rate is not applicable for rabies in animals. Data reflect number of positive rabies results versus total number of animals tested

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Shigellosis REPORTED CASES	Shigellosis RATE PER 100,000	Spotted Fever Rickettsiosis, including RMSF REPORTED CASES	Spotted Fever Rickettsiosis, including RMSF RATE PER 100,000	*Staphylococcus aureus* Infection, Invasive (MRSA) REPORTED CASES	*Staphylococcus aureus* Infection, Invasive (MRSA) RATE PER 100,000
VIRGINIA TOTAL	8,382,993	358	4.3	312	3.7	951	11.3
LOCALITY							
Accomack County	32,973	4	12.1	2	6.1	1	3.0
Albemarle County	105,703	3	2.8	2	1.9	8	7.6
Alleghany County	15,677	0	0.0	1	6.4	5	31.9
Amelia County	12,903	0	0.0	1	7.8	1	7.8
Amherst County	31,914	1	3.1	3	9.4	0	0.0
Appomattox County	15,414	0	0.0	6	38.9	0	0.0
Arlington County	229,164	8	3.5	3	1.3	22	9.6
Augusta County	74,314	0	0.0	3	4.0	10	13.5
Bath County	4,470	0	0.0	0	0.0	0	0.0
Bedford County	77,724	0	0.0	18	23.2	2	2.6
Bland County	6,561	3	45.7	0	0.0	1	15.2
Botetourt County	33,347	0	0.0	2	6.0	8	24.0
Brunswick County	16,698	0	0.0	0	0.0	1	6.0
Buchanan County	22,776	0	0.0	0	0.0	2	8.8
Buckingham County	17,032	0	0.0	1	5.9	5	29.4
Campbell County	55,086	0	0.0	8	14.5	1	1.8
Caroline County	29,984	3	10.0	4	13.3	13	43.4
Carroll County	29,724	0	0.0	3	10.1	1	3.4
Charles City County	7,040	0	0.0	0	0.0	1	14.2
Charlotte County	12,201	0	0.0	8	65.6	1	8.2
Chesterfield County	335,687	5	1.5	28	8.3	37	11.0
Clarke County	14,363	0	0.0	0	0.0	5	34.8
Craig County	5,211	0	0.0	0	0.0	1	19.2
Culpeper County	49,432	0	0.0	3	6.1	2	4.0
Cumberland County	9,719	2	20.6	0	0.0	2	20.6
Dickenson County	15,115	0	0.0	0	0.0	1	6.6
Dinwiddie County	27,852	0	0.0	3	10.8	2	7.2
Essex County	11,130	0	0.0	0	0.0	0	0.0
Fairfax County	1,142,234	26	2.3	10	0.9	71	6.2
Fauquier County	68,782	1	1.5	5	7.3	11	16.0
Floyd County	15,651	0	0.0	1	6.4	4	25.6
Fluvanna County	26,235	0	0.0	1	3.8	3	11.4
Franklin County	56,264	0	0.0	2	3.6	9	16.0
Frederick County	83,199	0	0.0	1	1.2	11	13.2
Giles County	16,708	1	6.0	1	6.0	5	29.9
Gloucester County	37,143	0	0.0	0	0.0	0	0.0
Goochland County	22,253	1	4.5	1	4.5	6	27.0
Grayson County	16,012	0	0.0	0	0.0	2	12.5
Greene County	19,162	0	0.0	1	5.2	2	10.4
Greensville County	11,885	0	0.0	0	0.0	1	8.4
Halifax County	35,125	0	0.0	0	0.0	5	14.2
Hanover County	103,227	3	2.9	0	0.0	17	16.5
Henrico County	325,155	25	7.7	3	0.9	57	17.5
Henry County	51,881	0	0.0	10	19.3	22	42.4
Highland County	2,214	0	0.0	0	0.0	0	0.0
Isle of Wight County	36,314	1	2.8	7	19.3	2	5.5
James City County	73,147	2	2.7	4	5.5	2	2.7

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Shigellosis REPORTED CASES	Shigellosis RATE PER 100,000	Spotted Fever Rickettsiosis, including RMSF REPORTED CASES	Spotted Fever Rickettsiosis, including RMSF RATE PER 100,000	*Staphylococcus aureus* Infection, Invasive (MRSA) REPORTED CASES	*Staphylococcus aureus* Infection, Invasive (MRSA) RATE PER 100,000
VIRGINIA TOTAL	8,382,993	358	4.3	312	3.7	951	11.3
LOCALITY							
King and Queen County	7,158	0	0.0	0	0.0	1	14.0
King George County	25,515	0	0.0	9	35.3	3	11.8
King William County	16,269	0	0.0	0	0.0	1	6.1
Lancaster County	10,965	1	9.1	1	9.1	2	18.2
Lee County	24,742	0	0.0	0	0.0	5	20.2
Loudoun County	375,629	4	1.1	13	3.5	28	7.5
Louisa County	34,602	1	2.9	4	11.6	6	17.3
Lunenburg County	12,299	0	0.0	1	8.1	0	0.0
Madison County	13,134	0	0.0	0	0.0	3	22.8
Mathews County	8,862	0	0.0	0	0.0	0	0.0
Mecklenburg County	31,081	0	0.0	1	3.2	2	6.4
Middlesex County	10,606	0	0.0	0	0.0	1	9.4
Montgomery County	97,653	1	1.0	4	4.1	4	4.1
Nelson County	14,785	0	0.0	3	20.3	0	0.0
New Kent County	20,392	1	4.9	2	9.8	0	0.0
Northampton County	12,155	3	24.7	4	32.9	2	16.5
Northumberland County	12,232	0	0.0	1	8.2	2	16.4
Nottoway County	15,673	0	0.0	2	12.8	2	12.8
Orange County	35,385	0	0.0	6	17.0	4	11.3
Page County	23,726	0	0.0	1	4.2	5	21.1
Patrick County	18,045	0	0.0	5	27.7	1	5.5
Pittsylvania County	62,194	2	3.2	2	3.2	3	4.8
Powhatan County	28,031	0	0.0	8	28.5	6	21.4
Prince Edward County	22,952	0	0.0	4	17.4	7	30.5
Prince George County	37,862	0	0.0	1	2.6	4	10.6
Prince William County	451,721	6	1.3	9	2.0	26	5.8
Pulaski County	34,332	0	0.0	2	5.8	11	32.0
Rappahannock County	7,378	0	0.0	1	13.6	0	0.0
Richmond County	8,908	0	0.0	0	0.0	0	0.0
Roanoke County	94,409	2	2.1	8	8.5	15	15.9
Rockbridge County	22,354	0	0.0	1	4.5	3	13.4
Rockingham County	78,593	0	0.0	1	1.3	9	11.5
Russell County	27,891	0	0.0	0	0.0	14	50.2
Scott County	22,126	13	58.8	0	0.0	5	22.6
Shenandoah County	43,190	0	0.0	2	4.6	10	23.2
Smyth County	31,470	10	31.8	0	0.0	7	22.2
Southampton County	18,109	1	5.5	0	0.0	2	11.0
Spotsylvania County	130,475	1	0.8	7	5.4	21	16.1
Stafford County	142,003	3	2.1	4	2.8	15	10.6
Surry County	6,709	2	29.8	0	0.0	0	0.0
Sussex County	11,715	1	8.5	3	25.6	2	17.1
Tazewell County	42,899	1	2.3	0	0.0	8	18.6
Warren County	39,083	0	0.0	2	5.1	13	33.3
Washington County	54,591	0	0.0	0	0.0	16	29.3
Westmoreland County	17,629	0	0.0	0	0.0	0	0.0
Wise County	39,718	0	0.0	0	0.0	9	22.7
Wythe County	29,119	3	10.3	1	3.4	10	34.3
York County	67,837	1	1.5	1	1.5	3	4.4

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Shigellosis REPORTED CASES	Shigellosis RATE PER 100,000	Spotted Fever Rickettsiosis, including RMSF REPORTED CASES	Spotted Fever Rickettsiosis, including RMSF RATE PER 100,000	*Staphylococcus aureus* Infection, Invasive (MRSA) REPORTED CASES	*Staphylococcus aureus* Infection, Invasive (MRSA) RATE PER 100,000
VIRGINIA TOTAL	8,382,993	358	4.3	312	3.7	951	11.3
LOCALITY							
Alexandria	153,511	10	6.5	0	0.0	12	7.8
Bristol	17,141	1	5.8	0	0.0	7	40.8
Buena Vista	6,618	0	0.0	0	0.0	0	0.0
Charlottesville	46,597	2	4.3	3	6.4	6	12.9
Chesapeake	235,429	31	13.2	2	0.8	32	13.6
Colonial Heights	17,820	0	0.0	0	0.0	2	11.2
Covington	5,658	0	0.0	0	0.0	1	17.7
Danville	42,082	0	0.0	1	2.4	3	7.1
Emporia	5,496	0	0.0	0	0.0	0	0.0
Fairfax City	24,013	0	0.0	0	0.0	6	25.0
Falls Church	13,892	1	7.2	0	0.0	2	14.4
Franklin City	8,490	0	0.0	0	0.0	5	58.9
Fredericksburg	28,118	2	7.1	1	3.6	4	14.2
Galax	6,914	0	0.0	0	0.0	0	0.0
Hampton	136,454	8	5.9	2	1.5	13	9.5
Harrisonburg	52,538	1	1.9	0	0.0	6	11.4
Hopewell	22,378	0	0.0	1	4.5	5	22.3
Lexington	7,262	0	0.0	0	0.0	0	0.0
Lynchburg	79,812	4	5.0	13	16.3	3	3.8
Manassas	41,764	1	2.4	0	0.0	1	2.4
Manassas Park	15,726	1	6.4	0	0.0	0	0.0
Martinsville	13,645	0	0.0	2	14.7	5	36.6
Newport News	182,385	25	13.7	3	1.6	12	6.6
Norfolk	246,393	47	19.1	1	0.4	20	8.1
Norton	3,939	0	0.0	0	0.0	2	50.8
Petersburg	32,477	0	0.0	2	6.2	5	15.4
Poquoson	12,059	0	0.0	0	0.0	0	0.0
Portsmouth	96,201	10	10.4	0	0.0	31	32.2
Radford	17,403	0	0.0	1	5.7	1	5.7
Richmond City	220,289	22	10.0	10	4.5	52	23.6
Roanoke City	99,897	2	2.0	2	2.0	39	39.0
Salem	25,432	2	7.9	0	0.0	2	7.9
Staunton	24,416	0	0.0	0	0.0	3	12.3
Suffolk	88,161	7	7.9	4	4.5	5	5.7
Virginia Beach	452,745	30	6.6	4	0.9	5	1.1
Waynesboro	21,491	1	4.7	0	0.0	4	18.6
Williamsburg	15,052	2	13.3	0	0.0	1	6.6
Winchester	27,284	2	7.3	0	0.0	2	7.3

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Shigellosis REPORTED CASES	Shigellosis RATE PER 100,000	Spotted Fever Rickettsiosis, including RMSF REPORTED CASES	Spotted Fever Rickettsiosis, including RMSF RATE PER 100,000	*Staphylococcus aureus* Infection, Invasive (MRSA) REPORTED CASES	*Staphylococcus aureus* Infection, Invasive (MRSA) RATE PER 100,000
VIRGINIA TOTAL	8,382,993	358	4.3	312	3.7	951	11.3
DISTRICT/REGION							

Central Shenandoah	294,270	2	0.7	5	1.7	35	11.9
Lord Fairfax	230,845	2	0.9	6	2.6	46	19.9
Rappahannock	356,095	9	2.5	25	7.0	56	15.7
Rappahannock/Rapidan	174,111	1	0.6	15	8.6	20	11.5
Thomas Jefferson	247,084	6	2.4	14	5.7	25	10.1
Northwest Region	1,302,405	20	1.5	65	5.0	182	14.0

Alexandria	153,511	10	6.5	0	0.0	12	7.8
Arlington	229,164	8	3.5	3	1.3	22	9.6
Fairfax	1,180,139	27	2.3	10	0.8	79	6.7
Loudoun	375,629	4	1.1	13	3.5	28	7.5
Prince William	509,211	8	1.6	9	1.8	27	5.3
Northern Region	2,447,654	57	2.3	35	1.4	168	6.9

Alleghany	179,734	4	2.2	11	6.1	32	17.8
Central Virginia	259,950	5	1.9	48	18.5	6	2.3
Cumberland Plateau	108,681	1	0.9	0	0.0	25	23.0
Lenowisco	90,525	13	14.4	0	0.0	21	23.2
Mount Rogers	191,532	17	8.9	4	2.1	44	23.0
New River	181,747	2	1.1	9	5.0	25	13.8
Pittsylvania/Danville	104,276	2	1.9	3	2.9	6	5.8
Roanoke City	99,897	2	2.0	2	2.0	39	39.0
West Piedmont	139,835	0	0.0	19	13.6	37	26.5
Southwest Region	1,356,177	46	3.4	96	7.1	235	17.3

Chesterfield	381,538	5	1.3	36	9.4	45	11.8
Chickahominy	152,912	5	3.3	3	2.0	24	15.7
Crater	156,374	3	1.9	10	6.4	19	12.2
Henrico	325,155	25	7.7	3	0.9	57	17.5
Piedmont	102,779	2	1.9	17	16.5	18	17.5
Richmond City	220,289	22	10.0	10	4.5	52	23.6
Southside	82,904	0	0.0	1	1.2	8	9.6
Central Region	1,421,951	62	4.4	80	5.6	223	15.7

Chesapeake	235,429	31	13.2	2	0.8	32	13.6
Eastern Shore	45,128	7	15.5	6	13.3	3	6.6
Hampton	136,454	8	5.9	2	1.5	13	9.5
Norfolk	246,393	47	19.1	1	0.4	20	8.1
Peninsula	350,480	30	8.6	8	2.3	18	5.1
Portsmouth	96,201	10	10.4	0	0.0	31	32.2
Three Rivers	140,902	1	0.7	2	1.4	7	5.0
Virginia Beach	452,745	30	6.6	4	0.9	5	1.1
Western Tidewater	151,074	9	6.0	11	7.3	14	9.3
Eastern Region	1,854,806	173	9.3	36	1.9	143	7.7

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		**Streptococcal Disease, Group A, Invasive or TSS**		**Syphilis, Early**		**Tuberculosis**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	240	2.9	1072	12.8	205	2.4
LOCALITY							
Accomack County	32,973	0	0.0	0	0.0	0	0.0
Albemarle County	105,703	0	0.0	5	4.7	1	0.9
Alleghany County	15,677	1	6.4	0	0.0	0	0.0
Amelia County	12,903	0	0.0	0	0.0	0	0.0
Amherst County	31,914	0	0.0	0	0.0	1	3.1
Appomattox County	15,414	0	0.0	2	13.0	0	0.0
Arlington County	229,164	6	2.6	62	27.1	10	4.4
Augusta County	74,314	4	5.4	0	0.0	2	2.7
Bath County	4,470	0	0.0	0	0.0	0	0.0
Bedford County	77,724	1	1.3	3	3.9	0	0.0
Bland County	6,561	0	0.0	0	0.0	0	0.0
Botetourt County	33,347	2	6.0	0	0.0	1	3.0
Brunswick County	16,698	0	0.0	2	12.0	0	0.0
Buchanan County	22,776	0	0.0	0	0.0	0	0.0
Buckingham County	17,032	1	5.9	1	5.9	0	0.0
Campbell County	55,086	1	1.8	1	1.8	0	0.0
Caroline County	29,984	2	6.7	1	3.3	0	0.0
Carroll County	29,724	1	3.4	1	3.4	0	0.0
Charles City County	7,040	1	14.2	3	42.6	0	0.0
Charlotte County	12,201	0	0.0	1	8.2	0	0.0
Chesterfield County	335,687	7	2.1	40	11.9	4	1.2
Clarke County	14,363	0	0.0	0	0.0	0	0.0
Craig County	5,211	0	0.0	0	0.0	0	0.0
Culpeper County	49,432	0	0.0	0	0.0	0	0.0
Cumberland County	9,719	0	0.0	0	0.0	0	0.0
Dickenson County	15,115	2	13.2	0	0.0	0	0.0
Dinwiddie County	27,852	0	0.0	6	21.5	0	0.0
Essex County	11,130	1	9.0	0	0.0	0	0.0
Fairfax County	1,142,234	21	1.8	81	7.1	65	5.7
Fauquier County	68,782	2	2.9	0	0.0	0	0.0
Floyd County	15,651	0	0.0	2	12.8	0	0.0
Fluvanna County	26,235	1	3.8	1	3.8	0	0.0
Franklin County	56,264	2	3.6	2	3.6	1	1.8
Frederick County	83,199	3	3.6	0	0.0	0	0.0
Giles County	16,708	1	6.0	2	12.0	0	0.0
Gloucester County	37,143	0	0.0	1	2.7	0	0.0
Goochland County	22,253	1	4.5	6	27.0	0	0.0
Grayson County	16,012	1	6.2	0	0.0	0	0.0
Greene County	19,162	1	5.2	0	0.0	0	0.0
Greensville County	11,885	0	0.0	4	33.7	0	0.0
Halifax County	35,125	1	2.8	0	0.0	0	0.0
Hanover County	103,227	4	3.9	4	3.9	1	1.0
Henrico County	325,155	10	3.1	57	17.5	14	4.3
Henry County	51,881	1	1.9	3	5.8	0	0.0
Highland County	2,214	0	0.0	0	0.0	0	0.0
Isle of Wight County	36,314	2	5.5	10	27.5	0	0.0
James City County	73,147	1	1.4	1	1.4	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:

LOCALITY/DISTRICT/REGION	2015 POPULATION	Streptococcal Disease, Group A, Invasive or TSS REPORTED CASES	Streptococcal Disease, Group A, Invasive or TSS RATE PER 100,000	Syphilis, Early REPORTED CASES	Syphilis, Early RATE PER 100,000	Tuberculosis REPORTED CASES	Tuberculosis RATE PER 100,000
VIRGINIA TOTAL	8,382,993	240	2.9	1072	12.8	205	2.4
LOCALITY							
King and Queen County	7,158	0	0.0	0	0.0	0	0.0
King George County	25,515	1	3.9	1	3.9	1	3.9
King William County	16,269	1	6.1	2	12.3	0	0.0
Lancaster County	10,965	0	0.0	2	18.2	0	0.0
Lee County	24,742	2	8.1	0	0.0	1	4.0
Loudoun County	375,629	9	2.4	18	4.8	14	3.7
Louisa County	34,602	2	5.8	0	0.0	0	0.0
Lunenburg County	12,299	0	0.0	1	8.1	0	0.0
Madison County	13,134	0	0.0	0	0.0	0	0.0
Mathews County	8,862	0	0.0	0	0.0	0	0.0
Mecklenburg County	31,081	0	0.0	1	3.2	0	0.0
Middlesex County	10,606	0	0.0	0	0.0	0	0.0
Montgomery County	97,653	4	4.1	4	4.1	0	0.0
Nelson County	14,785	0	0.0	0	0.0	0	0.0
New Kent County	20,392	1	4.9	1	4.9	0	0.0
Northampton County	12,155	1	8.2	0	0.0	0	0.0
Northumberland County	12,232	0	0.0	0	0.0	1	8.2
Nottoway County	15,673	0	0.0	5	31.9	0	0.0
Orange County	35,385	0	0.0	0	0.0	0	0.0
Page County	23,726	1	4.2	0	0.0	0	0.0
Patrick County	18,045	2	11.1	0	0.0	0	0.0
Pittsylvania County	62,194	0	0.0	6	9.6	0	0.0
Powhatan County	28,031	1	3.6	1	3.6	0	0.0
Prince Edward County	22,952	0	0.0	1	4.4	1	4.4
Prince George County	37,862	0	0.0	13	34.3	0	0.0
Prince William County	451,721	7	1.5	36	8.0	15	3.3
Pulaski County	34,332	2	5.8	0	0.0	0	0.0
Rappahannock County	7,378	0	0.0	0	0.0	0	0.0
Richmond County	8,908	0	0.0	0	0.0	0	0.0
Roanoke County	94,409	6	6.4	0	0.0	5	5.3
Rockbridge County	22,354	2	8.9	1	4.5	0	0.0
Rockingham County	78,593	3	3.8	2	2.5	2	2.5
Russell County	27,891	1	3.6	0	0.0	0	0.0
Scott County	22,126	0	0.0	0	0.0	0	0.0
Shenandoah County	43,190	2	4.6	0	0.0	0	0.0
Smyth County	31,470	1	3.2	1	3.2	0	0.0
Southampton County	18,109	1	5.5	2	11.0	1	5.5
Spotsylvania County	130,475	1	0.8	6	4.6	3	2.3
Stafford County	142,003	5	3.5	7	4.9	3	2.1
Surry County	6,709	0	0.0	0	0.0	0	0.0
Sussex County	11,715	0	0.0	2	17.1	0	0.0
Tazewell County	42,899	0	0.0	0	0.0	0	0.0
Warren County	39,083	2	5.1	2	5.1	0	0.0
Washington County	54,591	2	3.7	0	0.0	1	1.8
Westmoreland County	17,629	1	5.7	0	0.0	0	0.0
Wise County	39,718	1	2.5	0	0.0	0	0.0
Wythe County	29,119	1	3.4	1	3.4	0	0.0
York County	67,837	1	1.5	6	8.8	0	0.0

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		**Streptococcal Disease, Group A, Invasive or TSS**		**Syphilis, Early**		**Tuberculosis**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	240	2.9	1072	12.8	205	2.4
LOCALITY							
Alexandria	153,511	5	3.3	41	26.7	19	12.4
Bristol	17,141	1	5.8	0	0.0	0	0.0
Buena Vista	6,618	1	15.1	1	15.1	0	0.0
Charlottesville	46,597	0	0.0	7	15.0	0	0.0
Chesapeake	235,429	4	1.7	45	19.1	3	1.3
Colonial Heights	17,820	0	0.0	0	0.0	0	0.0
Covington	5,658	0	0.0	0	0.0	0	0.0
Danville	42,082	2	4.8	3	7.1	0	0.0
Emporia	5,496	1	18.2	1	18.2	0	0.0
Fairfax City	24,013	1	4.2	0	0.0	2	8.3
Falls Church	13,892	0	0.0	2	14.4	0	0.0
Franklin City	8,490	2	23.6	3	35.3	0	0.0
Fredericksburg	28,118	1	3.6	1	3.6	0	0.0
Galax	6,914	0	0.0	1	14.5	0	0.0
Hampton	136,454	7	5.1	51	37.4	2	1.5
Harrisonburg	52,538	1	1.9	3	5.7	0	0.0
Hopewell	22,378	0	0.0	7	31.3	0	0.0
Lexington	7,262	0	0.0	0	0.0	0	0.0
Lynchburg	79,812	4	5.0	3	3.8	0	0.0
Manassas	41,764	0	0.0	1	2.4	1	2.4
Manassas Park	15,726	0	0.0	1	6.4	0	0.0
Martinsville	13,645	0	0.0	3	22.0	1	7.3
Newport News	182,385	6	3.3	68	37.3	1	0.5
Norfolk	246,393	9	3.7	106	43.0	7	2.8
Norton	3,939	1	25.4	0	0.0	0	0.0
Petersburg	32,477	2	6.2	29	89.3	1	3.1
Poquoson	12,059	0	0.0	0	0.0	0	0.0
Portsmouth	96,201	5	5.2	31	32.2	0	0.0
Radford	17,403	0	0.0	2	11.5	0	0.0
Richmond City	220,289	8	3.6	100	45.4	2	0.9
Roanoke City	99,897	10	10.0	3	3.0	2	2.0
Salem	25,432	2	7.9	0	0.0	0	0.0
Staunton	24,416	2	8.2	0	0.0	0	0.0
Suffolk	88,161	1	1.1	17	19.3	3	3.4
Virginia Beach	452,745	16	3.5	111	24.5	9	2.0
Waynesboro	21,491	1	4.7	0	0.0	0	0.0
Williamsburg	15,052	0	0.0	3	19.9	3	19.9
Winchester	27,284	1	3.7	4	14.7	1	3.7

Number of Cases and Rate for each Locality, District, and Region for these Diseases in 2016:		**Streptococcal Disease, Group A, Invasive or TSS**		**Syphilis, Early**		**Tuberculosis**	
LOCALITY/DISTRICT/REGION	2015 POPULATION	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000	REPORTED CASES	RATE PER 100,000
VIRGINIA TOTAL	8,382,993	240	2.9	1072	12.8	205	2.4
DISTRICT/REGION							

Central Shenandoah	294,270	14	4.8	7	2.4	4	1.4
Lord Fairfax	230,845	9	3.9	6	2.6	1	0.4
Rappahannock	356,095	10	2.8	16	4.5	7	2.0
Rappahannock/Rapidan	174,111	2	1.1	0	0.0	0	0.0
Thomas Jefferson	247,084	4	1.6	13	5.3	1	0.4
Northwest Region	1,302,405	39	3.0	42	3.2	13	1.0

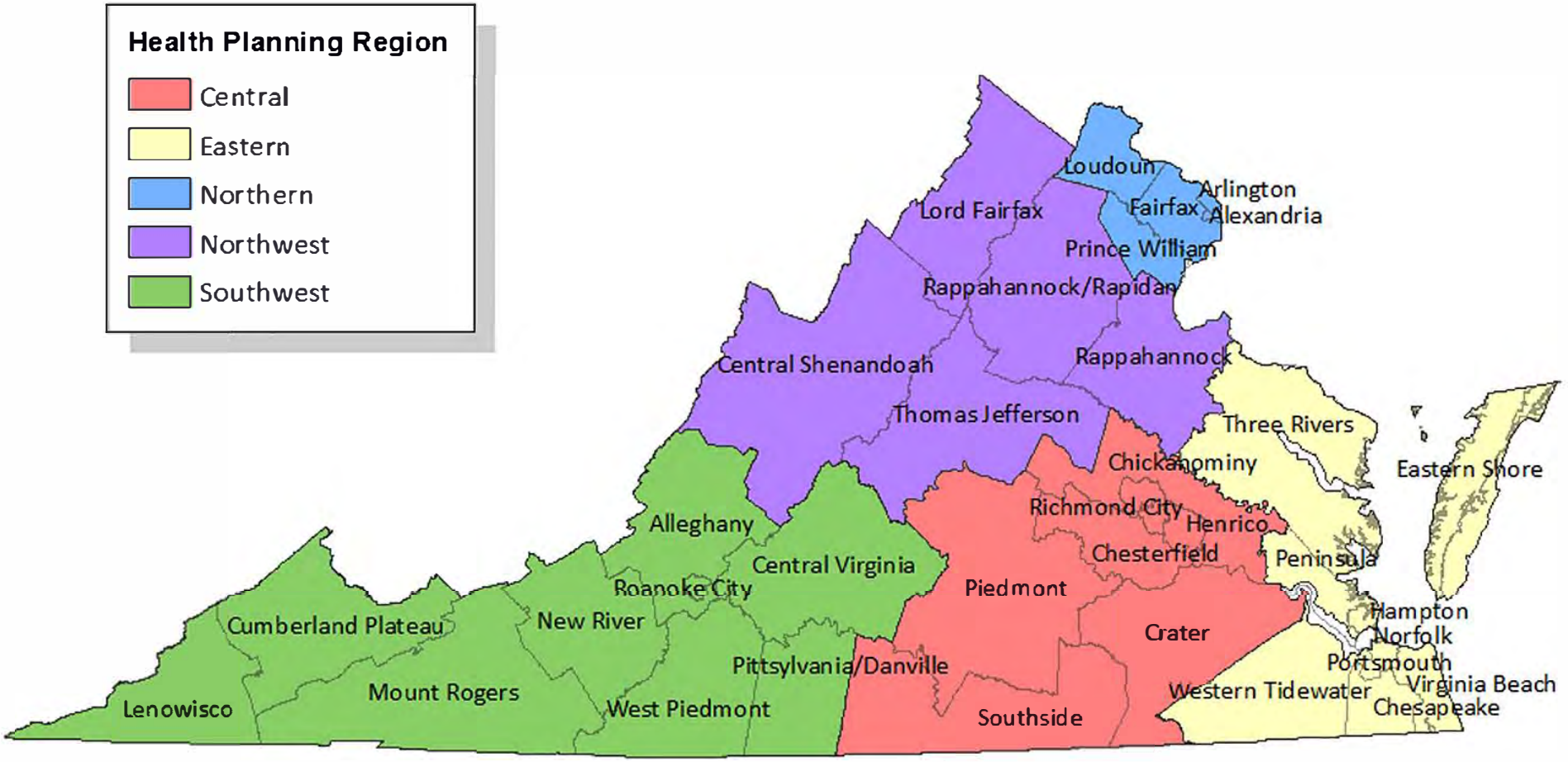
Alexandria	153,511	5	3.3	41	26.7	19	12.4
Arlington	229,164	6	2.6	62	27.1	10	4.4
Fairfax	1,180,139	22	1.9	83	7.0	67	5.7
Loudoun	375,629	9	2.4	18	4.8	14	3.7
Prince William	509,211	7	1.4	38	7.5	16	3.1
Northern Region	2,447,654	49	2.0	242	9.9	126	5.1

Alleghany	179,734	11	6.1	0	0.0	6	3.3
Central Virginia	259,950	6	2.3	9	3.5	1	0.4
Cumberland Plateau	108,681	3	2.8	0	0.0	0	0.0
Lenowisco	90,525	4	4.4	0	0.0	1	1.1
Mount Rogers	191,532	7	3.7	4	2.1	1	0.5
New River	181,747	7	3.9	10	5.5	0	0.0
Pittsylvania/Danville	104,276	2	1.9	9	8.6	0	0.0
Roanoke City	99,897	10	10.0	3	3.0	2	2.0
West Piedmont	139,835	5	3.6	8	5.7	2	1.4
Southwest Region	1,356,177	55	4.1	43	3.2	13	1.0

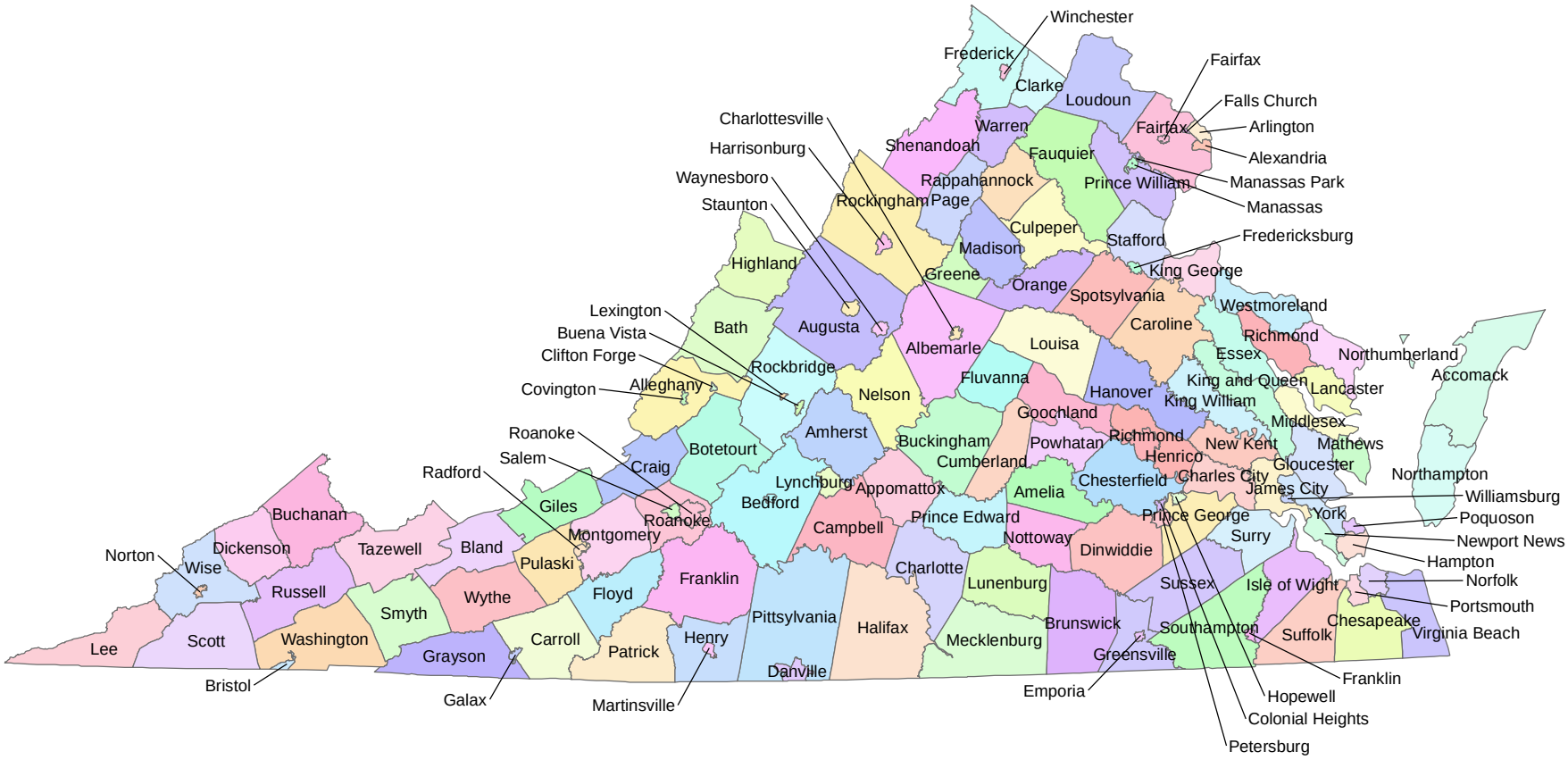
Chesterfield	381,538	8	2.1	41	10.7	4	1.0
Chickahominy	152,912	7	4.6	14	9.2	1	0.7
Crater	156,374	3	1.9	62	39.6	1	0.6
Henrico	325,155	10	3.1	57	17.5	14	4.3
Piedmont	102,779	1	1.0	9	8.8	1	1.0
Richmond City	220,289	8	3.6	100	45.4	2	0.9
Southside	82,904	1	1.2	3	3.6	0	0.0
Central Region	1,421,951	38	2.7	286	20.1	23	1.6

Chesapeake	235,429	4	1.7	45	19.1	3	1.3
Eastern Shore	45,128	1	2.2	0	0.0	0	0.0
Hampton	136,454	7	5.1	51	37.4	2	1.5
Norfolk	246,393	9	3.7	106	43.0	7	2.8
Peninsula	350,480	8	2.3	78	22.3	4	1.1
Portsmouth	96,201	5	5.2	31	32.2	0	0.0
Three Rivers	140,902	3	2.1	5	3.5	1	0.7
Virginia Beach	452,745	16	3.5	111	24.5	9	2.0
Western Tidewater	151,074	6	4.0	32	21.2	4	2.6
Eastern Region	1,854,806	59	3.2	459	24.7	30	1.6

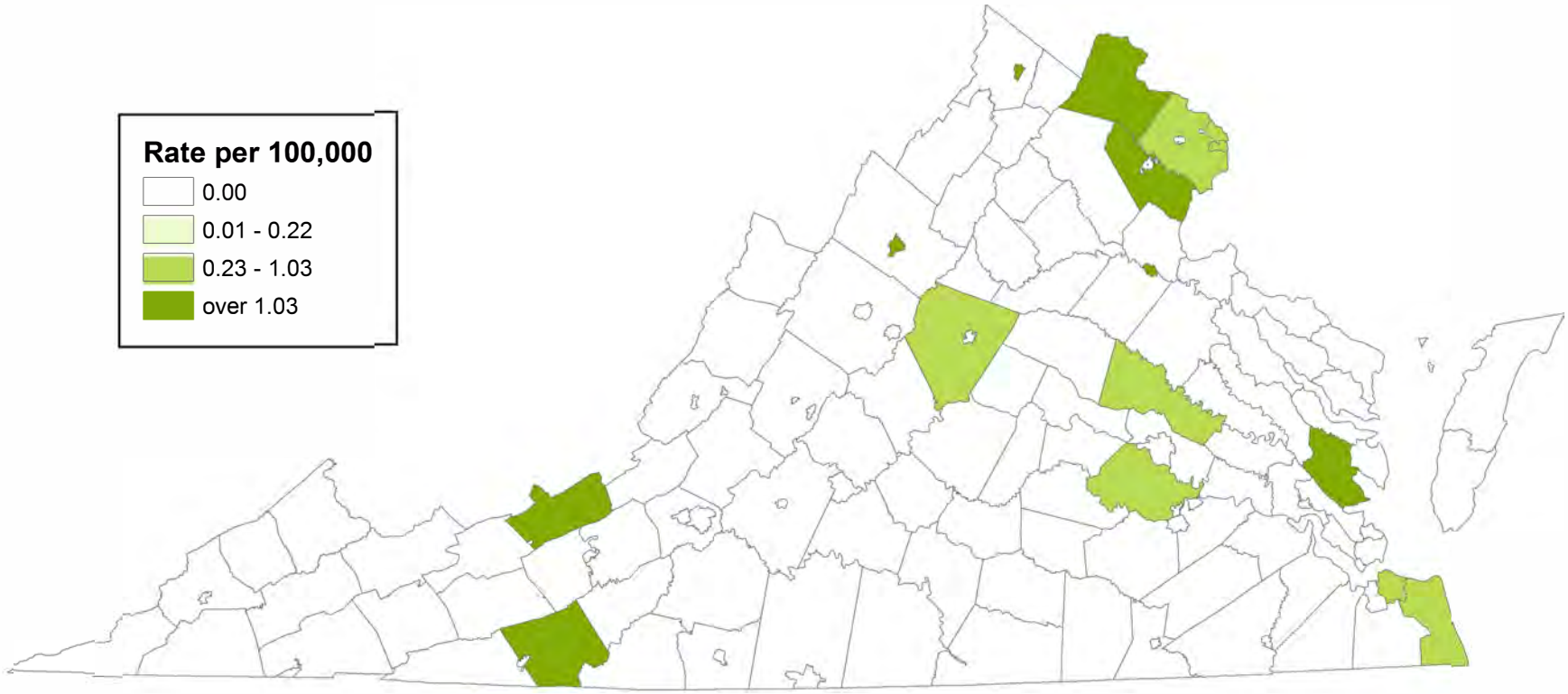
Virginia Department of Health
Health Districts and Health Planning Regions



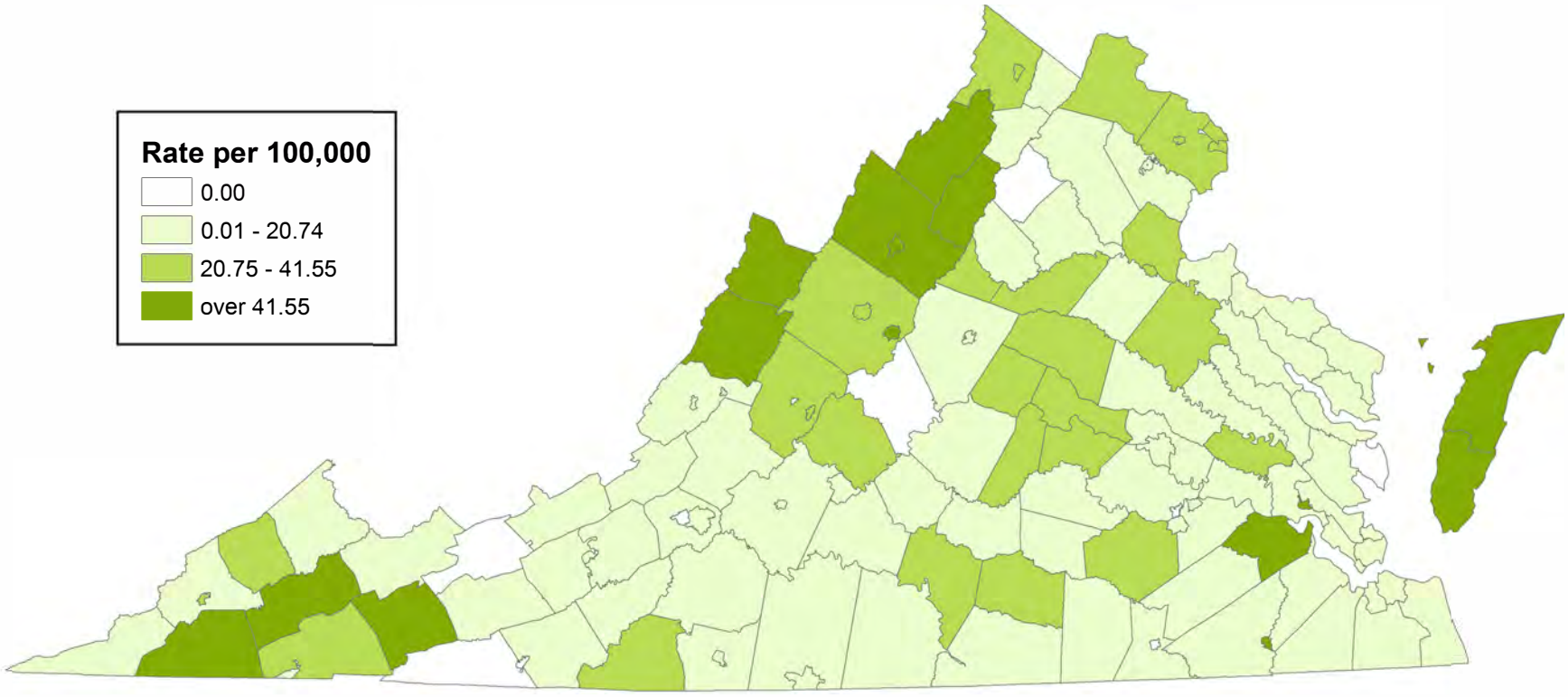
Virginia Localities



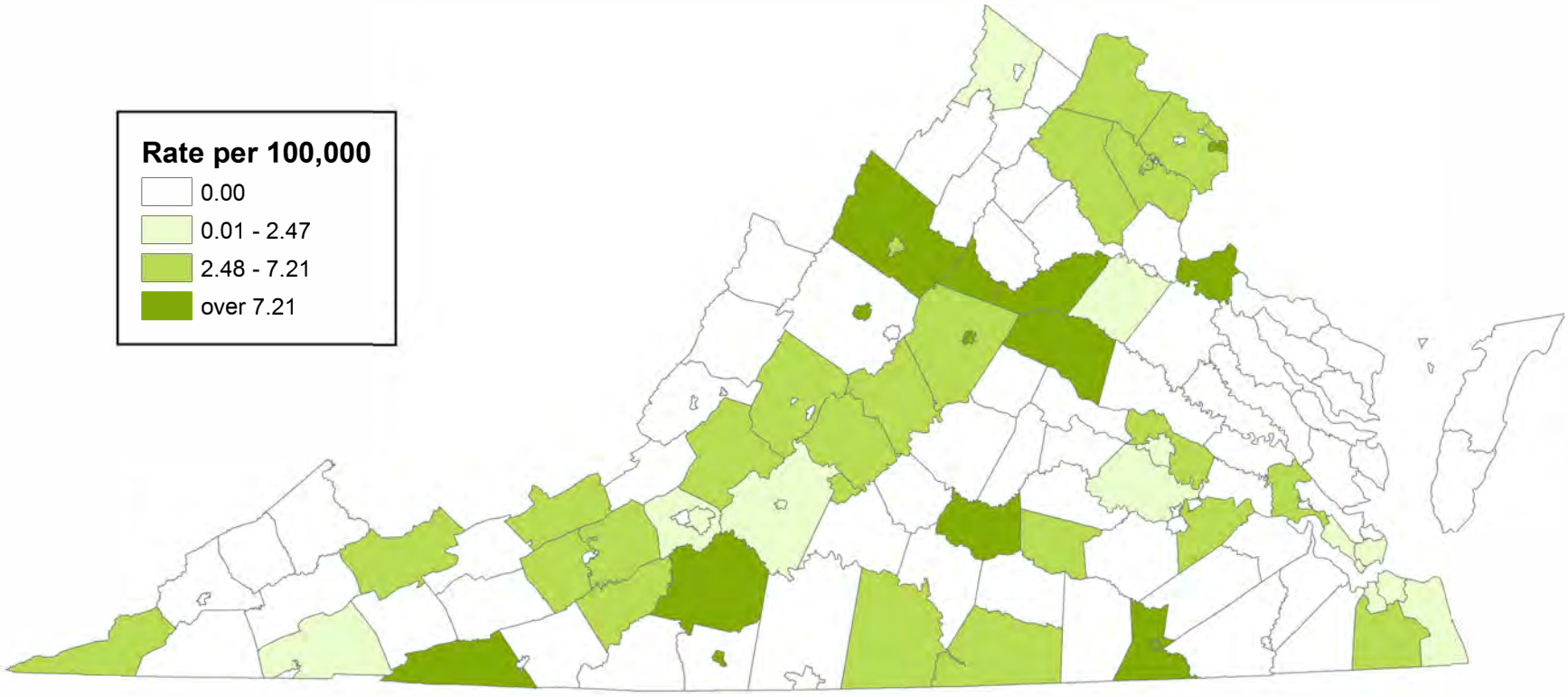
Amebiasis Incidence Rate by Locality
Virginia, 2016



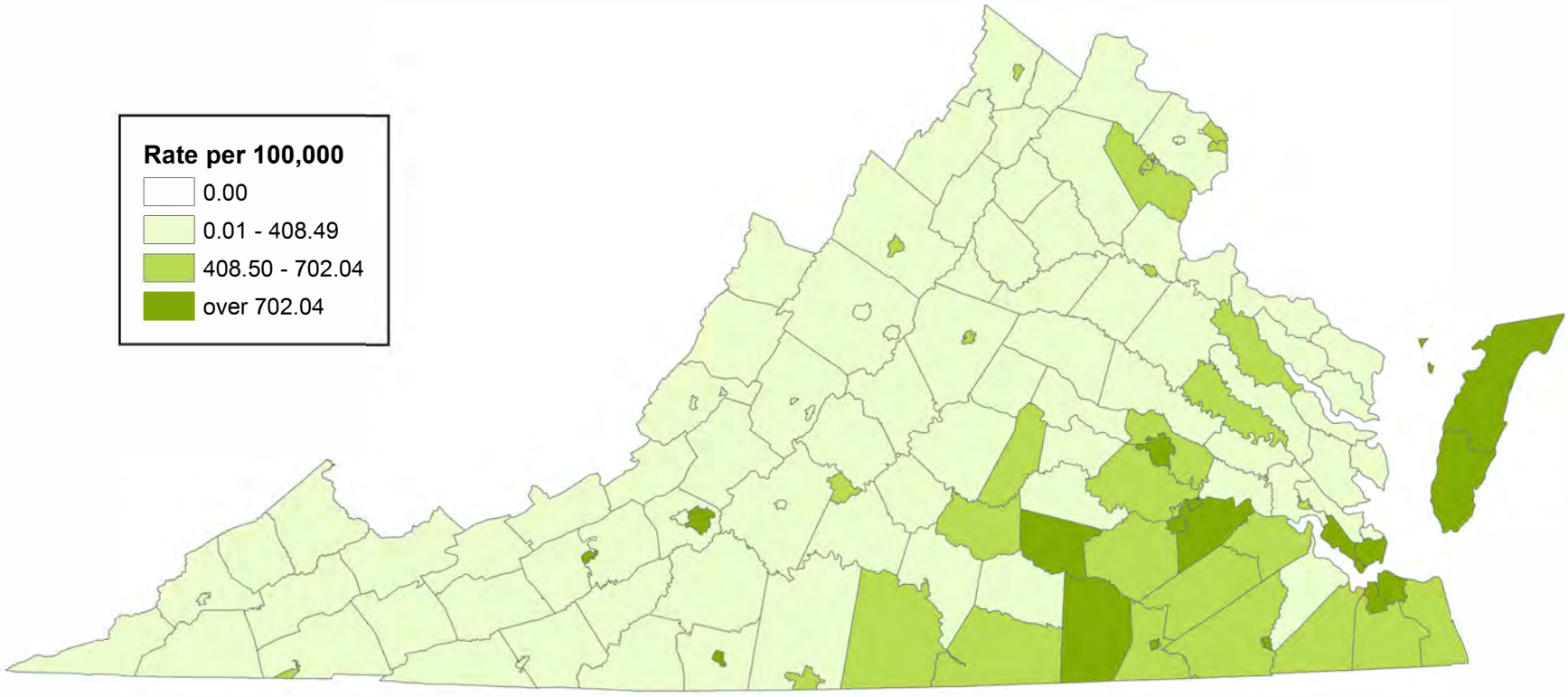
Campylobacteriosis Incidence Rate by Locality
Virginia, 2016



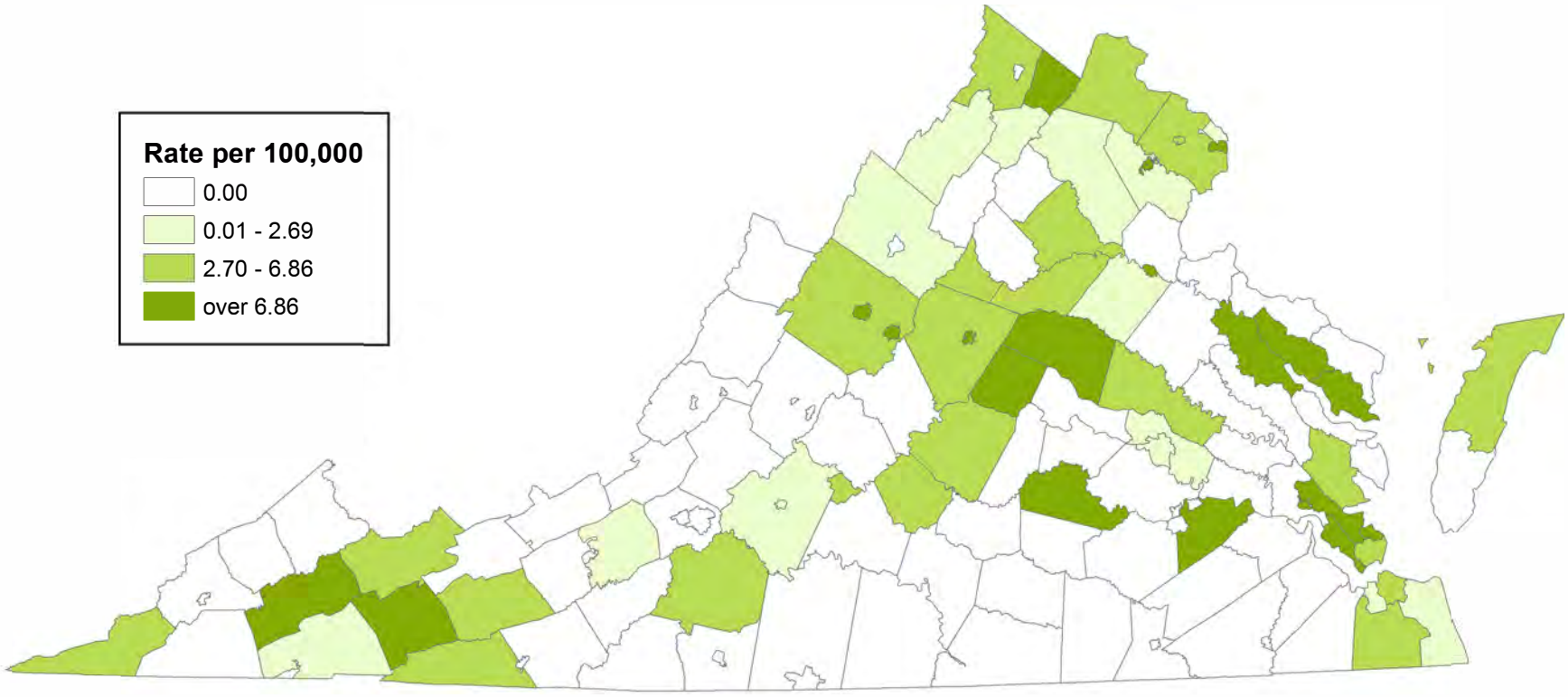
Chickenpox Incidence Rate by Locality
Virginia, 2016



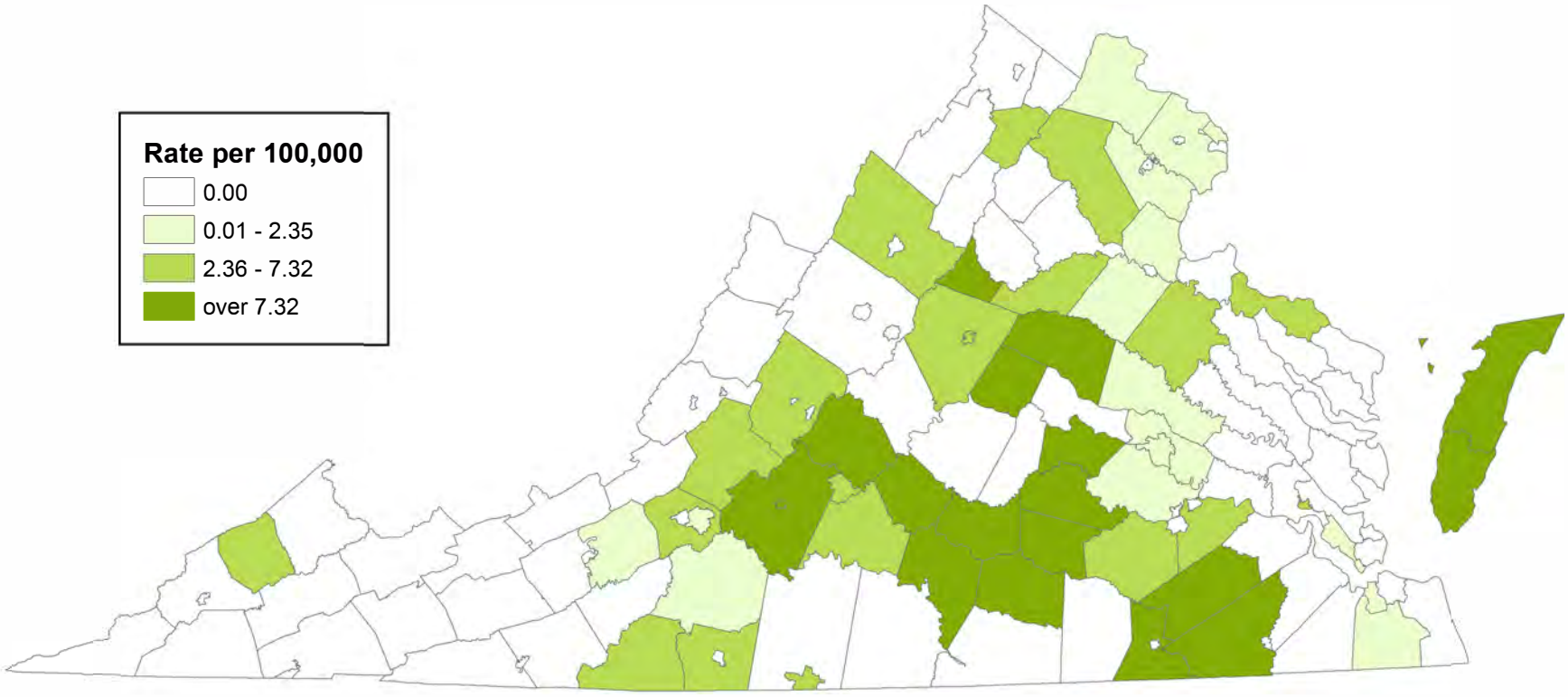
Chlamydia trachomatis Infection Incidence Rate by Locality Virginia, 2016



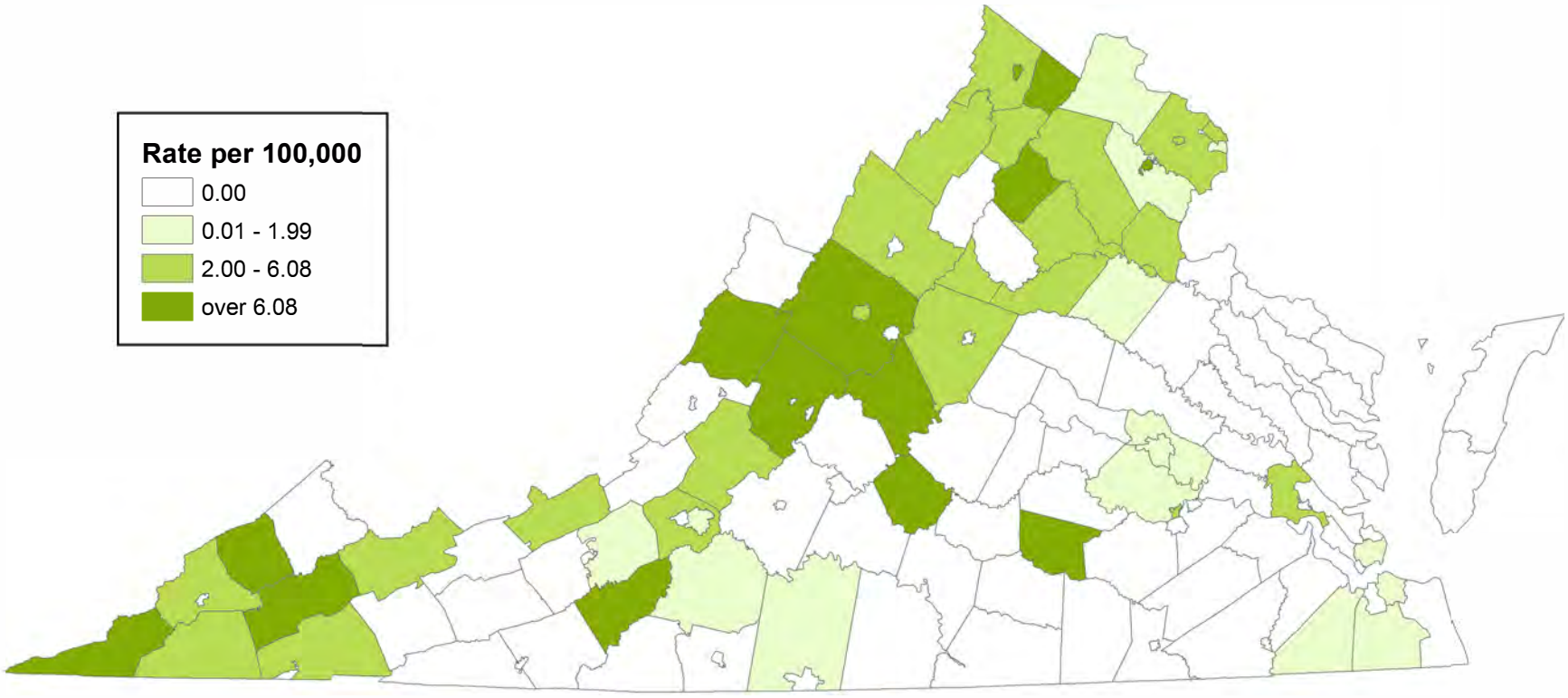
Cryptosporidiosis Incidence Rate by Locality
Virginia, 2016



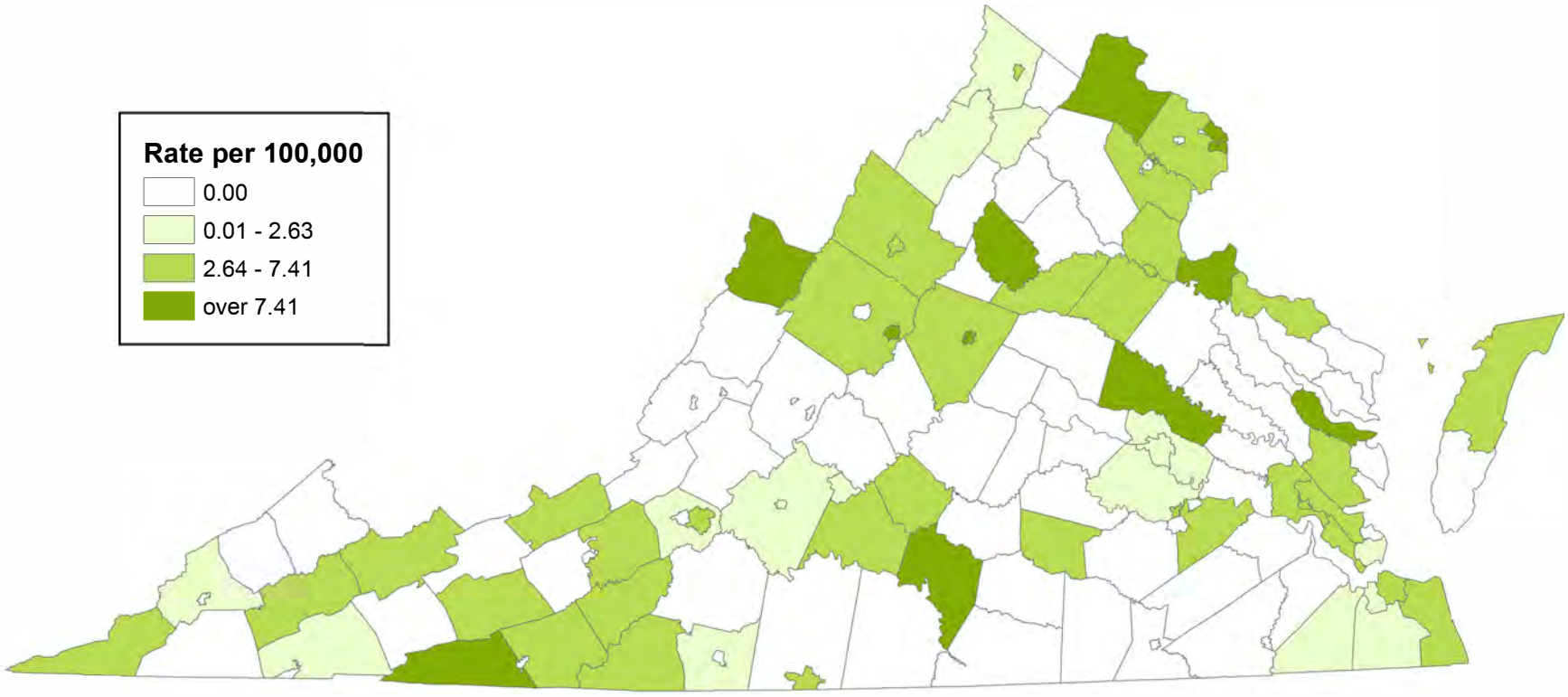
Ehrlichiosis / Anaplasmosis Incidence Rate by Locality
Virginia, 2016



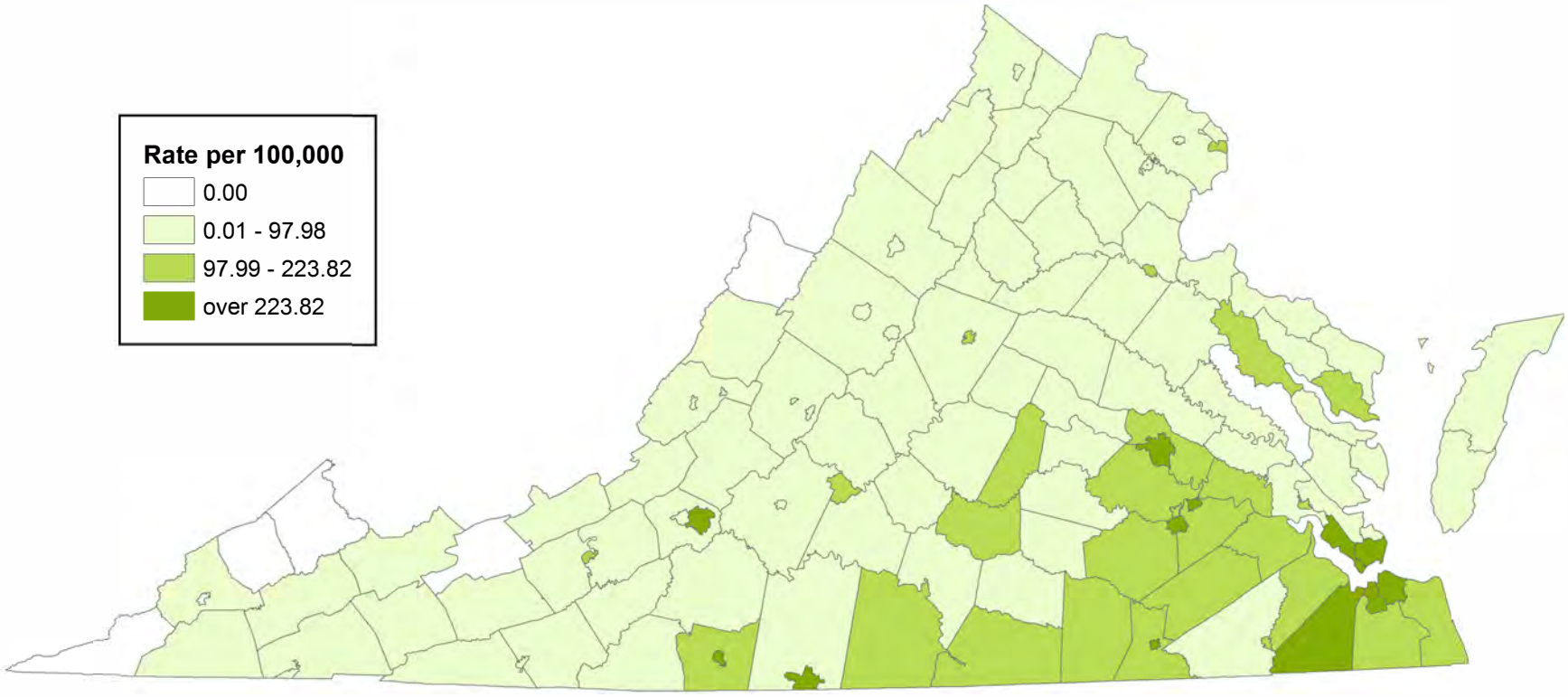
Escherichia coli Infection, Shiga Toxin-Producing Incidence Rate by Locality, Virginia, 2016



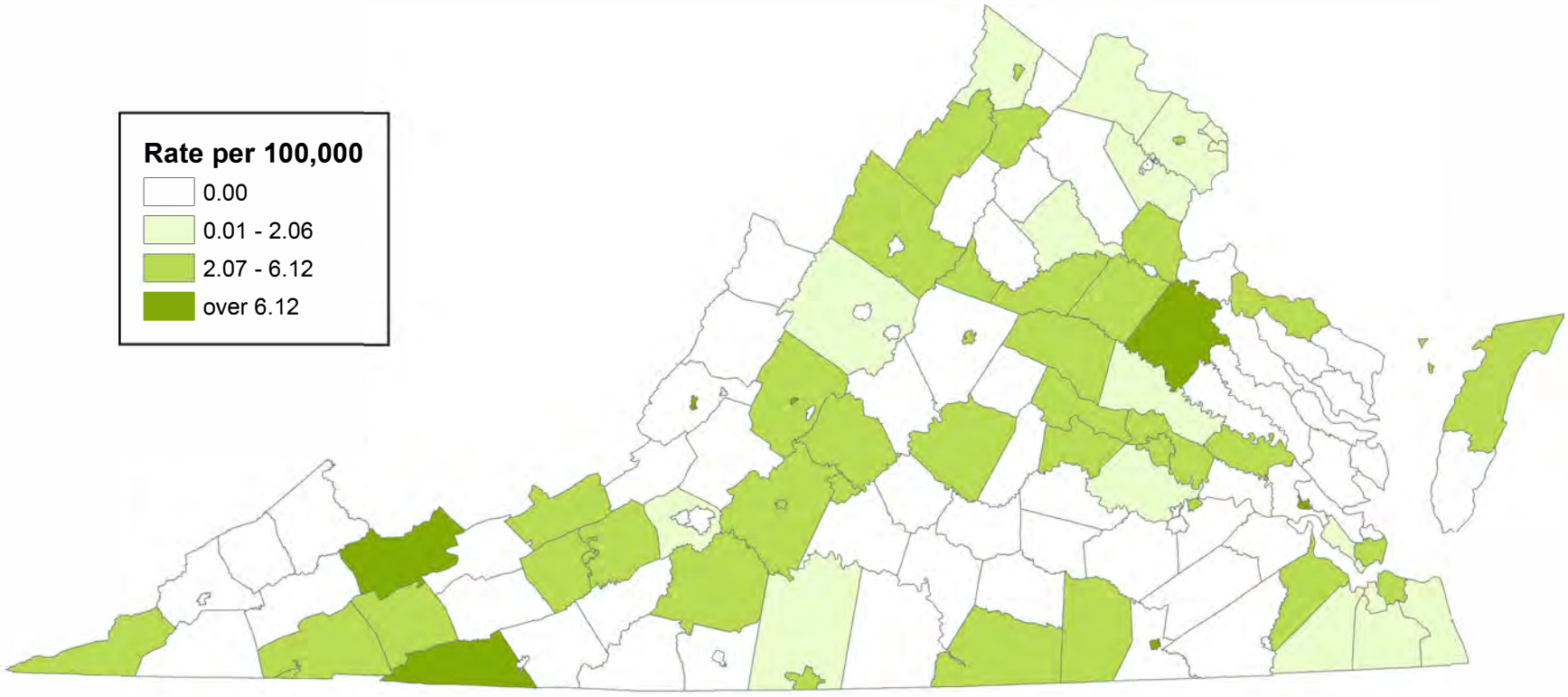
Giardiasis Incidence Rate by Locality
Virginia, 2016



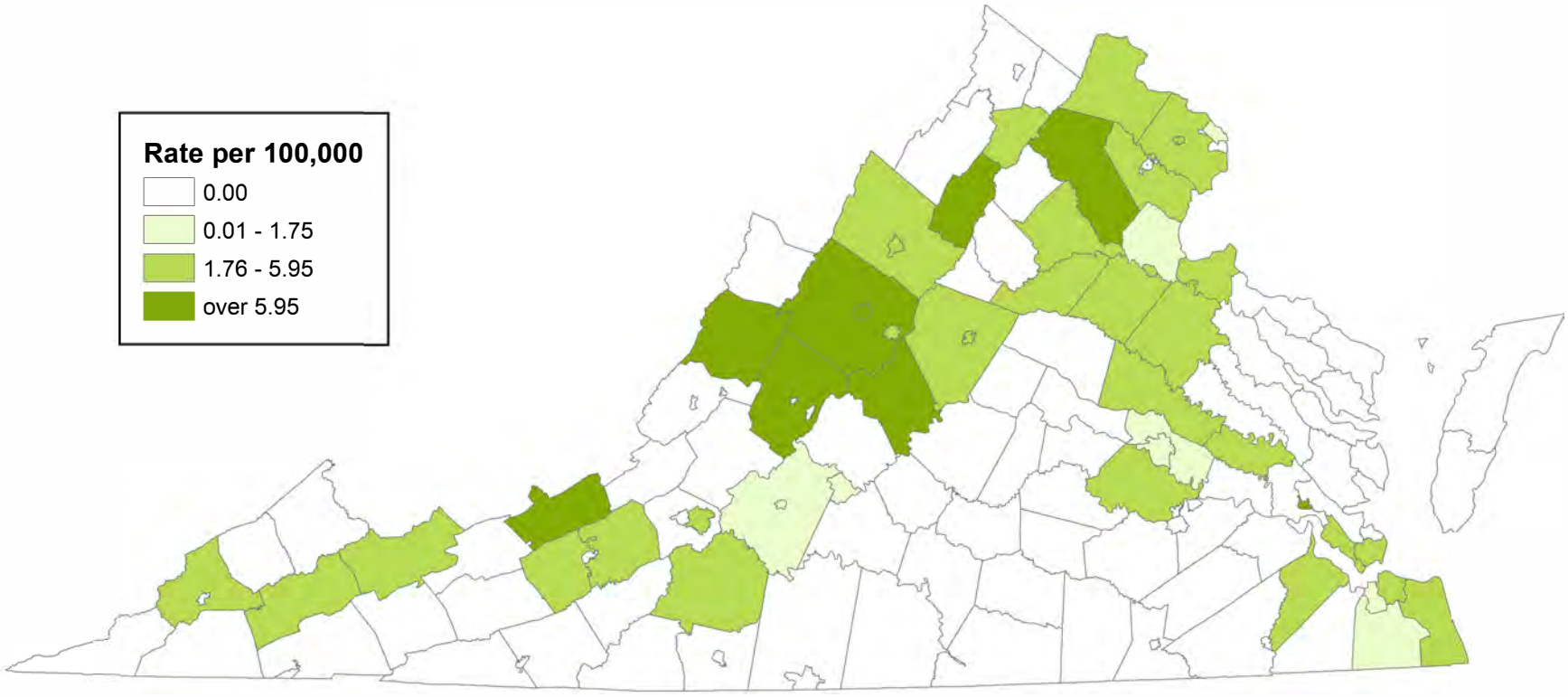
Gonorrhea Incidence Rate by Locality
Virginia, 2016



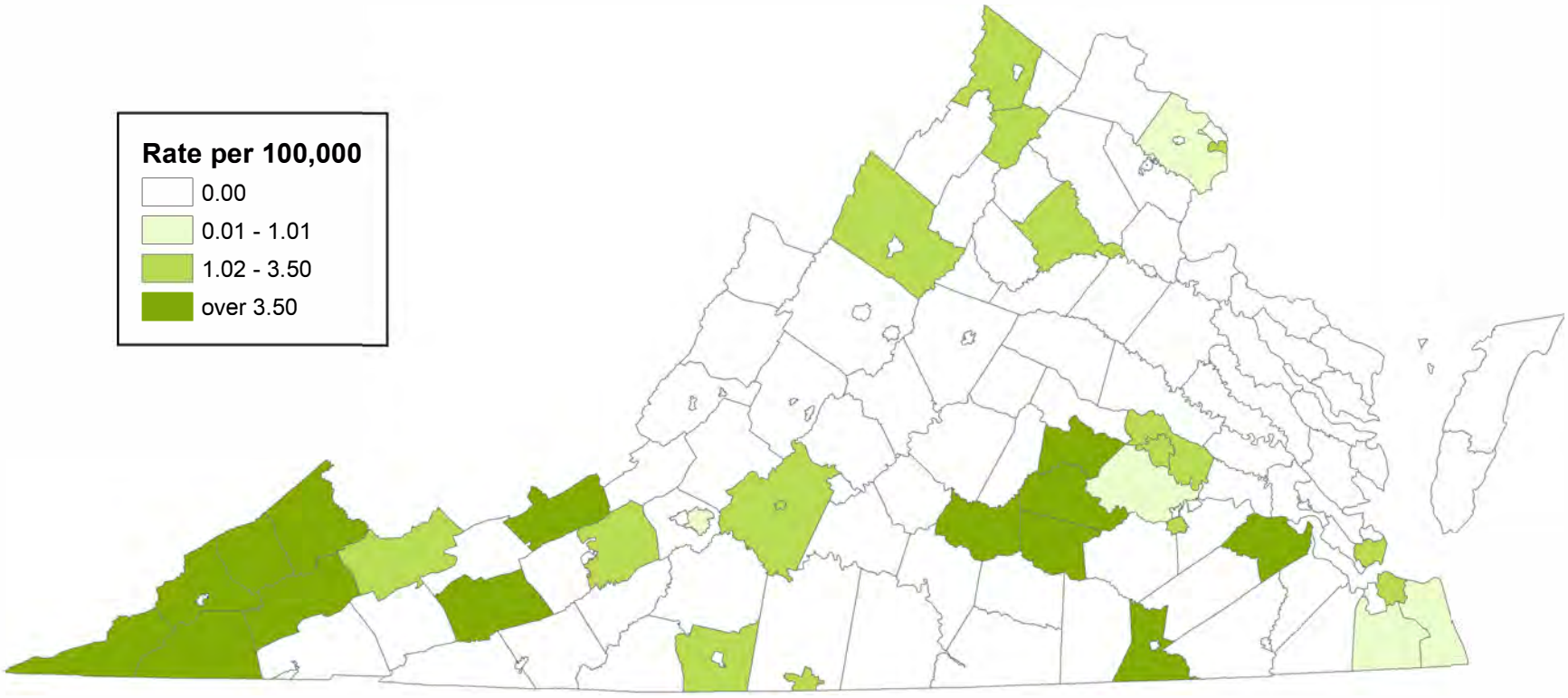
Haemophilus influenzae Infection, Invasive, Incidence Rate by Locality, Virginia, 2016



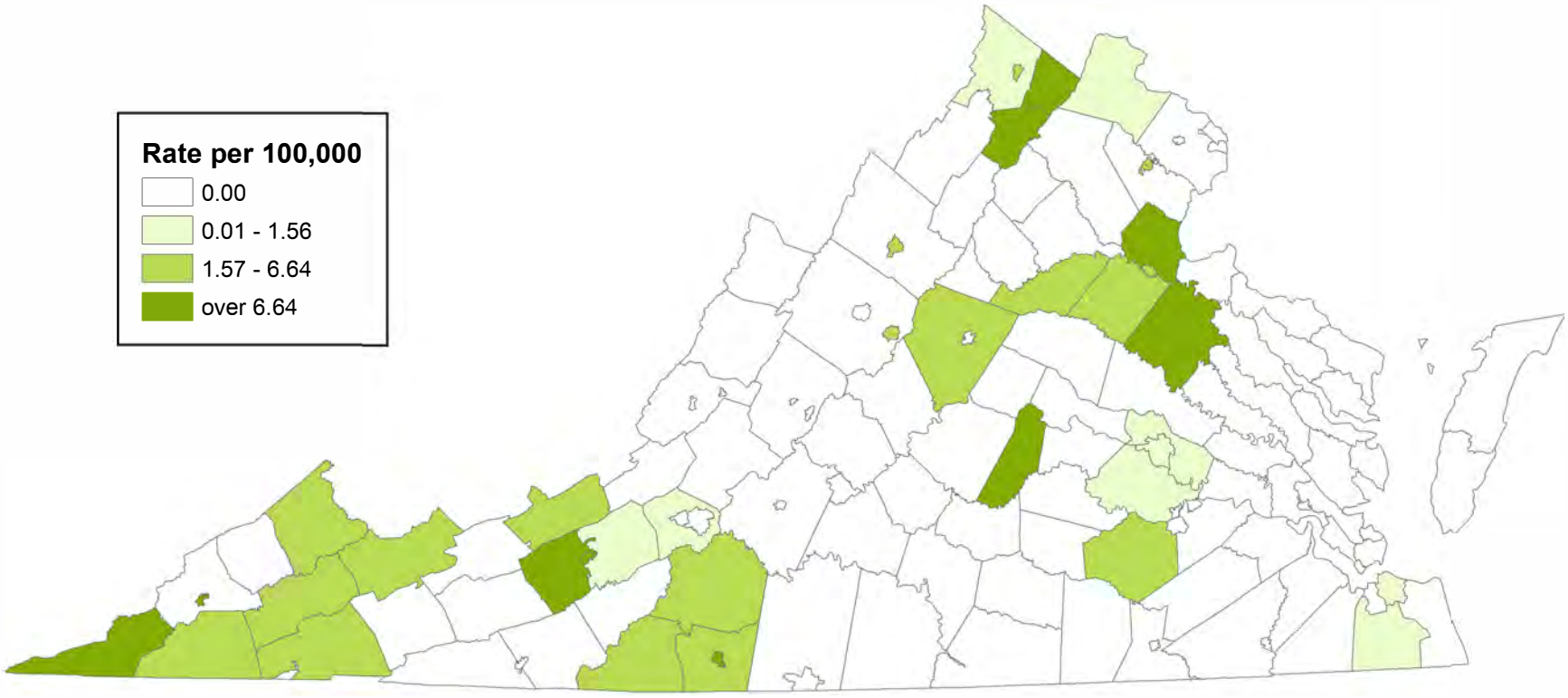
Hepatitis A Incidence Rate by Locality
Virginia, 2016



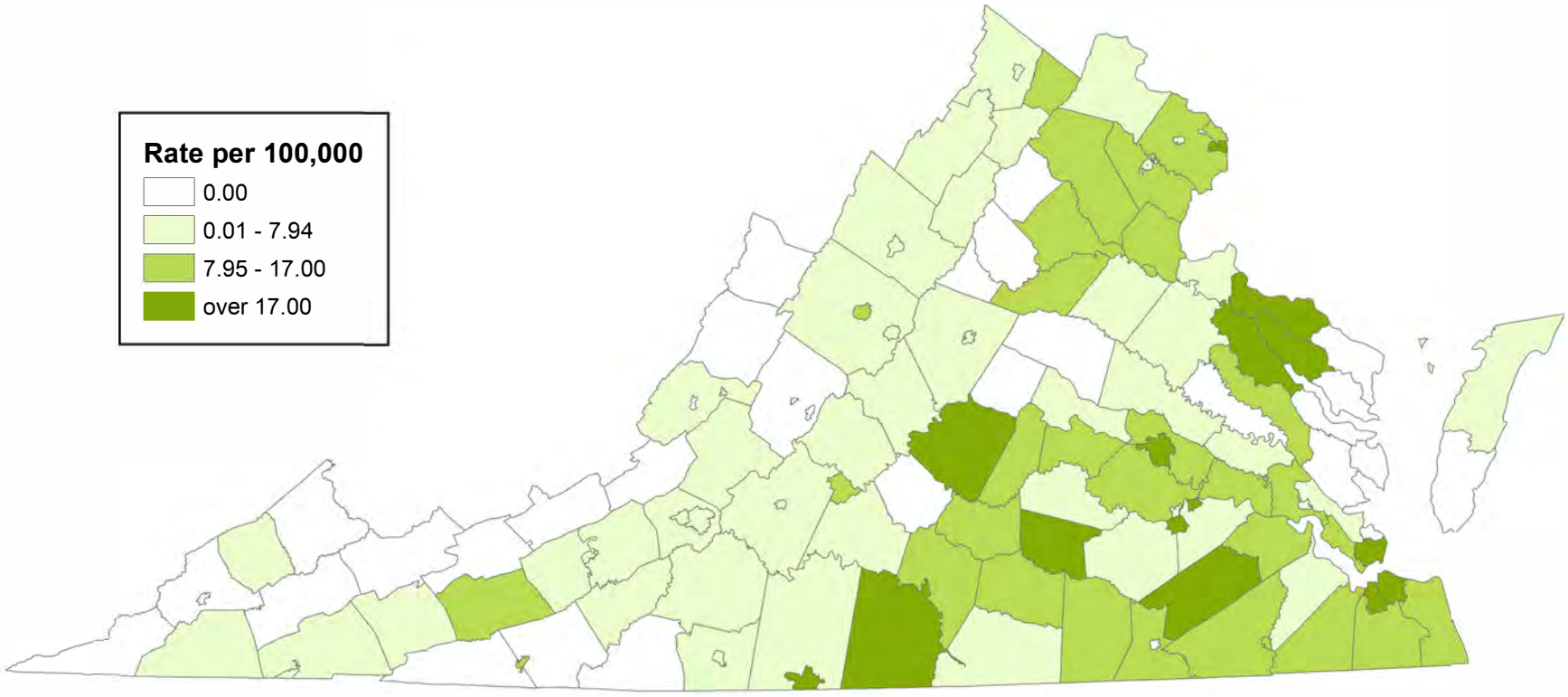
Hepatitis B, Acute, Incidence Rate by Locality
Virginia, 2016



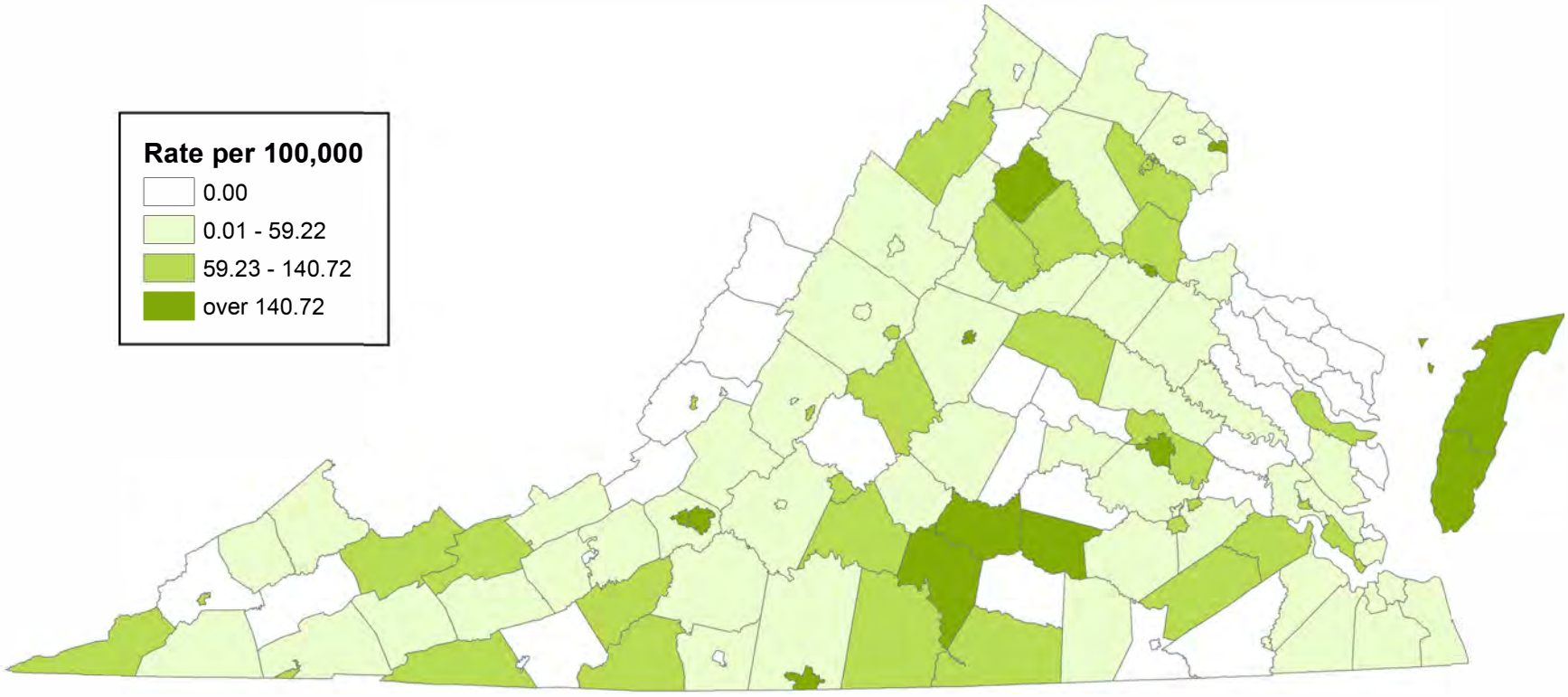
Hepatitis C, Acute, Incidence Rate by Locality
Virginia, 2016



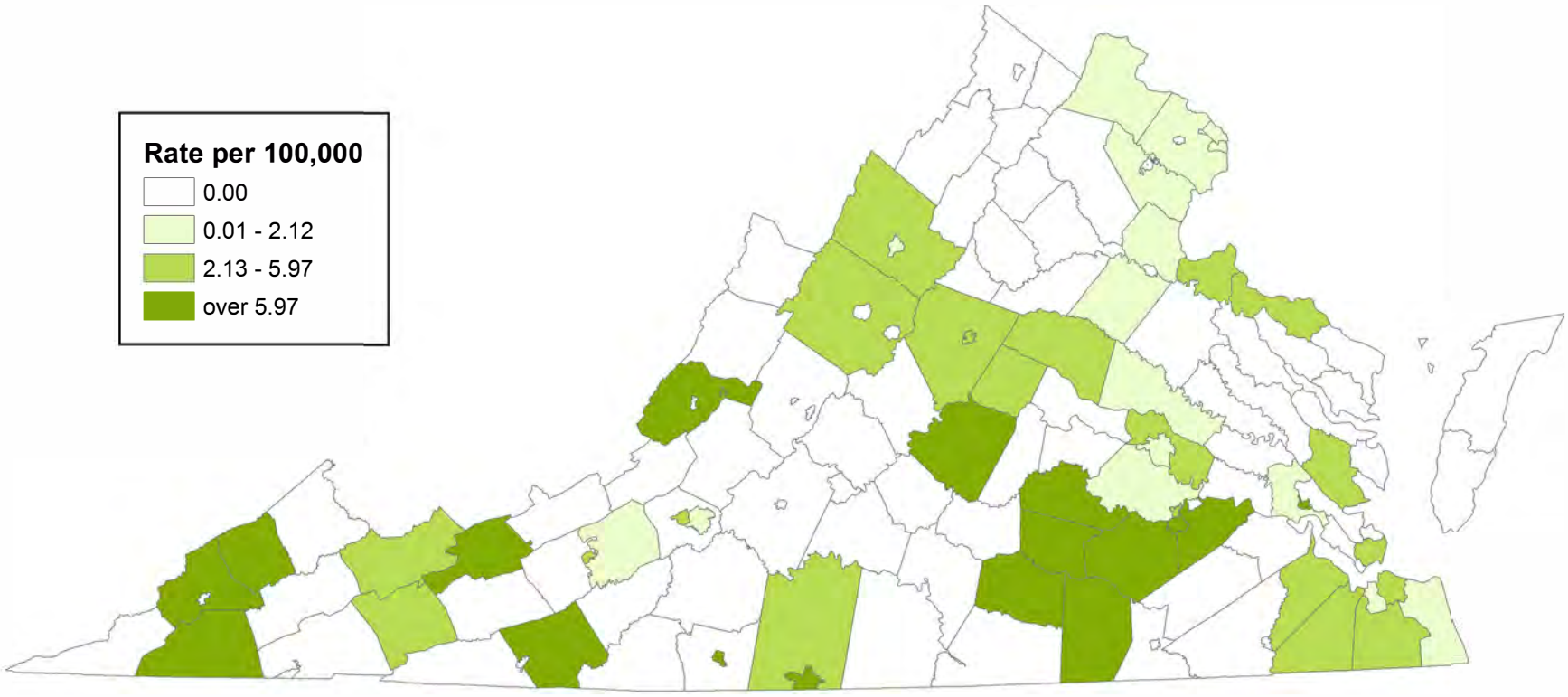
HIV Disease Incidence Rate by Locality
Virginia, 2016



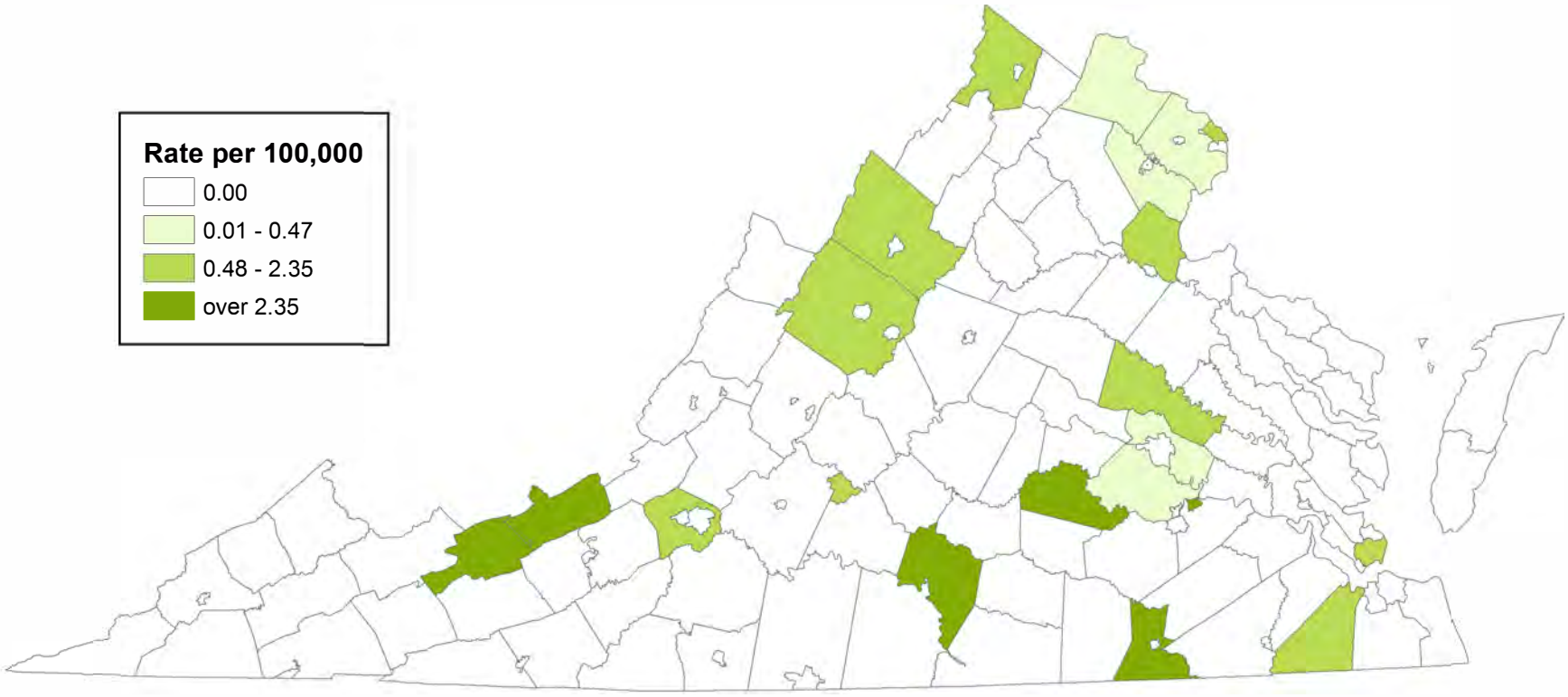
Lead - Elevated Blood Levels in Children
Incidence Rate by Locality, Virginia, 2016



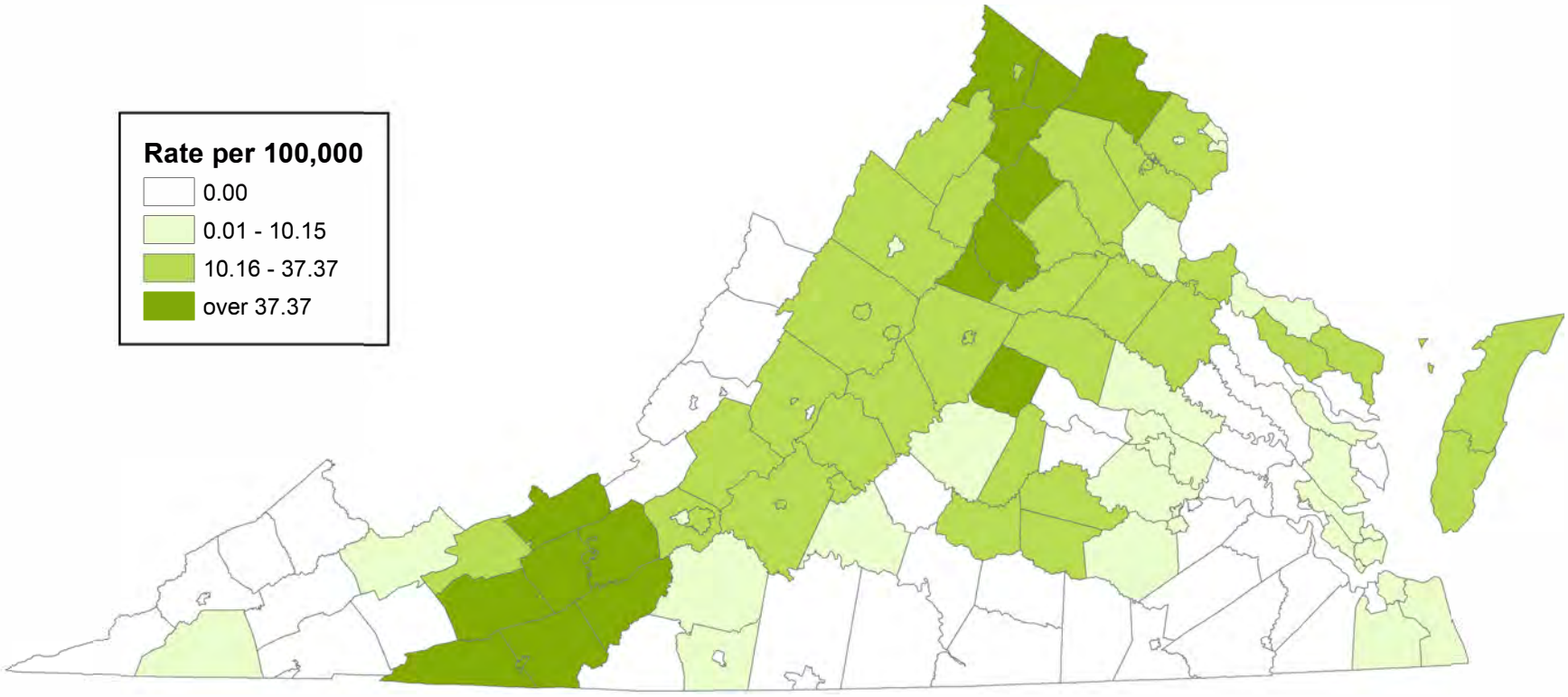
Legionellosis Incidence Rate by Locality
Virginia, 2016



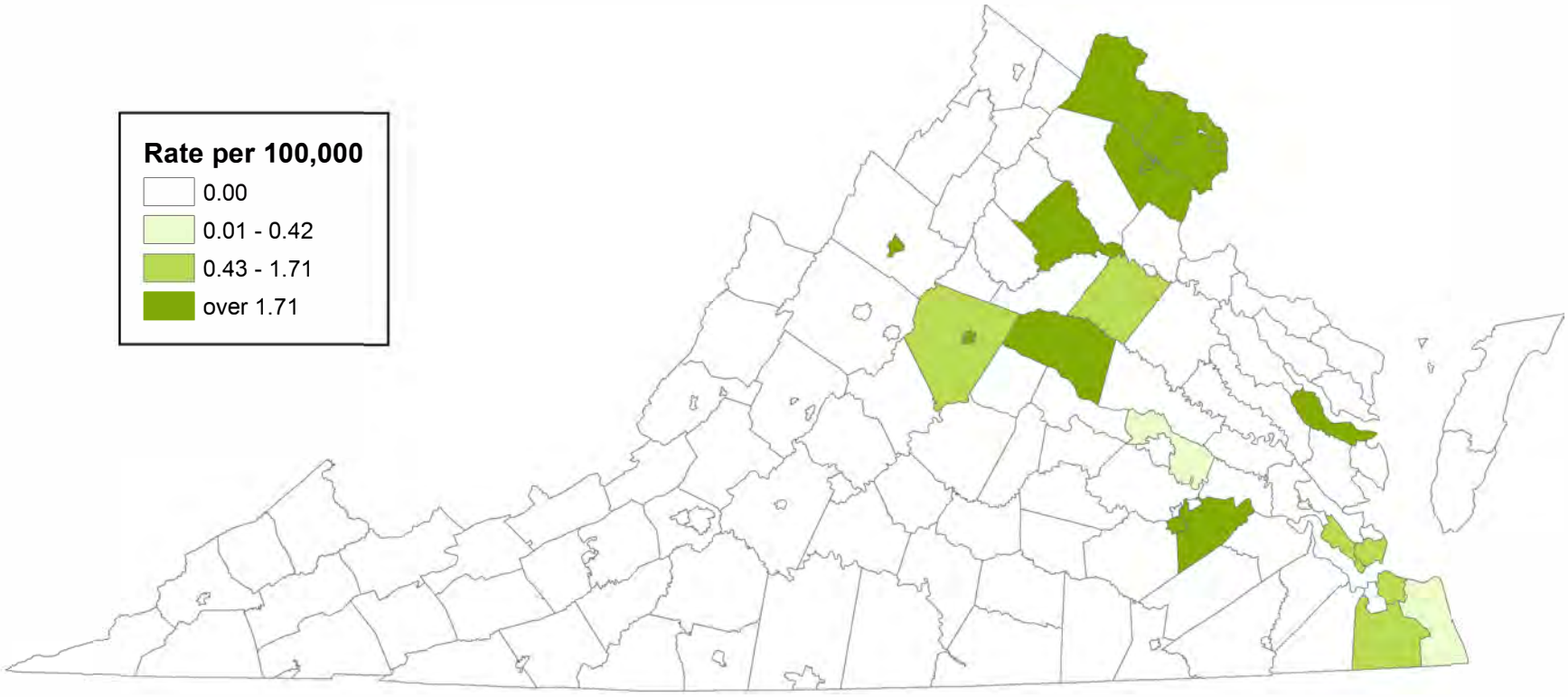
Listeriosis Incidence Rate by Locality
Virginia, 2016



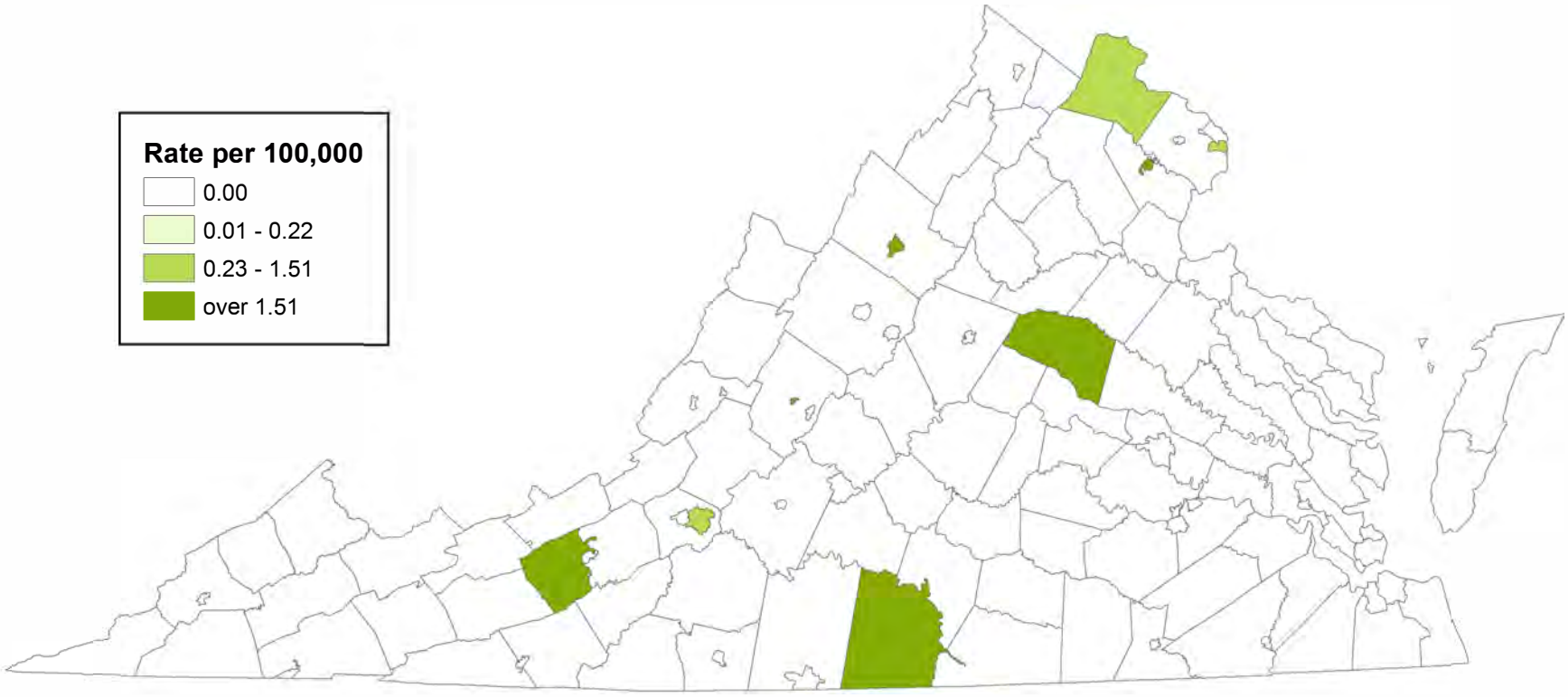
Lyme Disease Incidence Rate by Locality
Virginia, 2016



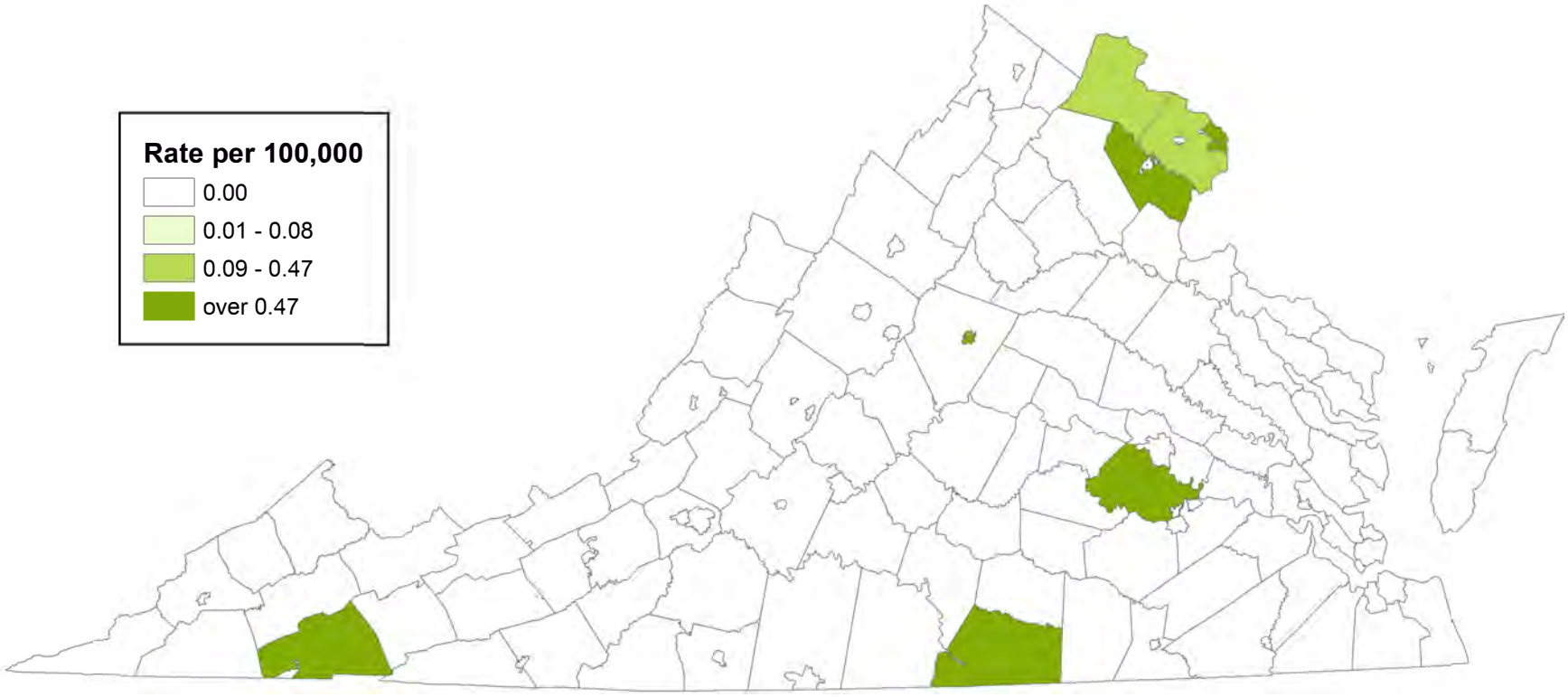
Malaria Incidence Rate by Locality
Virginia, 2016



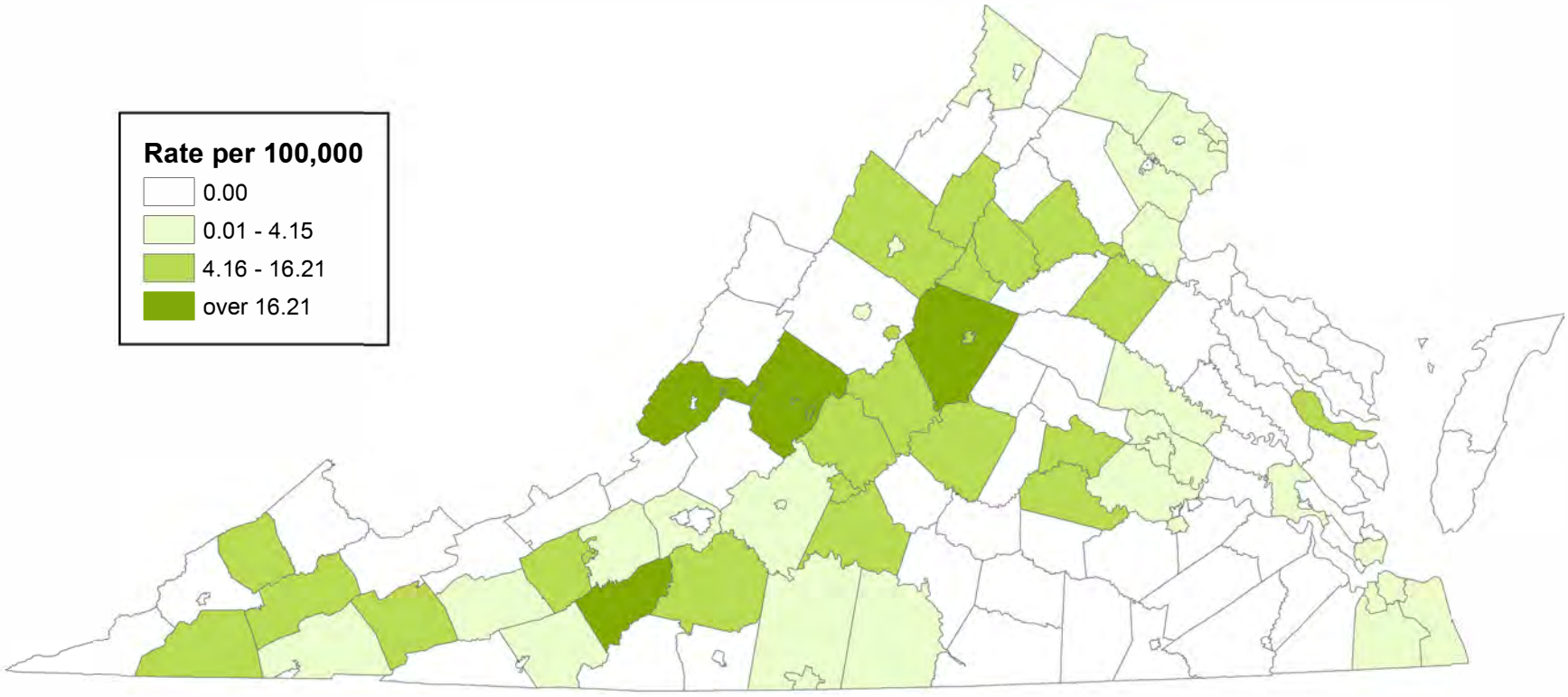
Meningococcal Disease Incidence Rate by Locality
Virginia, 2016



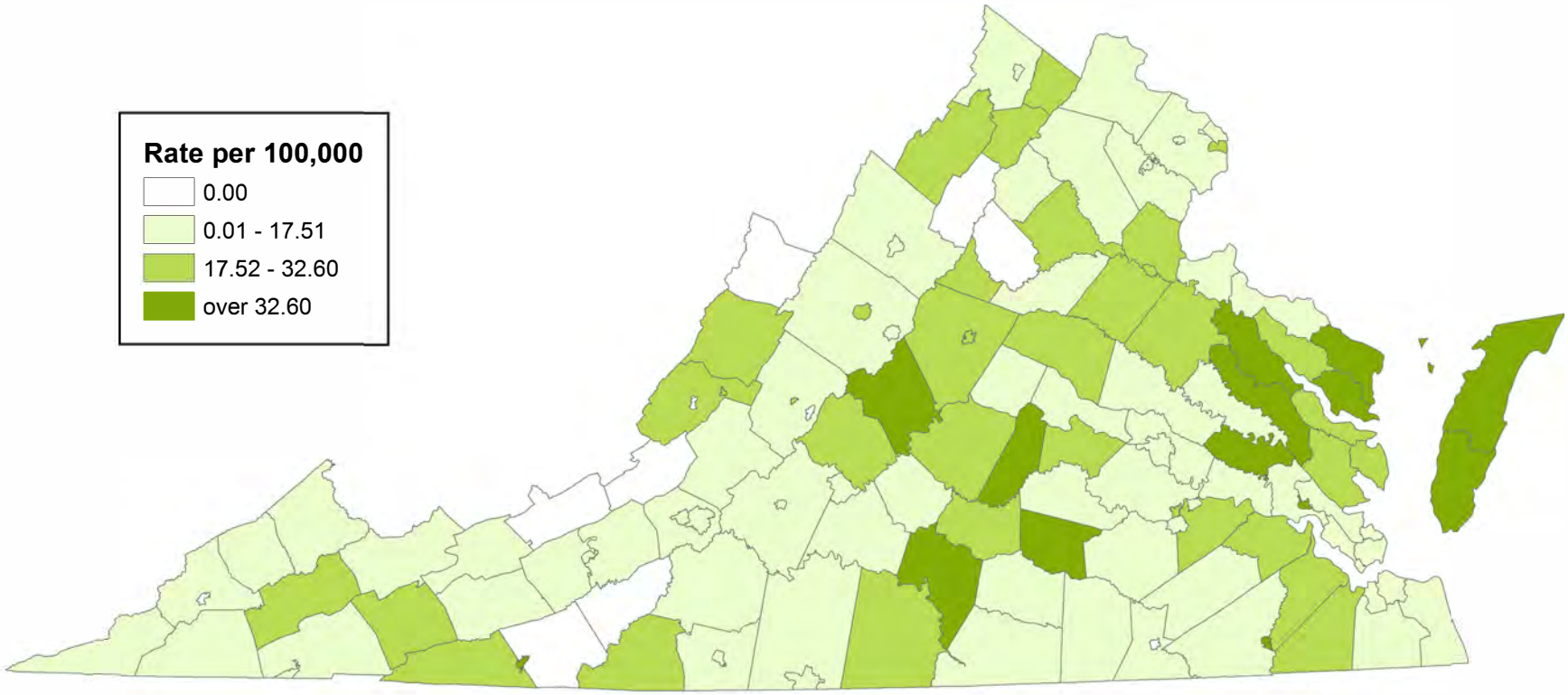
Mumps Incidence Rate by Locality
Virginia, 2016



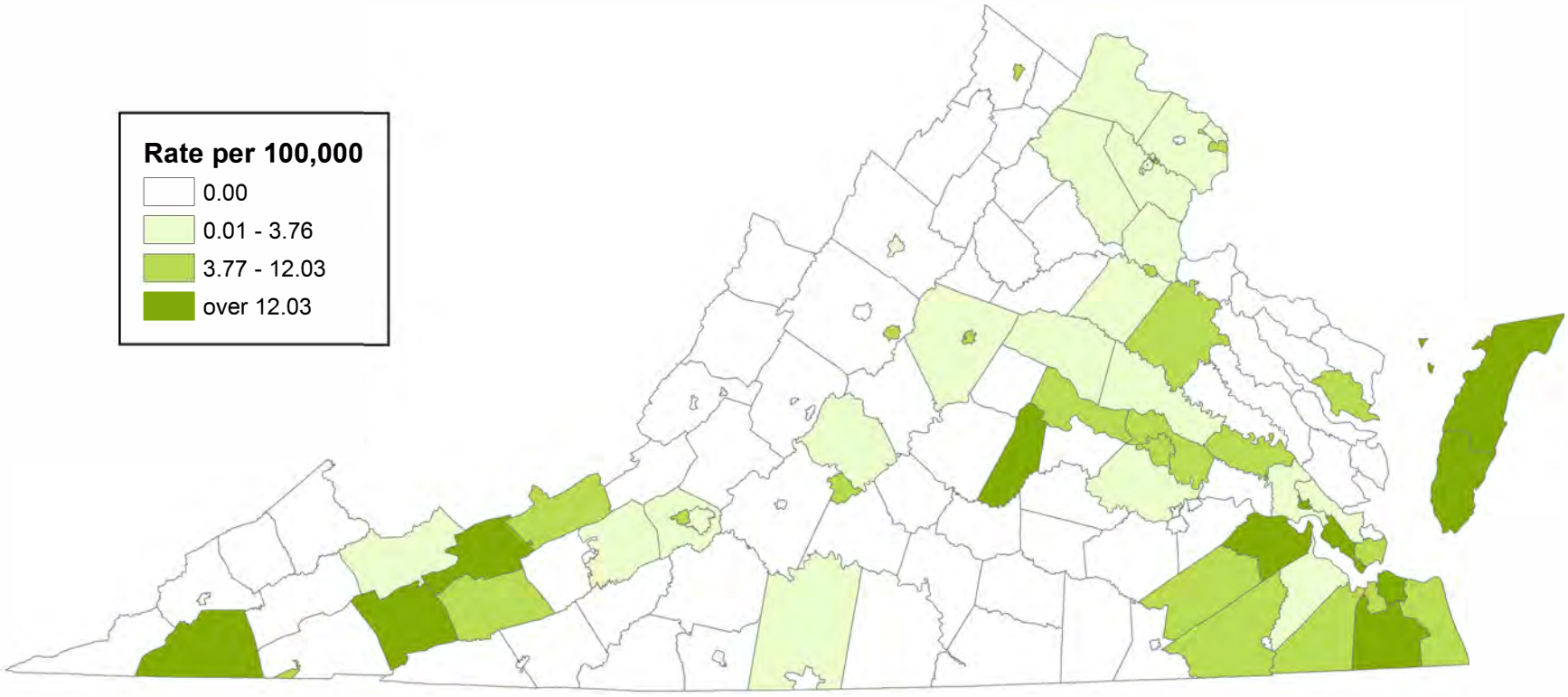
Pertussis Incidence Rate by Locality
Virginia, 2016



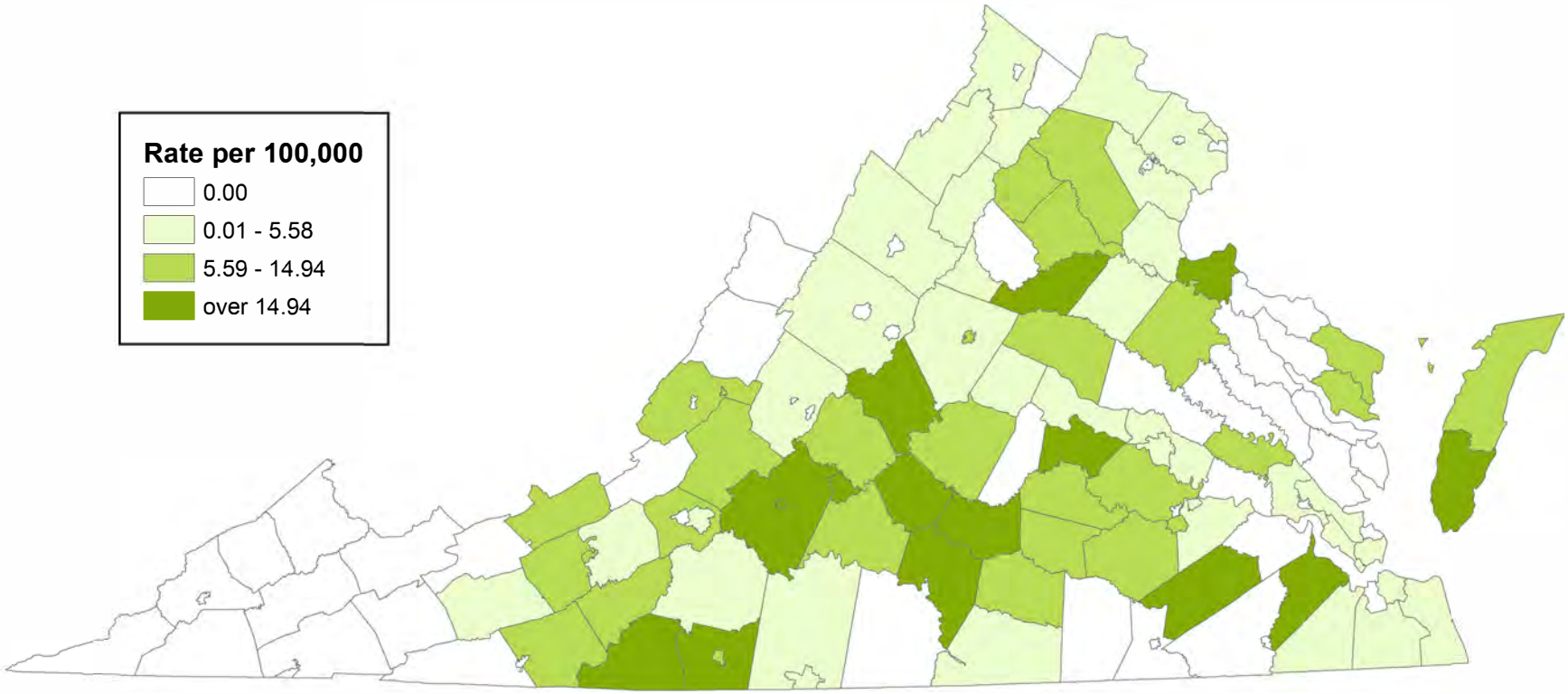
Salmonellosis Incidence Rate by Locality
Virginia, 2016



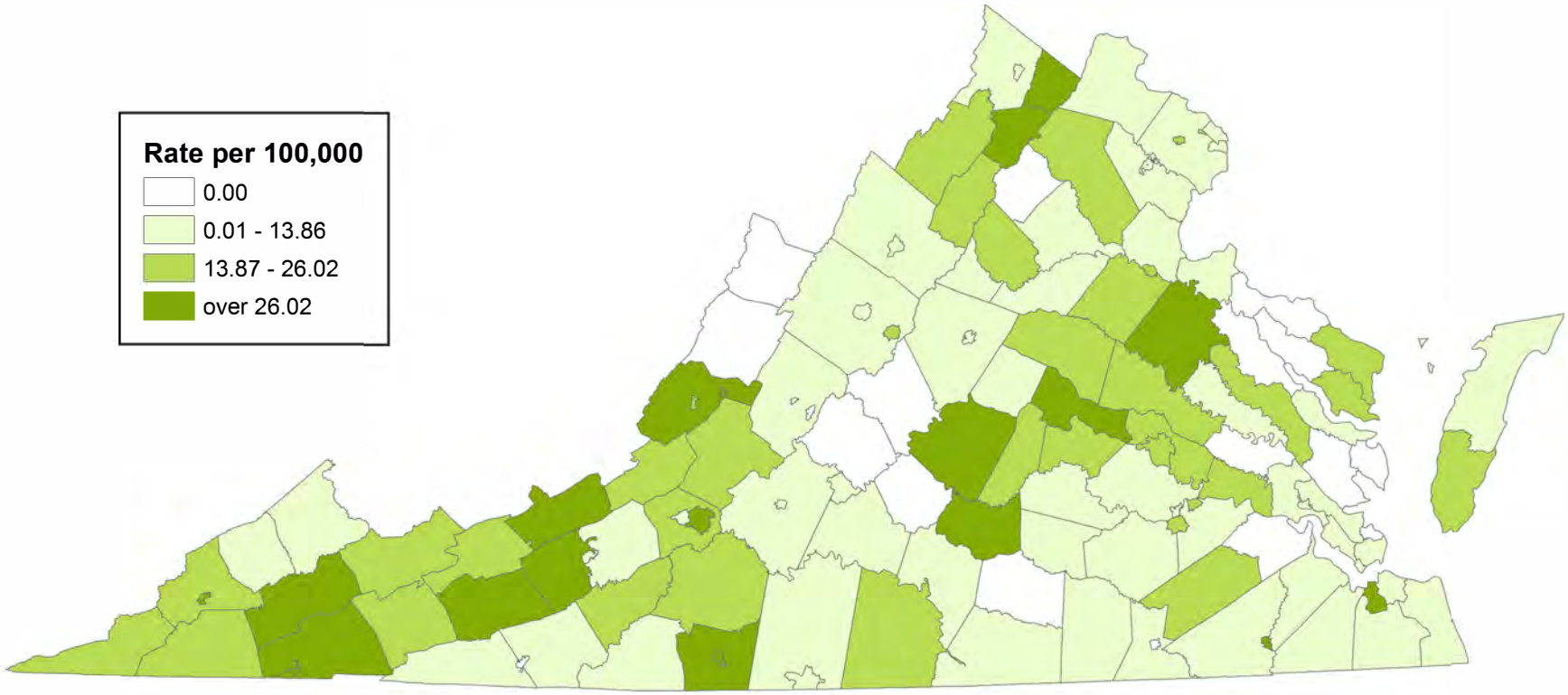
Shigellosis Incidence Rate by Locality
Virginia, 2016



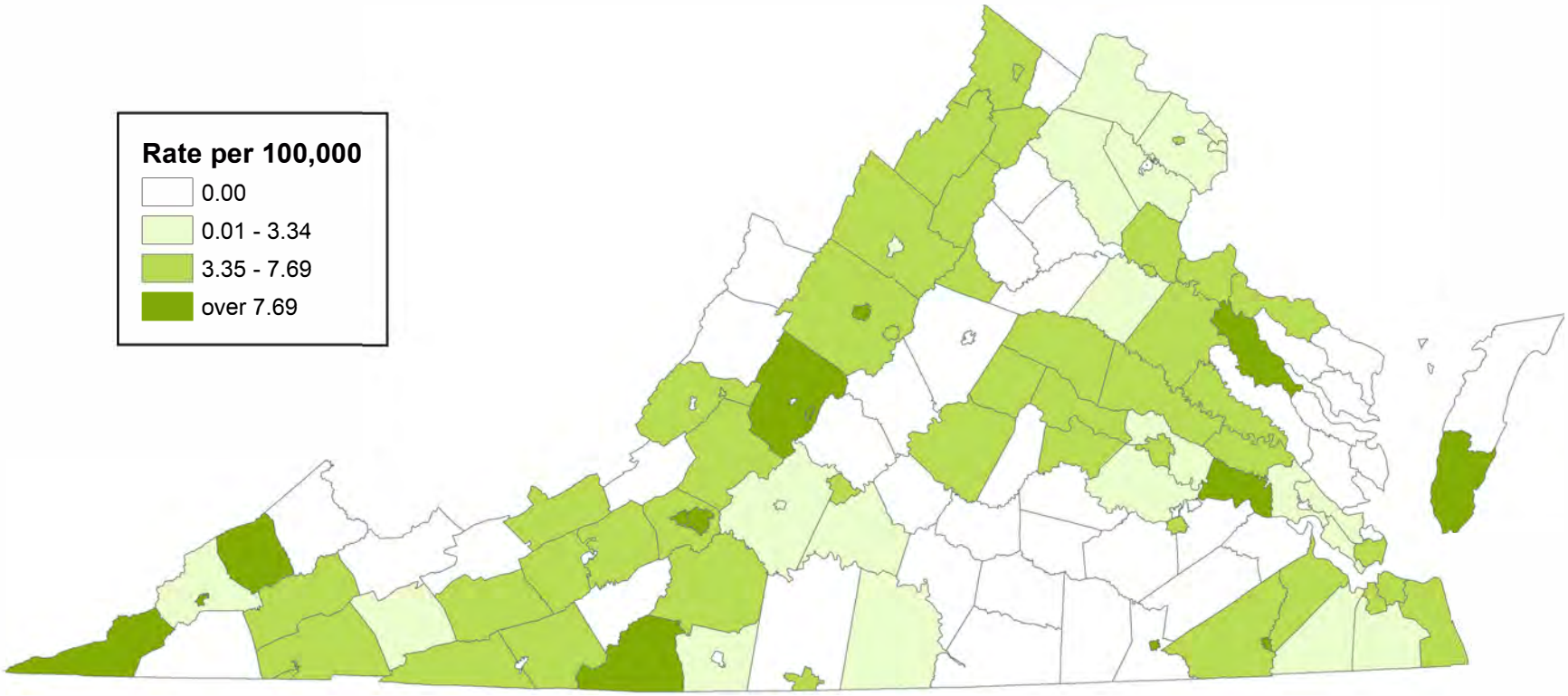
Spotted Fever Rickettsiosis, including RMSF, Incidence Rate by Locality, Virginia, 2016



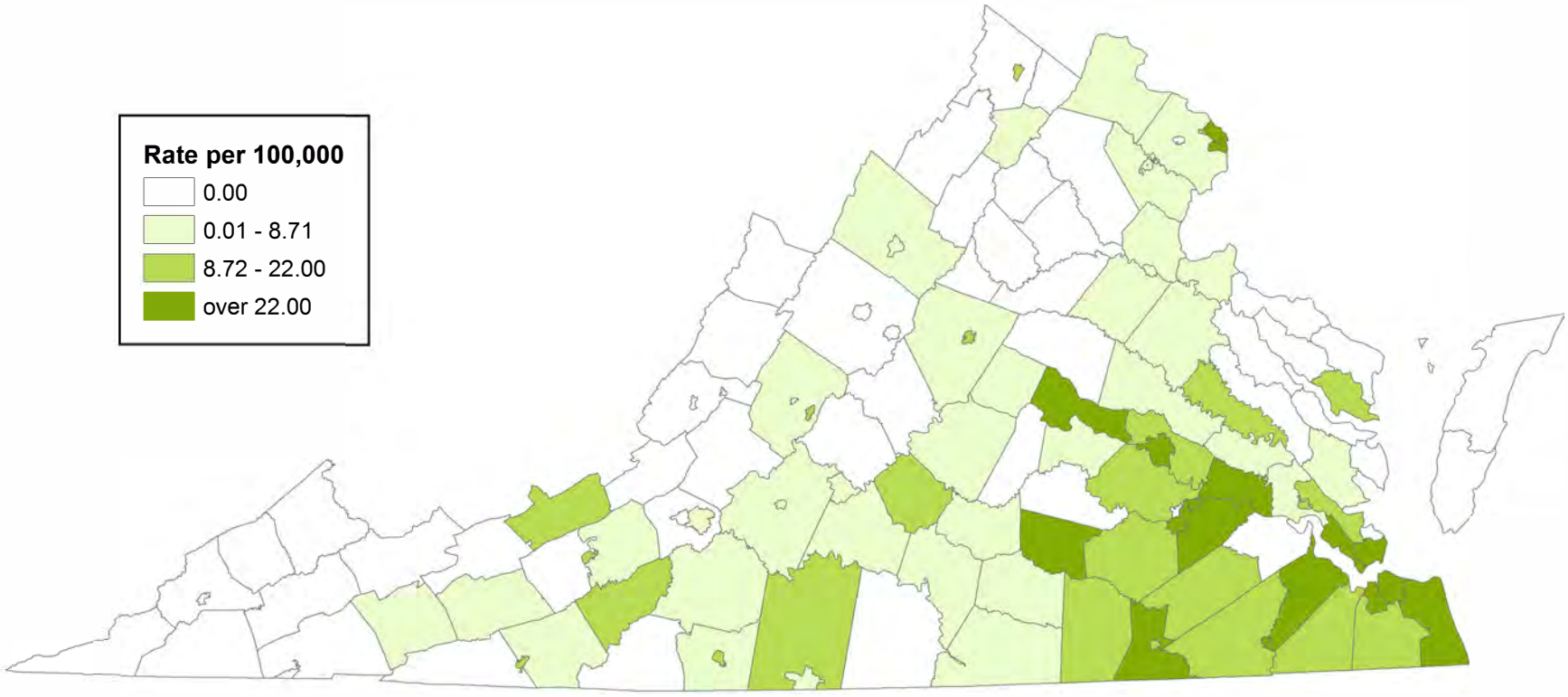
Staphylococcus aureaus Infection, Invasive, Methicillin-Resistant (MRSA), Incidence Rate by Locality, Virginia, 2016



Streptococcal Disease, Group A, Invasive or TSS Incidence Rate by Locality, Virginia, 2016



Syphilis, Early Stage, Incidence Rate by Locality
Virginia, 2016



Tuberculosis Incidence Rate by Locality
Virginia, 2016