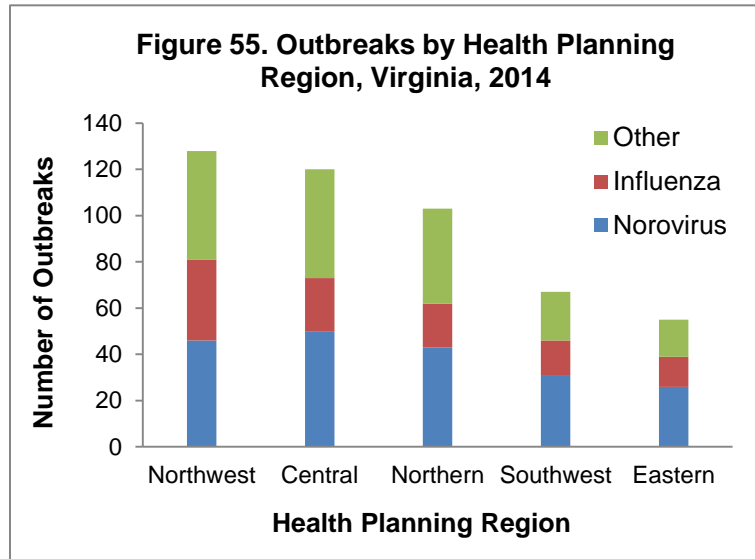


Outbreaks

Introduction

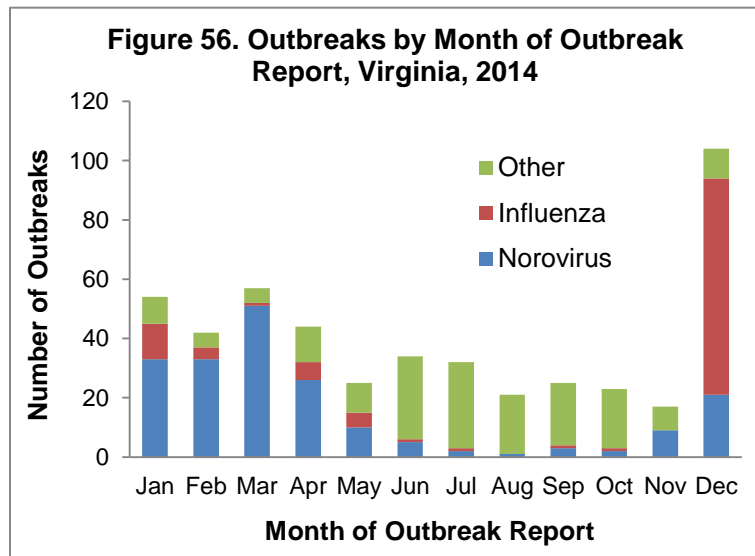
In 2014, a total of 478 outbreaks were reported to the Virginia Department of Health (VDH). Approximately two-thirds of the outbreaks (301, 63%) were suspected or confirmed to be caused by norovirus (196, 41%) or influenza (105, 22%). Other etiologic agents were suspected or confirmed to have contributed to the remaining outbreaks (177, 37%).

Geographically, 128 (27%) outbreaks were reported from the northwest region, followed in frequency by the central (120 outbreaks, 25%), northern (103 outbreaks, 22%), southwest (67 outbreaks, 14%), and eastern (55 outbreaks, 12%) regions (Figure 55). In addition, the VDH Central Office led investigations in 5 multi-state or multi-jurisdictional outbreaks (1%). Another state led the investigation in one out-of-state outbreak in which VDH provided assistance. This out-of-state outbreak was not counted in the 478 Virginia outbreaks in 2014.

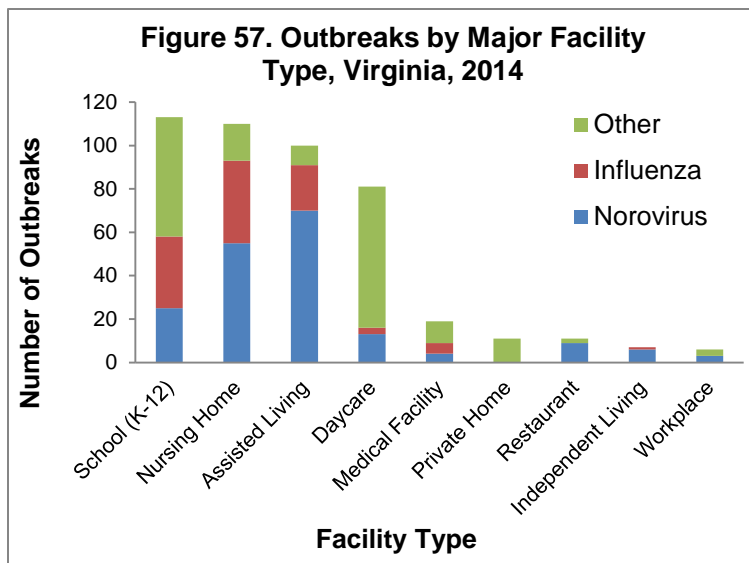


Outbreaks were reported throughout the year in 2014, but more outbreaks were reported in the colder months. Close to two-thirds of outbreaks occurred in January, February, March, April, or December of 2014 (301, 63%). Consistent with previous years, the majority of outbreaks during the colder months were confirmed or suspected to be caused by norovirus and influenza, reflecting the active circulation of these pathogens in colder months (Figure 56). The large number of outbreaks in December 2014 indicates the abrupt start of the 2014-2015 influenza season in Virginia.

Schools (K-12) reported the most outbreaks (113, 24%) in 2014, followed by nursing homes (110, 23%), assisted living facilities (100, 21%), and daycare centers (81, 17%). The majority of outbreaks reported from these facilities were



confirmed or suspected to be caused by influenza or norovirus. Outbreaks were also reported from medical facilities (19, 4%), restaurants (11, 2%), private homes (11, 2%), and other settings, including independent living facilities (7, 2%), workplaces (6, 1%), adult daycare centers (4, 1%), colleges (4, 1%), camps (2, 0.4%), correctional facilities (2, 0.4%), military bases (2, 0.4%), community event (1, 0.2%), country club (1, 0.2%), youth event (1, 0.2%), private party (1, 0.2%), church (1, 0.2%), and hotel (1, 0.2%) (Figure 57).



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 196 (41%) outbreaks in Virginia in 2014, similar to the 187 norovirus outbreaks reported in 2013. Among these, 179 were transmitted through person-to-person contact and 14 through food. The mode of transmission could not be determined in three outbreaks. The average number of persons who became ill in person-to-person norovirus outbreaks was 39, with a range of 3 to 214 persons.

Person-to-person norovirus outbreaks were reported from all regions in Virginia in 2014. Overall, the most person-to-person norovirus outbreaks were reported from the central region (47, 26%), followed by the northwest region (40, 22%), northern region (38, 21%), southwest region (28, 16%), and eastern region (26, 15%).

The most frequent settings for person-to-person norovirus outbreaks were assisted living facilities (70, 39%), nursing homes (55, 31%) and schools (K-12) (24, 13%). Outbreaks from these three settings accounted for the majority (149, 83%) of all person-to-person norovirus outbreaks in 2014. This distribution pattern was similar to that of 2013, in which 38%, 29%, 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 (13, 7%), independent living facilities (6, 3%), adult daycare centers (3, 2%), and medical facilities (3, 2%). In addition, a workplace, camp, college, hotel, and military base each reported one person-to-person norovirus outbreak.

Although person-to-person norovirus outbreaks occurred throughout the year in 2014, the majority of these outbreaks occurred in the colder months of January (31, 17%), February (33, 18%), March (47, 26%), April (23, 13%), and December (19, 11%).

Norovirus was confirmed by laboratory testing in over half (101, 56%) of the 179 person-to-person norovirus outbreaks. Sequencing analysis was performed for 57 of 101 confirmed outbreaks, which revealed that norovirus genotype *Sydney* (36, 63%) predominated among all norovirus with sequencing data in 2014. Other strains identified included *Potsdam* (13, 23%), *Gwynedd* (4, 7%), *Shindlesham* (1, 2%), *Southampton* (1, 2%), *Seacroft* (1, 2%), and *Miami* (1, 2%). Sequencing data were not available for 44 (44%) of the confirmed outbreaks.

In addition to the 179 person-to-person norovirus outbreaks, there were three norovirus outbreaks in 2014 for which the transmission route could not be determined. Two of these outbreaks occurred in the northwest region; one was associated with a restaurant and the other was associated with a school (K–12). The third norovirus outbreak with unknown transmission route occurred in the central region and was associated with a restaurant.

Influenza Outbreaks

After norovirus, influenza (105, 22%) was the most common suspected or confirmed etiologic agent responsible for causing outbreaks in Virginia in 2014. An average of 31 people became ill in each influenza outbreak, with a range of 3 to 215 people.

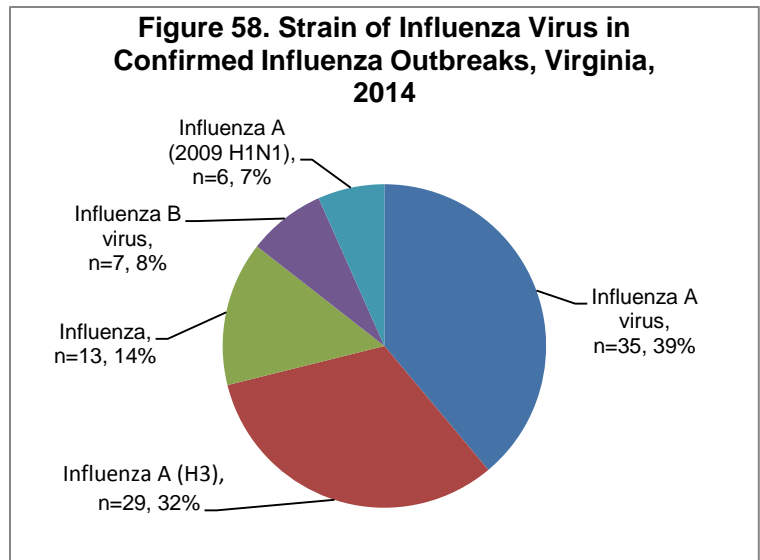
Influenza outbreaks were reported from all regions in Virginia in 2014. The northwest region had 35 (33%) influenza outbreaks, followed by the central (23, 22%), northern (19, 18%), southwest (15, 14%), and eastern (13, 12%) regions. Of note, the northwest region consistently reported more influenza outbreaks than most other regions in 2012 (28, 28%), 2013 (19, 24%), and 2014 (35, 33%).

More than half of influenza outbreaks were reported from nursing home (38, 36%) or assisted living facility (21, 20%) settings in 2014. Schools (K-12) reported 33 (31%) influenza outbreaks in 2014, which was an increase from 2013, during which schools (K-12) reported approximately one-tenth of all influenza outbreaks (9, 11%). Influenza outbreaks were also occasionally reported by other facilities, including medical facilities (5, 5%), child daycare centers (3, 3%), correctional facilities (2, 2%), an independent living facility (1, 1%), an adult daycare center (1, 1%), and a military base (1, 1%).

Two-thirds of influenza outbreaks (73, 70%) were reported in December 2014, which corresponded to a month when an abrupt, substantial increase in influenza activity was observed in both outbreaks and sporadic cases. The remaining outbreaks were scattered throughout the following months of 2014: January (13, 12%), February (3, 3%), March (1, 1%), April (6, 6%),

May (5, 5%), June (1, 1%), July (1, 1%), September (1, 1%), and October (1, 1%). Three (3%) of the outbreaks reported in January had illness onset in December 2013.

Among the 105 influenza outbreaks occurring in 2014, 90 (86%) were confirmed by laboratory testing. Influenza A virus predominated in 70 (78%) of these confirmed outbreaks. Specifically, among laboratory-confirmed influenza outbreaks, influenza A (H3) was identified in 29 (32%) outbreaks, influenza A (not further specified) was identified in 35 (39%) outbreaks, influenza A (2009 H1N1) was identified in 6 (7%) outbreaks, and influenza B was identified in 7 (8%) outbreaks. Influenza was identified by rapid test in another 13 (14%) outbreaks but information on the virus subtype was not available (Figure 58).



For information on influenza outbreaks that occurred in the 2014-2015 influenza season (rather than calendar year 2014, as described above), please see the “Outbreaks” section of the “Influenza” chapter of the annual report.

Foodborne Outbreaks

During 2014, 23 foodborne outbreaks were reported in Virginia. This is similar to the 20 outbreaks reported in 2013 (Table 8). The average number of ill persons per outbreak was 31 and ranged from one to greater than 200 persons.

Foodborne outbreaks occurred throughout the year, although 12 (52%) had illness onset between April and July. Geographically, eight (35%) outbreaks occurred in the northwest health planning region, followed by six (26%) in the northern, and three each (13%) in the central and southwest regions. The remaining three (13%) outbreaks were multi-state outbreaks that involved cases from Virginia and other states.

Etiologic agents were confirmed by laboratory testing in 16 (70%) of 23 outbreaks. The majority of confirmed outbreaks (62%) were due to viral pathogens, while 38% were due to bacterial agents. Confirmed etiologic agents included norovirus (10), *Salmonella* (5), and *Clostridium perfringens* (1). Three outbreaks were multistate (fewer than the seven reported in 2013), and all were attributed to *Salmonella*. Norovirus was suspected in four additional outbreaks. The etiologic agent was unknown in three of the outbreaks (13%). Most foodborne outbreaks were associated with food prepared in restaurant (8, 35%) or private home (5, 22%) settings. The remaining outbreak settings included two caterers, two colleges, two hotels, a grocery store, a manufacturing plant, and a community park. One outbreak was associated with an undetermined setting due to exposures at multiple types of locations. Contributing factors were identified in twelve (52%) of these outbreaks, including 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 intended kill step (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 8. Foodborne Outbreaks Reported in Virginia, 2014

Onset Date	Health District	Number of Cases	Etiologic Agent	Vehicle	Place Where Food Prepared
1/12/2014	Richmond City	19	Norovirus GI.3B Potsdam	Unknown; Food handler implicated	Caterer
1/15/2014	Chesterfield	44	Norovirus GI.3B Potsdam	Sub sandwiches	Grocery store
2/28/2014	Pittsylvania-Danville	45	Norovirus GII.3A Milwaukee	Salad	Restaurant
3/16/2014	Alleghany	7	Norovirus suspected	Unknown	Restaurant
3/29/2014	New River	8	Norovirus suspected	Unknown	Restaurant
4/02/2014	Central Shenandoah	64	Norovirus GII	Unknown	College/ University
4/03/2014	Lord Fairfax	36	<i>Clostridium perfringens</i>	Chicken	Private Home
4/06/2014	Lord Fairfax	8	Unknown	Unknown	Restaurant
4/24/2014	Multi-state	1 VA 20 US	<i>Salmonella</i> ser. Baildon	Cantaloupe (suspected)	Private Home
4/25/2014	Fairfax	35	Norovirus GI	Unknown; Food handler implicated	Restaurant
5/04/2014	Central Shenandoah	25	Norovirus GI	Unknown	Caterer
5/05/2014	Fairfax	10	Norovirus suspected	Unknown	Restaurant
5/19/2014	Thomas Jefferson	4	<i>Salmonella</i> ser. Typhimurium	Possible ground beef	Community park
5/28/2014	Henrico	32	Unknown	Spoiled milk	Manufacturing plant
6/15/2014	Lord Fairfax	50	Norovirus GI.3B Potsdam	Unknown	Undetermined
7/13/2014	Multi-state	27 VA 275 US	<i>Salmonella</i> ser. Newport	Cucumbers	Private Home
7/31/2014	Fairfax	16	Unknown	Unknown	Restaurant
8/16/2014	Central Shenandoah	37	<i>Salmonella</i> ser. Thompson	Chicken	Private Home

Table 8. Foodborne Outbreaks Reported in Virginia, 2014 (cont.)

Onset Date	Health District	Number of Cases	Etiologic Agent	Vehicle	Place Where Food Prepared
10/20/2014	Arlington	4	Norovirus suspected	Unknown	Restaurant
11/12/2014	Multi-state	1 VA 115 US	<i>Salmonella</i> ser. Enteritidis	Bean sprouts	Private Home
11/15/2014	Thomas Jefferson	>200	Norovirus GII.6B Miami	University cafeteria lunch items; Food handler implicated	College/ University
12/7/2014	Arlington	29	Norovirus GII.4 Sydney	Unknown; Food handler implicated	Hotel
12/10/2014	Arlington	15	Norovirus GII	Unknown; Food handler implicated	Hotel

Outbreak spotlight: Out-of-state outbreak suspected to be caused by Clostridium perfringens

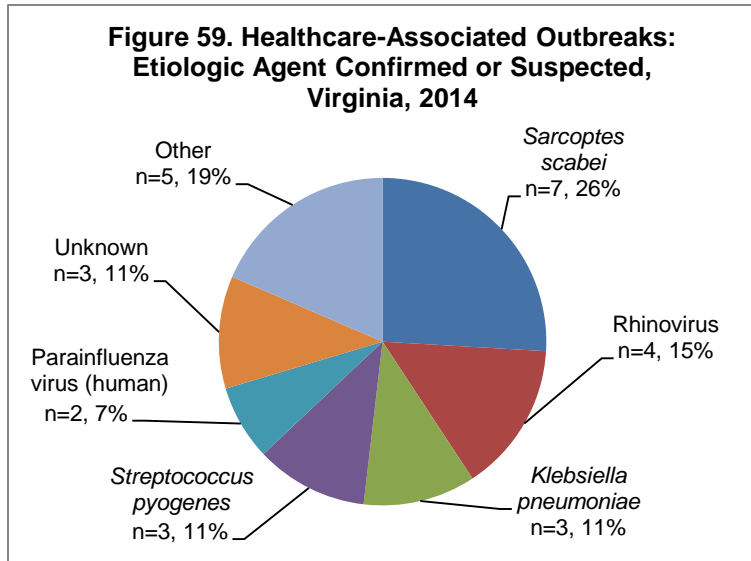
In 2014, one outbreak suspected to be caused by *Clostridium perfringens* was investigated by another state health department and thus not included as a Virginia outbreak. However, 8 Virginia residents and 208 out-of-state residents developed gastrointestinal illness after consuming a catered lunch at a convention center. The investigation indicated that chicken marsala might have become contaminated due to improper hot holding.

Healthcare-Associated Outbreaks

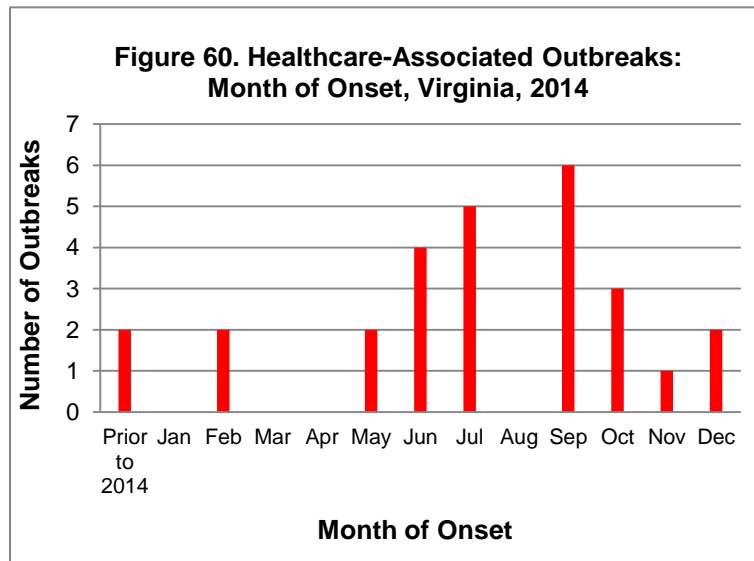
A healthcare-associated outbreak is a group of illnesses with a common etiology among patients, residents, or staff in a healthcare setting (e.g., hospital, medical center, nursing home, physician's office, dialysis center, or other healthcare facility), where the illness is associated with that setting. 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 2014, 27 healthcare-associated outbreaks with suspected or confirmed etiologic agents other than norovirus or influenza were reported in Virginia. This is similar to the 30 non-norovirus, non-influenza outbreaks reported from healthcare facilities in 2013. The average number of ill persons per healthcare-associated outbreak in 2014 was 14, and ranged from two to 57 persons. The majority of healthcare-associated outbreaks occurred in nursing homes (17, 63%) and the remaining outbreaks (10, 37%) occurred in medical facilities, including hospitals, an outpatient facility, and an intermediate care facility for people with disabilities. The majority of the healthcare-associated outbreaks (22, 81%) were attributed to person-to-person transmission. One outbreak was related to environmental exposure (1, 4%). The route of transmission could not be determined in 4 outbreaks (15%).

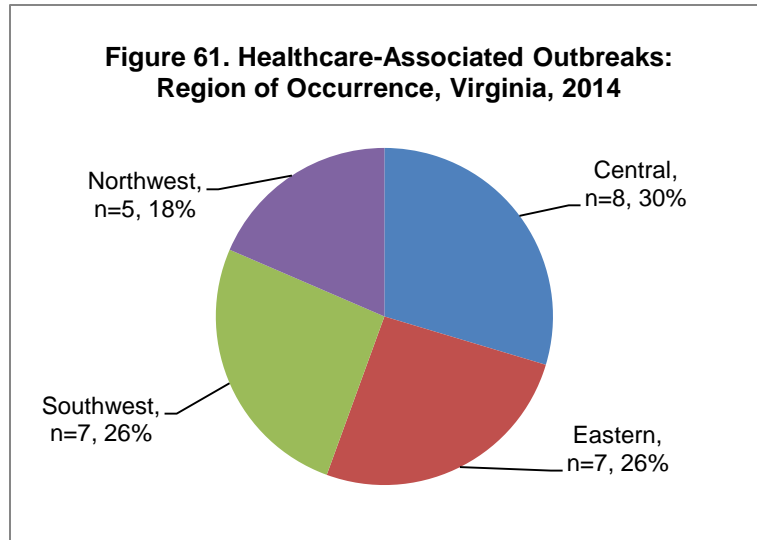
Etiologic agents were confirmed in 17 (63%) of the outbreaks, suspected in 7 (26%) and unknown in 3 (11%). *Sarcoptes scabiei* (scabies) (7, 26%), rhinovirus (4, 15%), *Klebsiella pneumoniae* (3, 11%), *Streptococcus pyogenes* (3, 11%), and human parainfluenza viruses (2, 7%) were each suspected or confirmed in multiple outbreaks. Aspergillus, respiratory syncytial virus, *Sphingomonas paucimobilis*, *Clostridium difficile*, and methicillin resistant *Staphylococcus aureus* were each responsible for one outbreak (Figure 59). The seven scabies outbreaks reported from healthcare facilities in 2014 is similar to the eight reported outbreaks in 2013. The three outbreaks associated with *Streptococcus pyogenes* involved invasive disease. Two outbreaks occurred in nursing homes and one occurred in an outpatient medical facility.



Although healthcare-associated outbreaks were reported throughout the year, they tended to cluster in the warmer weather months (Figure 60). More than half (16, 59%) had onsets between May and September with more than one-third (10, 37%) occurring in July or September. This contrasts with the healthcare-associated outbreaks from 2013, when 13 (43%) of the outbreaks had onsets during the colder months of December, January, February, and March.



In 2014, healthcare-associated outbreaks were reported most frequently from the central (8, 30%), eastern (7, 26%), and southwest (7, 26%) health planning regions. The northwest region reported five outbreaks (19%), while the northern region reported none (Figure 61).

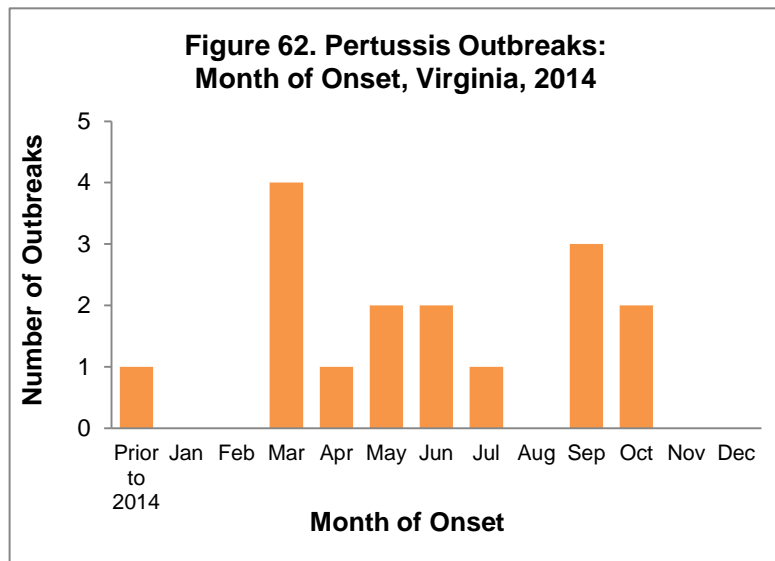


Vaccine-Preventable Disease Outbreaks

During 2014, a total of 17 vaccine-preventable disease outbreaks were reported in Virginia. This is higher than 2013, when 14 outbreaks were reported. Of these 17 outbreaks, 16 were related to pertussis and one was related to varicella (chickenpox).

All 16 of the pertussis outbreaks reported in 2014 were confirmed by laboratory testing. The average number of ill persons per outbreak was 6, with a range from two to 23 persons. Ten (63%) of the 16 pertussis outbreaks occurred in schools (K-12) and three (19%) occurred in private homes. Of the remaining three outbreaks, one (6%) was associated with a camp/campground, one (6%) occurred in a daycare/pre-K facility, and one (6%) was associated with a country club.

Pertussis outbreaks were spread fairly evenly throughout the year, although the months from March to July accounted for more than half (10, 63%) of the outbreaks (Figure 62). This varies slightly from 2013, when the majority of outbreaks (80%) were reported in the second half of the year.



The northern areas of the state had substantially more pertussis outbreaks (13, 81%) than other areas in 2014. The northwest health planning region reported the most outbreaks (7, 44%), followed by the northern region (6, 38%). The southwest region had two pertussis outbreaks (13%), while the eastern region had one pertussis outbreak (6%).

One chickenpox outbreak was reported in 2014. The outbreak occurred in a private home in the central region and was not confirmed by laboratory testing. Six people were affected by the outbreak.

Lack of compliance with the recommended immunization schedule contributed to these outbreaks. For the 16 pertussis outbreaks, up-to-date immunizations were reported among all case-patients in only five outbreaks (31%). The other 11 outbreaks affected persons who were either unvaccinated, had not received all recommended doses of vaccine, or documentation was not available to confirm that all recommended doses had been received. No other outbreaks caused by vaccine-preventable diseases such as measles, mumps, rubella, or *Haemophilus influenzae* type B were reported in 2014.

Waterborne Outbreaks

In 2014, one waterborne outbreak was reported in Virginia (Table 9), compared to three outbreaks reported in 2013. The outbreak occurred in July in a private home in the southwest region and affected two individuals. It was confirmed to be caused by *Legionella pneumophila*, resulting from an inhalational exposure to a treated recreational water source (hot tub).

Table 9. Waterborne Outbreaks Reported in Virginia, 2014

Onset Date	Health District	Number of Cases	Etiologic Agent	Suspected Vehicle	Place Where Outbreak Occurred
7/28/2014	Mount Rogers	2	<i>Legionella pneumophila</i>	Recreational water source - treated	Private Home

Zoonotic Outbreaks

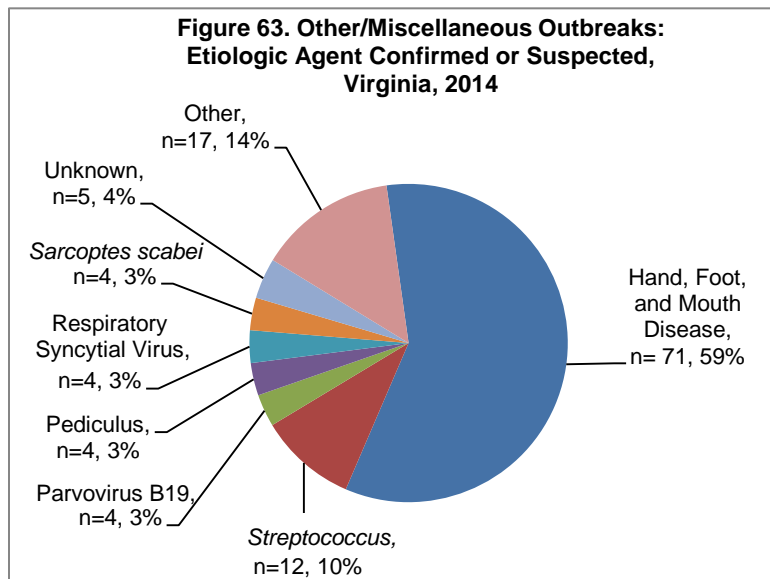
In 2014, two multi-state zoonotic outbreaks were reported that involved residents of Virginia. Both occurred in private home settings. One of the outbreaks was caused by *Salmonella* ser. Hadar, Infantis, and Newport and involved live poultry exposure. The other outbreak was due to *Salmonella* ser. Typhimurium and was associated with exposure to frozen feeder rodents. There were 26 total Virginia cases in these multi-state outbreaks, with 25 cases occurring as a result of the live poultry outbreak and one case due to the feeder rodent outbreak (Table 10).

Table 10. Zoonotic Outbreaks Reported in Virginia, 2014

Onset Date	Health District	Number of Cases	Etiologic Agent	Vehicle	Place Where Outbreak Occurred
4/05/2014	Multi-state	25 VA 363 US	<i>Salmonella</i> ser. Hadar, Infantis, and Newport	Live Poultry	Private Home
6/13/2014	Multi-state	5 VA 41 US	<i>Salmonella</i> ser. Typhimurium	Frozen feeder rodents	Private Home

Other Outbreaks

In addition to the norovirus, influenza, foodborne, healthcare-associated, vaccine-preventable, waterborne, and zoonotic disease outbreaks discussed above, 121 other outbreaks were reported in Virginia in 2014, which was a 89% increase compared to the 64 outbreaks reported in 2013. The average number of ill persons per outbreak was 15, and ranged from one to 76 persons. As in previous years, the majority of these outbreaks (114, 94%) were attributed to person-to-person transmission. Environmental exposure, chemical exposure, and laboratory exposure contributed to one outbreak (1%) each. The remaining six (5%) outbreaks were attributed to undetermined factors.



The most frequent causes of outbreaks reported from other settings were confirmed or suspected to be hand, foot, and mouth (HFMD) disease (71 outbreaks, 59%) or *Streptococcus* (12, 10%). The remaining 38 outbreaks were suspected or confirmed to be caused by a variety of etiologic agents (Figure 63). Four outbreaks each were suspected or confirmed to be caused by human parvovirus B19, pediculus (head lice), respiratory syncytial virus, and *Sarcoptes scabiei* (scabies). The number and percentage of scabies outbreaks decreased notably compared to the prior year. In 2013, there were 14 scabies outbreaks, representing 22% of all outbreaks in other settings. Other outbreaks in 2014 included three gastrointestinal illnesses confirmed to be due to *Shigella*, two skin infections suspected to be caused by *Tinea corporis* (ringworm), and two outbreaks of gastrointestinal illness confirmed to be caused by *Salmonella* ser. Typhimurium. In addition, single outbreaks were confirmed or suspected to be gastrointestinal illness caused by *Campylobacter jejuni*, carbon monoxide poisoning, gastrointestinal illness suspected to be due to enterovirus, respiratory illness confirmed to be due to enterovirus/rhinovirus, gastrointestinal illness caused by *Escherichia coli* O157:H7, skin infection caused by human herpes virus 1,

upper respiratory illness caused by metapneumovirus, gastrointestinal illness caused by rotavirus, gastrointestinal illness caused by sapovirus, and gastrointestinal illness caused by *Staphylococcus aureus*. The etiologic agent was unknown in three gastrointestinal illness outbreaks, one respiratory illness outbreak, and one conjunctivitis outbreak.

Overall, the most common settings for these 121 outbreaks were daycare/pre-K facilities (64, 53%), schools (K-12) (43, 35%), and assisted living facilities (9, 7%).

In addition, two (2%) outbreaks were reported from a business/workplace. One (1%) outbreak occurred in each of the following settings: a laboratory, private home, and restaurant. One outbreak was a cluster of genetically related enteric bacteria identified by the state public health laboratory that had an undetermined route of transmission (i.e., not foodborne, waterborne, or zoonotic).

Although these outbreaks occurred throughout the year, more than two-thirds (83, 69%) of the outbreaks had illness onset in the warmer months of the year, between May and September (Figure 64).

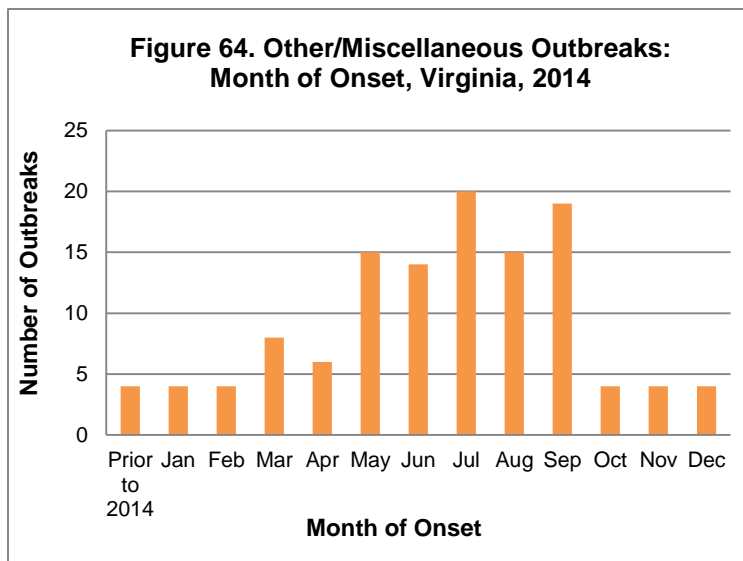
Regionally, outbreaks occurred throughout the state, with the largest proportions in the central (37, 31%), northern (33, 27%), and northwest (31, 26%) health planning regions, followed by the southwest (11, 9%) and eastern (8, 7%) regions. One (1%) multi-state outbreak affected a resident of the northern region.

Outbreak spotlight: Streptococcal infection

Twelve outbreaks of Streptococcal disease (7 confirmed, 5 suspected) were reported in other settings in 2014. These outbreaks caused respiratory or rash illnesses (primarily presenting as “strep throat”) in 8 school (K-12) settings, 3 daycare/pre-K settings, and 1 assisted facility. One of the outbreaks in a daycare/pre-K setting included one case of invasive group A Streptococcal infection and numerous cases of non-invasive illness. Eight of the 12 *Streptococcus* outbreaks were reported from the northwest region. All other regions except the central region reported at least one outbreak.

Outbreak spotlight: Hand, foot, and mouth disease

Among the 121 other outbreaks in 2014, 71 (59%) were outbreaks suspected to be due to hand, foot, and mouth (HFMD) disease, a viral illness that can cause fever, blister-like sores in the mouth, and a skin rash. This is ten times the number of HFMD outbreaks reported in 2013. HFMD disease usually affects infants and children younger than 5 years of age, but can sometimes occur in adults. HFMD disease is caused by the Enterovirus group of viruses, which includes



polioviruses, coxsackieviruses, echoviruses, and enteroviruses. None of the 71 HFM outbreaks in 2014 was confirmed by laboratory testing. More than two-thirds of the HFM disease outbreaks occurred in daycare facilities (50, 70%), and the remaining outbreaks occurred in school (K-12) settings (21, 30%).

Disease spotlight: Enterovirus D68 (EV-D68) infection

In 2014, eight large community events involving more than 150 cases were confirmed to be caused by enterovirus D68 (EV-D68). EV-D68 can cause mild to severe respiratory illness and is spread from person to person through contact or droplets, similar to influenza. The central, eastern, and northern regions were affected by these community events, but sporadic cases of EV-D68 were reported throughout the state in the fall of 2014. The increase in EV-D68 infection in Virginia in 2014 was consistent with the trend in the U.S. Other states experienced community clusters and outbreaks of EV-D68 during this period as well. From mid-August 2014 to mid-January 2015, more than 1,150 people in 49 states and the District of Columbia were confirmed to have respiratory illness caused by EV-D68. Nearly all of the confirmed cases nationally were among children, many of whom had a history of asthma or wheezing.