



Hazard Identification and Risk Assessment

4.20 Contagious / Communicable Diseases

4.20.1 Hazard Profile

A communicable disease is an illness caused by an infectious agent or its toxic products that develops when the agent or its product is transmitted from an infected person, animal, or arthropod to a susceptible host. Infectious agents include viruses, bacteria, fungi, parasites, or aberrant proteins called prions. The infectious agent might spread by one of several mechanisms, including contact with the infected individual or his or her bodily fluids, contact with contaminated items or a vector, or contact with droplets or aerosols. An infection, which is the actual spread of the infectious agent or its toxic product, is not synonymous with disease because an infection may not lead to the development of clinical signs or symptoms.

4.20.1.1 Geographic Location and Previous Occurrences

4.20.1.1.1 Human Diseases

Table 4-168 shows the top reportable communicable human diseases by incidence rate in the CVPDC area. Compared to the top communicable disease conditions in Virginia in 2018, campylobacteriosis, Lyme Disease, salmonellosis, giardiasis, chickenpox, and cryptosporidiosis were shared as most commonly occurring both statewide and locally for the CVPDC (excluding Chronic Hepatitis) (Figure 4-177).¹⁰⁰

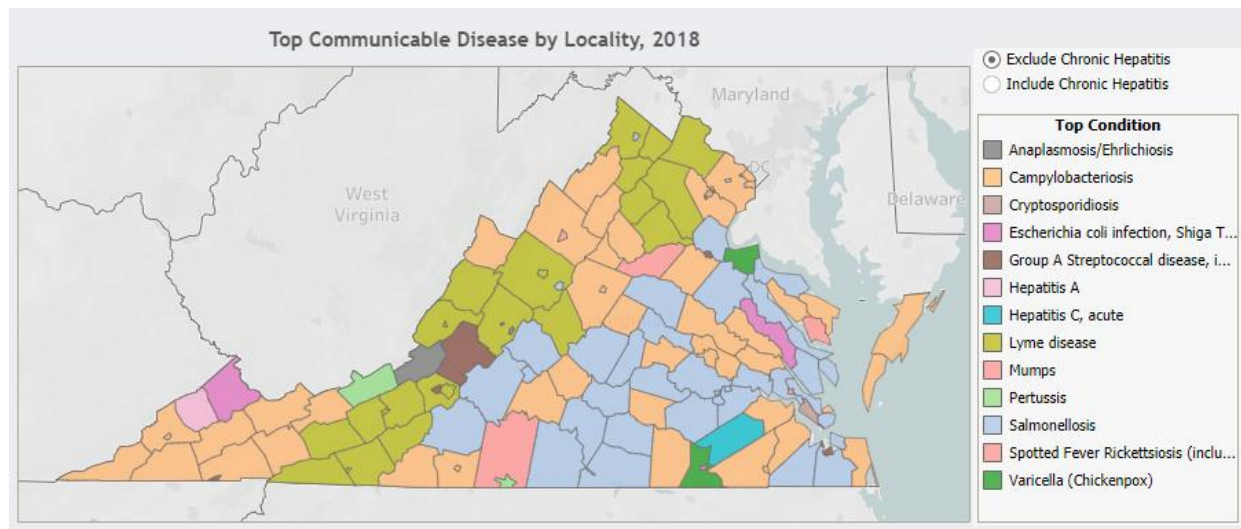


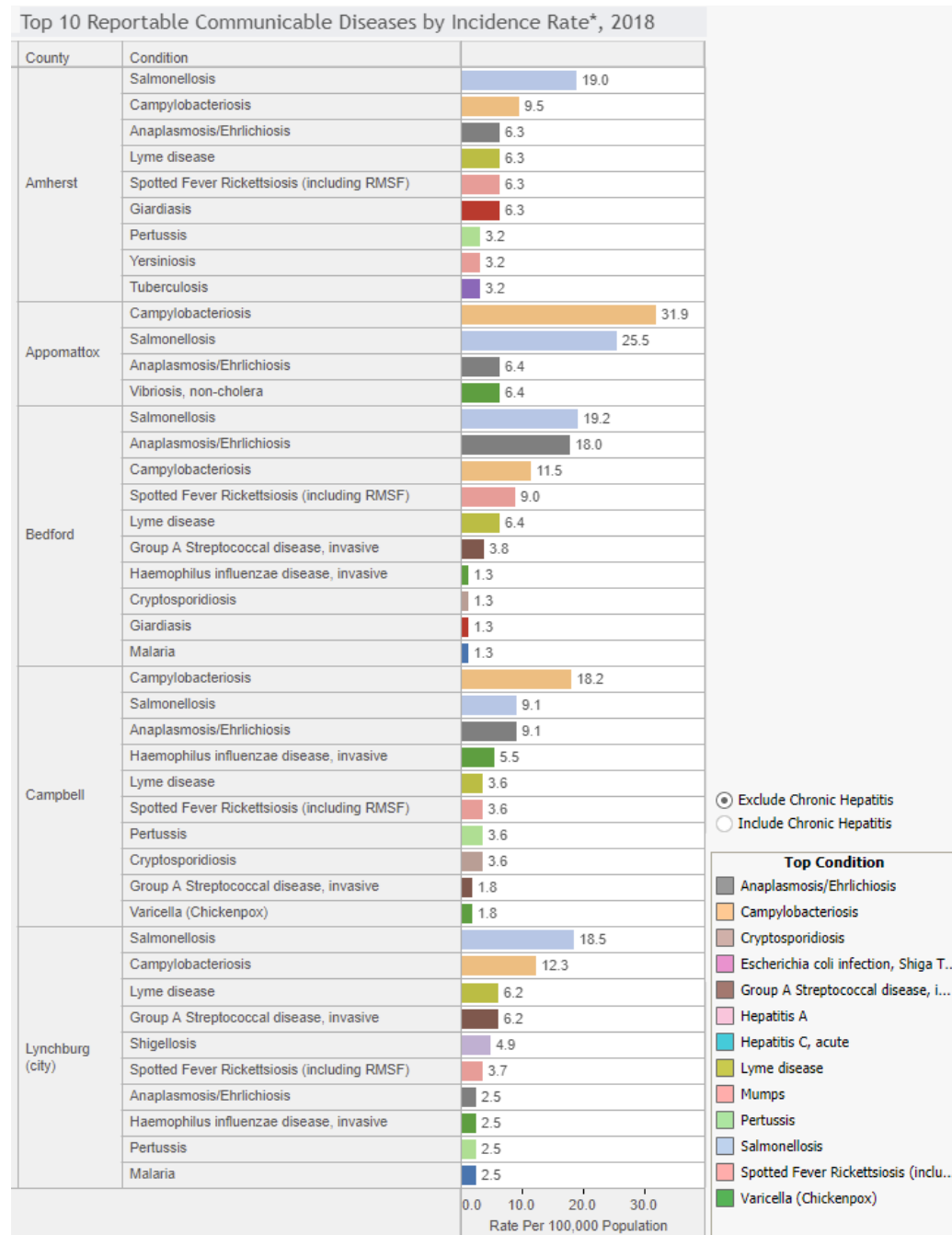
Figure 4-177 Top communicable diseases in Virginia by Locality, 2018 (exclude Chronic Hepatitis)

¹⁰⁰ Virginia: Vector-borne Diseases Profile (2004-2016) <http://www.vdh.virginia.gov/data/communicable-diseases/>



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Table 4-168 Top Reportable Communicable Diseases by Incidence Rate in CVPDC in 2018



(Source: Virginia Department of Health, 2020)

According to Centers for Disease Control and Prevention (CDC), there were a total of 2003 reported vector-borne disease cases in Virginia in 2016.¹⁰¹ The most reported mosquito-borne disease is **Zika Virus**, and the top tick-borne disease is Lyme disease. There have been 115 reported cases of Zika virus disease

¹⁰¹ <https://www.cdc.gov/nceid/dvbd/vital-signs/virginia.html>



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in Virginia since December 2015. Mosquito-borne Zika reached the Americas in May 2015, and by January of 2016, the CDC opened its emergency operations center to prepare for potential domestic impacts caused by the global outbreak. Across the United States, the Zika virus was the most common disease borne by ticks, mosquitoes and fleas reported in 2016, with 41,680 cases reported, followed by Lyme disease, with 36,429 cases. As of 2018 and 2019, no mosquito-borne Zika virus transmission has been reported in the CVPDC area.

Influenza (flu) spreads mainly from person to person by droplets from the nose or throat that are released when an infected person coughs or sneezes. It happens every year and is more common in the fall and winter. An estimated 19 million influenza illnesses occur in the United States each year. During the 2017-2018 flu season, approximately 710,000 people across the United States were hospitalized from the flu, of which, thousands died.¹⁰² People at highest risk for flu-related complications include children younger than 5 years (especially those younger than 2 years old), adults 65 years of age and older, pregnant women, and people who have certain medical conditions such as asthma, heart disease, chronic lung disease, kidney disease, or weakened immune systems due to disease or medication. During the 2018-2019 flu season, Virginia has spent 16 weeks at widespread activity level, which indicates that lab activity has had either elevated influenza-like illness reports or more than one outbreak in three or more regions. Virginia Department of Health (VDH) reported 4,310 distinct infections, 4 influenza-associated pediatric deaths, and 1,813 pneumonia and influenza-associated deaths¹⁰³.

A new **Coronavirus** (COVID-19) was detected in Wuhan City, Hubei Province, China and is causing an outbreak of respiratory illness. The COVID-19 outbreak began in December 2019, and there are now millions of reported cases around the world, including the United States. Cases of COVID-19 have been confirmed in all jurisdictions in the CVPDC area. According to VHD, by July 2020, there were over 90 thousands confirmed cases in Virginia, and over one thousand cases in CVPDC.¹⁰⁴ COVID-19 symptoms can range from mild (or no symptoms) to severe illness. There is currently no vaccine to protect against COVID-19. Everyone is at risk of getting COVID-19. Older adults and people of any age who have serious underlying medical conditions may be at higher risk for more severe illness.

4.20.1.1.2 Animal Diseases

Virginia Animal and Food Industry Services maintains surveillance and control of infectious and contagious animal diseases throughout the Commonwealth. The most common communicable diseases found in Virginia include Eastern Equine Encephalitis, Equine Herpes Virus, West Nile Virus, and Avian Influenza.¹⁰⁵ While Zoonotic diseases (those transmissible between humans and animals or via an animal vector) are also a concern for the region, those events are best addressed in a pandemic or contagious disease plan rather than this hazard mitigation plan.

¹⁰² Summary of the 2017-2018 Influenza Season. Centers for Disease Control and Prevention.

<https://www.cdc.gov/flu/about/season/flu-season-2017-2018.htm>

¹⁰³ Virginia Department of Health Weekly Influenza Activity Report. (Report generated on June 20, 2019)

<http://www.vdh.virginia.gov/epidemiology/influenza-flu-in-virginia/influenza-surveillance/>

¹⁰⁴ <https://www.vdh.virginia.gov/coronavirus/covid-19-daily-dashboard/>

¹⁰⁵ <https://www.vdacs.virginia.gov/animals-animal-health.shtml>



Figure 4-178 shows the interrelationship (causation, concurrence, *etc.*) between this hazard and other hazards discussed in this plan update.

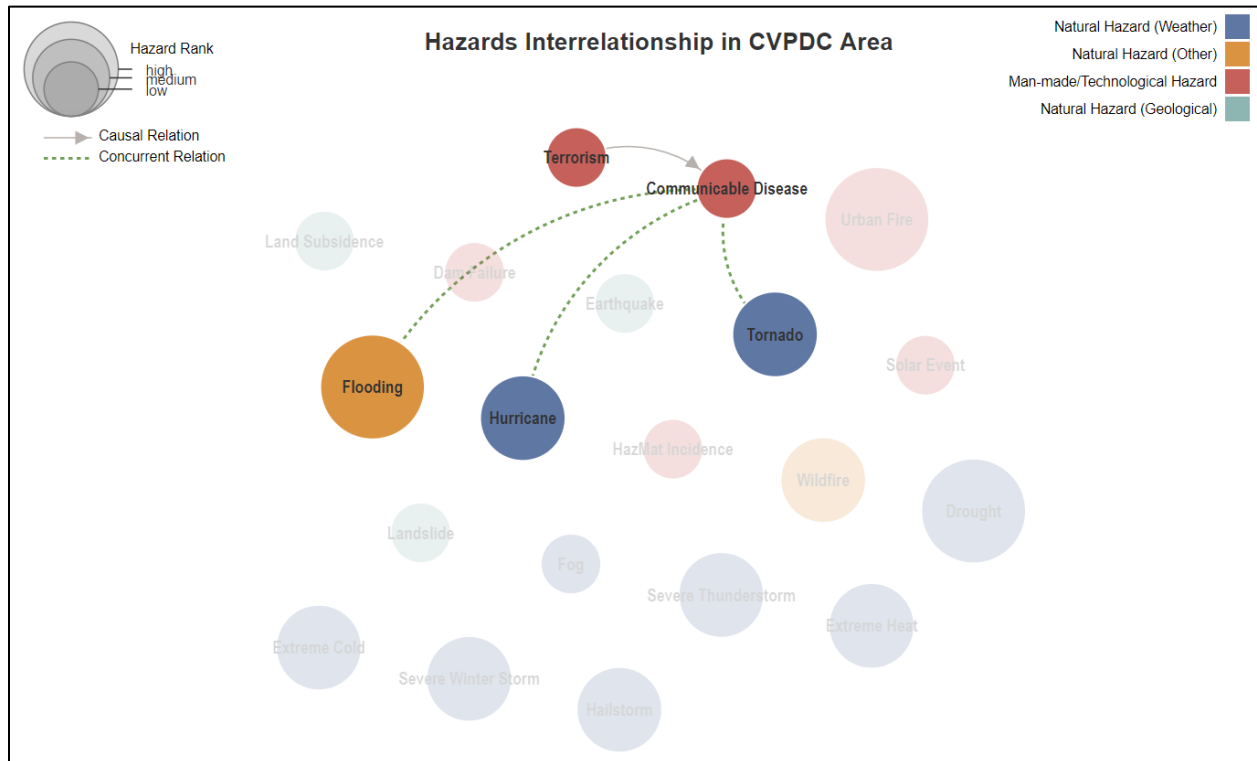


Figure 4-178 Hazards interrelationship

4.20.2 Impact and Vulnerability

4.20.2.1 Communicable Diseases Associated with Natural Disasters

The risk associated with communicable disease in the region has not been formally quantified, due to the difficulty in predicting specific occurrences, and the lack of complete data on impacts. However, the potential risk and impact of communicable diseases is often presumed to be very high in the chaos that follows natural disasters (WHO, 2006).¹⁰⁶

Natural disasters, particularly meteorological and geological events such as hurricanes, floods and earthquakes, can bring about serious health consequences. These disasters can affect vector breeding sites and vector-borne disease transmission. In a flood hazard area, initial flooding may wash away existing mosquito breeding sites, but standing-water caused by heavy rainfall or overflow of rivers can create new breeding sites. This can result (with typically some weeks delay) in an increase of the vector population and potential for disease transmission, depending on the local mosquito vector species and its preferred habitat. The crowding of infected and susceptible hosts, a weakened public health infrastructure and interruptions of ongoing control programs are all risk factors for vector-borne disease transmission.

¹⁰⁶ https://www.who.int/diseasecontrol/emergencies/guidelines/CD_Disasters_26_06.pdf



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High death counts during a natural disaster (either human or animal) can indicate an increased risk of outbreaks associated with the size, health status, and living conditions of the population displaced by the natural disaster. Crowding, inadequate water and sanitation, and poor access to health services, often characteristic of sudden population displacement, increase the risk of communicable disease transmission.¹⁰⁷

The major causes of communicable disease from natural disasters can be categorized into four areas: Infections due to contaminated food and water, respiratory infections, vector and insect borne diseases, and infections due to wounds and injuries. The most common causes of morbidity and mortality in this situation are diarrheal disease and acute respiratory infections.¹⁰⁸

- Waterborne diseases: Diarrheal disease outbreaks can arise subsequent to drinking-water contamination, and have been reported after flooding and related movement. Hepatitis A and E have fecal-oral transmission in areas with poor water sanitation.
- Diseases associated with crowding: Acute respiratory infections are the main cause of morbidity and mortality among unsettled people and are seen predominantly in children less than 5 years old.
- Vector-borne diseases: The most common vector-borne diseases in Virginia, according to the Virginia Department of Health, are carried by mosquitoes and ticks and include Lyme Disease, Rocky Mountain Spotted Fever, West Nile Virus, and Eastern equine encephalitis. Environmental changes after disaster could increase vector breeding sites and proliferation of disease vectors.
- Infections due to wounds and injuries: The potentially significant threats to persons suffering a wound are tetanus, staphylococci, and streptococci.

4.20.2.2 Critical Facilities

All human-occupied critical facilities are assumed to be at risk of contamination from a communicable disease. If facilities supporting emergency response lost their functionality because of contamination, delays in emergency services could result. Additionally, with a significant human disease outbreak, resources of health care systems such as ambulance services, hospitals, and medical clinics could quickly become overwhelmed. For example, during the 2018-2019 flu season, the Virginia Department of Health reported a peak of 11.6% of emergency department and urgent care facility visits were for influenza-like illness during the week ending February 10, 2018.¹⁰⁹ In most cases, critical infrastructure would not be affected by communicable disease. Scenarios that would affect infrastructure include the contamination of the water supplies and diseases that require special provisions in the treatment of wastewater. Should an epidemic necessitate quarantine or incapacitate a significant portion of the population, support of and physical repairs to infrastructure may be delayed, and services may be disrupted for a time due to limitations in getting affected employees to work.

¹⁰⁷ https://wwwnc.cdc.gov/eid/article/13/1/06-0779_article

¹⁰⁸ <https://www.ncbi.nlm.nih.gov/pubmed/22279466>

¹⁰⁹ http://www.vdh.virginia.gov/content/uploads/sites/3/2018/11/Weekly-Influenza-Activity-Report_2017-18-Season.pdf



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4.20.2.3 Bioterrorism and pandemics

Communicable disease disasters involve a biological agent/disease and that can result in mass casualties, such as a bioterrorism attack, a pandemic, or an outbreak of an emerging infectious disease. Human epidemics may lead to quarantines, large-scale medical needs, and mass fatalities. The elderly, young children, and those with suppressed immune systems are usually at the greatest risk. Natural illnesses of particular concern include Influenza, Meningitis, Pertussis, Measles, Severe Acute Respiratory Syndrome (SARS), and food-borne illnesses such as E. Coli and Salmonella outbreaks, among others. These diseases can infect populations rapidly, particularly through groups of people in close proximity such as schools, assisted living facilities, and workplaces.

Bioterrorism is a concern in all areas. According to CDC, the following biological agents are considered the highest bioterrorism threats (Category A) due to their ease of dissemination or person-to-person transmission, high mortality rate with potential for major public health impacts, and potential for public panic and social disruption: Anthrax, Botulism, Plague, Smallpox, Tularemia, and Viral Hemorrhagic Fevers.

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Unlike a bioterrorism attack or outbreak of an emerging infection, a pandemic is usually not an event that occurs suddenly. The World Health Organization (WHO) describes six phases of a pandemic, starting with the period in which there are few to no human cases from the organism/disease to the period in which there is efficient and sustained disease spread from person to person. The six WHO pandemic phases are outlined in Table 4-169.

Table 4-169 WHO pandemic phase descriptions and main actions by phase

Phase	Estimated probability of pandemic	Description of the phase	Main action in affected area	Main action in not-yet affected area
1	Uncertain	Low risk of human cases	Producing, implementing, exercising, and harmonizing pandemic preparedness and response plans with emergency preparedness and response plans.	
2	Uncertain	Higher risk of human cases		
3	Uncertain	No or very limited human-to-human transmission		
4	Medium to high	Evidence of increased human-to-human transmission	Rapid containment	Readiness for pandemic response
5	High to certain	Evidence of significant human-to-human transmission	Pandemic response	Readiness for imminent response
6	Pandemic in progress	Efficient and sustained human-to-human transmission and community-level outbreaks		

(Adapted from *Pandemic Influenza Preparedness and Response: A WHO Guidance Document*. Geneva: World Health Organization; 2009. <https://www.ncbi.nlm.nih.gov/books/NBK143061/> and <https://www.who.int/csr/disease/swineflu/phase/en/>)

¹¹⁰ <https://emergency.cdc.gov/agent/agentlist-category.asp#catdef>



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4.20.3 Risk Assessment

Populations that are vulnerable to communicable diseases include the economically disadvantaged, racial and ethnic minorities, the uninsured, low-income children, the elderly, the homeless, and those with other chronic health conditions, including severe mental illness. It may also include rural residents, who often encounter barriers to accessing healthcare services, transportations, or the internet. Figure 4-179 and Figure 4-180 provide demographic and socioeconomic profiles of the vulnerable groups in the CVPDC area.



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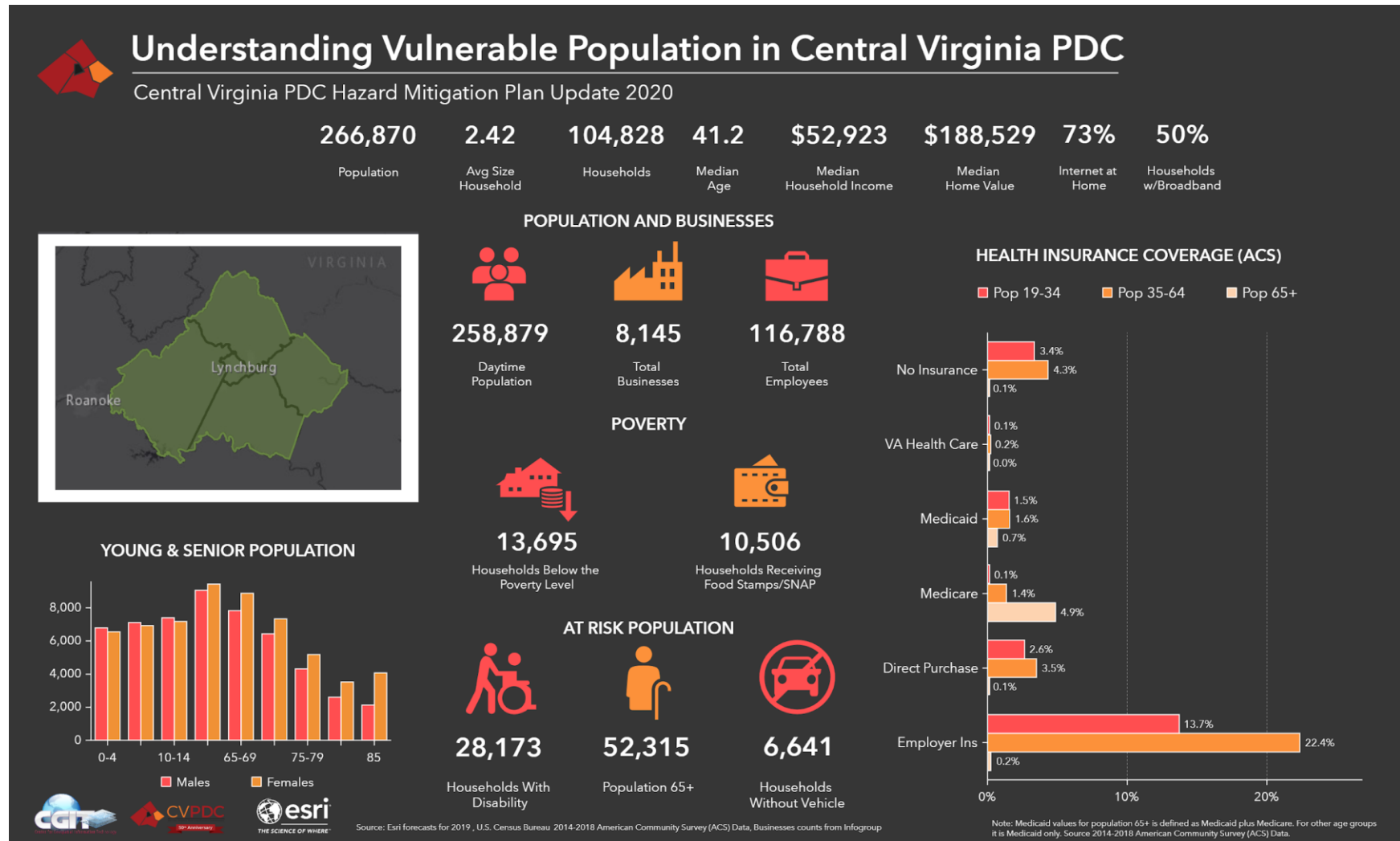


Figure 4-179 Demographic and Socioeconomic Profiles of the Vulnerable Groups to Communicable Diseases in the CVPDC Area (Panel A)



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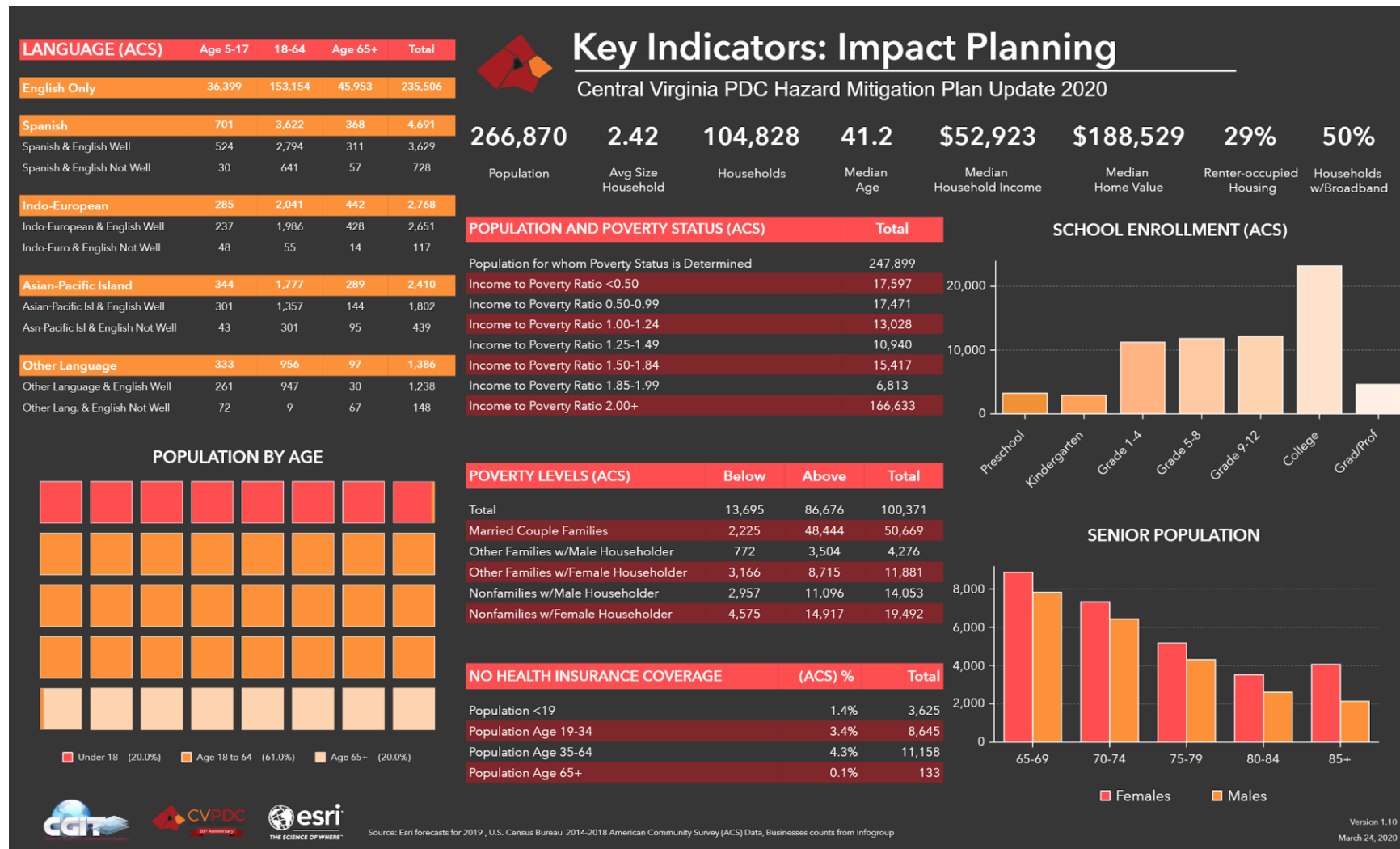


Figure 4-180 Demographic and Socioeconomic Profiles of the Vulnerable Groups to Communicable Diseases in the CVPDC Area (Panel B)



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4.20.4 Probability of Future Occurrences

The future incidence of communicable disease is highly unpredictable and may be localized, which makes it difficult to assess the probability of a future occurrence. Unlike other hazards, near-term conditions cannot reliably be extrapolated from past trends.

Infectious agents that can cause communicable diseases are constantly transmitted across the region, thus the real challenge is to assess the timing, location, and severity of the outbreak. No sources of information on long-term historic frequency of communicable disease or future probability of communicable disease were identified for inclusion in this plan.

4.20.5 References

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