Virginia Hepatitis C Epidemiologic Profile

2016

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VDH VIRGINIA DEPARTMENT OF HEALTH

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Hepatitis C was the fourth most common reportable disease among Virginians in 2015, and the rate of reported cases is rising. The Virginia Hepatitis C Epidemiologic Profile was developed to assess the burden of hepatitis C in Virginia, provide a platform to present this complex subject, and use the findings to inform public health planning, resource allocation, and policy development.

The Virginia Hepatitis C Epidemiologic Profile provides a cohesive summary based on multiple data sources pertinent to hepatitis C including disease surveillance, testing, treatment, morbidity (illness), and mortality (deaths). Additionally, it summarizes findings for specific populations at increased risk, including injection drug users (IDU), baby boomers, persons under 30 years old, and residents of the Appalachian region of Virginia. Data analyses presented here depict descriptive epidemiologic findings and trends over time to draw attention to emerging issues across multiple topic areas. Informational maps developed to showcase geospatial characteristics relevant to hepatitis C throughout the state are also included.

Hepatitis C, if untreated, can result in chronic liver disease or hepatocellular cancer, which are difficult to treat and often lead to recurrent hospitalizations or liver transplantation. In late 2013, new treatments were approved for hepatitis C with markedly higher cure rates and fewer side effects than previously available treatments (CDC, 2016). Such progress highlights the importance of diagnosing hepatitis C and facilitating linkage to care. Data on liver transplantation and liver cancer as well as recent trends in treatment of hepatitis C across Virginia are included in this profile.

The primary risk factor for newly acquired hepatitis C virus (HCV) infection is IDU and opioid drug use has escalated in Virginia in recent years, leading to a syndemic of opioid abuse and HCV infection (Zibbell, 2015).

The report concludes with suggestions for using the profile for public health action. It also proposes future directions to extend these analyses as additional and updated data sources become available. This profile can serve to increase awareness of current trends, and dissemination is encouraged as we collectively strive to improve population health and decrease the ongoing syndemic of hepatitis C and opioid abuse.

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ABBREVIATIONS

Ab Antibody

ACME Automated Classification of Medical Entities

Ag Antigen

APCD All Payer Claims Database

ARC Appalachian Regional Commission

BOP Federal Bureau of Prisons

CBO Community Based Organization

CCS Council of Community Services

CDC Centers for Disease Control and Prevention

CHPG Community HIV Planning Group

CRF Case Report Form

CSTE Council of State and Territorial Epidemiologists

DAA Direct-Acting Antiviral

DDP Division of Disease Prevention

DOI Division of Immunization

eHARS Electronic HIV/AIDS Reporting System

EIA Enzyme-linked Immunosorbent Assay

ELR Electronic Laboratory Report

HBcAb HBV core antibody

HBsAb HBV surface antibody

HBsAg HBV surface antigen

HBV Hepatitis B Virus

HCC Hepatocellular Carcinoma

HCV Hepatitis C Virus

HIV Human Immunodeficiency Virus

IDU Injection Drug Use/ Injection Drug Users

IQR Interquartile Range

LHD Local Health Department

MMWR Morbidity and Mortality Weekly Report

MSA Metropolitan Statistical Area

NEDSS National Electronic Disease Surveillance System

NIH National Institutes of Health

OCME Office of the Chief Medical Examiner

PCR Polymerase Chain Reaction

SAMHSA Substance Abuse and Mental Health Services Administration

STD Sexually Transmitted Disease

SUD Substance Use Disorder

TEDS SAMHSA Drug Treatment Episode Dataset

UNOS United Network for Organ Sharing

VCR Virginia Cancer Registry

VDH Virginia Department of Health

VEDSS Virginia Electronic Disease Surveillance System

VHI Virginia Health Information

VMEDS Virginia Medical Examiner Database System

BACKGROUND

In the United States, more people die of hepatitis C than 60 other nationally notifiable infectious diseases combined (Ly, 2016). Hepatitis (inflammation of the liver) is a clinical manifestation that may result from or be exacerbated by certain infections (including HCV infection), autoimmune conditions, or substances. HCV is most commonly transmitted via direct blood exposure, and the virus may persist in dried blood or on objects for several weeks. Injection drug users (IDU), people who received a blood transfusion before 1992, healthcare workers with blood exposure (e.g., accidental needle stick), children born to mothers infected with HCV, long-term dialysis patients, and persons with HIV infection are most frequently infected with hepatitis C. Hepatitis C may also be transmitted via improper tattoo or body piercing, or use of shared razors, toothbrushes, glucose monitors, or other materials that may come into contact with even trace amounts of another person's blood (VDH, 2013).

Because many people do not have symptoms of hepatitis C, many do not know they have been exposed and do not seek testing. When illness does occur, symptoms include fever, fatigue, yellowing of skin (jaundice), dark urine, and light colored stool. These symptoms may occur in the initial acute stage of infection or throughout long-term chronic disease, which can persist for decades. Individuals with chronic hepatitis C are at increased risk for hepatocellular carcinoma, cirrhosis, and advanced liver disease requiring liver transplantation. Approximately 80% of people infected with HCV develop chronic hepatitis C (VDH, 2013).

The Virginia Department of Health (VDH) received over 8,000 new reports of chronic and acute hepatitis C in 2015. The Virginia Hepatitis C Epidemiologic Profile was developed to better understand the full impact of hepatitis C in Virginia. It provides a cohesive summary of hepatitis C transmission, testing, treatment, morbidity, mortality, surveillance, and prevention. A collation of findings from a broad range of datasets describes the burden of hepatitis C in Virginia to promote evidence-based public health actions and policies.

An estimated 3.5 million U.S. residents are currently infected with HCV; however, 45-85% are unaware they are infected (Edlin, 2015; Smith, 2012). In late 2013, new treatments with markedly higher cure rates and fewer side effects became available nationwide (CDC, 2016). Although these drugs currently are cost prohibitive to most patients living with hepatitis C, they are an encouraging advancement in the management of a disease once thought to be incurable.

Despite the high initial cost of new drug treatments, studies show they are cost-effective when compared to the significant long-term costs of chronic hepatitis C infection. Associated complications can result in recurrent hospitalizations, invasive procedures, and liver transplantations (Gissel, 2015; Harinder, 2016). Further, curing hepatitis C both improves and extends quality and length of life and serves as a preventive measure by reducing the number of people who transmit the virus to others. Because there is no vaccine for HCV, transmission reduction remains a fundamental component of reducing the overall disease burden.

CDC reports that the current primary risk factor for new HCV infection is IDU (Zibbell, 2015). The US has faced an escalating IDU epidemic in recent years (Rudd, 2016), particularly concerning opioid drugs. As IDU continues to increase, HCV can quickly move through a population of drug users, leading to a syndemic of opioid abuse and HCV infection. While rates are increasing nationwide, the Appalachian region—which includes 25 counties in Virginia—has been identified as a hotspot. In the last decade, there has been a shift in the population most frequently affected by this syndemic toward young, non-Hispanic White individuals living in non-urban regions (Zibbell, 2015).

VDH has recognized this syndemic as a high-priority public health issue and has taken recent action to enhance prevention, testing, surveillance, and data management of hepatitis C. Additionally, VDH is addressing the emerging opioid crisis through monitoring syndromic surveillance data for indicators of opioid abuse, sharing community-level surveillance data with law enforcement, participating in committees and task forces dedicated to drug user health, and submitting a legislative proposal for harm reduction services in the event of a public health emergency. Hepatitis C and opioid abuse comprise a complex issue that requires a multifaceted approach, but limited public health resources for hepatitis C prevention, testing, and surveillance often prohibit a more robust response at the state and federal levels (DHHS, 2016).

CDC reports that the volume of hepatitis C cases overwhelms surveillance capability of most health departments. Data processing and entry, quality assurance, case investigation, patient linkage to care, and education are all challenging with limited dedicated resources. Because health departments frequently lack the resources necessary to fully complete all of these tasks, hepatitis C is underreported, and cases are often missing information. In 2013, only about 60% of the more than 132,000 chronic hepatitis C cases submitted to CDC had sufficient case information. These limitations in surveillance data hamper the ability to accurately assess morbidity, develop public health programs, allocate resources effectively, adequately inform stakeholders, and advocate for policy changes that promote effective interventions (CDC, 2015).

Stakeholders

In order to develop an epidemiologic profile that serves stakeholders' needs, VDH sought input from Virginia's Community HIV Planning Group (CHPG). Virginia's CHPG is comprised of HIV prevention and care stakeholders, representative of the client and service provider community throughout the state. Interested members of CHPG convened a smaller HCV workgroup starting in 2014 due to heightened concern over IDU-related outbreaks of viral hepatitis, specifically HCV. To elicit feedback from CHPG, VDH created a survey to assess the utility of currently available resources and to identify key topics for the Virginia Hepatitis C Epidemiologic Profile. Survey responders included representatives from community-based organizations (CBOs), the Department of Corrections, people living with or who had lived with hepatitis C, medical providers of people with hepatitis C, and social workers.

Results of the stakeholder survey showed that responders are planning to use the epidemiologic profile for patient education, self-education, clinician education, non-clinical professional education, and dissemination to lawmakers or funders to request support for hepatitis C programs. Planned uses of hepatitis C data available from VDH over the next year include grant writing, health program planning, and educating community members and decision makers. Topics identified as important include surveillance and testing data, hospitalization and mortality data, liver transplantation data, testing guidelines, testing sites, current treatments, treatment providers, provider adherence to testing recommendations, substance abuse, young IDU, baby boomers, incarcerated Virginians with hepatitis C, and co-infection with HCV and HIV. This wide range of topics emphasizes the complexity of understanding the burden of hepatitis C in Virginia. This epidemiologic profile aims to provide an initial cohesive report on hepatitis C that addresses stakeholders' needs and promotes actions to improve health outcomes.

Data sources

To overcome the known challenges in rendering reliable information on hepatitis C, this epidemiologic profile showcases findings from eleven unique data sources to elucidate the burden of hepatitis C in Virginia and its public health implications. Further, during the course of this project, rigorous quality assurance was performed on Virginia's hepatitis C surveillance data.

The recent attention on this topic brought on by the novel curative medications and burgeoning opioid crisis highlight the need for urgent action. Availability of curative drugs has garnered newfound motivation for identifying and treating those who are infected. Hepatitis C treatment and prevention has entered a new era with new hurdles, and the need to quickly reverse the trajectory of this syndemic is increasingly apparent. This profile aims to summarize key topics relevant to the transmission, prevention, treatment, morbidity, and mortality associated with hepatitis C infection using comprehensive data from diverse sources.

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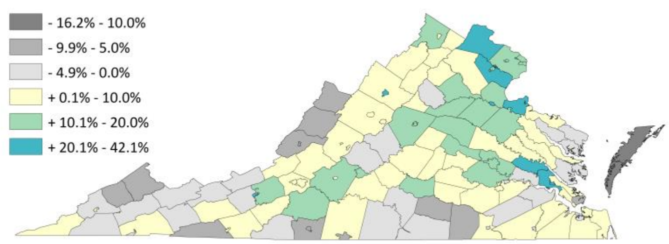
VIRGINIA DEMOGRAPHIC CHARACTERISTICS

Virginia is a medium sized mid-Atlantic state, consisting of 95 counties and 39 independent cities, organized for health planning purposes into five health regions comprised of 35 health districts.

Population growth

Virginia's population in 2014 was 8,326,289, accounting for 2.6% of the population of the United States (US Census, 2014). Virginia's population increased by nearly 326,000 from 2010 to 2014; this 4% growth rate was higher than the national growth rate of 3%. Virginia's population growth also surpassed that of neighboring jurisdictions of West Virginia and Maryland (US Census, 2014). The geographic areas with the largest proportion of population growth included northern and central Virginia (Fig. 1.1).

Figure 1.1. Change in population, 2005-2014.
**Fields in gray represent population loss.*



Age

Virginia's population is distributed by age similarly to the national population. The 2014 median age in Virginia was 37.7 years (US Census, 2014). This represents a 1.7 year increase from the estimated median age of 36 years in 2005, which indicates that Virginia's population is aging overall. During the same year, over 25% of the population was under the age of 19 years, and 13% was 65 years and older (US Census, 2014).

Race and ethnicity

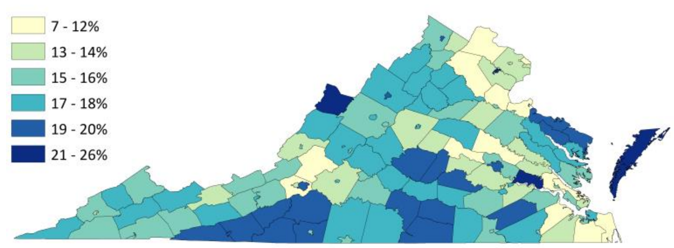
In 2014, 69% of Virginians were White and approximately 19% were Black. About 6% of Virginia's population is Asian, up from an estimated 4% in 2006. The percent of population which identifies as Hispanic ethnicity was 9% in 2014, up from 1% in 1970 and 6% in 2006. This trend makes Hispanics the second largest racial or ethnic minority group in Virginia, reaching a population of nearly 750,000 in 2014.

Insurance

The percentage of uninsured Virginians in recent years has been estimated at 11-16% (VA Performs, 2011) (Fig. 1.2). The US Census Bureau estimates the national percentage of uninsured people at 14% in 2014, a decrease from 2010 (16.3%). These increases in coverage are likely attributed to implementation of the Affordable Care Act (ACA). Provisions of this policy went into effect from 2010-2014.

In 2014, Hispanics were the least insured racial or ethnic group in Virginia (27.9%) by a wide margin, followed by Black individuals (13.7%). The percentages of White, Black, Asian, and Hispanic individuals without health insurance all decreased from 2010 to 2014 (US Census).

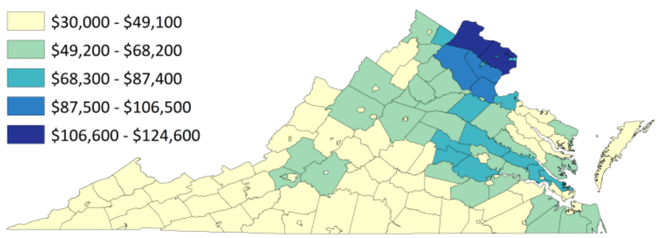
Figure 1.2. Percent of adults under 65 years of age who are uninsured, 2015.



Income and poverty

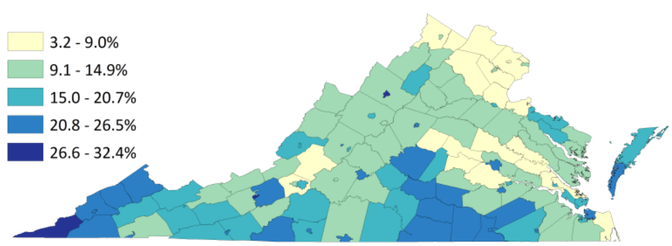
In 2014, the median household income in the United States was $53,482, a 3% increase from 2010. Nationwide, there are racial and ethnic disparities in median household income: the median household income for White households was 1.6 and 1.3 times that of Black and Hispanic households, respectively. In Virginia, median household income varies substantially by region, with the highest median household income in the Northern region (Fig. 1.3). In Virginia, the estimated median household income in 2014 was $64,792, exceeding the national median by more than $10,000.

Figure 1.3. Median household income, 2014.



Statewide, 12% of Virginians were living in poverty in 2014 (Fig. 1.4), lower than the national estimate of 16%.

Figure 1.4. Percent living in poverty, 2014.



Health planning geography

For health planning and notifiable disease reporting purposes, Virginia's independent cities are categorized equivocally to counties. Of the 43 independent cities in the United States, 39 are in Virginia (Stover, 2009). Collectively, Virginia's 95 counties and 39 independent cities are organized into 35 local health districts (LHDs). While some districts are comprised solely of one independent city, others contain numerous counties and/or independent cities. These 35 districts are assembled into five health regions (Central, Eastern, Northern, Northwest, and Southwest). A reference map and table with Virginia's health planning regions, districts, and counties/cities is available on page 46.

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HEPATITIS C SURVEILLANCE

Hepatitis C is a reportable disease in Virginia and nationwide. The Code of Virginia and the Board of Health Regulations for Disease Reporting and Control govern notifiable conditions within the Commonwealth of Virginia, including laboratory results consistent with HCV infection.

VDH uses a version of the National Electronic Disease Surveillance System (NEDSS) developed by CDC and designed for reporting infectious diseases, most of which can be confirmed by a single laboratory test. Hepatitis C, however, requires an average of four laboratory tests to confirm an acute infection, and it is not always possible to distinguish acute and chronic* HCV infections by these tests alone (Valdiserri, 2014).

** "Chronic hepatitis C" is the clinical term that is used interchangeably with the surveillance term "hepatitis C, past or present" used in the Council of State and Territorial Epidemiologists (CSTE) case definition for the time periods described in this report.*

Epidemiologists typically need clinical information during a public health investigation to identify an acute HCV infection, but limited resources prevent the majority of hepatitis C cases from being investigated. Acute hepatitis C is therefore underestimated. Because only 20-30% of acute infections are symptomatic (CDC, 2016), incidence of acute hepatitis C would likely still be underestimated even if resources allowed for more thorough investigation. Many individuals infected with hepatitis C may not know their infection status until they have late symptoms of chronic disease, at which point it may be difficult to determine the approximate time of initial infection.

The Virginia Electronic Disease Surveillance System (VEDSS) received over 8,000 reports of chronic hepatitis C in 2015. VDH guidelines specify that local health departments should investigate likely cases of acute HCV infection, while others are to be investigated as resources permit. Since 2013, two health districts in the Southwest region of Virginia have allocated resources to investigate the vast majority of both acute and chronic hepatitis C cases after hepatitis C case management and prevention was prioritized at the local level. Surveillance data for those two districts are presented in the Appalachia section of this profile.

Because LHDs are not required to perform investigations on every case of chronic hepatitis C, data entry and management of chronic hepatitis C is most often performed at the state health department. A nearly decade-long backlog of hepatitis C data awaiting verification peaked in the spring of 2015, when quality improvement methods were initiated on records from 2011-2015. Quality improvement actions added more than 3,000 new hepatitis C records, de-duplicated more than 1,000 records, and corrected discrepancies within specific fields in over 3,000 records.

Despite these efforts, data management and analysis of hepatitis B and C remains challenging with VEDSS. Some of the limitations to using VEDSS to analyze risk factor data for hepatitis B and C include:

- information frequently entered into the comments fields of VEDSS are too inconsistent to capture during statistical analysis;
- fields in VEDSS for risk factors do not align exactly with fields on case report forms (CRFs);
- different paper and electronic forms exist for acute and chronic hepatitis B and C, complicating data entry given the overlapping risk factors and exacerbated by

the potential for a single patient to have more than one condition;

- slightly different risk factor questions are asked on the forms for acute and chronic hepatitis B and C, so questions about the timeframe for exposures (i.e., lifetime versus acute) might not be captured for each condition;
- at the time an interview is performed, the interviewer might not know if the individual has acute or chronic hepatitis C or if they are co-infected with hepatitis B, so the interviewer might not know which CRF is most appropriate.

Key findings from interviews about hepatitis C surveillance in Southwest Virginia

In late 2015, district epidemiologists at each of the four districts in the Southwest region of Virginia were interviewed to assess capacity for investigating and managing hepatitis B and hepatitis C cases and to compare local trends. While the findings from this region are not representative of the state as a whole, the epidemiologists' responses provide insight into the differences in procedures used even among neighboring districts. Furthermore, some districts have novel mechanisms for increasing local capacity for hepatitis C surveillance and connecting with patients that might be useful for other districts to consider adding to their protocols.

Of the four districts, one reported that they investigate all newly reported cases of hepatitis C, one stated they do not investigate any chronic hepatitis C cases, and two intend to investigate all chronic cases but are limited by insufficient staffing resources. The latter two districts prioritize investigations for specific groups, such as pregnant women, persons under 25 years of age, and people in congregate living situations. One district engages public health graduate students from a local university to assist with interviewing people with hepatitis C infection. Another district uses Disease Intervention Specialists (DIS), who usually perform partner services for individuals with sexually transmitted infections, for interviewing and contact investigation. Those two districts also have used social media or texting to connect with patients and attempt to conduct in-person interviews to gather more accurate information. Challenges reported by these districts include:

- lack of access to electronic medical records or information from providers, which are needed to confirm acute cases;
- discrepancies between fields on CRFs and in VEDSS;
- patients' resistance (e.g., not reporting risk behaviors or avoiding phone calls);
- insufficient number of staff at the local level to keep up with the high number of cases;
- inadequate and overlapping CRFs for acute and chronic hepatitis B and C (e.g., history of tattoo not included on chronic hepatitis B or C forms).

Outbreaks

In addition to surveillance data, VDH collects and manages outbreak data for hepatitis C. The most recent hepatitis C outbreak in Virginia occurred in 2006. Since 2012, however, there have been two hepatitis B outbreaks in Virginia. Hepatitis B virus (HBV) is more easily transmitted than HCV, but has similar modes of transmission.

One of the two hepatitis B outbreaks was in a rural community in Southwest Virginia among IDU, while the other was in an assisted living facility in Central

Virginia associated with an infection control breech involving shared blood glucose monitoring (BGM) devices. VDH assists with detection and mediation of infection control breeches at healthcare facilities and, from 2012-2015, seven infection control breeches involving BGM were identified in Virginia and warranted testing of exposed individuals.

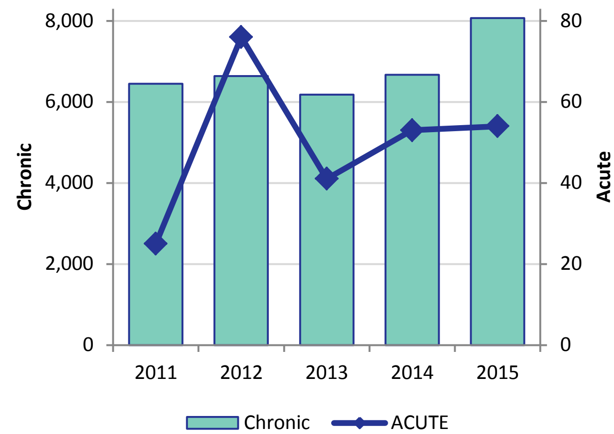
Community HCV outbreaks might not be identified because most people with hepatitis C are not aware of their infection and only 20-30% of people develop symptoms of acute hepatitis C (Smith, 2012). Additionally, those who have been exposed might not seek care or report their potential exposure, particularly when exposure is via illegal IDU (Zibbell, 2015). The 2015 HIV outbreak in Indiana revealed that over 84% of those with HIV were also co-infected with HCV (Conrad MMWR, 2015). Because HCV tends to be transmitted more easily than HIV among IDU, HCV infections are considered a potential indicator for predicting IDU-related HIV outbreaks (Shavor, 2015).

Robust federally-funded HIV prevention, surveillance, and treatment programs help facilitate public health action for persons living with HIV/AIDS, but parallel programs do not exist for hepatitis C (Valdiserri, 2014). There is heightened concern for future hepatitis C outbreaks in the Appalachian region given the increasing incidence of opioid abuse, injection drug use, and concomitant increase in acute hepatitis C rates (MMWR Appalachia 2015).

Longitudinal trends

Acute hepatitis C cases represent less than 1% of all hepatitis C cases reported to VEDSS, which is likely reflective of the inherent underestimation of acute cases by the current surveillance system. Figure 2.1 illustrates the trends in acute hepatitis C cases relative to the number of chronic cases reported to VDH between 2011 and 2015.

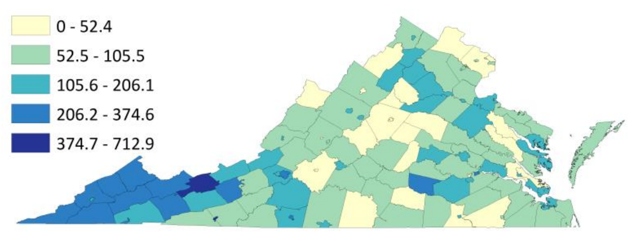
Figure 2.1. Acute and chronic hepatitis C cases reported in VEDSS, 2011-2015.



Geographic distribution

Figure 2.2 depicts the rate of cases of acute and chronic hepatitis C per 100,000 persons by city/county of residence. The southwestern Appalachian region of Virginia has the highest incidence of newly reported chronic and acute hepatitis C.

Figure 2.2. Reported hepatitis C per 100,000*

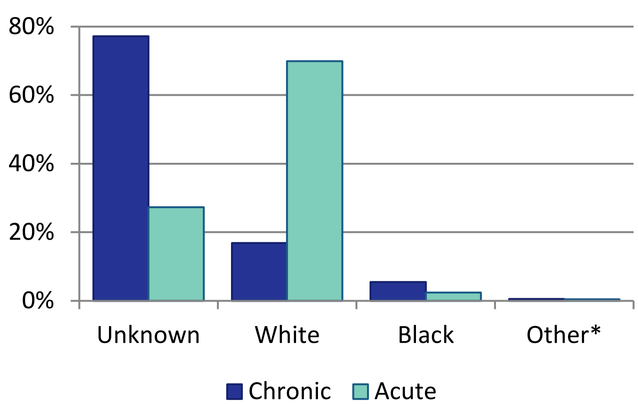


**This map excludes results from hepatitis C testing performed at correctional facilities to prevent false clustering of cases. Incarcerated individuals are not included in census population data for the counties where correctional facilities are located. Trends in hepatitis C in the incarcerated population are described separately.*

Sex

Of people newly reported to have chronic hepatitis C from 2011-2015, 59% were male, 40% female, and 1% had unknown or missing information on sex. Of acute cases of hepatitis C in the same time period, 55% occurred in females and 45% in males. Surveillance data is insufficient for determining whether females are more likely than males to present for care and testing during acute illness, or whether females are more likely to be identified during a contact investigation.

Figure 2.3. Reported chronic hepatitis C, percent by race, 2011-2015 (VEDSS).



**Other race includes American Indian or Alaska Native, Asian, Mixed, and Native Hawaiian or Other Pacific Islander, in which very few hepatitis C cases reported.*

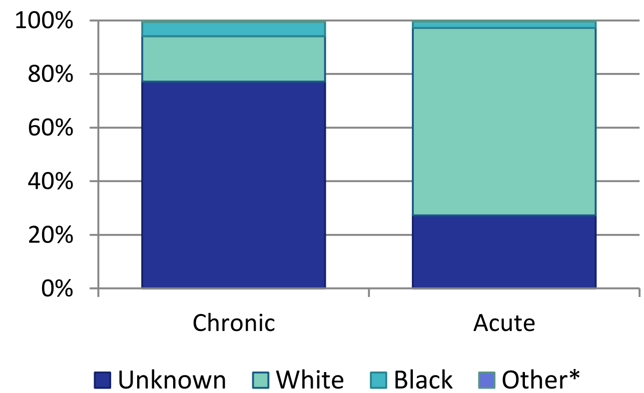
Race

Among people with chronic hepatitis C, data on race are limited; 77% of chronic cases record race as “missing” or “unknown” in VEDSS (Fig. 2.3). Approximately 95% of reports are submitted via electronic laboratory report (ELR), which frequently do not include data on race. As most cases of chronic hepatitis C are not investigated, data available in VEDSS are often limited to data from the ELR. Data quality regarding race should improve as electronic case reporting is initiated in Virginia and nationwide in coming years.

Race data on acute hepatitis C cases are more complete; 27% of acute cases have missing/unknown data on race. Acute hepatitis C cases are more likely to have additional demographic and epidemiologic information from CRFs used during a public health investigation.

In Virginia from 2011-2015, White individuals comprised the majority of newly reported chronic hepatitis C cases of which there is known race and nearly 70% of acute hepatitis C cases (Fig. 2.4). Black individuals comprised 2.4% of acute hepatitis C cases and 5.5% of newly reported chronic hepatitis C cases in this time period.

Figure 2.4. Reported chronic vs. acute hepatitis C, percent by race, 2011-2015 (VEDSS).

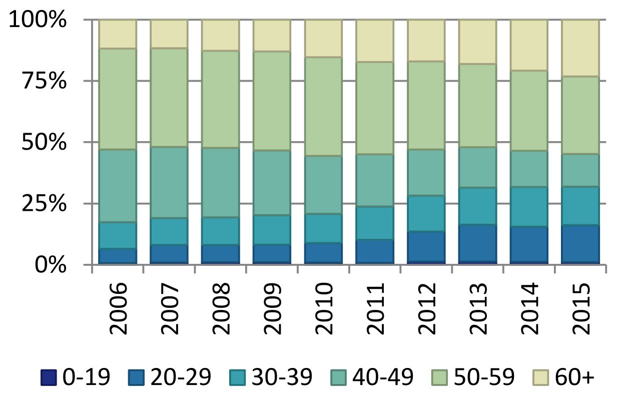


Age

The median age of people with chronic hepatitis C is 51 years (IQR 36-58), and the median age of people with acute hepatitis C is 32 years (IQR 25-41).

Separating these data into age groups reveals that reports of newly diagnosed acute or chronic hepatitis C are declining in persons aged 40-59 years, while reports are increasing in persons aged 20-39 years and 60+ years (Fig. 2.5). Awareness of these trends can guide resource allocation toward targeted interventions.

Figure 2.5. Reported chronic hepatitis C, percent by age in years, 2011-2015 (VEDSS).



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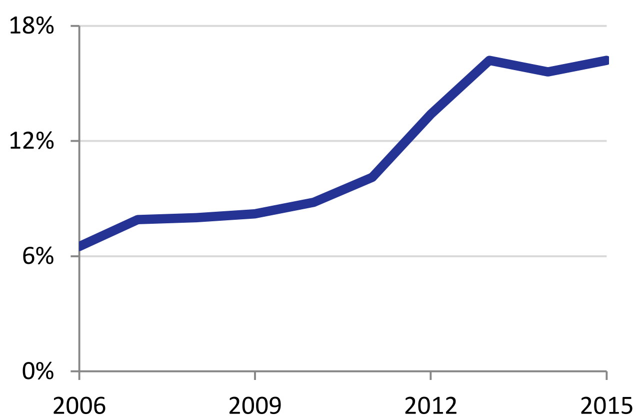
Special Populations and Risk Factors

Persons under 30 years of age

Recent increases in reports of acute hepatitis C among persons under 30 years old in central Appalachia have drawn attention to hepatitis C in young individuals, particularly those who are White, inject drugs, and reside in non-urban communities. Virginia was one of four states highlighted in a 2015 CDC report that illustrated the emerging triad of opioid abuse, IDU, and hepatitis C infection among persons aged 30 years or younger (Zibbell, 2015).

Over the last decade, the percentage of acute and chronic hepatitis C cases which are newly reported in persons under 30 years old in Virginia has increased (Fig. 3.1). This trend highlights the need for development and implementation of health services tailored to this age group.

Figure 3.1. Percent of reported hepatitis C occurring in individuals under 30 years of age (VEDSS).



Given that IDU is the primary risk factor for HCV infection in the United States, integrated health services are needed to provide substance abuse treatment, hepatitis C treatment, and prevention services to stop transmission (Zibbell, 2015). This population is also at risk for infection with other bloodborne pathogens, such as HIV and hepatitis B virus (HBV). Co-infections of HIV and HCV are described in a separate section of this profile.

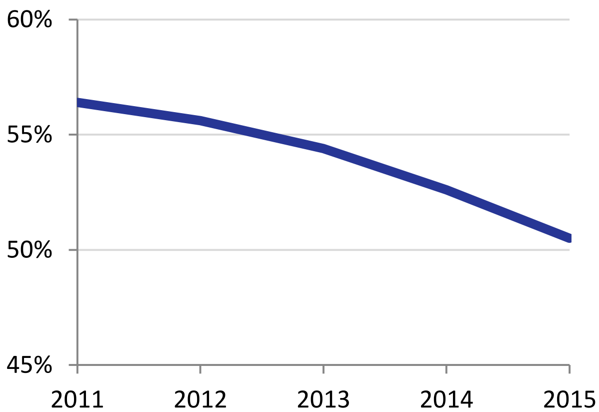
Baby Boomers

Another age group known to be disproportionately affected by hepatitis C is the “baby boomer” population, defined as individuals born from 1945-1965. In a 2012 report, CDC estimated that baby boomers account for approximately 75% of all HCV-infected individuals nationwide (Smith, 2012). CDC and the US Preventive Services Task Force recommend that all persons in this birth cohort be tested for HCV infection (Smith, 2012; USPSTF, 2013).

Baby boomers infected several decades ago are reaching the stage at which chronic sequelae of HCV infection are most prevalent. Approximately 75-85% of persons infected with HCV develop chronic infection that can manifest as liver cirrhosis or hepatocellular cancer long after the infection occurred. The emphasis on testing and treating baby boomers is, in part, to promote clinical interventions before the occurrence of late stages of disease, which are difficult and costly to treat and decrease life expectancy. There is heightened attention on linking baby boomers to care now that effective and well-tolerated curative treatments for hepatitis C are available.

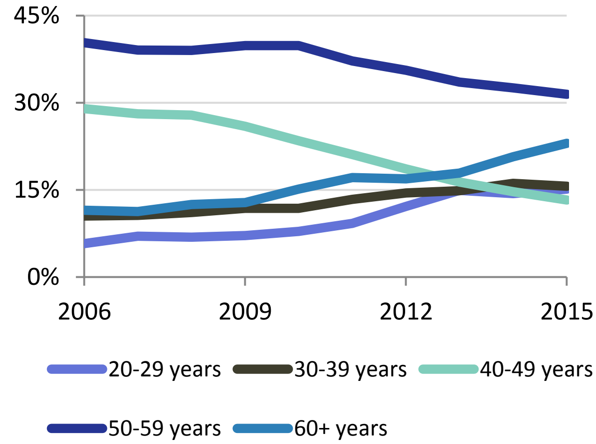
In Virginia, surveillance data reveal that the percentage of newly reported HCV infections occurring among baby boomers had an overall downward trend in recent years (Figure 3.2). When stratified by more defined age groups, reports of hepatitis C in persons aged 40-59 years are decreasing, while reports of hepatitis C in persons 60+ years are increasing (Fig. 3.2 and 3.3). While new surveillance reports for baby boomers as a whole are decreasing, reports for the oldest age group are increasing.

Figure 3.2. Percent of reported hepatitis C occurring in individuals born from 1945-1965 (VEDSS).



Because acute hepatitis C occurs within 6 months of exposure, approximate date of infection can be determined in those diagnosed with acute infection; however, acute infections comprise only approximately 1% of all hepatitis C cases in the VEDSS surveillance system. The median age of persons diagnosed with acute hepatitis C in Virginia has remained stable from 2011-2015 at approximately 19 years younger than those diagnosed with chronic hepatitis C. Age at diagnosis of chronic hepatitis C cannot be used to estimate age at the time of infection.

Figure 3.3. Percent of reported hepatitis C by age in years at diagnosis, 2006-2015 (VEDSS).



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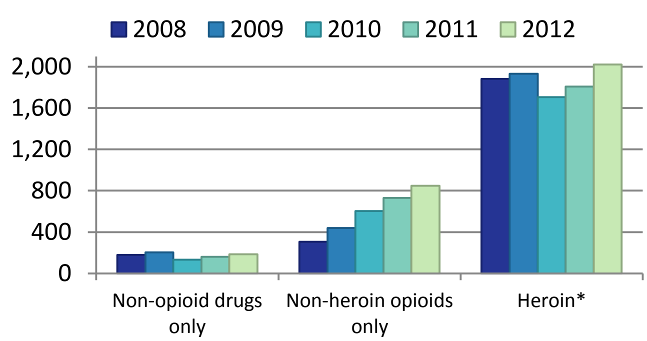
OPIOIDS AND INJECTION DRUG USE

CDC reports that most new infections of hepatitis C in the United States are transmitted via shared needles or other injection materials, such as cookers or cotton; 73% of acute hepatitis C cases with identified risks reported IDU in a recent MMWR published by CDC (Zibbell, 2015). New cases of hepatitis C nationwide have occurred primarily among young, White, non-urban individuals with a history of IDU and prescription opioid use (CDC, 2016). Approximately one in three young (aged 18-30 years) IDU and 70-90% of older or former IDU are infected with HCV (CDC, 2013).

One quarter of IDU become infected with HCV within two years of initiation of injecting (Page, 2013). HCV has extremely high infectivity through bloodborne transmission; a person is ten to 30 times more likely to become infected with HCV than with HIV through a contaminated needle stick or similar direct blood exposure (CDC, 2013). HCV can remain viable in liquid and dried blood, contaminated needles and syringes, and inanimate objects and surfaces for several weeks.

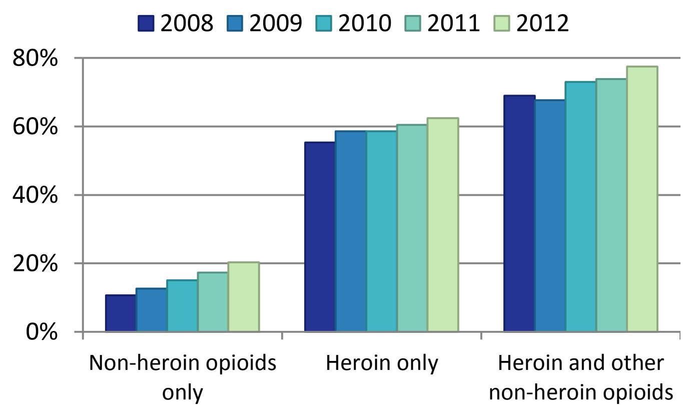
Figure 3.4. Total drug treatment admissions in Virginia with reported IDU, by opioids reported* (TEDS, 2008-2012).



**Admissions in which patients report heroin use, with or without concurrent other opioid or non-opioid drug use.*

Drug treatment center admissions for both heroin and non-heroin opioids in Virginia reached a five-year high in 2012 (Fig. 3.4), and the percentage of opioid users reporting IDU has steadily increased (Fig. 3.5). These individuals are at high risk for infection with HCV.

Figure 3.5. Percent of drug treatment admissions in Virginia in which IDU is reported, by opioids reported (TEDS, 2008-2012)**.**



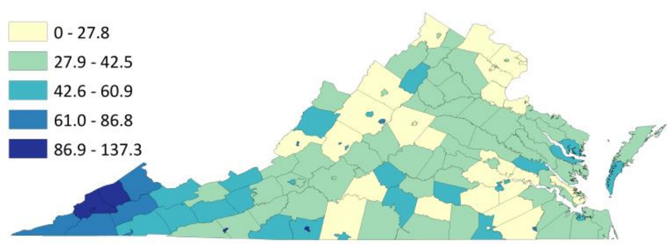
Drug treatment admissions

The Substance Abuse and Mental Health Services Administration (SAMHSA) Treatment Episode Data Set (TEDS) provides data on individual drug treatment center admissions in the United States. Because these data are based on individual admissions, patients with multiple admissions may be represented more than once. Further, treatment admissions data includes admissions for all substances, including those acquired both legally (e.g., alcohol or prescribed medication) and illegally (e.g., heroin, cocaine, and other illegal substances, or illegally purchased prescription drugs). Approximately 67% of all drug treatment center admissions in the United States are captured in the TEDS dataset.

Although more treatment center admissions for heroin use report IDU (62%) than admissions for only other opioids (20%), both groups are growing. The percentage of admissions of non-heroin opioid users reporting IDU increased from 11% to 20% from 2008 to 2012. Heroin-exclusive opioid users reporting IDU increased 12.9%. Seventy-seven percent of admissions for both heroin and other opioids reported IDU.

A 2014 SAMHSA report found that there has been a significant increase in hospitalizations for opioid misuse, and nearly 2.4 million Americans have a substance use disorder (SUD) related to prescription opioids. Approximately 500,000 Americans have a SUD related to heroin (Mir, 2016). In 2014, 11.1% of all admissions to drug treatment centers listed heroin as the primary substance of abuse. Ten percent listed other opioids. Ninety-four percent of admissions where IDU was reported listed opioids as a used substance (SAMHSA TEDS, 2014).

Figure 3.6. Opioid prescriptions per 100 people, 2014 (APCD*).

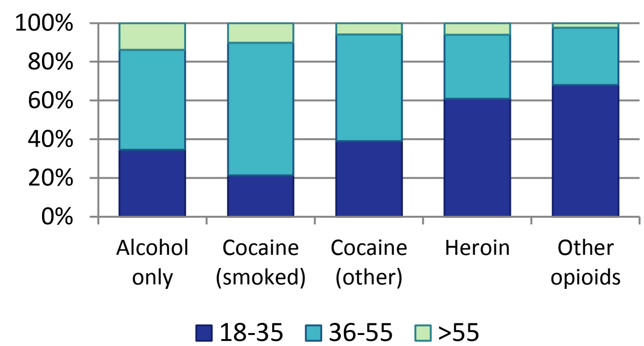


**APCD does not include all prescriptions, including Medicare fee-for-service and self-pay (i.e., no payment through an insurer).*

Prescription opioids and heroin

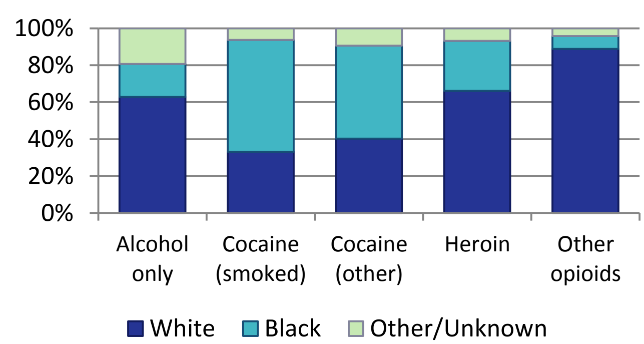
Individuals abusing prescription opioids are at high risk for HCV infection and other bloodborne pathogens if they inject or insufflate (snort) using shared materials. Of prescriptions available from the All Payer Claims Database (APCD), opioid prescriptions in 2014 were highest in the far Southwest region of Virginia (Fig 3.6), at up to 137.3 prescriptions per 100 people. Because APCD does not capture all prescriptions filled statewide, the true number is likely far higher. Patients who self-pay for prescriptions (i.e., do not pay through an insurer) are not included in this dataset and may represent a significant portion of misused opioid prescriptions acquired through licensed pharmacies in Virginia.

Figure 3.7. Age at time of admission, by primary drug of use (percent), Virginia, 2014. TEDS (SAMHSA).



Those admitted primarily for heroin and other opioids in 2014 were disproportionately 35 years of age or younger (Fig. 3.7) and White (Fig. 3.8), particularly in comparison to individuals admitted primarily for alcohol or cocaine.

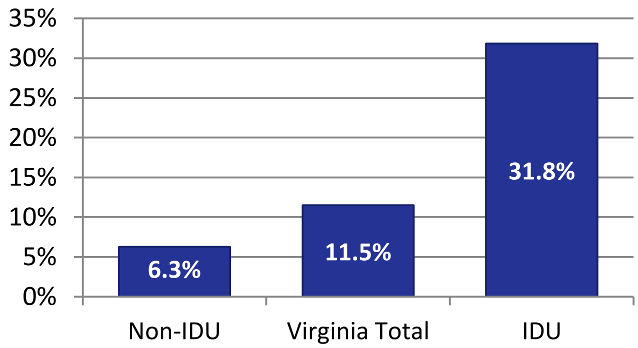
Figure 3.8. Percent of admissions by race, by primary drug of use, Virginia, 2014. TEDS (SAMHSA).



HCV positivity among IDU at free testing sites in Virginia

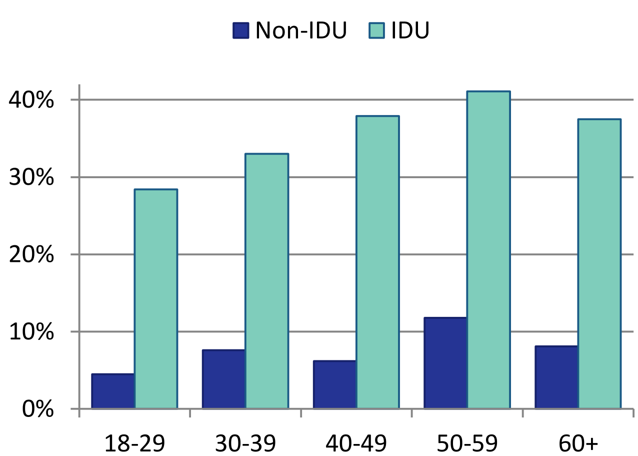
Individuals reporting at least one risk factor for HCV infection in Virginia are eligible to receive free HCV testing at VDH-supported local health departments, CBOs, and drug treatment centers. HCV positivity at free test sites among IDU (31.8%) far surpassed positivity among those reporting other risk factors (6.3%) (Fig. 3.9).

Figure 3.9. Percent of individuals tested at free testing sites January 2014 – March 2016 with a positive HCV antibody test or HCV RNA test, by injection drug use.



This disparity persists in every age group (Fig. 3.10).

Figure 3.10. Percent of individuals tested at free testing sites January 2014 – March 2016 with a positive HCV antibody test or HCV RNA test, by age in years and injection drug use.



Fatal overdose

The Office of the Chief Medical Examiner (OCME) reports that the total number of fatal drug overdoses in Virginia has been increasing annually. In 2013, fatal drug overdose became the number one method of unnatural death, surpassing deaths related to motor vehicle accidents or guns.

Heroin

National surveys have identified a nationwide increase in first-time heroin use (Zibbell, 2015). Although fatal heroin overdoses dropped to 0.6 deaths per 100,000 in 2010, this rate has since increased to 2.9 deaths per 100,000 (2014). Of fatal heroin overdoses, over 98% were deemed accidental. Deaths most frequently occurred in White males and males aged 25-44 years. Heroin death rates were highest in the Northwest, Central, and Eastern regions of Virginia, most dramatically affecting urban regions such as the cities of Richmond, Roanoke, and Portsmouth. Fatal heroin overdose rates were low in most non-urban localities, with the exception of the Northwest region of the state (Fig. 3.11), which has seen heightened rates of both heroin and prescription opioid fatal overdoses. Prescription opioid abuse is often a precursor to initiation of heroin, as heroin is frequently less expensive and easier to prepare for injection than opioids in pill form (National Drug Threat Assessment, 2011; Cicero, 2012).

Figure 3.11. Fatal heroin overdoses per 100,000, 2007-2014 (OCME).

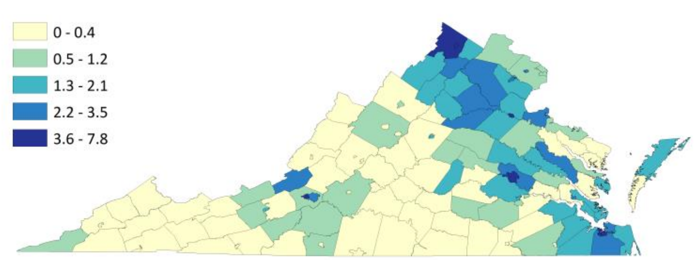
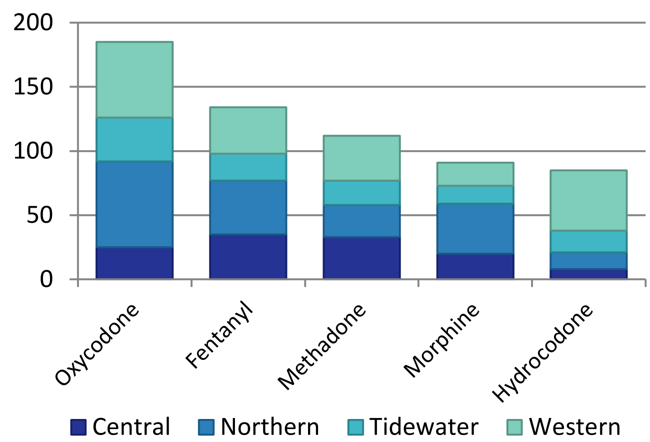


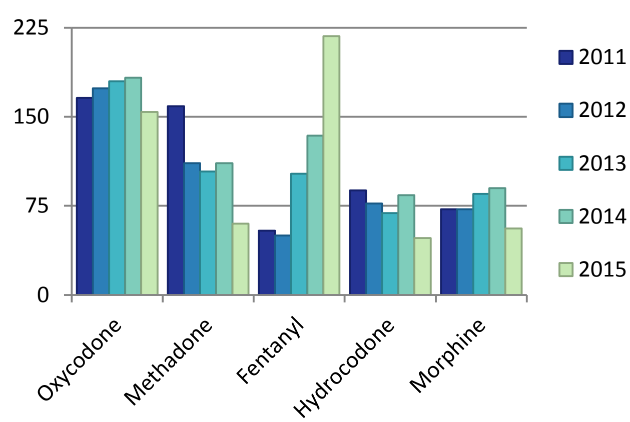
Figure 3.12. Fatal overdoses caused by prescription opioids, by opioid causing death, by region, 2014 (Top 5). OCME.



Prescription opioids

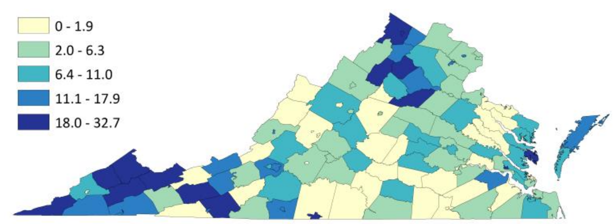
Deaths by prescription opioid overdose have been increasing in Virginia, with a particularly dramatic recent increase in deaths caused by fentanyl, a synthetic opioid far more potent than morphine or heroin. Although oxycodone has most frequently been attributed to fatal overdose in recent years (Fig. 3.12), deaths caused by fentanyl surpassed deaths caused by oxycodone in 2015 (Fig. 3.13).

Figure 3.13. Fatal overdoses caused by prescription opioids, by opioid causing death, 2011-2015 (Top 5 primary opioid substances causing death, OCME).



Because HCV and other blood-borne pathogens, including HBV and HIV, are highly transmissible via shared needles, cookers, and other injection materials, these increases are concerning due to both the direct risks of drug abuse and addiction (such as fatal overdose) and the other risks associated with unsafe injection practices (such as HCV infection).

Figure 3.14. Fatal prescription opioid overdoses per 100,000, 2014 (OCME).



In 2014, 55.5% of the 992 total fatal drug overdoses in Virginia involved prescription opioids. Eighty-four percent of fatal prescription opioid overdoses were deemed accidental, 10.5% suicide, and 5.1% undetermined. Eighty-seven percent of fatal prescription opioid overdoses occurred in White individuals. Males aged 25-44 comprised the largest cohort of persons with both fatal heroin overdose and fatal prescription opioid overdose. In 2014, fatal prescription opioid overdose rates were generally highest in the far Southwest and Northwest regions. (Fig. 3.14).

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APPALACHIAN REGION

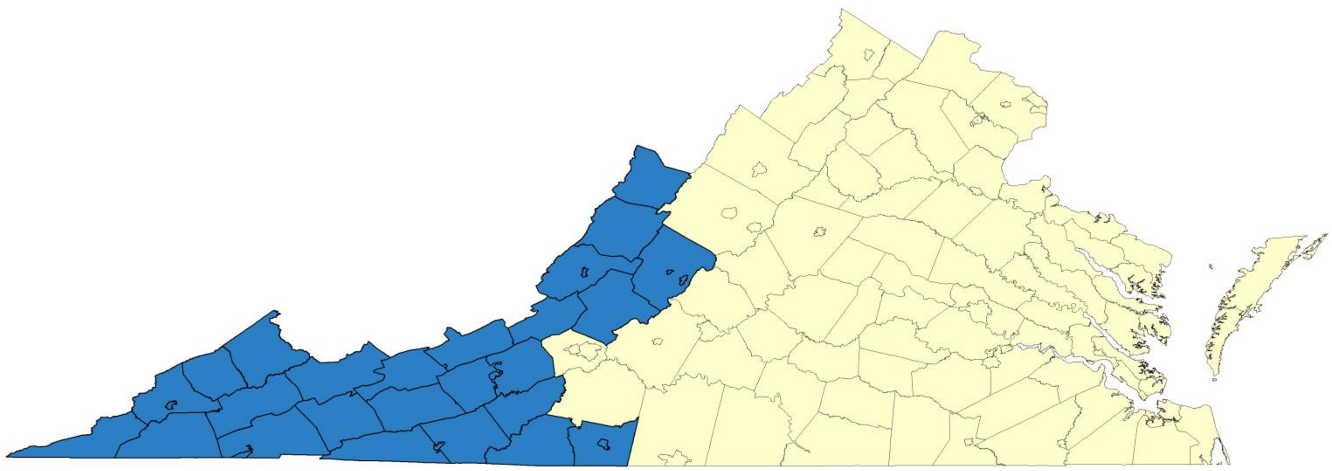
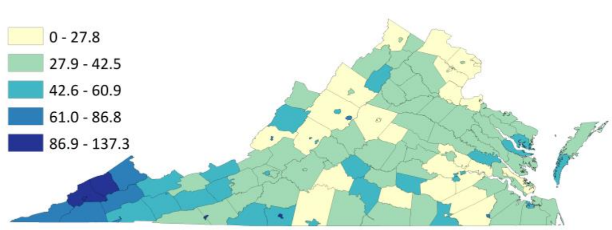


Figure 3.15 (above). Counties and independent cities of Virginia; the Appalachian region is highlighted in blue.

The Appalachian region of Virginia includes twenty-five counties and independent cities (Fig. 3.15). This region includes 8% of Virginia's population but accounts for 15% of Virginia's opioid prescriptions (All Payer Claims Database - APCD). The ten Virginia counties and cities with the highest rates of opioid prescriptions all lie within the Appalachian region, ranging from 69.9 (Scott County) to 137.3 (Martinsville) opioid prescriptions per 100 people (Fig. 3.16). Because the APCD does not capture data on all prescriptions filled in Virginia, the true rates of opioid prescribing are likely far higher.

Figure 3.16. Opioid prescriptions per 100 people, 2014 (APCD*).



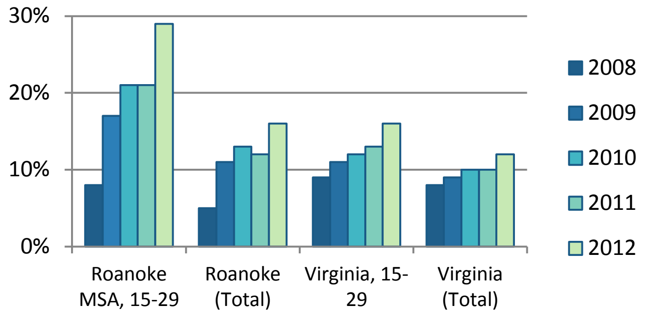
**APCD does not include all prescriptions, including Medicare fee-for-service and self-pay (i.e., no payment through an insurer).*

2015 Morbidity and Mortality Weekly Report (MMWR)

In 2015, CDC released a MMWR highlighting an increase in hepatitis C in IDU under 30 years old living in Kentucky, Tennessee, Virginia, and West Virginia. An analysis of state surveillance and SAMHSA Drug Treatment Episode Data Set (TEDS) found that the increase in new HCV infections in central Appalachia is likely correlated with a regional increase in injection of heroin and other opioids (Zibbell, 2015).

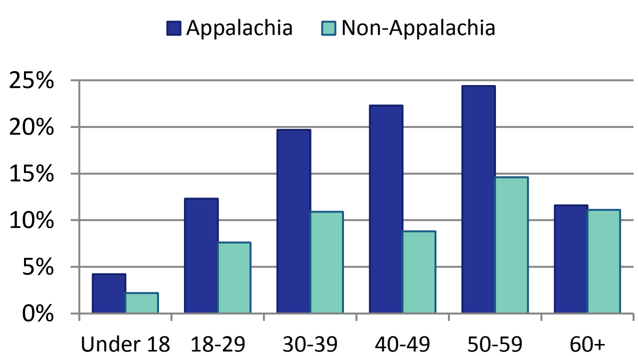
Although TEDS data can geographically be stratified only by major metropolitan statistical areas (MSA), several Appalachian counties reside within the Roanoke MSA. IDU trends within the Roanoke MSA were therefore compared to trends for the rest of Virginia.

Figure 3.17. Percent of Virginia drug treatment center admissions in which patient reports IDU, Roanoke MSA vs. Virginia, 2008-2012 (TEDS).



The Roanoke MSA experienced dramatic increases in admissions reporting IDU between 2008 and 2012: a 257.2% increase in the proportion of young adult (aged 18-29 years) admissions reporting IDU, and a 223.8% increase in total admissions (all ages) reporting IDU. The Roanoke MSA far surpassed the state average (Fig. 3.17); statewide, there was a 66% increase in 18-29 year old admissions reporting IDU and a 46% increase in total admissions reporting IDU.

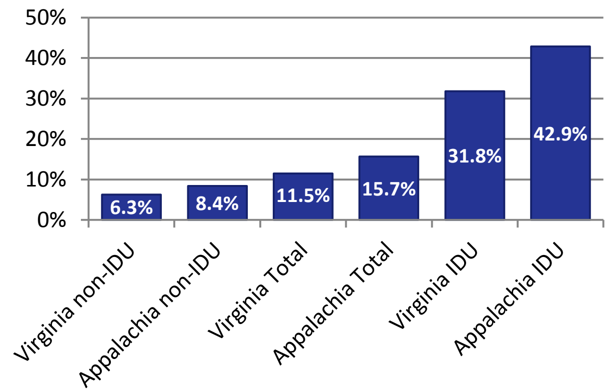
Figure 3.18. Percent of individuals tested at free testing sites January 2014-March 2016 with a positive HCV RNA or HCV antibody test, by age, Appalachia vs. Virginia (DDP).



HCV positivity at free testing sites in Appalachia

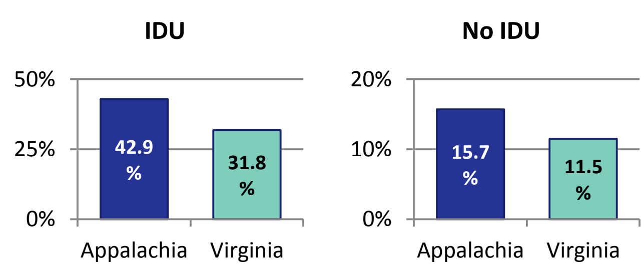
Individuals with at least one risk factor for hepatitis C are able to obtain a free HCV test at a number of VDH-supported sites statewide. HCV positivity at these VDH-supported test sites is substantially higher within Virginia's Appalachian region. This disparity is clear among every age group (Fig 3.18), and among those who both do and do not report IDU (Fig 3.19).

Figure 3.19. Percent of individuals tested at free testing sites January 2014-March 2016 with a positive HCV RNA or HCV antibody test, by injection drug use, Appalachia vs. Virginia (DDP).



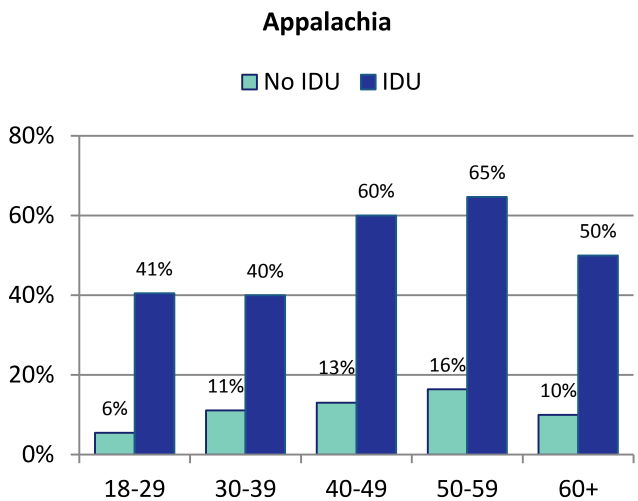
Among IDU who were tested for HCV at VDH-supported free testing sites in Appalachia, 42.9% received a positive test result, compared to 31.8% of IDU tested in Virginia overall, 8.4% of Appalachian non-IDU, and 6.3% of all Virginian non-IDU (Fig. 3.20). IDU in every age group were more likely to test positive for HCV, both in and outside of Appalachia (Fig 3.21 and 3.22).

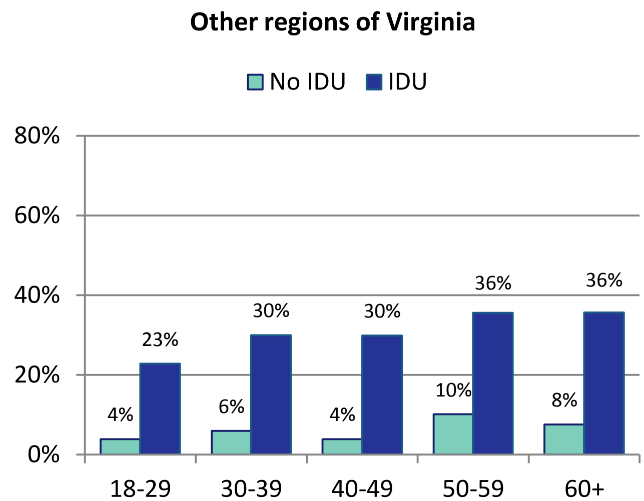
Figure 3.20. Percent of individuals who report and do not report IDU tested at free testing sites January 2014-March 2016 with a positive HCV RNA or HCV antibody test, Appalachia vs. Virginia (DDP).



The Appalachian region of Virginia is comprised of the counties of Alleghany, Bath, Bland, Botetourt, Buchanan, Carroll, Craig, Dickenson, Floyd, Giles, Grayson, Henry, Highland, Lee, Montgomery, Patrick, Pulaski, Rockbridge, Russell, Scott, Smyth, Tazewell, Washington, Wise, and Wythe, and the independent cities of Bristol, Buena Vista, Covington, Galax, Lexington, Martinsville, Norton, and Radford.

Figure 3.21 (left) and 3.22 (right). Percent of individuals tested at free testing sites January 2014 – March 2016 with a positive HCV antibody test or HCV RNA test, reporting IDU vs. non-IDU, by age in years, Appalachia vs. all other regions in Virginia (DDP).





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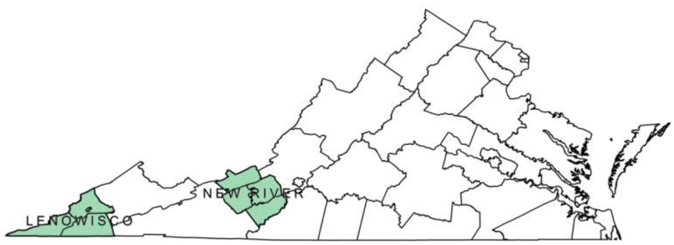
APPALACHIAN REGION:

Spotlight on Southwest Virginia

Figure 3.23. Lenowisco and New River Health Districts.



The New River and Lenowisco Health Districts, located in the Southwest region of Virginia (Fig 3.22), noticed an increase in hepatitis C and, in 2012, enhanced case follow-up and investigation to include cases of chronic hepatitis C. Most districts in Virginia investigate acute cases of hepatitis C but defer data management of chronic hepatitis C to VDH's central office, so contact investigation (i.e., tracing and interviewing injection drug "partners") for chronic hepatitis C is often bypassed. The clinical criteria necessary to stage a hepatitis C case as many acute might not be available to the central office if a local investigation does not occur.

Approximately 95% of chronic hepatitis C cases are reported to VDH via ELRs, which do not include risk factor data and often do not include data on race. These analyses of New River and Lenowisco offer insight into the expanded surveillance that would be possible if resources were allocated for more in-depth investigation of hepatitis C statewide.

New River Health District

Floyd, Giles, Montgomery and Pulaski counties and the independent city of Radford

From 2012-2013, New River Health District (NRHD) conducted a case-control study to identify geographic hotspots of hepatitis C cases associated with specific risk factors to strategically design and implement targeted control and prevention programs. Analysis confirmed that IDU, unsafe sexual practices, and unsafe tattooing were risk factors for acquisition of hepatitis C in NRHD. Further analysis demonstrated that risk factors differed by specific location within the LHD. In Pulaski County, a cluster of HCV infections were associated with unsafe tattoo practices. In Giles County, one cluster of HCV infections was associated with unsafe sexual behavior and another cluster with IDU. As a result of this study, these counties became the main focus of public health interventions aimed at education and mitigation of risk factors related to sexual behavior, IDU, and unsafe/unlicensed tattooing in NRHD (Telionis, 2013).

Lenowisco Health District

Lee, Scott and Wise counties and the independent city of Norton

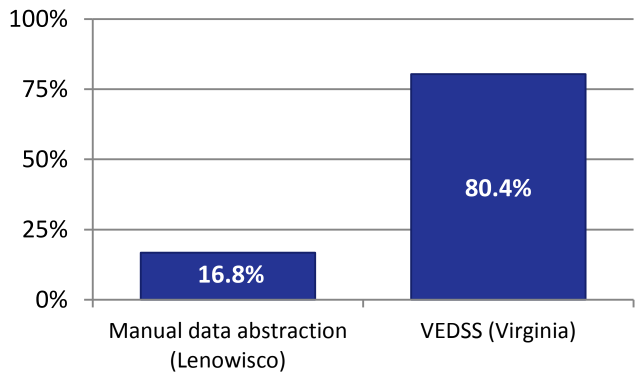
In Lenowisco, manual data abstraction from paper case report forms (CRFs) was performed to assess risk factors for hepatitis B and hepatitis C, which may be recorded on paper but are not consistently captured electronically in VEDSS. Lenowisco had intermittently elevated rates of hepatitis B and C since the occurrence of a hepatitis B outbreak among IDU in 2012. Hepatitis B and C share risk factors, and the rate of co-infection of hepatitis B and C was 10.6%. This evaluation assessed a random sample of 114 cases of chronic hepatitis C from 2013-2015 from all four localities in

Lenowisco. Because over 98% of cases were staged as chronic infection, acute cases were excluded from analysis.

Data completeness

Hepatitis C cases reported through VEDSS frequently do not include the patient's race, ethnicity, or reported risk factors. Over 80% of chronic hepatitis C cases reported in VEDSS from 2013-2015 lacked information on race, compared to only 16.8% of cases manually reviewed in Lenowisco (Fig. 3.24).

Figure 3.24. Percent of reported chronic hepatitis C cases with missing or unknown race, manual data abstraction findings (Lenowisco) vs. VEDSS (Virginia), 2013-2015.



Risk factors

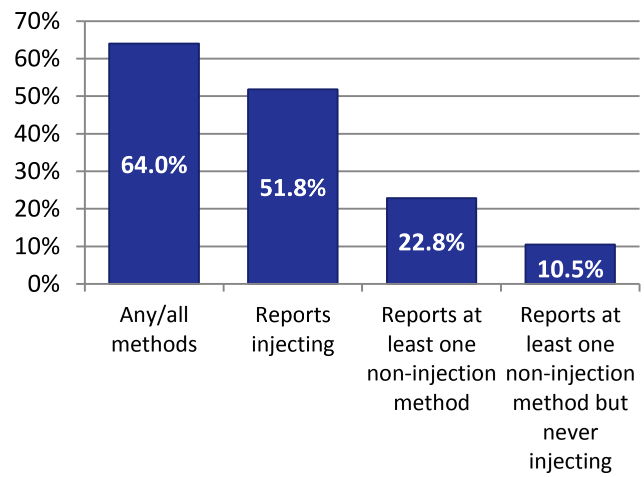
These data are consistent with national trends noting IDU as the primary risk factor for people newly infected with hepatitis C (Smith, 2012). CDC surveillance data show that 61.6% of persons with acute hepatitis C reported IDU (CDC surveillance, 2015). A comparable risk factor assessment is not available for chronic hepatitis C cases nationally. The majority of persons with chronic hepatitis C in Lenowisco reported IDU, although this trend did not persist among baby boomers (Table 3.1).

Table 3.1. IDU among people with chronic hepatitis C in Lenowisco Health District, 2013—2015.

Report of IDU among baby boomers and non-baby boomers	Percentage of people with hepatitis C reporting IDU
Ever IDU (n=114)	51.8%
Ever IDU among baby boomers (n=33)	41.9%
Ever IDU among non-baby boomers (n=81)	63.9%

Over 22% of persons with chronic hepatitis C reported using "street drugs" without injecting, despite the fact that this question is not on the CRF for chronic hepatitis C (Fig. 3.25). This value is likely underestimated as it was collected without a distinct prompt and then written in as a comment on the CRF. Further, street drugs were not explicitly defined in the CRF, and individuals may have differing views on what constitutes a street drug.

Figure 3.25. Methods of drug use among individuals with newly diagnosed chronic hepatitis C in Lenowisco, 2013—2015 (n=114).

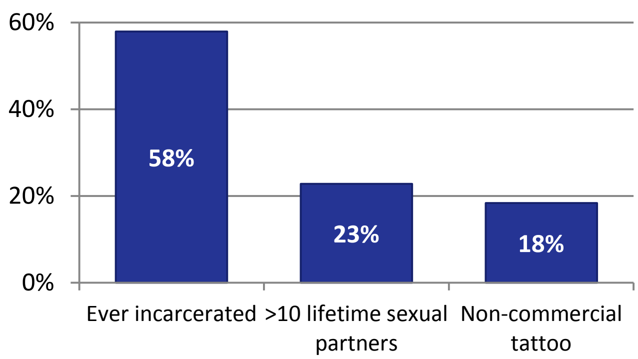


** 11 of the 114 cases in the manual abstraction were missing risk factor information on the CRF.*

CDC's CRFs for acute hepatitis B and C contain this question: "During the 2 weeks - 6 months prior to onset of symptoms [did you] use street drugs but not inject?" It does not specify if this refers to using oral, intranasal, or another mode of delivery of opioids or another "street drug," so responses depend on how the question, as well as the term "street drugs," is interpreted.

Because use of street drugs without injecting is not included on the CRFs for chronic hepatitis B or C, its contribution to the risk of chronic hepatitis C from statewide and national data cannot be determined. The manual data abstraction in Lenowisco facilitated review of comments on CRFs that specifically mentioned snorting drugs and sharing materials used to insufflate (snort) drugs, a biologically plausible mechanism for exposure to bloodborne pathogens like hepatitis C. Among persons with chronic hepatitis C, 10.5% reported use of non-injection street drugs in the absence of IDU; however, among persons with acute hepatitis B, 26.7% of persons reported only using non-injection street drugs. The true risk of street drug use via insufflation for hepatitis B or C infection remains unknown, but may warrant further investigation.

Table 3.26. Reported risk factors other than use of street drugs among people with newly diagnosed chronic hepatitis C in Lenowisco, 2013—2015.



The mean number of risk factors per person with hepatitis C in this population was three. There was a high frequency of persons reporting incarceration, and to a lesser extent, having more than ten lifetime sexual partners or receiving a tattoo at a non-commercial venue (Table 3.26). These findings can inform development of appropriate educational messages and specific preventive activities, and highlight the utility of having risk factor data available for the entire state. This would require adjustments to how risk factor data are collected and managed in the current electronic surveillance system for hepatitis C.

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INCARCERATED INDIVIDUALS

Approximately 33% of the 2.2 million incarcerated individuals in the United States have hepatitis C, which is notably higher than the 1.3% prevalence of chronic hepatitis C in the general population (CDC, 2013; CDC, 2003). Nationwide, drug use in the month before incarceration was reported by 55% of inmates and IDU by 18%. Drug screening at entry suggests that drug use is likely underreported by individuals in jails (BOP, 2014). Some correctional systems provide substance-abuse treatment programs, but demand for these programs often exceeds capacity (CDC, 2003)

Testing in correctional facilities

CDC and the Federal Bureau of Prisons (BOP) recommend that correctional facilities offer testing for hepatitis C upon admission if the individual reports risk factors* (CDC, 2003; BOP, 2013). If chronic hepatitis C infection is present, the patient should be assessed for liver disease. Although correctional facilities are not required to provide treatment to patients with asymptomatic hepatitis C, screening within the correctional facility is nonetheless a valuable tool for reaching many high-risk individuals who may not otherwise seek testing (BOP, 2014).

**Risk factors include: injection drug use, receipt of tattoos or body piercings while previously incarcerated, HIV or HBV infection, blood transfusion or organ transplant prior to 1992, clotting factor transfusion prior to 1987, percutaneous exposure to blood, and hemodialysis.*

Demographic characteristics

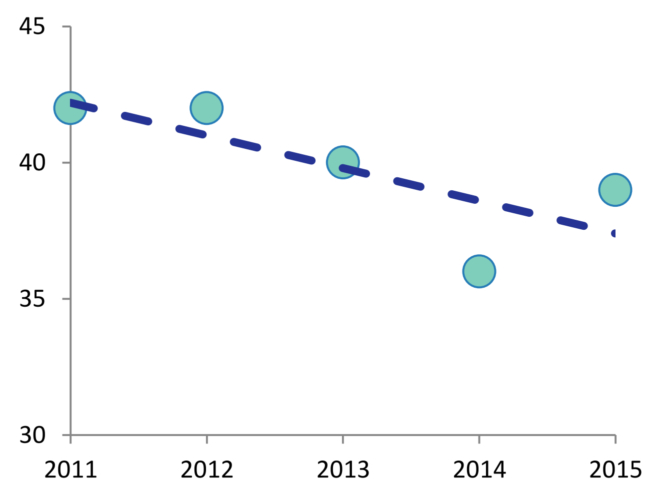
Nine percent of acute and chronic hepatitis C diagnoses from 2011-2015 occurred in individuals who were incarcerated at the time of diagnosis (VEDSS). Among the 3,085 persons who were incarcerated when they tested positive for hepatitis C, 75% were male. Although less than 8% of all incarcerated Virginians were female in 2013 (Carson, 2014), over 25% of incarcerated persons testing positive for HCV infection were female.

Table 3.2. Age in years (Median, IQR) at time of diagnosis of hepatitis C among all Virginians and among Virginians who were incarcerated at diagnosis, by gender (VEDSS)

	Virginia Total	Incarcerated in Virginia
Male	**52** [40-59]	**42** [31-54]
Female	**48** [32-57]	**33** [27-41]

Both incarcerated males and females tested positive for hepatitis C at a younger age than non-incarcerated individuals (Table 3.2). Both incarcerated and non-incarcerated females tested positive at a younger age than males. The median age of hepatitis C diagnosis has been decreasing slightly since 2011 (Fig. 3.27).

Figure 3.27. Median age in years of Virginians diagnosed with hepatitis C while incarcerated from 2011-2015 (based on data in VEDSS).



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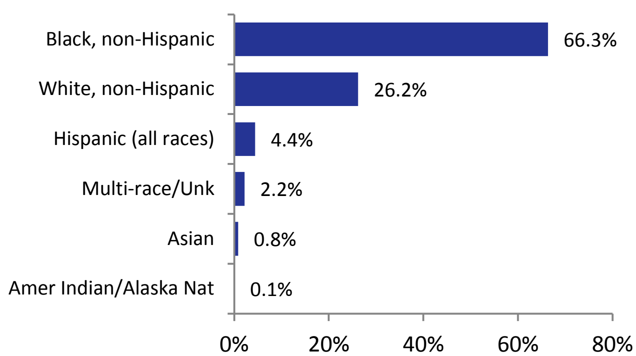
HIV/HCV CO-INFECTION

Nationwide, about 25% of persons living with HIV disease are also infected with hepatitis C virus (HCV). Compared to people who only have HIV disease, this co-infected group has three times higher rates of liver disease and liver failure and significantly lower life expectancy (CDC, 2013).

To identify co-infections, all hepatitis C cases reported in Virginia from 2006-2015 through VEDSS were matched with all cases of HIV disease identified through the Virginia HIV surveillance database (Electronic HIV/AIDS Reporting System-eHARS) reported from 1982 through 2015. A total of 1,572 person matches were found: 3.8% of those with HIV disease also had record of HCV infection, and 2.5% of those with hepatitis C also had record of HIV disease. This is likely an underestimate of the true co-infection burden, given that hepatitis C surveillance did not begin until 2006.

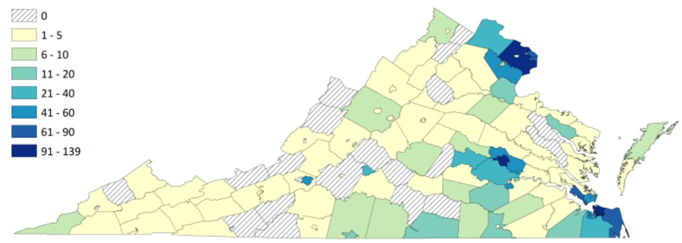
Figure 3.28. Race/ethnicity of HIV/HCV coinfected individuals (eHARS, VEDSS).



Demographic characteristics

Of the 1,547 HIV/HCV co-infected individuals identified, 405 (26.2%) were female and 1,142 (73.8%) were male. A majority (66.7%) were Black, 25.9% were White, and 4.4% were Hispanic (Figure 3.28). They resided mainly in large urban areas. Few co-infections were diagnosed in people living in the rural areas of Virginia (Fig. 3.30).

Figure 3.29. Number of HIV/HCV co-infected individuals, by county (eHARS, VEDSS).



Co-infections in Southwest Virginia

While the number of HIV/HCV co-infections is small in counties in the Southwest region of the state (Fig. 3.29), people living with HIV disease in this region are more likely to be co-infected with HCV than people living with HIV in the other Virginia regions. The rate of co-infection with HCV among people living with HIV in Southwest Virginia is 2.5 times higher than among people living with HIV in the rest of the state, and 14 times higher than the rate of HCV infection in the general population (Table 3.3).

Table 3.3. Rates of hepatitis C among different populations in Virginia (eHARS, VEDSS).

	Hepatitis C cases/100,000
Rate of acute and chronic hepatitis C diagnoses in Virginia	84.0
Rate of acute and chronic hepatitis C diagnoses among persons living with HIV disease*	463.3
Rate of acute and chronic hepatitis C diagnoses among persons living with HIV disease* in Southwest Virginia	1,181.7

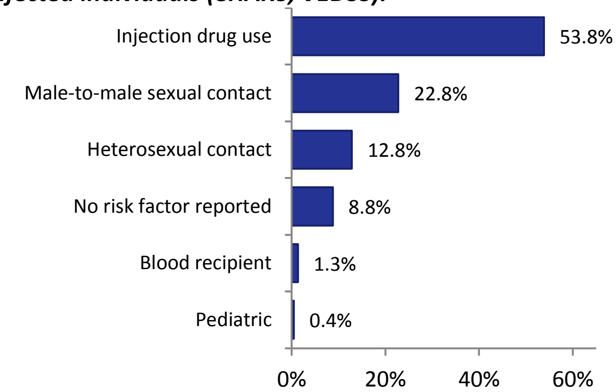
**as of December 31, 2014*

Risk

Risk information is incomplete in the hepatitis C surveillance reports in VEDSS, so risk information from eHARS was used. More than half (53.8%) of those co-infected with HIV/HCV had documented history of IDU. Other reported risks were male-to-male sexual contact (22.8%), high-risk heterosexual contact† (12.8%), and receipt of a blood product (1.3%) (Fig. 3.30).

† High risk heterosexual contact is defined as heterosexual contact with a person known to have, or to be at high risk for, HIV infection.

Figure 3.30. Transmission risk category of HIV/HCV coinfected individuals (eHARS, VEDSS).



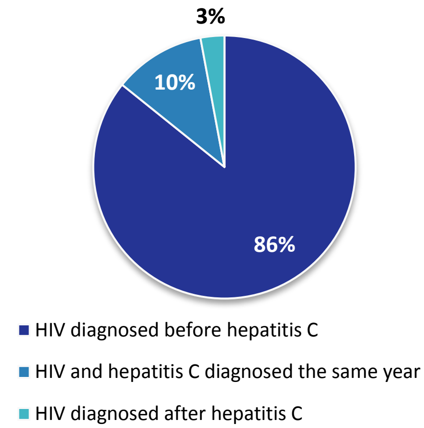
Deaths

Among those co-infected with HIV/HCV for whom the HIV infection was diagnosed between 2006-2015, 65 individuals were identified as deceased in eHARS. Those co-infected are 2.8 times more likely to have died than those who are infected only with HIV (16.0% and 5.6%, respectively). However, because cause of death and date of HCV infection is unknown for a majority of the cases in eHARS, these data should be interpreted with caution.

Timeline of HIV and hepatitis C diagnoses

In a majority of cases (87%), HIV disease was diagnosed at least one year before HCV infection; for 11% of co-infections, HIV and HCV infection were diagnosed in the same year, and in 3% of cases, HCV infection was diagnosed at least one year after the HIV diagnosis (Fig. 3.31). However, these data might be skewed due to HCV testing not becoming widely available until recent years, more than a decade after HIV testing became widely available. In addition, because HCV testing is included in the CDC-recommended HIV care regimen, those who might not have otherwise sought HCV testing might discover their HCV status after entering care for HIV infection.

Figure 3.31. Timing of hepatitis C diagnosis versus HIV diagnosis (eHARS, VEDSS).



Co-infection with HIV/HCV in Indiana: A warning for Appalachia

In January 2015, the Indiana State Department of Health (ISDH) began an investigation of what became the largest HIV outbreak in the U.S. since 1996 (CDC, 2016). During the investigation, 135 individuals were diagnosed with HIV in a rural community of 4,200. Testing revealed that more than 84% of those individuals were co-infected with HCV. A majority (80%) of those infected with HIV reported dissolving and injecting tablets of oxymorphone (Opana), a prescription opioid. Historically, rural areas have low prevalence of HIV, but this outbreak was primarily attributed to frequent use of shared injection equipment. Percutaneous exposure to contaminated blood is the most efficient mode of transmission of HCV and HIV (CDC, 2015).

CDC reported an increase in HCV infection related to IDU among people ages 30 years or younger in central Appalachia from 2006-2012 (Zibbell, 2015). Appalachia, which spans 25 counties and cities in Virginia, is a rural area with demographic characteristics similar to the community in Indiana where the HIV outbreak occurred. Although the rate of HIV has historically been low in Appalachia, the increase in cases of HCV infection transmitted via IDU raises concerns for susceptibility to outbreaks of other bloodborne pathogens. VDH organized ongoing programs for HIV, HCV, and syphilis screening in rural areas, including methadone clinics in Appalachia, to prevent co-infection and provide linkage to care to those who test positive. Emergency preparedness activities, including a tabletop exercise, have also been conducted to better evaluate and plan for rapid and effective response in the event of an HIV/HCV outbreak in the far southwest Appalachian region of Virginia.

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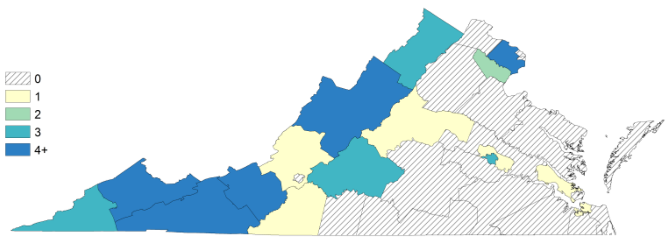
TESTING

Figure 4.1. Free HCV test sites per health district, 2015.



Virginia HCV Testing Program

The Virginia Department of Health initiated a hepatitis C testing program in 2006. Testing has expanded from ten to fifteen of the 35 health districts in Virginia (Fig. 4.1). Testing for hepatitis B virus (HBV) was added in 2011. There were 1,332 HCV antibody (Ab) tests performed in 2015; 176 (13.2%) were positive for HCV Ab (indicative of a history of HCV infection) and 71 (5.3%) were identified with active HCV infection.

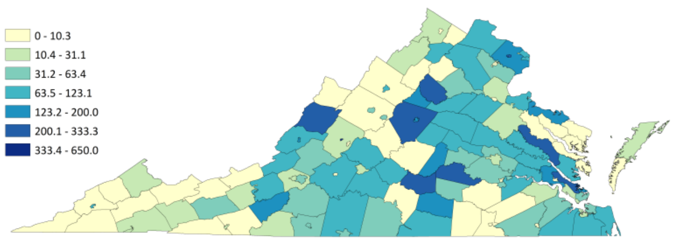
Populations at risk for HBV or HCV infection are tested in sexually transmitted disease (STD) clinics in LHDs and by partnering CBOs. Testing for HBV and HCV is currently recommended for individuals who: have a history of IDU, have sex partners with hepatitis B or hepatitis C, have HIV, have been incarcerated for over 90 days, have received blood products or organs transplants, have received dialysis, or who are men who have sex with men (MSM). One-time HCV testing for those born from 1945-1965 ("baby boomers") is also recommended. Clients who are HBsAg + or HCV PCR+ are referred for medical evaluation to a private physician, academic medical institutions, Veterans' Administration Hospitals or statewide free or sliding scale clinics with a hepatologist, infectious disease physician, or gastroenterologist.
Testing sites were selected based on prevalence of cases and location in areas of high drug use prevalence, estimated using rates of drug overdose, IDU, and opioid prescribing.

VDH's viral hepatitis prevention coordinator has collaborated with HIV Prevention staff within DDP to provide testing services for HBV (since 2011) and HCV (since 2006) to high-risk clients in LHD STD clinics, or through CBOs and drug treatment centers (DTCs). Conventional and rapid tests are currently used for HCV, for which the conventional testing algorithm includes a HCV enzyme-linked immunosorbent assay (EIA) followed by HCV polymerase chain reaction (PCR) for the confirmatory test. A conventional testing panel is used for HBV, including the HBV surface antigen (HBsAg), HBV surface antibody (HBsAb) and total HBV core antibody (HBcAb). DDP also collaborates with the Division of Immunization (DOI) to provide HBV vaccine in STD clinics, as well as LHDs and CBOs to conduct outreach events and provide training and prevention support to DTCs.

Limitations of the program in the past included a lack of state-level resources to conduct comprehensive data entry and investigation of all hepatitis B and hepatitis C reports received at the central office, as well as a lack of LHD resources limiting local hepatitis testing, follow-up, and linkage to care. Federal resources are not currently allocated to hepatitis surveillance, making it difficult for state and local health departments to assess the impact of prevention activities or the true prevalence and incidence of hepatitis C.

TREATMENT

Figure 4.2. Hepatitis C treatment prescriptions per 100 new hepatitis C diagnoses (APCD, VEDSS).



Recently developed direct-acting antivirals (DAAs) have high cure rates for hepatitis C and minimal side effects (Chatwal, 2015). DAAs can prevent development of chronic liver disease, and are most effective if initiated prior to the onset of chronic sequelae of hepatitis C, such as cirrhosis or hepatocellular cancer. These new medications are often cost prohibitive; treatment typically lasts twelve weeks and costs approximately $1,000 per day (Chatwal, 2015).

Although curative hepatitis C treatment can exceed $80,000, the cost of liver transplantation is estimated at $577,000 (UNOS, 2013). Studies show that DAAs are cost-effective when compared to the significant long-term costs of chronic hepatitis C (Gissel, 2015; Harinder, 2016). From 2010-2019, decompensated cirrhosis and hepatocellular cancer in people younger than 65 years are estimated to lead to 720,000 life years lost, $21.3 billion in societal costs, and indirect associated costs of $54.2 billion (Davis, 2011).

Linking persons with hepatitis C to care is a fundamental component of hepatitis C prevention. Curing hepatitis C reduces transmission of HCV through the population (NAP, 2016).

APCD contains data on the majority of prescriptions paid through an insurer, including old- or new-generation* treatment drug prescriptions prescribed to patients with hepatitis C. Although new drugs may be curative and have significantly fewer side effects, older treatment options may still be prescribed and were included in this analysis. Newer DAAs are often difficult to access due to high cost and prioritization for patients with more advanced liver disease (Medscape, 2016).

**Newer medications for hepatitis C treatment are listed in the APCD as: Olysio, Harvoni, Viekira Pak, and Sovaldi*
***Older medications for hepatitis C treatment are listed in the APCD as: Ribavirin and Pegintron*

Figure 4.2 depicts the number of hepatitis C treatment prescriptions per 100 new diagnoses of hepatitis C. Because people with chronic hepatitis C may not become ill and receive treatment for several decades after infection, these data should be interpreted with caution, as it is not possible to determine when or where a patient with chronic hepatitis C was initially infected using surveillance data.

The far Southwest region of Virginia has a disproportionately low amount of hepatitis C treatment relative to its disease burden (Fig. 4.2). Although a small number of individuals may pay for hepatitis C treatment out of pocket, the price is prohibitive to many who are uninsured; APCD therefore likely represents the majority of hepatitis C treatment prescribed in Virginia.

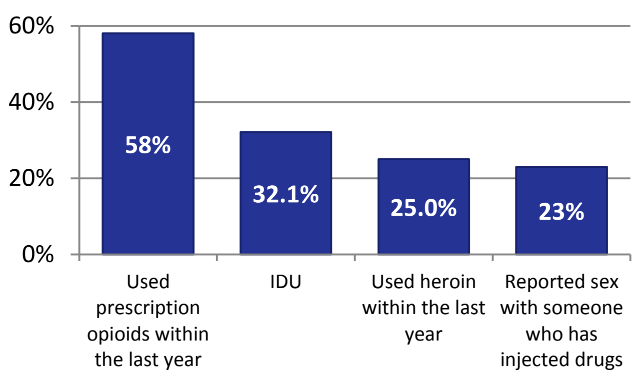
Spotlight: Bringing testing resources to Appalachia

In light of rising rates of heroin and opioid abuse, the Virginia Department of Health (VDH) partnered with a local community-based organization, the Council of Community Services (CCS), to implement a program at the CCS Drop-In Center. As part of the ongoing program, trained staff members travel to methadone clinics, drug abuse clinics, and other sites in far southwestern Virginia, a geographic area with high rates of opioid use and hepatitis C, to administer rapid HCV, HIV and syphilis tests.

Trained staff members travel up to 3.5 hours from their offices in Roanoke, Virginia, to the rural far southwestern region to administer testing at drug abuse centers. This model allows individuals at high risk of contracting HCV to be tested on site. Currently, Drop-In Center staff travel to eleven remote sites, including five methadone clinics, four substance abuse clinics, and two non-drug related sites. In addition to testing services, the staff provides harm reduction counseling and tracks test results and linkage to care. Travel expenses and testing materials are provided by VDH through an HIV community testing program funded by CDC's Comprehensive HIV Prevention Programs for Health Departments.

This partnership creates linkages to appropriate health care services and improves health outcomes within Virginia's rural and underserved Appalachian communities. During 2015, 76 of the 246 (31%) participants received positive test results. All of these individuals were referred to care services, 73 (96%) were referred to prevention services, and 35 (46%) attended a follow up medical appointment. Based on a sampling survey conducted by CCS among those who tested positive for HCV, 56% were unemployed. Reported risk factors are summarized in Figure 4.3.

Figure 4.3. Risk factors reported among people who tested positive for HCV at CCS Drop-In Centers



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HEPATITIS C AND HEPATOCELLULAR CANCER

Hepatocellular carcinoma (HCC) is a primary liver cancer typically affecting people with chronic liver disease and cirrhosis (Cicalese, 2015). Eighty percent of liver cancer cases are hepatocellular carcinoma, which is frequently attributed to chronic HCV or HBV infection (American Cancer Society, 2014; Cicalese, 2015). The incidence rate of HCC has increased in recent years, largely due to hepatitis C-related cases (American Cancer Society, 2014). Among patients with cirrhosis, 1-6% will develop HCC; this risk is exacerbated by alcohol abuse in patients with viral hepatitis (Cicalese, 2015).

In the United States, HCC is the fastest growing cause of cancer mortality (Cicalese, 2015). Although the delay between HCV infection and development of HCC can be as long as 30-40 years, hepatitis C remains one of the primary causes of HCC . The increase in incidence of HCC has been highest among Black individuals (from 4.7 to 7.5 per 100,000) (Cicalese, 2015).

HCC is the third leading cause of death by cancer worldwide (CDC, 2010). In the United States in 2014, there were an estimated 23,000 deaths and over 33,000 new cases of liver cancer (ACS, 2014). The mortality rate for HCC has increased from 2.8 to 4.7 per 100,000 people over the last 10 years. Many patients who have exhausted other treatment options are not transplant candidates due to advanced stage of disease (Cicalese, 2015).

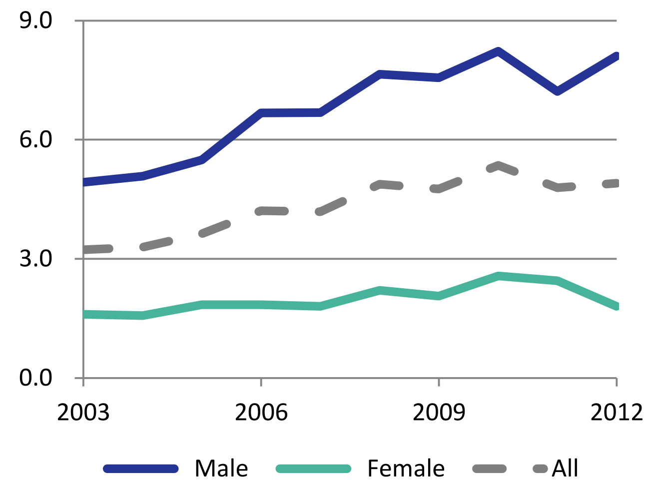
HCC in Virginia

The Virginia Cancer Registry (VCR) is managed by the Division of Chronic Disease Prevention and Control at VDH. The VCR maintains a statewide registry of Virginians diagnosed with cancer; however, it does not include data on associated conditions, such as HCV infection.

Sex

From 2003-2012, 76.2% of Virginians diagnosed with HCC were male. Rates of HCC among males in particular have continued to increase since 2003 (Fig. 5.1).

Figure 5.1. HCC cases per 100,000, by sex (VCR).



Race

Rates of HCC were higher in Black individuals than in White individuals, although both groups experienced increasing trends (Fig. 5.2).

Figure 5.2. HCC cases per 100,000, by race (VCR).

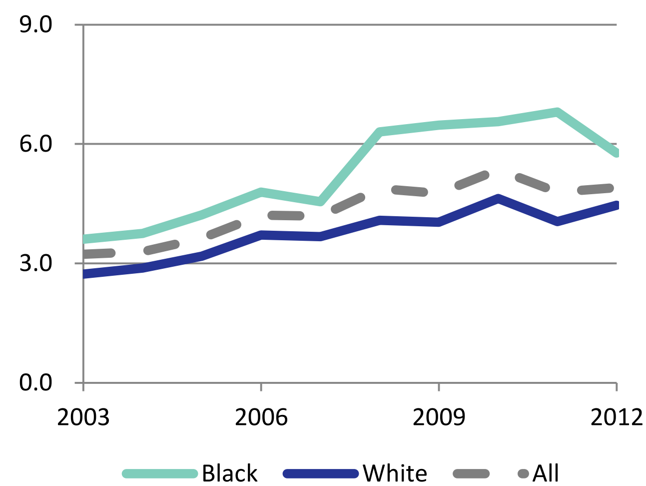
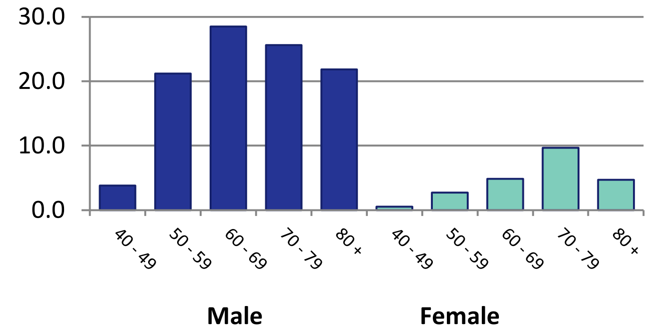


Figure 5.3. HCC cases per 100,000, by age in years and sex (VCR).

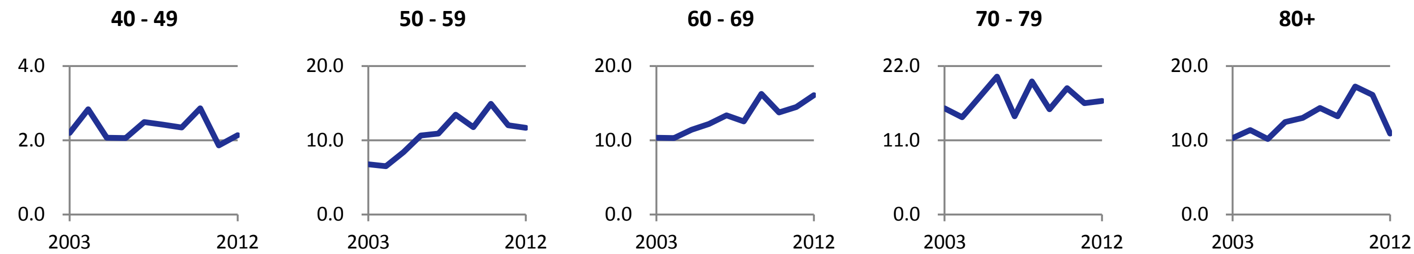


Age

Men are more likely to develop HCC than women, and at a younger average age (Fig. 5.3).

While HCC rates have remained relatively stable for those aged 40-49 and 70-79 years, there has been a steady increase in HCC rates among those aged 50-59 and 60-69 years (Fig. 5.4).

Figure 5.4. HCC cases per 100,000, by age in years, 2003-2012 (VCR).



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LIVER TRANSPLANTATION

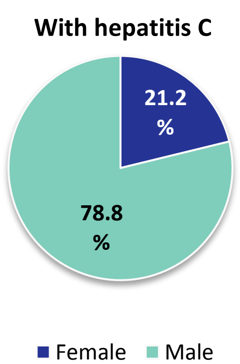
Chronic hepatitis C is the most common reason for liver transplantation in the United States (CDC, 2016). Prior to the development of DAA medications for hepatitis C, liver transplant was the only treatment option for people with decompensated cirrhosis (NIH, 2002). Liver transplantation does not cure hepatitis C and necessitates indefinite use of anti-rejection medications. Despite the risks and high costs, the five-year survival rate for liver transplant patients is nearly 75% (American Liver Foundation, 2012).

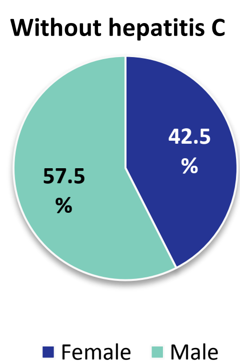
Liver transplantation may cost as much as $577,000 (UNOS, 2013). Over 7,000 liver transplants were performed in the U.S. in 2015, and over 14,000 people are on the liver transplant waiting list. From 2011-2015, 782 Virginians received a liver transplant. Nearly one third of these individuals had hepatitis C.

Sex

Seventy-nine percent of liver transplant recipients with hepatitis C were male. Fifty-eight percent of liver transplant recipients without hepatitis C were male (Fig. 5.5).

Figure 5.5. Sex of liver transplant recipients with (left) and without (right) hepatitis C in Virginia, 2011-2015 (UNOS).





Women, both with and without hepatitis C, are less likely to receive a liver transplant. Women have higher rates of spontaneous clearance of HCV and lower frequency of cofactors associated with liver fibrosis, such as heavy alcohol use (Sarkar, 2015). Estrogens, which are more abundant in females, are thought to provide protective effects from liver fibrosis. Further, women are more likely to become too ill for liver transplantation candidacy. Clinical indicators of poor health can be underestimated in women, requiring further progression of liver disease than men before reaching eligibility on the transplant list (Sarkar, 2015).

Age

The median age for liver transplant recipients in Virginia for 2011-2015 was 57 years for people with hepatitis C and 54 years for people without hepatitis C. The median age at transplantation for women with hepatitis C was 58 years, and 57 years for men.

Race

The racial distribution of Virginia residents receiving a liver transplant from 2011-2015 is similar for those with and without hepatitis C (Table 5.1). Seventy-six percent of liver transplant recipients with hepatitis C were White. White individuals also made up the majority (73.2%) of liver transplant recipients without hepatitis C.

Table 5.1. Race or ethnicity of Virginia residents who received a liver transplant from 2011-2015, by hepatitis C status (UNOS).

Race/Ethnicity	With Hepatitis C (n=245)	Without Hepatitis C (n=537)	All Virginians (n=8,382,993)
White	76.3%	73.2%	69%
Black	15.5%	14.2%	19%
Hispanic	2.9%	5.6%	9%
Asian	4.5%	6.3%	6%
Native Hawaiian/ Pacific Islander	0.0%	0.2%	0.1%
Multiracial	0.8%	0.6%	2.8%

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HOSPITALIZATION

While chronic hepatitis C is typically clinically silent for decades, up to 20% of people with chronic hepatitis C develop cirrhosis of the liver. Even in the absence of cirrhosis, chronic hepatitis C can lead to other liver complications and is the primary cause of hepatocellular cancer (HCC) in the United States (Davis, 2011). Beyond this, chronic hepatitis C has been linked to chronic fatigue, decreased quality of life, and higher mortality rates from all causes (Davis, 2011; Ly, 2014). Medical expenditures for chronic hepatitis C are predicted to be $10.7 billion between 2010 and 2020 (Davis, 2011).

Baby boomers (i.e., the cohort born from 1945-1965) account for approximately 75% of individuals with hepatitis C in the US (Smith, 2012). Given the aging population with hepatitis C, the chronic manifestations of hepatitis C are expected to increase (Davis, 2011). These advanced sequelae of long-term chronic disease place a significant burden on the healthcare system.

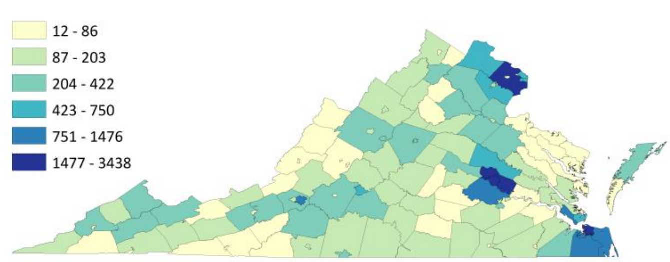
VDH collaborates with Virginia Health Information (VHI) to provide information to the public on the cost and quality of health care, including data on hospital discharges in Virginia. There was an average of 1.5 hospitalizations annually among all people discharged with a primary or secondary diagnosis of hepatitis C.

These data (Table 5.2) include 48,862 hospital discharges for people who had hepatitis C listed as a discharge diagnosis† during a hospitalization in Virginia from 2011 through 2014. Of these, 10,971 discharges (22.5%) had hepatitis C listed as the primary or secondary diagnosis. Demographic characteristics and total charges for the hospitalizations were similar between those with a primary or secondary diagnosis of hepatitis C and those with any of the 17 diagnoses listed as hepatitis C.

The median age of individuals hospitalized with hepatitis C as the primary or secondary diagnosis was 54 years, ten years younger than the median age for individuals hospitalized with other diagnoses. Patients who did not have a hepatitis C diagnosis at discharge were twice as likely to have Medicare as a payer source, while Medicaid was twice as frequent among patients with a hepatitis C diagnosis. Individuals with hepatitis C listed as a primary or secondary diagnosis at discharge were three times more likely to have self-pay as a payer source compared to persons without hepatitis C as a primary or secondary discharge diagnosis (Table 5.2).

The number of hospitalizations in which hepatitis C was listed at the primary or secondary diagnosis by county is shown in Fig. 5.6.

Figure 5.6. Number of hospital discharges in which the primary or secondary diagnosis was hepatitis C, 2011-2015.



†Diagnosis codes were based on the following ICD9 codes that correspond to chronic hepatitis C: 07070, 07071, 07041, 07044, 07051, 07054.

Table 5.2. Demographic characteristics and total charges of hospitalizations among Virginians with a primary or secondary diagnosis of hepatitis C, with any of the 17 diagnoses listed as hepatitis C, and with non-hepatitis C related diagnoses from 2011 to 2014.

Characteristics	Discharges with hepatitis C listed as primary or secondary discharge diagnosis (n = 10,961)	Discharges with hepatitis C listed as any of the 17 discharge diagnoses (n = 48,862)	All discharges, non-hepatitis C related diagnoses (n = 33,334,174)
Male	61.5%	62.3%	43.2%
Female	38.5%	37.7%	56.8%
Median age in years [IQR]	54 [47-60]	55 [49-61]	64 [47-78]
White	62.5%	59.2%	68.4%
Black	29.5%	34.6%	22.8%
Asian	1.2%	1.3%	1.8%
Hispanic	0.9%	1.0%	1.9%
Other race	1.9%	1.3%	1.7%
Unknown race	3.7%	2.5%	3.3%
Total charges (median)	$18,511.00	$21,253.00	$21,072.00
Length of stay- days (median, [IQR])	5 [3-26]	6 [2-24]	5 [2-15]
Payer			
Medicare	27.0%	34.0%	54.3%
Medicaid	23.0%	23.2%	10.5%
Private insurance	30.9%	25.8%	28.9%
Self-pay	12.4%	11.0%	4.3%
Other	6.7%	6.0%	2.0%

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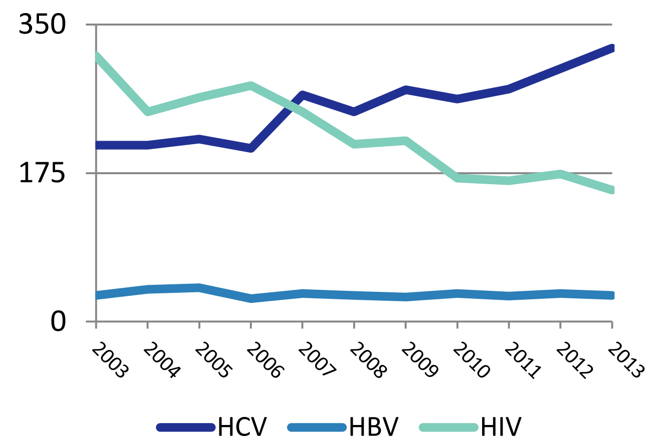
MORTALITY (DEATHS)

Individuals infected with long-term chronic hepatitis C may develop serious sequelae associated with premature death, including hepatocellular cancer and cirrhosis (Davis, 2011). From 2003-2013, the number of hepatitis C-related deaths increased more than 75%. One study estimated that by 2020, the proportion of liver-related deaths among people with chronic hepatitis C will increase by 180% (Davis, 2011). In 2007, the number of deaths associated with HCV infection surpassed the number of deaths associated with HIV infection (Fig 6.1). While HIV-associated deaths continue to decline, annual HCV-associated deaths have risen from 208 deaths (2003) to 322 deaths (2013).

Figure 6.1. Deaths attributed to HCV, HBV, and HIV in Virginia, 2003-2013 (VDH Office of Vital Records).



Chronic liver disease typically occurs 20 to 30 years after infection with HCV, so data obtained from death certificates are most reflective of the population that acquired hepatitis C approximately 20 to 30 years prior (Hoofnagle, 1997; NIH, 2002). A national study that assessed mortality among people with hepatitis C found that the death rate was greatly underestimated; only 20% of people with hepatitis C had record of infection on their death certificate (Mahajan, 2015).

Data from the Virginia Department of Health's Office of Vital Records capture individuals who had hepatitis C as an underlying or contributing cause of death documented on their death certificate. From 2011 to 2014, there was a 16% increase in hepatitis C-associated deaths in Virginia.

Age

Consistent with national trends, the median age of hepatitis C-associated deaths in Virginia is 58 years (Moorman, 2013) and nineteen years younger than the median age of death for the general population in Virginia for 2011-2014.

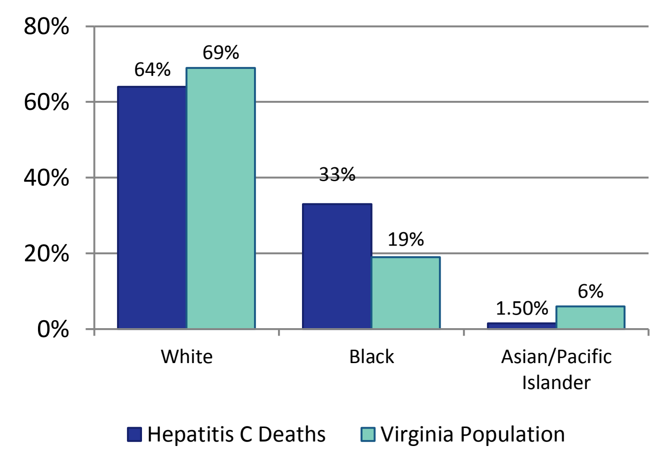
Sex

While males accounted for 59% of newly diagnosed cases of chronic hepatitis C from 2011-2014, they accounted for 73% of hepatitis C-associated deaths (Mahajan, 2014).

Race

While Black individuals comprise 19% of Virginians, they comprise 33% of the hepatitis C-associated deaths from 2011-2014 (Fig. 6.2).

Figure 6.2. Race of individuals who died of HCV-related causes (2011-2014) vs. race of all Virginians (Office of Vital Records, US Census).



Cause of death

The most common underlying causes of death in those with chronic hepatitis C were complications of chronic liver disease (Table 6.1). Nearly 5% of deaths were attributed to alcoholic cirrhosis, highlighting the co-occurrence of liver damage from both alcohol and chronic hepatitis C infection. Alcohol, as well as HIV or HBV infection, is known to accelerate the rate of progression of chronic hepatitis C (NIH, 2002).

Table 6.1. Percent of deaths of people with hepatitis C, by underlying cause of death.

Underlying cause of death	Percentage of Deaths
Chronic viral hepatitis C	41.2
Hepatocellular carcinoma	13.1
Other unspecified cirrhosis of liver	4.7
Alcoholic cirrhosis of liver	4.6
Malignant neoplasm of liver, not specified as primary or secondary	3.6

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NEXT STEPS

The Virginia Hepatitis C Epidemiologic Profile aims to draw attention to the many facets of public health affected by hepatitis C, discuss the current state of public health efforts, highlight the issues warranting further attention, and use this knowledge—made possible by collating multiple data sources—as a springboard for action to promote health and prevent disease among Virginians living with or at-risk for hepatitis C.

Data presented in the Virginia Hepatitis C Epidemiologic Profile provide a foundation for development of targeted, data-driven actions to reduce the burden of hepatitis C in Virginia. VDH will continue to promote testing for hepatitis C, facilitate linkage to care, and advocate for policies that remove barriers to prevention and treatment. Local jurisdictions can utilize this profile to better understand risk factors and morbidity among their constituents and cultivate solutions for populations most affected by hepatitis C in their geographic area. Additionally, public health practitioners can promote measures to prevent ongoing transmission through education and access to care.

Prioritizing hepatitis C prevention, surveillance, investigation, and health care services will ensure improved health outcomes and high quality, complete data in years to come. Local health districts might choose to draw from enhanced surveillance activities performed in New River and Lenowisco to better understand risk factors for those affected by hepatitis C within their communities. At the central office, sustainable plans for program planning (including outbreak response), hepatitis testing, quality assurance and data management are vital so that multi-faceted viral hepatitis program activities and analyses can be integrated into standard practices.

Certain data were not available for the first edition of this profile, but will be pursued in subsequent updates. Two of the data sources of greatest interest are those of the Department of Veteran's Affairs and the Department of Corrections; veterans and incarcerated individuals historically have high prevalence of hepatitis C (Backus, 2013; Zampino, 2015). Additionally, more complete data on prescribing patterns for opioids and other drugs of abuse from Virginia's Prescription Drug Monitoring Program will be pursued in future editions.

One area of concern identified during evaluation of risk behaviors in Appalachia was the high prevalence of non-injection drugs among people with hepatitis C. While attention has frequently been directed toward IDU and the risk for bloodborne pathogens, the risk from sharing equipment to insufflate (i.e., snort) drugs is not fully understood. Further study of the populations engaging in this behavior might prove instrumental in elucidating the risk of acquiring hepatitis C via drug use, even in the absence of shared injection equipment. Risk factors for hepatitis C vary across populations and in different regions of Virginia, so public health responders must remain aware of the risk factors most prevalent in their community to tailor messaging and interventions.

In a small evaluation performed in Lenowisco Health District, hepatitis C virus (HCV) and hepatitis B virus (HBV) co-infection was not uncommon, and statewide data suggest that individuals with HIV disease in Southwest Virginia are more likely to be co-infected with HCV than those with HIV in other parts of the state. In light of the HIV/HCV outbreak in Indiana that occurred in a population similar to that of Southwest Virginia (Conrad, 2015), vigilant monitoring of co-infection is crucial. VDH plans to use local data sources to create a state-specific "vulnerability index" to identify counties at highest risk for hepatitis C and hepatitis B or HIV outbreaks with more granularity than available from a national index developed by CDC. Knowledge of what counties are most vulnerable to an outbreak among IDU can be used to direct resources toward prevention efforts, rather than waiting for a public health emergency to occur.

VDH hopes to create a care cascade for hepatitis C, similar to the HIV care continuum, measuring engagement at each step of care from diagnosis, to linkage to care, to access to treatment, to completion of treatment, to viral suppression (CDC, 2014). Approximately half of people with hepatitis C do not know they are infected, but diagnosis is only the first step in the care cascade (Smith, 2012). Currently, only about 9% of persons diagnosed with hepatitis C are cured (i.e., reach the final step in the cascade) despite newly available curative medications. The care cascade can serve as a guide to identify at which steps most drop-offs occur so that interventions are focused on the areas of greatest need. More timely movement through the cascade allows patients to become virally suppressed before transmitting HCV to others or developing serious sequelae (Wolitski, 2016).

While much work remains, these data allow for an evidence-based, comprehensive picture of the impact of hepatitis C on Virginians. This profile should be utilized to increase awareness of current trends and to inform future plans for prevention and treatment of hepatitis C. We encourage dissemination of the Virginia Hepatitis C Epidemiologic Profile to all partners in the fight against hepatitis C.

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DATASETS ANALYZED

Hepatitis C Surveillance:
Hepatitis C surveillance data contain fields for case status, relevant dates (e.g, date of laboratory test, date of report), address, demographics, risk factors (limited), laboratory results, incarceration status, and other information from epidemiologic investigations. Data managed in the Virginia Electronic Disease Surveillance System (**VEDSS**), provided by Virginia Department of Health (**VDH**) Division of Surveillance and Investigation (**DSI**).

Hepatitis C Outbreaks
Details about outbreaks of hepatitis C that occur in Virginia, outbreak response, and control measures are managed at **VDH** by **DSI**.

Opioid and Hepatitis C Treatment Prescriptions Claims:
Data represent about 50% of Virginians and excludes prescriptions or medical procedures paid by Medicare fee-for-service and self-pay, as well as approximately 30-35% of commercially insured individuals. Data provided by the All Payer Claims Database (**APCD**) via Virginia Health Information (**VHI**), a nonprofit organization.

Death Certificates:
Death certificate data include fields captured on death certificates that list hepatitis C as a cause of death. Data maintained by VDH Division of Health Statistics (**DHS**) and **Office of Vital Records**, and are provided by the **VDH Data Warehouse**.

Hospital Discharges:
Hospital discharge diagnoses and the medical conditions contributing to the need for hospitalization. Data maintained by **VHI** and provided by VDH **Data Warehouse**.

Drug Treatment Center Admissions:
De-identified, patient-level records of approximately 67% of substance abuse treatment admissions nationwide. Captures all substances reported at admission, as well as methods of administration, patient demographics, metropolitan area, and method of payment. Data maintained in the Drug Treatment Episode Dataset – Admissions (**TEDS-A**) provided by the Substance Abuse and Mental Health Services Administration (**SAMHSA**), publically available online at https://www.icpsr.umich.edu/icpsrweb/NAHDAP/studies/25221?q=%22mental+health%22

Free Hepatitis C Testing:
Patient-level data on individuals tested for hepatitis C who report a risk factor and receive free testing; includes test results, risk factors, and patient demographics. These data include negative test results. Data provided by VDH Division of Disease Prevention (**DDP**).

Liver Transplants:
Liver transplants performed on Virginians with and without hepatitis C. Data provided by the United Network for Organ Sharing (**UNOS**). UNOS is a private, non-profit organization that manages the nation's organ transplant system under contract with the federal government.

Hepatocellular Cancer:
Incidence of hepatocellular cancer in Virginia. Data include demographic details, but do not include hepatitis C infection status of patient. Data provided by VDH **Virginia Cancer Registry**.

Fatal Drug Overdoses:
Fatal drug overdoses, including substances found, patient demographics, and accidental overdoses, are maintained within the Virginia Medical Examiner Database System (**VMEDS**). Data publically available on the VDH Office of the Chief Medical Examiner (**OCME**) website: http://www.vdh.state.va.us/medExam/

HIV surveillance:
Contains people diagnosed with and/or living with HIV infection, as well as patient demographics, risk factors, and lab results. Data maintained in the Electronic HIV/AIDS Reporting System (**eHARS**) and provided by VDH **DDP**.

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  - Division of Health Statistics
  - Division of Surveillance and Investigation
  - Lenowisco Health District
  - New River Health District
  - Office of Chief Medical Examiner
  - Office of Epidemiology
  - Virginia Cancer Registry
  - Virginia Health Information/Data Warehouse

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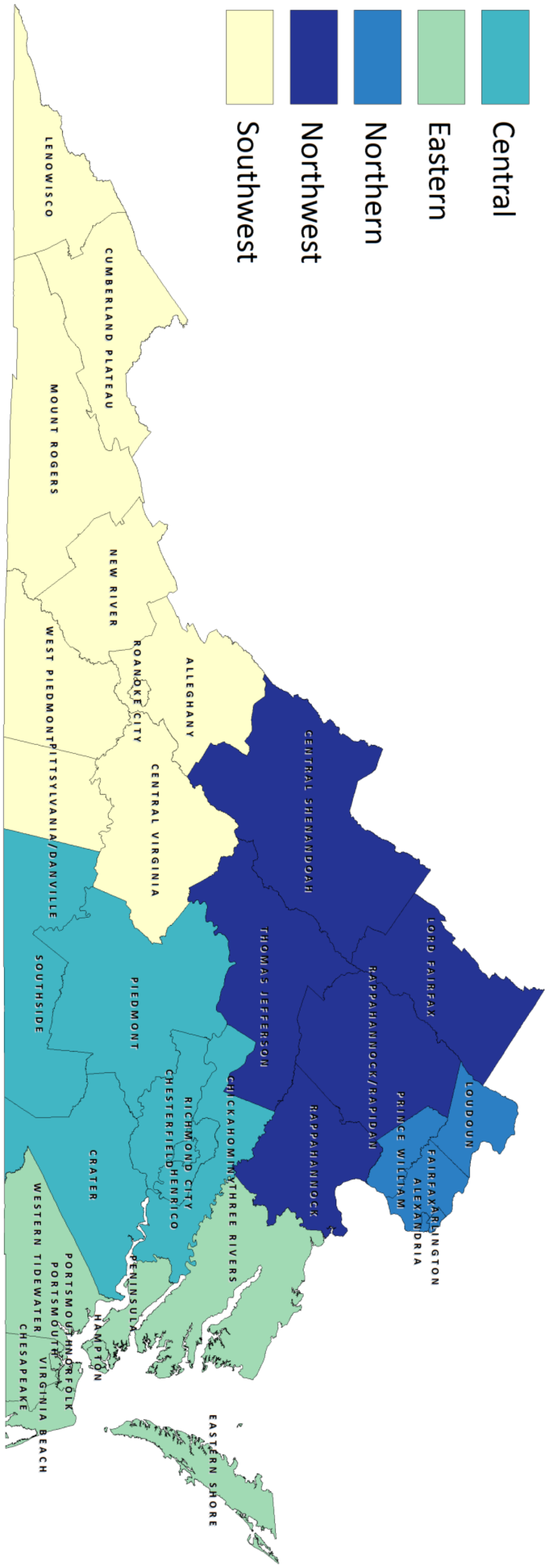

Health Planning Region
- ***Health Planning District***

County or City

CENTRAL REGION
- ***Chesterfield***

Chesterfield
Colonial Heights
Powhatan
- ***Crater***

Dinwiddie
Greensville
Prince George
Surry
Sussex
Emporia (City)
Hopewell (City)
Petersburg (City)
- ***Chickahominy***

Charles City
Goochland
Hanover
New Kent
- ***Henrico***

Henrico
- ***Piedmont***

Amelia
Buckingham
Charlotte
Cumberland
Lunenburg
Nottoway
Prince Edward
- ***Richmond***

Richmond (City)
- ***Southside***

Brunswick
Halifax
Mecklenburg

EASTERN REGION
- ***Chesapeake***

Chesapeake
- ***Eastern Shore***

Accomack
Northampton
- ***Hampton***

Hampton (City)
- ***Norfolk***

Norfolk (City)
- ***Peninsula***

James City
York
Newport News (City)
Poquoson (City)
Williamsburg (City)
- ***Portsmouth***

Portsmouth (City)
- ***Three Rivers***

Essex
Gloucester
King & Queen
King William
Lancaster
Mathews

EASTERN REGION cont.

Middlesex
Northumberland
Richmond County
Westmoreland
- ***Virginia Beach***

Virginia Beach
- ***Western Tidewater***

Isle of Wight
Southampton
Franklin (City)
Suffolk

SOUTHWEST REGION
- ***Alleghany***

Alleghany
Botetourt
Craig
Roanoke County
Covington (City)
Salem (City)
- ***Central Virginia***

Amherst
Appomattox
Bedford
Campbell
Lynchburg (City)
- ***Cumberland Plateau***

Buchanan
Dickenson
Russell
Tazewell
- ***Lenowisco***

Lee
Scott
Wise
Norton (City)
- ***Mount Rogers***

Bland
Carroll
Grayson
Smyth
Washington
Wythe
Bristol (City)
Galax (City)
- ***New River***

Floyd
Giles
Montgomery
Pulaski
Radford (City)
- ***Pittsylvania/Danville***

Pittsylvania
Danville (City)
- ***Roanoke***

Roanoke (City)
- ***West Piedmont***

Franklin County
Henry
Patrick
Martinsville (City)

NORTHERN REGION
- ***Alexandria***

Alexandria (City)
- ***Arlington***

Arlington
- ***Fairfax***

Fairfax County
Fairfax (City)
Falls Church (City)
- ***Loudoun***

Loudoun
- ***Prince William***

Prince William
Manassas (City)
Manassas Park (City)

NORTHWEST REGION
- ***Central Shenandoah***

Augusta
Bath
Highland
Rockbridge
Rockingham
Buena Vista (City)
Harrisonburg (City)
Lexington (City)
Staunton (City)
Waynesboro (City)
- ***Lord Fairfax***

Clarke
Frederick
Page
Shenandoah
Warren
Winchester (City)
- ***Rappahannock***

Caroline
King George
Spotsylvania
Stafford
Fredericksburg (City)
- ***Rappahannock/Rapidan***

Culpeper
Fauquier
Madison
Orange
Rappahannock
- ***Thomas Jefferson***

Albemarle
Fluvanna
Greene
Louisa
Nelson
Charlottesville (City)

2016 Virginia Hepatitis C Epidemiologic Profile

VIRGINIA DEPARTMENT OF HEALTH