MDHHS

Michigan Department of Health & Human Services

2018 Hepatitis B and C Annual Surveillance Report

Viral Hepatitis Surveillance and Prevention Unit

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Viral Hepatitis Data Summary

Table 1. Summary of Demographic Information by Type of Hepatitis, Michigan, 2018

	Acute Hepatitis B	% Acute Hepatitis B	Chronic Hepatitis B	% Chronic Hepatitis B	Acute Hepatitis C	% Acute Hepatitis C	Chronic Hepatitis C	% Chronic Hepatitis C	MI Population	% MI Population
n	79	100%	1,089	100%	179	100%	10,545	100%	9,962,311	100%
Sex										
Male	48	61%	645	59%	93	52%	5,969	57%	4,907,242	49%
Female	31	39%	443	41%	86	48%	4,540	43%	5,055,069	51%
Unknown	0	0%	1	0%	0	0%	36	0%	0	0%
Race and Ethnicity										
Caucasian	50	66%	314	37%	148	87%	5,413	70%	7,476,534	75%
Black or African American	19	25%	279	33%	7	4%	1,480	19%	1,359,264	14%
Hispanic	2	3%	13	2%	9	5%	202	3%	504,398	5%
Asian	3	4%	159	19%	3	2%	50	1%	306,376	3%
American Indian or Alaskan Native	0	0%	1	0%	2	1%	100	1%	45,421	0%
Other	2	3%	72	9%	2	1%	459	6%	270,318	3%
Unknown	3	-	251	-	8	-	2,841	-	0	-
Age										
Mean	48	-	48	-	36	-	49	-	N/A	-
Median	48	-	48	-	33	-	52	-	40	-
Range	27-74	-	0-98	-	18-76	-	0-102	-	N/A	-
0-19 years	0	0%	36	3%	5	3%	122	1%	2,447,883	25%
20-29 years	2	3%	135	12%	61	34%	1,657	16%	1,369,509	14%
30-39 years	14	18%	191	18%	58	32%	2,041	19%	1,185,671	12%
40-49 years	30	38%	216	20%	27	15%	1,094	10%	1,209,143	12%
50-59 years	24	30%	232	21%	14	8%	2,030	19%	1,401,864	14%
60+ years	9	11%	279	26%	14	8%	3,594	34%	2,348,241	24%
Unknown	0	0%	0	0%	0	0%	7	0%	0	0%

*Other MI population Includes 2016 census estimates of "some other race" and "two or more races"

The summary table above was created to illustrate the differences in the demographic make-up between the various viral hepatitis classifications. For instance, males were more likely to have had a diagnosis of all viral hepatitis classifications in 2018. There are some notable racial differences among reported hepatitis cases. Asians had a higher proportion of acute and chronic hepatitis B diagnosis than acute or chronic hepatitis C. Caucasians comprise a large majority of the acute hepatitis C cases, accounting for approximately 87% of cases reported with a known race. While they make up a minority of all cases, it should be noted that American Indians and Alaskan Natives are more likely to have a hepatitis C diagnosis than a hepatitis B diagnosis. The mean age for cases of acute hepatitis C is lower in comparison to the other viral hepatitis case classifications. More detailed information on each viral hepatitis case classification can be found in subsequent sections of this report.

This report presents hepatitis B and C data collected from case reports submitted to the Michigan Disease Surveillance System (MDSS) for calendar year 2018. Performing surveillance for viral hepatitis infections is important for identifying trends in rates of infection, characterizing at-risk groups, evaluating prevention programs, and identifying outbreaks. Below is a summary of the key findings from this year's report for the various hepatitis B and C case classifications, special populations, and hepatitis-related health outcomes.

Acute Hepatitis B

- There were 79 cases of acute hepatitis B infection reported in Michigan in 2018 for a rate of 0.79 cases per 100,000 people. This is below the most recent national rate of acute HBV infection (1.05 per 100,000).
- Case follow-up and completion of epidemiological risk factors was completed for 97% of acute hepatitis B cases in 2018.
- Receipt of a tattoo in the 6 months prior to diagnosis was the most commonly reported risk factor among 2018 acute hepatitis B cases.

Chronic Hepatitis B

- There were 1,089 new chronic hepatitis B diagnoses reported in Michigan in 2018 for a rate of 10.93 cases per 100,000 people.
- Males have shown higher rates of Chronic Hepatitis B than females since 2004.
- Asians are disproportionately affected by chronic hepatitis B with an infection rate of 51.90 per 100,000, compared to the state average of 10.93.

Acute Hepatitis C

- There were 179 cases of acute hepatitis C reported in Michigan in 2018 for a rate of 1.80 cases per 100,000 people. This is a decrease from rates reported in Michigan in 2017 (2.36), but still higher than the national acute HCV rate of 1.00 cases per 100,000 reported in 2016.
- The median age of acute hepatitis C cases, 33 years old, was at least 15 years younger than that of other hepatitis case classifications.
- Case follow-up and completion of epidemiological risk factors was completed for about 92% of acute hepatitis C cases in 2018.
    - Where data were available, injection drug use was reported by 56% of acute hepatitis C cases.

Chronic Hepatitis C

- There were 10,545 new chronic hepatitis C diagnoses reported in Michigan in 2018 for a rate of 105.85 cases per 100,000 people.
- The rate of chronic hepatitis C is higher in Michigan males (121.64 per 100,000) versus females (89.81 per 100,000).
- American Indians and Alaskan Natives (220.16 per 100,000) have a higher rate of chronic hepatitis C infection than the general Michigan population.
- Case follow-up and completion of epidemiological risk factors was completed for about 56% of chronic hepatitis C cases in 2018.
    - Where data were available, injection drug use was a factor shared by 62% of cases. Incarceration was a risk factor in 61% of cases.
- Where data were available, 80% of chronic hepatitis C cases were reported with genotype 1 infection, 14% with genotype 3, and 7% with genotype 2.

Perinatal Hepatitis C

- There were 11 cases of perinatal hepatitis C reported in Michigan in 2018.
- The average age of infants reported for perinatal hepatitis C was 16.5 months.
- The majority of infants with perinatal hepatitis C were male (72.7%).
- 63.6% of perinatal hepatitis C cases were Caucasian.
- 10 out of the 11 reported cases (90.9%) were documented to be born to a hepatitis C infected mother.

Focus Populations

Hepatitis C in Adults Under 40 Years of Age

- From 2005 through 2018, the number of cases of chronic hepatitis C among persons aged 18-39 years has increased over 1,300% from 292 cases to 3,774 cases.
- A concurrent signal of increased heroin abuse has been evident within the same timeframe.
    - Injection drug use in 18-39 year olds was reported in 82% of hepatitis C patients.
    - Between 2000 and 2018 there has been a 173% increase in Michigan heroin substance abuse treatment admissions.
    - From 2000 through 2017 heroin overdose deaths in Michigan have increased by 783%
- The opioid epidemic is impacted both young males and females. As a result, we have seen 20 cases of perinatal hepatitis C as a result of mother-to-child transmission over the last 5 years, and a rate of 835.82 instances of treated neonatal abstinence syndrome (NAS) per 100,000 live births in 2016.

Viral Hepatitis and Human Immunodeficiency Virus (HIV) Co-infection

- From 2004-2018, there were 846 persons in Michigan reported with Hepatitis B/HIV co-infection.
    - 89.0% of these persons are male.
    - The primary modes of HIV transmission in the HIV/HBV co-infection group were men who have sex with men (MSM) at 67.5%
- From 2004-2018, there were 1,687 persons in Michigan reported with Hepatitis C/HIV co-infection.
    - 77.7% of these persons are male.
    - The primary modes of HIV transmission in the HIV/HCV co-infection group were IDU at 42.7% and MSM at 33.2%
- Incidence of HBV/HIV co-infections has continued to decline. As a result of better HIV linkage to care and treatment, coinfected individuals are living longer lives and thus prevalence of both HBV/HIV coinfection and HCV/HIV coinfection are increasing.
- Incidence of HIV/HCV coinfection has increased in recent years, likely due, in part, to the change in HCV case definition that was implemented in 2016.
- In 2018, the proportion of coinfections in Caucasians was higher than previous years.

Viral Hepatitis Outcomes

Hospitalization Data

- Hospitalizations attributed to hepatitis C increased by nearly 48% from 2005 through 2016, while total hospitalizations due to hepatitis B and HIV have remained steady.

Transplant Data

- Trends in liver transplantation may be indicative of increasing disease progression and morbidity associated with long-term HBV and/or HCV carriage.

Viral Hepatitis and Liver Cancer

- The overall incidence for liver cancer in Michigan has increased by 50% between 2007 and 2016.
- The liver cancer rate among African American males (15.4 cases per 100,000) remains high, although the gap in rates between them and Caucasian males (9.3 cases per 100,000) continued to shrink.
- The overall liver cancer mortality has increased by 46% between 2008 and 2017 in Michigan.
- In 2017, the Michigan liver cancer mortality rate was higher in African-American males (8.7 per 100,000) than it was in Caucasian males (5.4 per 100,000).

Viral Hepatitis-Related Mortality

- There were 109 deaths attributed to chronic hepatitis C in Michigan in 2016.
- Deaths due to chronic hepatitis C alone continue to decrease, and totaled the lowest count in 2017 that had been recorded since 2006.

Background and Technical Notes

INTRODUCTION

The Michigan Department of Health and Human Services (MDHHS) requires medical providers and laboratories to report cases of communicable diseases, including viral hepatitis, in accordance with Michigan's Communicable Disease Rules. Cases are reported to MDHHS via the Michigan Disease Surveillance System (MDSS), a web-based communicable disease reporting system developed for the state of Michigan. Providers and laboratories can enter cases manually or send cases via HL7 electronic laboratory report (ELR). The MDSS is compliant with CDC's National Notifiable Disease Surveillance System (NNDSS) and has been in use in Michigan since 2004. Case reporting is accomplished in MDSS via standard HTML demographic data collection fields with an enhanced viral hepatitis reporting form for disease-specific data. While acute hepatitis A, acute hepatitis B, acute hepatitis C, chronic hepatitis B, chronic hepatitis C, perinatal hepatitis B and perinatal hepatitis C are all reported in MDSS, this report will primarily highlight acute, chronic, and perinatal hepatitis B and C surveillance, along with updates regarding hepatitis A and populations of higher risk. MDHHS follows the current CDC Guidelines for Viral Hepatitis Surveillance and Case Management for reporting, investigating, and maintaining quality assurance in viral hepatitis surveillance. Viral hepatitis surveillance data is submitted to CDC weekly in accordance with Morbidity and Mortality Weekly Report (MMWR) notification standards. Cases are classified according to the most recently published CDC/CSTE case definitions.

BACKGROUND

"Hepatitis" means inflammation of the liver and can stem from both infectious and non-infectious causes. The most common types of viral hepatitis are hepatitis A (HAV), hepatitis B (HBV), and hepatitis C (HCV). These viruses can produce an acute illness characterized by nausea, malaise, abdominal pain, and jaundice, although many of these acute infections are asymptomatic or cause only mild disease. HAV is transmitted from person to person via ingestion of food and water contaminated with human waste while HBV and HCV are both blood borne pathogens. Many persons infected with HBV or HCV are unaware they are infected. Unlike HAV, both HBV and HCV can produce chronic infections that often remain clinically silent for decades while increasing the risk for liver disease and hepatocellular carcinoma. Viral hepatitis is the leading cause of liver cancer and the most common reason for liver transplantation in the United States. The CDC estimates that up to 5.7 million Americans are living with chronic hepatitis; most do not know they are infected due to the often asymptomatic nature of chronic infections.

Hepatitis A Virus

Hepatitis A is a liver disease caused by HAV. Hepatitis A can affect anyone, and the virus is spread through contaminated food or water and close contact with persons who are infected. Frequent hand washing with soap and warm water after using the bathroom, changing a diaper, or before preparing food can help prevent the spread of HAV, but the best form of protection is the hepatitis A vaccine.

Hepatitis B Virus

HBV is transmitted through contact with the blood or body fluids of an infected person, most often through sharing infected injection-drug use equipment, from sexual contact with an infected person, or from an infected mother to her newborn during childbirth. Transmission of HBV also can occur among persons who have prolonged contact with someone who is HBV-infected (e.g., household contacts). Most people do not experience any symptoms during the acute infection phase. However, some people have acute illness with symptoms that last several weeks, including jaundice, dark urine, extreme fatigue, nausea, vomiting and abdominal pain. In some people, the hepatitis B virus can also cause a chronic liver infection that can later develop into cirrhosis of the liver or liver cancer.

The risk for chronic HBV infection decreases with increasing age at infection. Among infants who acquire HBV infection from their mothers at birth, as many as 90% become chronically infected, whereas 30%–50% of children infected at age 1–5 years become chronically infected. This percentage is smaller among adults, in whom approximately 5% of all acute HBV infections progress to chronic infection.

In the United States, 850,000-2.2 million persons are estimated to be infected with the virus, most of whom are unaware of their infection status. Worldwide, approximately 257 million people have chronic HBV infection and about 887,000 died in 2015 due to the acute or chronic consequences.

Effective hepatitis B vaccines have been available in the United States since 1981 and the CDC recommends vaccination of all infants at birth. Several oral drugs are now available, leading to viral suppression in 90% of patients taking one of these new oral medications.

Hepatitis C Virus

HCV is transmitted primarily through exposure to infected blood, which can result from sharing infected injection-drug use equipment, needle-stick injuries involving contaminated blood, receipt of blood or blood products before the availability of a standard screening test in 1992 and inadequate infection control in health-care settings. Much less often, HCV transmission occurs among infants born to HCV-infected mothers or during sexual contact. HCV is not spread by sneezing, coughing, or kissing. The best way to prevent HCV infection is by avoiding behaviors that can spread the disease, especially sharing injection drug use equipment.

The incubation period for HCV is 2 weeks to 6 months. Following initial infection, approximately 80% of people do not exhibit any symptoms. Those who are symptomatic may

experience fever, fatigue, decreased appetite, nausea, vomiting, abdominal pain, dark urine, and jaundice. No laboratory distinction can be made between acute and chronic HCV infection. Diagnosis of chronic infection is made on the basis of anti-HCV positive results upon repeat testing and the presence of HCV in the blood. About 75–85 % of newly infected persons develop chronic infection and 60–70% of chronically infected people develop chronic liver disease; 5–20% of chronically infected people develop cirrhosis and 1–5% die from cirrhosis or liver cancer.

With an estimate of up to 5.5 million chronically infected persons nationwide, HCV infection is the most common blood-borne infection in the United States. Worldwide, about 71 million people are chronically infected with HCV, and approximately 399,000 people die every year from HCV-related liver diseases.

Since no vaccine is available for preventing HCV infection, other prevention activities, such as not sharing infected injection drug equipment and consistently implementing and practicing infection control in health-care settings, are vital. Linkage to care and treatment is critical to improving health outcomes for persons found to be infected with HCV. Such linkage is particularly important in light of the major advancements that have been made in treatment of hepatitis C. New HCV direct acting antivirals have few side effects or contraindications and can clear HCV infection in 8-24 weeks with a success rate of 90-95%.

TECHNICAL NOTES

Michigan Communicable Disease Reporting Requirements

Michigan's communicable disease rules are promulgated under the authority conferred on the Department of Health and Human Services by Section 5111 of Act No. 368 of the Public Health Acts 1978, as amended, being 333.5111 of the Michigan Compiled Laws. MDHHS maintains a list of conditions, including viral hepatitis, which must be reported by physicians, other authorized health care professionals and laboratories to the local health department in which the patient resides.

Michigan is a "home rule state," in which local governments have direct control over local health departments (LHD). Therefore, LHDs function as administratively autonomous units, separate from MDHHS. MDHHS provides administration of MDSS, expert consultation and other support as needed to LHDs. Physicians and laboratories report diseases to LHDs, who have authority to investigate and follow-up on the case in accordance with their own priorities and available resources.

Michigan has adopted standardized case definitions for HAV, HIV, perinatal HBV, and acute and chronic hepatitis B and C, which were developed and approved by the Council of State and Territorial Epidemiologists and CDC (see Page 11). Cases of acute and chronic hepatitis B and C are reported via MDSS using standardized CDC case report forms (see page 11).

Michigan Disease Surveillance System

Mandatory reporting of communicable diseases can be accomplished via the Michigan Disease Surveillance System (MDSS). The MDSS is a web-based communicable disease reporting system developed for the State of Michigan. The MDSS facilitates coordination among local health departments, MDHHS and federal public health agencies. MDSS provides for the secure transfer, maintenance and analysis of communicable disease surveillance information. MDSS has the capability to receive electronic laboratory reports directly from laboratories via HL7 messaging. Alternatively, cases can be manually entered into MDSS via the web portal by medical providers, laboratories or local health department staff. Cases that have been previously entered in MDSS are matched with incoming cases by a process known as deduplication. The MDSS deduplicates both the client and the disease event based on an algorithm of name, sex, and date of birth. Case reporting is accomplished in MDSS via standard HTML demographic data collection fields with an enhanced viral hepatitis reporting form for disease-specific data. MDHHS submits weekly de-identified individual case reports to CDC via the National Notifiable Disease Surveillance System Modernization Initiative, a computerized public health surveillance information system.

The data in this report includes all cases which meet the CDC/CSTE case definitions referenced in "Web Links to Case Definitions and Case Report Forms" on page 11. Data includes cases with referral dates between January 1, 2017 and December 31, 2017 in MDSS.

Local Health Jurisdiction Structure

The state of Michigan is divided into eight public health preparedness regions that are serviced by 45 health jurisdictions comprised of 84 counties. These local health departments, functioning as administratively autonomous units, provide basic public health services, including communicable disease-related services, to all Michigan citizens and health care providers. The MDHHS provides expert consultation, reference level diagnostic laboratory services, and support to local health departments. MDHHS's public health laboratory performs hepatitis serologic and molecular testing for public health partners.

Determination of Rates

When calculating rates for years prior to 2010, 2000 Michigan Census data was used. 2010 Census data was used for rates in the years 2010 - 2015. The U.S. Census Bureau's American Communities Survey (ACS) 1-year population estimates for 2017 was used to calculate rates in 2018. All rates were calculated per 100,000 persons in the Michigan population. Michigan Census data used in the annual report can be found at:

http://www.michigan.gov/cgi/0,4548,7-158-54534-252541--,00.html

National Benchmarks
References to national benchmarks come from CDC Division of Viral Hepatitis statistics via the National Notifiable Disease Surveillance System (NNDSS). National statistics used in the annual report can be found at:
http://www.cdc.gov/hepatitis/Statistics/index.htm

Data Limitations
There are several limitations to the data presented in this report. As a result, conclusions drawn from the data in this report should be interpreted with caution and with the appropriate recognition of these limitations. As described earlier, this report compiles data on new viral hepatitis diagnoses, which meet CDC/CSTE case definitions, reported to the MDSS in the year 2018. In general, this is not necessarily reflective of the true number of new infections that occurred in 2018 nor the total number of individuals infected with viral hepatitis currently living in Michigan. Rather, these numbers are a rough approximation of the number of new viral hepatitis diagnoses for the year. This should not, however, imply that these infections were contracted in the year 2018. Since the majority of newly diagnosed viral hepatitis infections are chronic in nature, our data has limited utility in deciphering the date of exposure or infection acquisition for these cases.

New case definitions for acute and chronic hepatitis C cases were adopted in 2016. This definition lowers the threshold for inclusion as a case (see page 11). As a result, increases in HCV case counts and rates since 2015 may be, at least in part, indicative of the change in case counting methodology.

Like many reportable diseases, cases of viral hepatitis are largely under-reported. CDC estimates suggest that only about 8-10% of acute HBV and 15-17% of acute HCV cases are reported each year. This is mainly due to the infections resulting in subclinical disease in the majority of individuals. Most viral hepatitis infections are asymptomatic and thus the infected person never seeks medical care and is not aware of their infection status until symptoms of the chronic infection develop later on in life. Indeed, it is estimated that up to 75% of individuals infected with HCV do not know they are infected. CDC data approximates that, nationwide, 850,000 to 2.2 million individuals (about 0.3-0.7% of the US population) and 3.5 million (about 1% of the US population) are infected with HBV and HCV respectively. Extrapolating that to the Michigan population, we would then expect approximately 30,000-70,000 Michiganders to be infected and living with HBV and 107,000 with HCV.

It should be noted that individuals who clear their HCV infection spontaneously (in about 25% of those exposed to the virus) or via antiviral treatment are still counted as cases in our disease surveillance system and are not removed from our case counts. Also, individuals who are repeatedly infected with HCV are only counted once in their lifetime in our surveillance system.

The Michigan Department of Corrections (MDOC) conducts HCV screening for new inmates and they report cases to the MDSS as with any provider. Inmates who are positive for HCV are entered into MDSS and are counted in the county where their correctional facility is located. All MDOC cases are removed from LHD case counts.

Enhanced Viral Hepatitis Surveillance, 2013-current
Starting in 2013 the Viral Hepatitis Unit initiated a plan to improve viral hepatitis surveillance in Michigan. New surveillance activities in this plan included: additional deduplication of cases in MDSS, active surveillance of cases of public health importance, recruitment of laboratories to report into MDSS electronically, and enhanced auditing and quality assurance of acute and chronic viral hepatitis cases. These enhancements to routine surveillance activities resulted in more reliable and complete information on viral hepatitis diagnoses. Large discrepancies in the data between 2013 and prior years may be a result of these enhanced surveillance efforts and not necessarily indicative of true disease trends.

Web Links to Case Definitions and Case Report Forms

National Notifiable Disease Surveillance System Case Definitions

- Hepatitis A
- Perinatal Hepatitis B
- Acute Hepatitis B

- Chronic Hepatitis B
- Acute Hepatitis C
- Chronic Hepatitis C

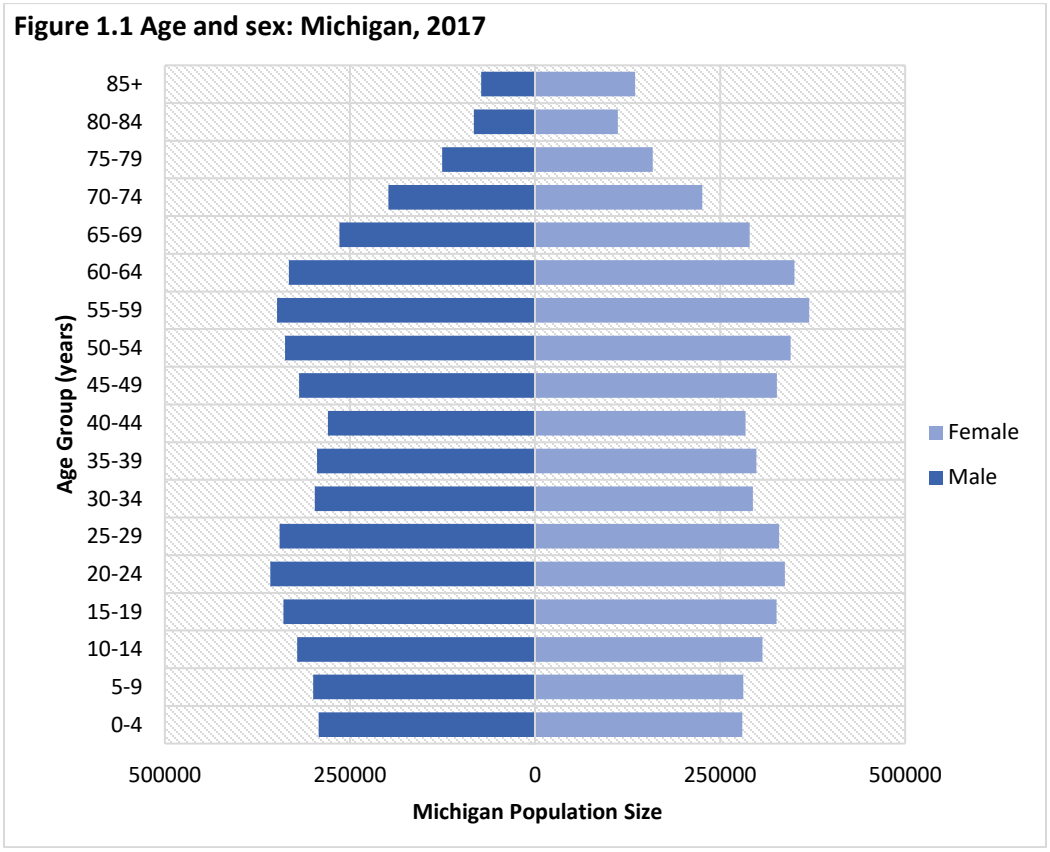
Michigan Viral Hepatitis Case Report Forms

- Hepatitis A
- Perinatal Hepatitis B
- Acute Hepatitis B
- Chronic Hepatitis B
- Acute Hepatitis C
- Chronic Hepatitis C
- Perinatal Hepatitis C

Michigan Census and Demographics

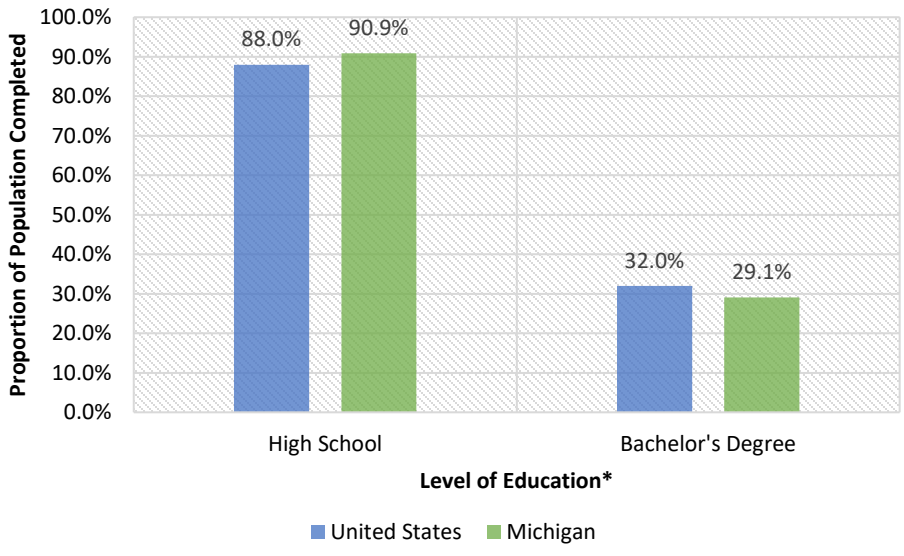
Population by Age, Gender & Education

Figure 1.1 Age and sex: Michigan, 2017



In 2017, the Michigan population was 9,962,311; the 10th most populous state in the United States. Persons born between 1945 through 1965, amounted to 2,585,727 persons or 26 percent of the total population. Females and males made up approximately the same proportion, but there was a notably higher percentage of females than males among the older population (75+ years old). About 77% of the total population was greater than eighteen years old, and residents greater than age sixty-five comprised 16% of the total population. The median age was forty years old.

Figure 1.2 Level of education: Michigan and the U.S., 2017



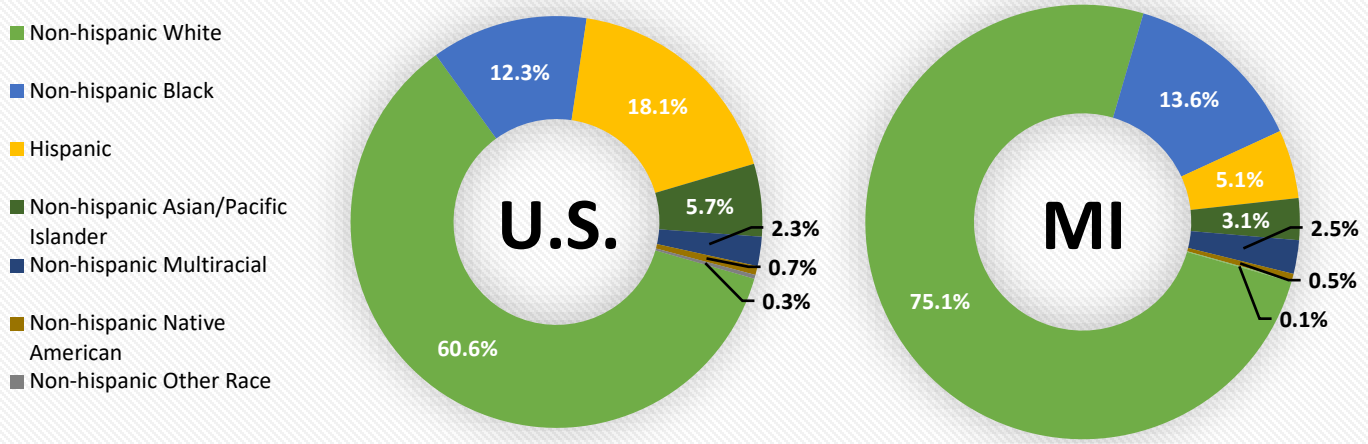
Looking at those aged twenty-five years and older, 90.9% of Michigan's population completed high school, more than the national benchmark at 88.0%. A higher percentage of the national population, however, completed a bachelor's degree than did those from the state of Michigan.

*Individuals who completed some college but did not finish a degree are still noted as high school graduates. Those considered to have completed a bachelor's degree include persons who finished any type of education higher than a Bachelor's degree.

Source: The United States Census Bureau

Population by Race & Ethnicity

Figure 1.3 Race and Ethnicity: Michigan and U.S., 2017



According to the 2017 ACS estimates, the racial and ethnic composition of Michigan is 75.1% non-Hispanic white; 13.6% black; 5.1% Hispanic; 3.1% non-Hispanic Asian alone; 2.5% multiracial or other race. Nationally, the population of non-Hispanic white is 60.6% of the total, and the Hispanic population is 18.1%. The proportion of male and females within each racial/ethnic group is similar. Between 2010 and 2016, there was a 29.4% rise in Michigan's Asian/ Pacific Islander population and a 42.5% rise in Michigan individuals with some other race classification.

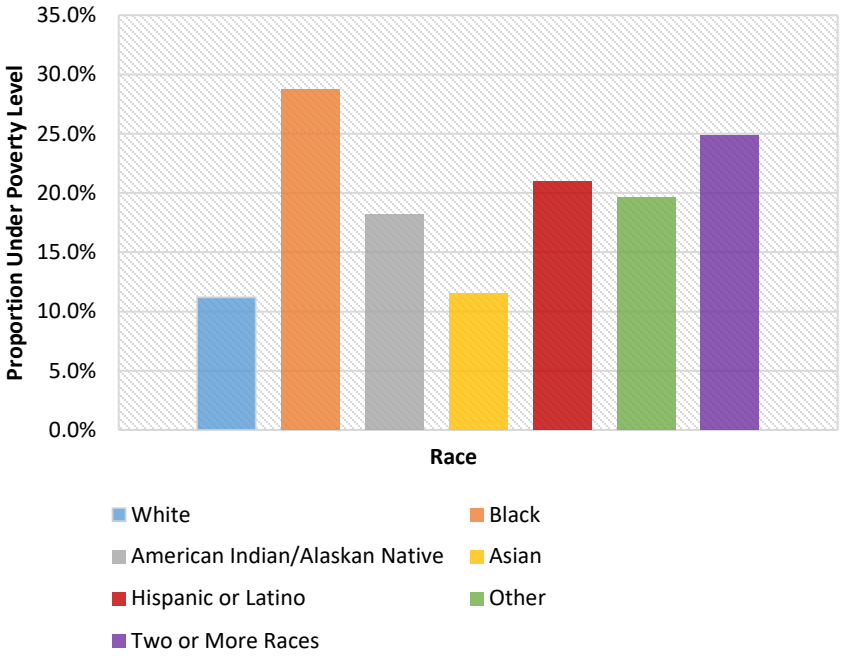
Table 1.1 Population by Race: Michigan, 2010-2017

	2010 Census		2017 ACS		2010-2017	
Race	**Population Count**	**Percent of Total**	**Population Count**	**Percent of Total**	**Change**	**Percent Change**
Total Population	9,883,640	100.00%	9,962,311	100.00%	78,671	0.80%
White Alone	7,569,939	76.59%	7,476,534	75.05%	-93,405	-1.23%
Black Alone	1,383,756	14.00%	1,359,264	13.64%	-24,492	-1.77%
Hispanic	436,358	4.41%	504,398	5.06%	68,040	15.59%
Asian/ Pacific Islander Alone	238,660	2.41%	308,716	3.10%	70,056	29.35%
Multiracial	190,396	1.93%	246,188	2.47%	55,792	29.30%
Native American Alone	54,665	0.55%	45,421	0.46%	-9,244	-16.91%
Other Race Alone	9,866	0.10%	14,060	0.14%	4,194	42.51%

Source: The United States Census Bureau

Poverty, Income & Health Insurance

Figure 1.4 Population under the poverty line by race: Michigan, 2017



The poverty line is determined at a national level each year. In 2017 a family of four would be considered in poverty if the household income in the past twelve months was under $24,000. The Black or African American community in Michigan had the highest rate of poverty in 2016 (28.7%), with over 380,000 individuals in poverty. The white population had the lowest percentage of poverty (11.2%) but the largest number of impoverished individuals (over 860,000). The American Indian/Alaskan Native and Hispanic/Latino populations, along with the multiracial population, showed similar percentages under the poverty line (about 18-25%).

In 2017, about 95% of Michigan's population was covered by public or private insurance, which was slightly higher than the U.S. population (91%). Consequently, the uninsured proportion of Michigan's population was smaller than the national proportion.

Figure 1.5 Health insurance coverage, Michigan and the U.S., 2017

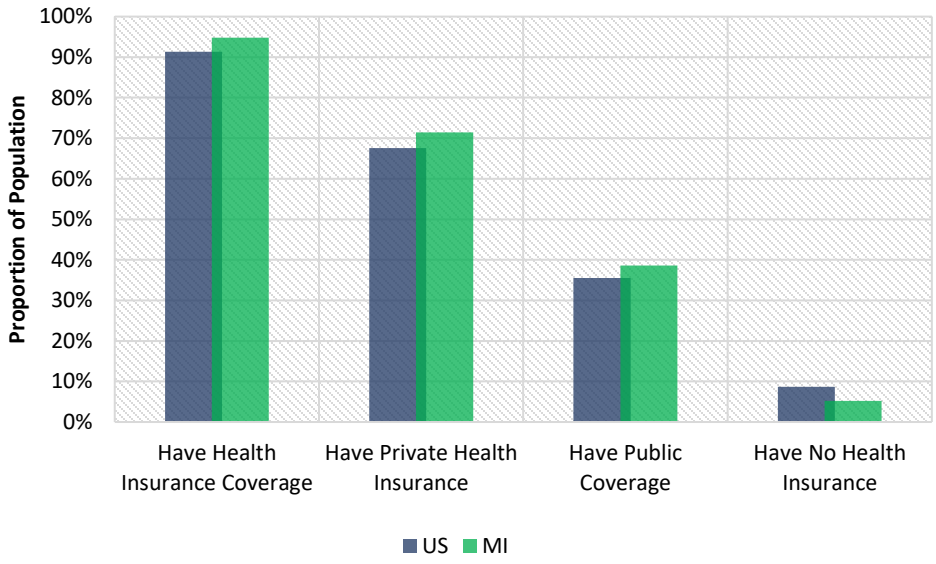
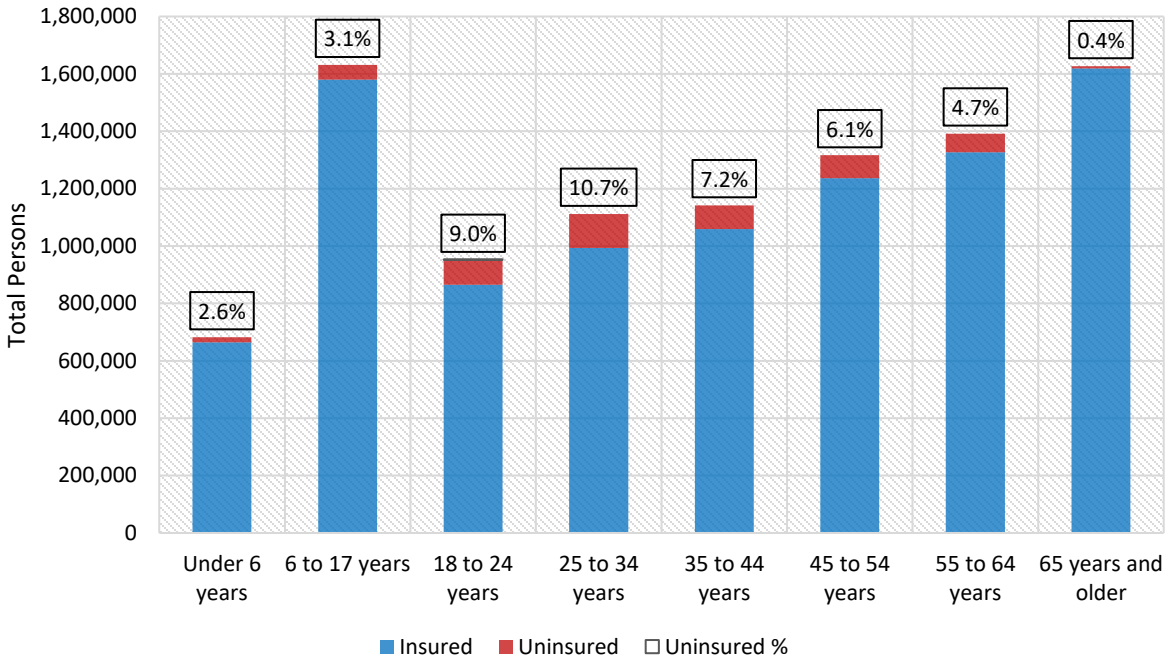
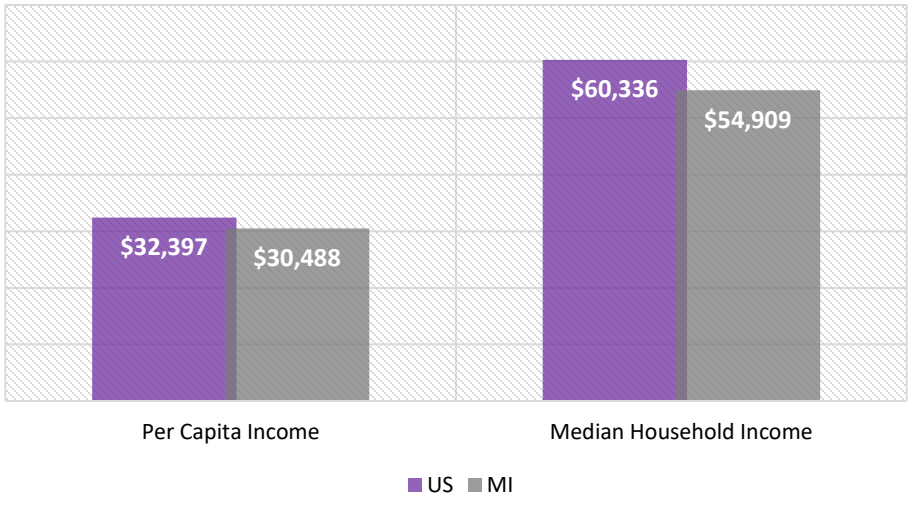


Figure 1.6 Michigan Population by Age Group, Proportion Insured, and Percent Uninsured, 2017



As estimated by the U.S. Census, the most populous age group in Michigan is aged 6-17 years, with approximately 1.63 million individuals. That group, along with the 65+ year old populations, are estimated to have insurance coverage of 97% or higher. In contrast, the young adult and middle-aged Michiganders are more likely to be uninsured. The 25 to 34-year-old population was estimated to have the largest proportion of uninsured individuals (10.7%), followed by the 18 to 24-year-old (9.0%) and 35 to 44-year-old (7.2%) cohorts.

Figure 1.7 Income: Michigan and the U.S., 2017



The Michigan population had lower levels of income than that of the U.S. population. The average per capita income for Michigan ($30,488) was 6% lower than the U.S. average ($32,397), and the median household income for Michigan ($54,909) was approximately 9.9% below the national median ($60,336).

Hepatitis A

Since August 1, 2016, a large ongoing outbreak of hepatitis A virus has taken place in Michigan, affecting more than 200 people in 2018 alone.
While many infected individuals live in Southeast Michigan, hepatitis A has spread throughout other parts of the state. Many instances of hepatitis A infection have caused severe illness, with most resulting in hospital admission and some deaths.

Acute Hepatitis A Outbreak Cases

- There were 219 new acute hepatitis A diagnoses reported in Michigan in 2018 for a rate of 2.19 cases per 100,000 people.
- Males have shown higher rates of Acute Hepatitis A than females during the outbreak.
- The average age of acute hepatitis A cases was 41 years old.
- Case follow-up and completion of epidemiological risk factors was completed for about 86% of acute hepatitis A cases.
- Where data were available, 61% of acute hepatitis A cases were reported with the outbreak genotype 1B.

Table 2.1 Summary of Demographic Information During the Hepatitis A Outbreak, Michigan, 2018

	Acute Hepatitis A	% Acute Hepatitis A
N= 219		
Sex		
Male	143	65%
Female	76	35%
Age		
Mean	41	
Median	37	
Range	<1-90	
0-19	4	2%
20-29	47	22%
30-39	73	33%
40-49	35	16%
50-59	35	16%
60+ years	25	11%

Hepatitis A in High Risk Populations

During this outbreak people who are more likely to be infected include, individuals who use drugs (injection, non-injection, or marijuana), currently homeless or in transient living, have sex with an infected person, recently in jail or prison, and have an underlying liver disease (e.g. cirrhosis, hepatitis B, or hepatitis C).

- Where data were available on acute HAV cases:
  - Substance use disorder was reported by 119 (59%) individuals
  - Homeless or transient living was reported by 30 (15%) individuals
  - 16 (12%) men reported having sex with other men (Includes only male cases)
  - Recently incarceration was reported by 17 (8%) individuals
  - Underlying liver disease (e.g. HCV, HBV) was reported by 55 (27%) individuals

Viral Hepatitis Outcomes

- 4 (2%) deaths have been attributed to the acute hepatitis A outbreak in Michigan in 2018.
- There have also been 162 (74%) hospitalizations attributed to acute hepatitis A outbreak.

Hepatitis A Resources

- Michigan Hepatitis A Outbreak
- Hepatitis A Outbreak Resources
- Hepatitis A Outbreak Public Health Response Overview
- CDC Hepatitis A Outbreak Information

Figure 2.1 Hepatitis A Cases in Michigan, 2000-2018

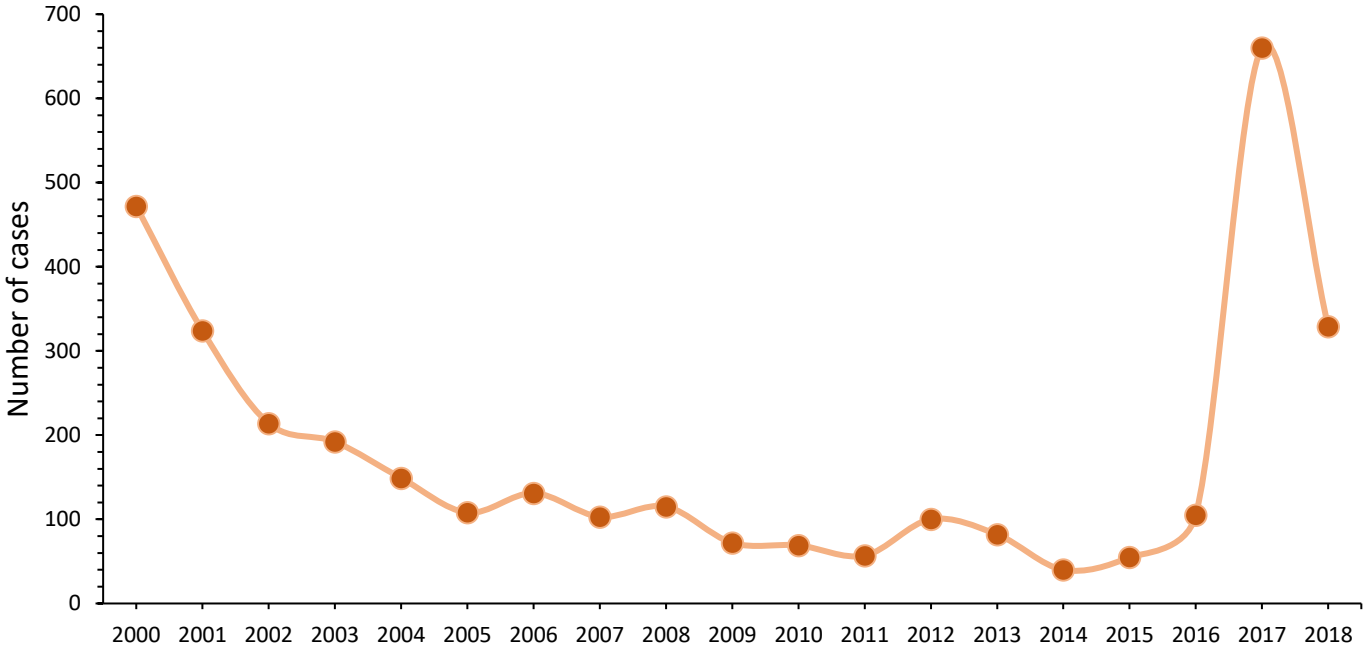
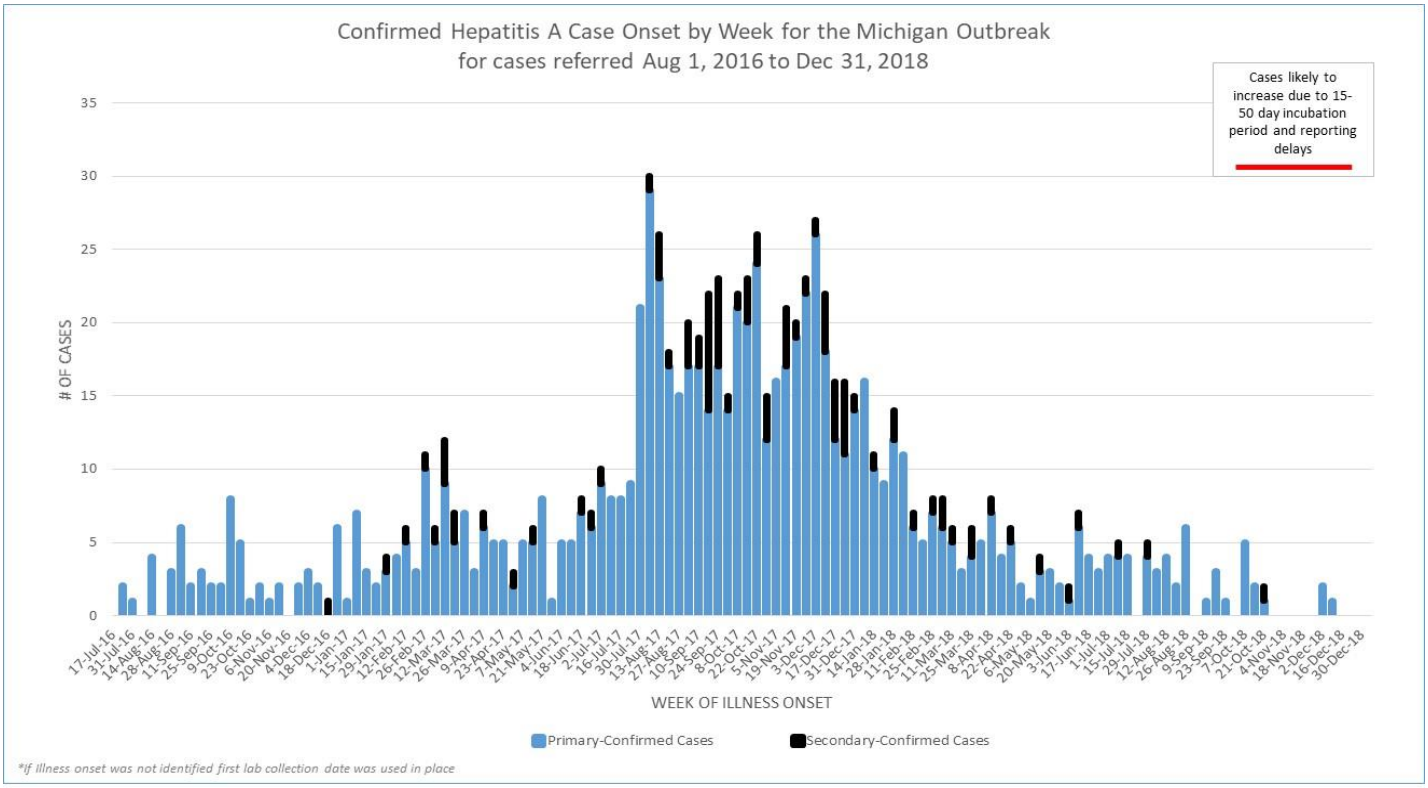


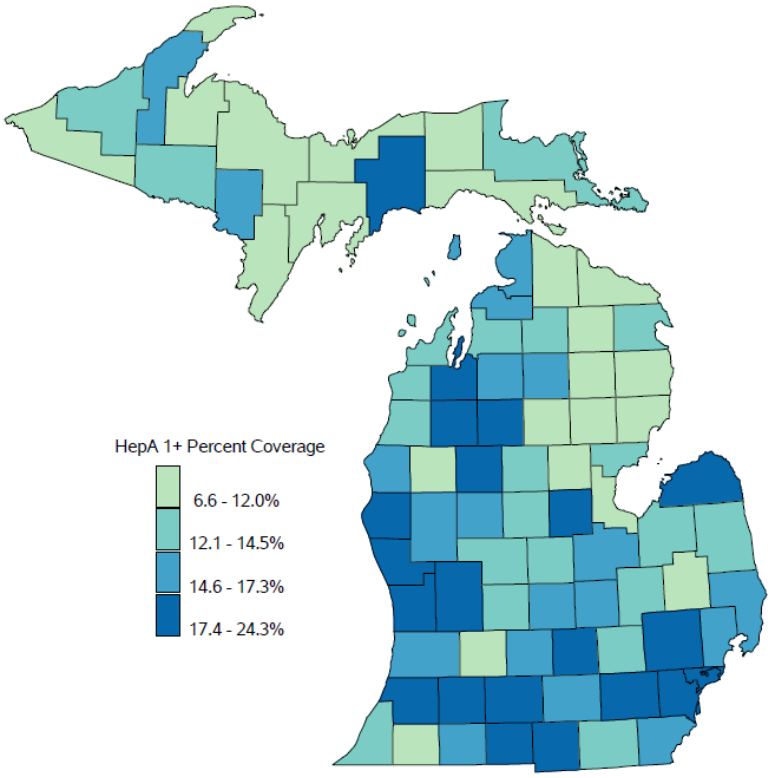
Figure 2.2 Confirmed Outbreak-associated Hepatitis A Cases in Michigan, August 2016-December 2018



Adult Hepatitis A Immunizations

The Michigan Care Improvement Registry (MCIR) is Michigan's immunization registry. The MCIR was started in 1998 as a childhood registry and was expanded to a lifespan registry in 2006. While vaccine record submission is not required for adults 20 years and older, it is highly encouraged. The MCIR has been a valuable tool throughout the hepatitis A outbreak to provide a centralized immunization record, monitor outbreak immunization response efforts and estimate immunization coverage.

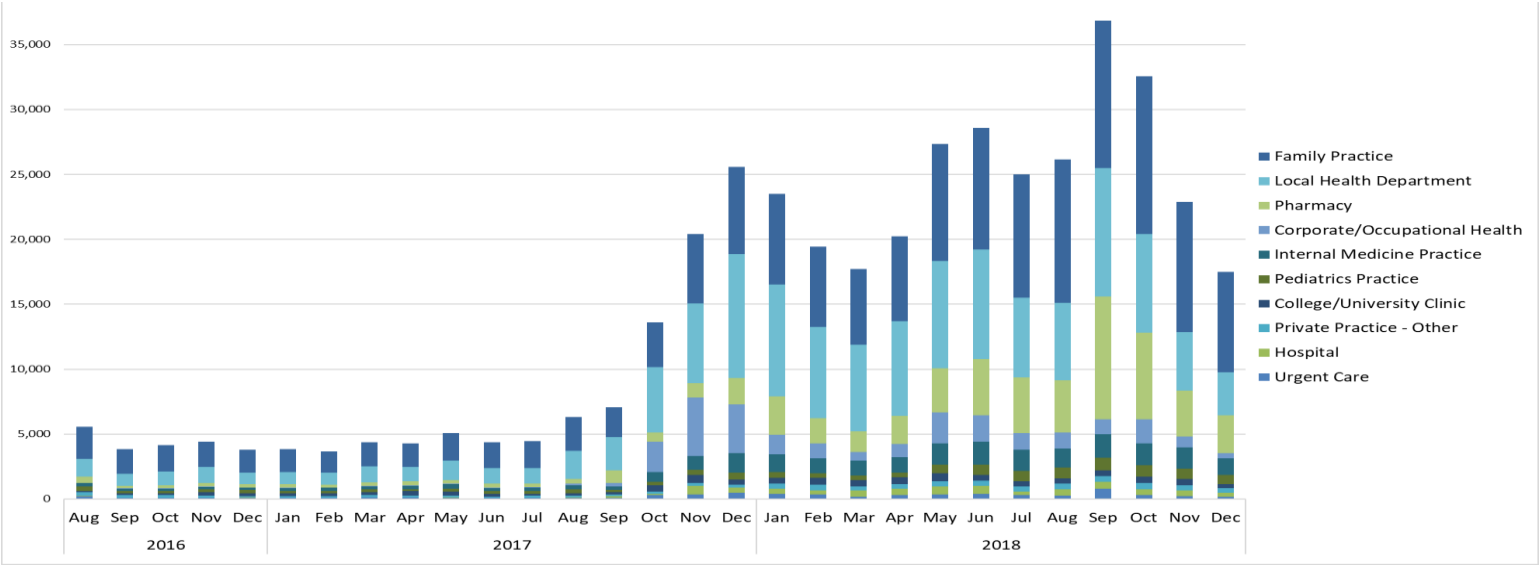
Figure 2.3 Hepatitis A coverage for adults 19 years and older by county and the City of Detroit, MCIR



- Hepatitis A vaccine is routinely recommended for adults with certain risk factors or other indications. Unfortunately, most adults are not protected against hepatitis A. According to MCIR data from April 19, 2019, the estimated proportion of adults 19 years or older who received at least 1 dose of hepatitis A vaccine was only 18.3 percent. Coverage estimates vary across the state (Figure 2.3).
- Administration of hepatitis A doses to adults increased as the outbreak continued (Figure 2.4). The top reporters of adult hepatitis A vaccine administrations have been facilities classified in the MCIR as family practices, local health departments and pharmacies.
- Adults often receive immunizations in a variety of settings. Therefore, it is critical that all health care professional report both administered and historical immunizations to the MCIR. Reporting will decrease the likelihood of missed immunization opportunities, over-immunizing and immunizing at invalid intervals.
- Interested in reporting to or using the MCIR? Contact your regional MCIR office (https://www.mcir.org/providers/contact-regions/).

Numerator: Adults 19 years and older with 1 or more doses of hepatitis A (hep A or hep A-hep B) in the MCIR as of December 31, 2018 by county and the City of Detroit. Denominator: 2017 census estimates for adults 19 years and older by county and the City of Detroit.

Figure 2.4 Hepatitis A vaccine doses administered and reported to the MCIR for adults 19 years of age and older by the top ten MCIR facility types and month, Michigan, 08/01/16-12/31/18



Acute Hepatitis B

Acute Hepatitis B—Incidence and Gender

Figure 3.1 Incidence of Acute Hepatitis B in Michigan and United States, 2012-2018

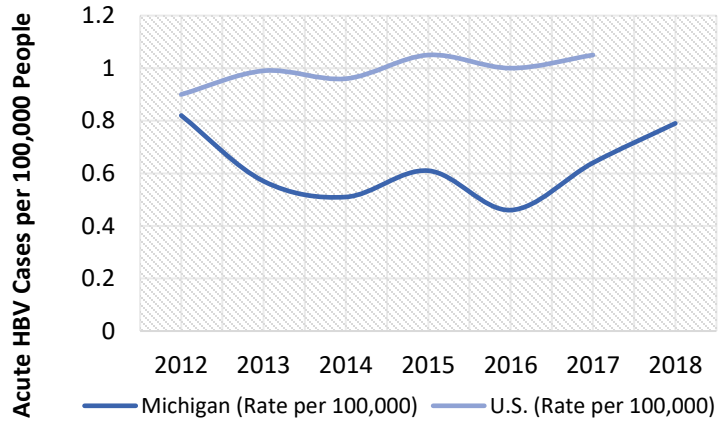


Table 3.1 Incidence of Acute Hepatitis B, Michigan and United States, 2014-2018

Year	Michigan Cases	Michigan (Rate per 100,000)	U.S. (Rate per 100,000)
2014	50	0.51	0.96
2015	61	0.61	1.05
2016	46	0.46	1.00
2017	64	0.64	1.05
2018	79	0.79	N/A

Following a dip in the incidence rate of acute HBV infections in 2016, incidence has increased in Michigan in 2017 and 2018. The increase in acute HBV cases may be related to an increase in opioid drug use in Michigan and a concurrent increase in HCV cases, due to sharing infected needles and drug works between people who inject drugs.

Figure 3.2 Number of Acute Hepatitis B Cases by Gender in Michigan, 2012-2018

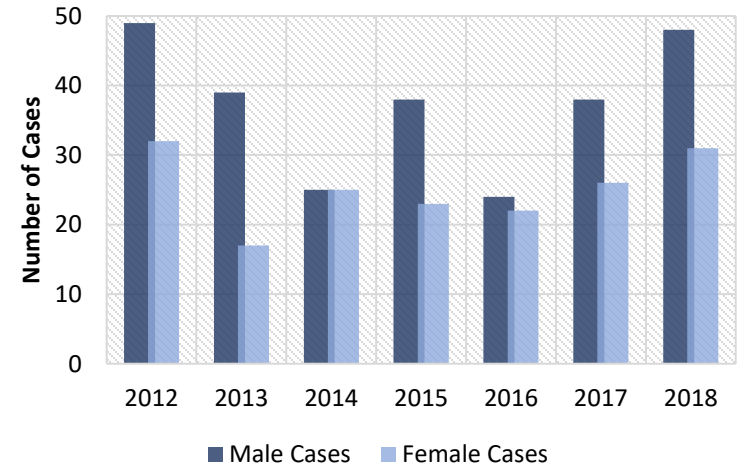


Table 3.2 Acute Hepatitis B Total Cases and Incidence Rate by Gender in Michigan, 2014-2018

Year	Male Cases	Male Incidence	Female Cases	Female Incidence
2014	25	0.52	25	0.50
2015	38	0.78	23	0.46
2016	24	0.49	22	0.44
2017	38	0.78	26	0.52
2018	48	0.98	31	0.61

Acute hepatitis B has been increasing in both males and females since 2016. Males have traditionally had a higher rate of acute HBV infections when compared to females, and that trend continued.

Acute Hepatitis B—Race and Ethnicity

Figure 3.3 Incidence of Acute Hepatitis B by Race in Michigan, 2012-2018

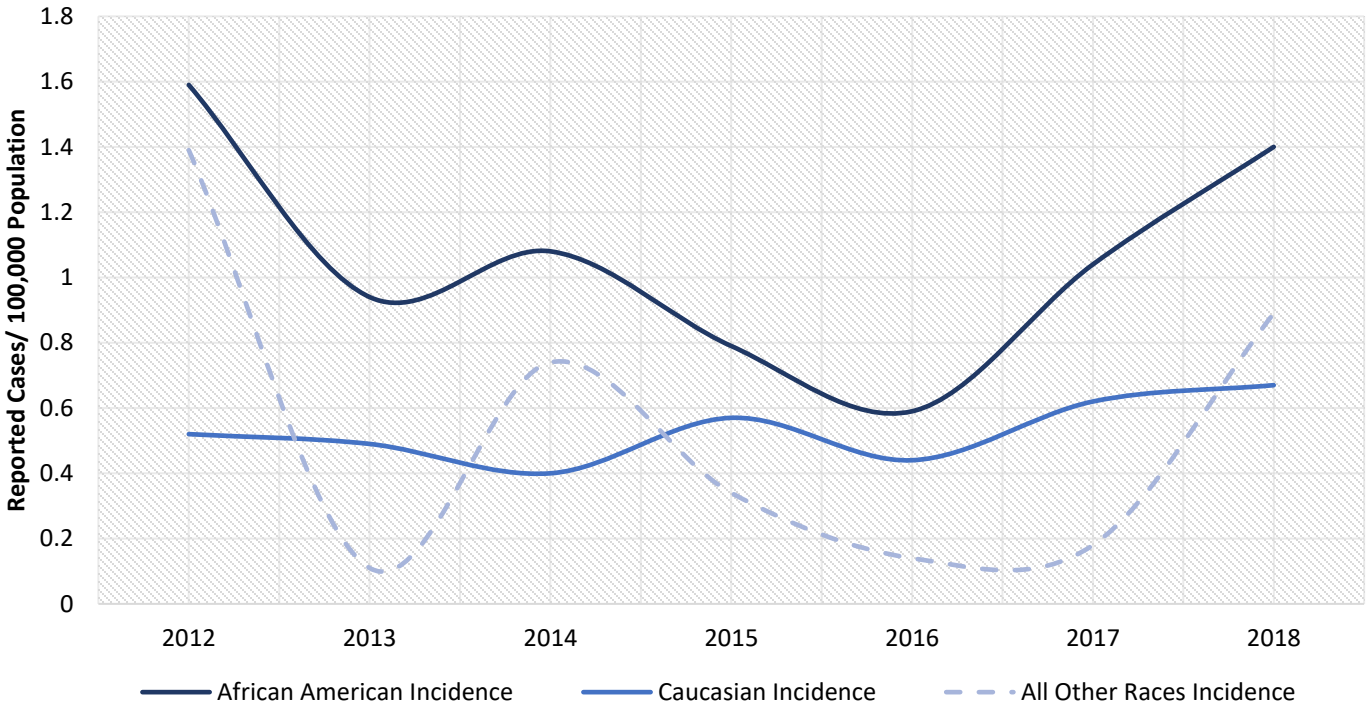


Table 3.3 Incidence of Acute Hepatitis B by Race and Ethnicity in Michigan, 2014-2018

Year	African American Cases	African American Incidence	American Indian or Alaskan Native Cases	American Indian or Alaskan Native Incidence	Asian Cases	Asian Incidence	Caucasian Cases	Caucasian Incidence	Hispanic Cases	Hispanic Incidence	Other Cases	Other Incidence
2014	15	1.08	1	1.83	1	0.42	30	0.40	1	0.23	1	0.49
2015	11	0.79	0	0.00	2	0.85	43	0.57	0	0.00	1	0.49
2016	8	0.59	0	0.00	1	0.34	33	0.44	1	0.21	0	0.00
2017	14	1.04	0	0.00	1	0.34	45	0.62	1	0.20	1	0.36
2018	19	1.4	0	0.00	3	0.98	50	0.67	2	0.40	2	0.04

In 2018, African Americans had the greatest incidence of acute HBV in Michigan. After 2016, when incidence reached a low, incidence has been increasing in African Americans, Asians, Caucasians and Hispanics. The rate of acute HBV was lowest for American Indian or Alaskan Natives. In 2016 we switched from using the 2010 Census to using 2015 Census estimates for calculation of infection rates, thus explaining disproportionate changes in incidence rates relative to changes in case counts that may occur throughout this report.

Acute Hepatitis B—Risk Behaviors

Table 3.4a Completeness of Acute Hepatitis B Reports by Risk Behavior in Michigan, 2018 (n = 79)

Risk Behavior	Completed
Injection Drug User	97%
Used Street Drugs	95%
Hemodialysis	95%
Received Blood Products	97%
Received a Tattoo	97%
Accidental Needle Stick	92%
Contact of Person with Hepatitis B	96%
Other Surgery	97%
Oral Surgery or Dental Work	96%
Employed in Medical Field	96%
Employed as Public Safety Officer	97%
Incarceration Longer than 6 Months	97%
Any Part of Body Pierced (other than ear)	97%

Table 3.4a shows the percentage of acute HBV risk behavior questions that were completed by local health department disease investigators in the MDSS case report form. A risk behavior was considered completed if the question was marked as 'Yes', 'No', or 'Unknown'. Acute HBV epidemiologic information questions were completed for approximately 96% of case reports. This is an increase from the 70% of acute HBV questions completed in the year 2012 before enhanced viral hepatitis surveillance funding and similar to case follow-up rates reported in 2017 (96%). According to the CDC, the national average for completeness of acute HBV case report forms was 58% in 2014.

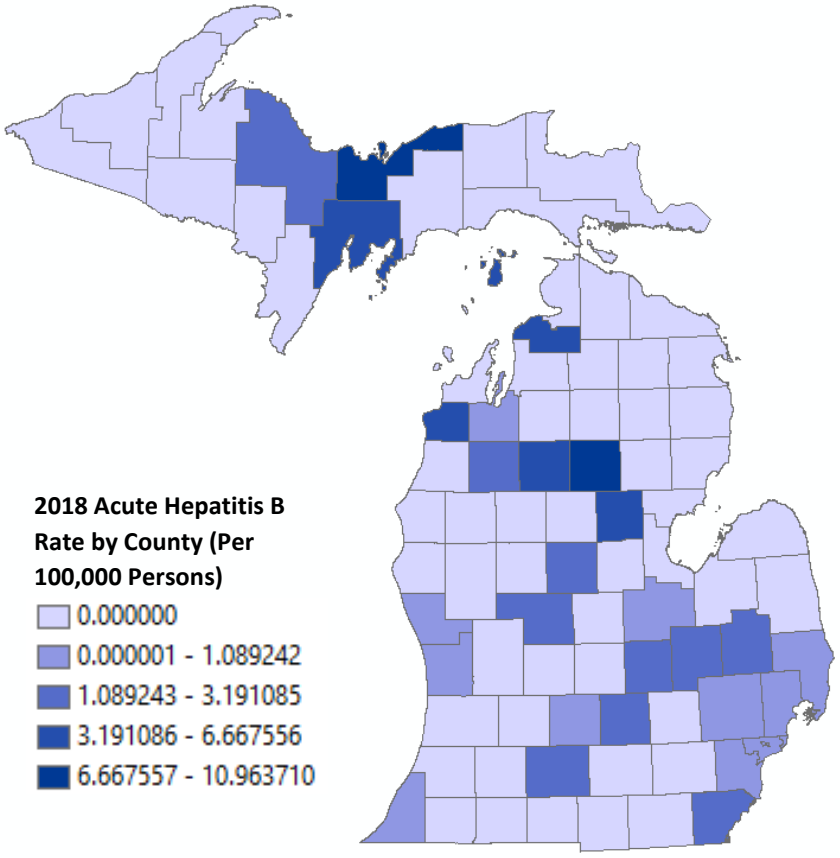
Table 3.4b Response of Completed Acute Hepatitis B Reports* by Risk Behavior in Michigan, 2018

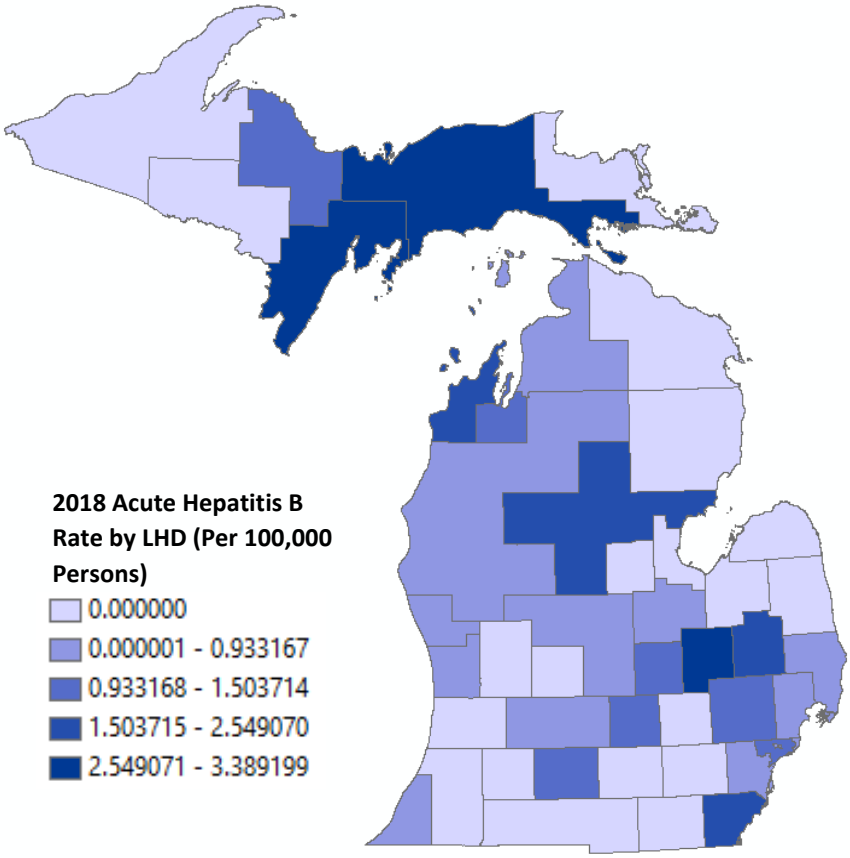
Risk Behavior	Yes*	No*	Unknown*	U.S. - 2014
Injection Drug User	10%	83%	6%	25.80%
Used Street Drugs	19%	69%	12%	
Hemodialysis	3%	89%	8%	0.20%
Received Blood Products	9%	74%	17%	0.10%
Received a Tattoo	30%	52%	18%	
Accidental Needle Stick	7%	70%	23%	4.90%
Contact of Person with Hepatitis B	9%	55%	36%	3.90%
Other Surgery	17%	65%	18%	10.80%
Oral Surgery or Dental Work	26%	51%	22%	
Employed in Medical Field	5%	80%	14%	0.30%
Employed as Public Safety Officer	1%	84%	14%	
Incarceration Longer than 6 Months	17%	65%	18%	
Any Part of Body Pierced (other than ear)	5%	74%	21%	

* Percentages calculated based upon those who completed the field; excludes missing data

Table 3.4b shows the HBV acquisition risk factors reported by clients in the 6 weeks to 6 months prior to onset of symptoms. "Received a Tattoo" was the most common potential exposure, with 'Yes' being selected on 30% of cases with completed risk behavior questions. "Employed as Public Safety Officer" is the least likely risk exposure in 2018 with only 1% of acute HBV cases reporting this risk. In 2017, 37% of cases reported "Used Street Drugs" in comparison to only 19% in 2018.

Acute Hepatitis B Rate Maps by County and Local Health Jurisdiction





Chronic Hepatitis B

Chronic Hepatitis B—Incidence and Gender

Figure 4.1 Chronic Hepatitis B Cases per 100,000 Persons, Michigan, 2012-2018

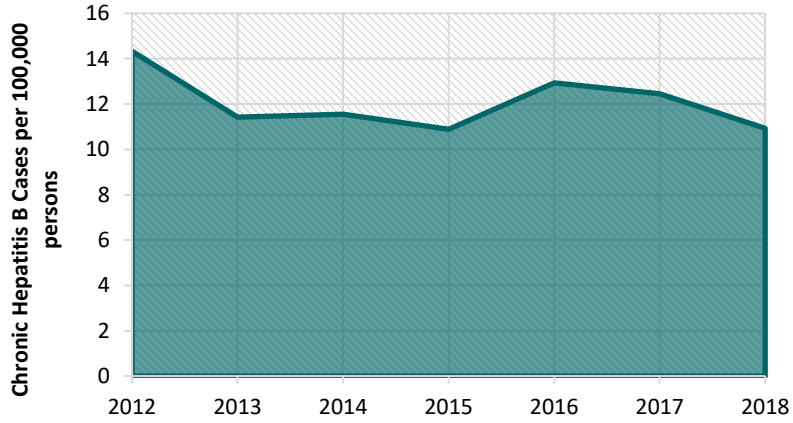


Table 4.1 Chronic Hepatitis B Cases per 100,000 Persons, Michigan, 2014-2018

Year	Michigan Cases	Michigan (Rate per 100,000)
2014	1142	11.55
2015	1076	10.89
2016	1283	12.93
2017	1237	12.46
2018	1089	10.93

Following an increase in cases in 2016, cases have decreased slightly in 2017 and 2018. There is no national benchmark for comparing rates of chronic HBV infection. Decreases in cases after 2012 may be due, in part, to increased deduplication efforts and removal of redundant cases by MDHHS staff. Increases in the number of cases reported in 2016 may be explained by improved laboratory reporting from some Michigan health systems and/or more frequent ordering of hepatitis panels as a result of a hepatitis A outbreak occurring at that time.

Figure 4.2 Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2012-2018

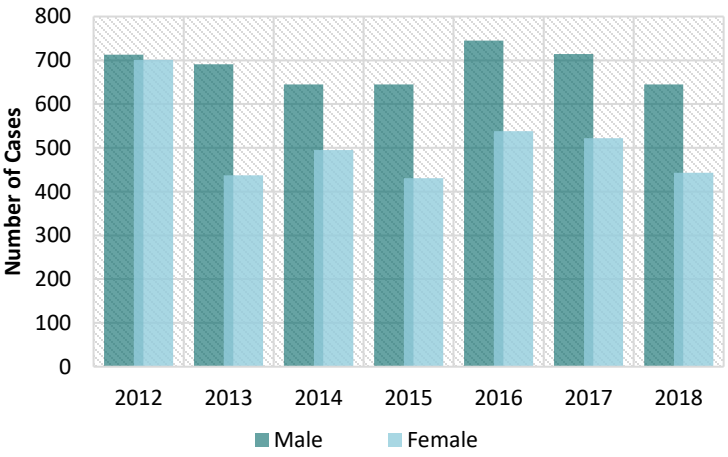


Table 4.2 Chronic Hepatitis B Cases per 100,000 Population by Gender in Michigan, 2014-2018

Year	Male	Male Incidence	Female	Female Incidence
2014	645	13.3	495	9.83
2015	645	13.3	431	8.56
2016	745	15.28	538	10.66
2017	714	14.62	522	10.33
2018	645	13.14	443	8.76

The rate of chronic HBV in males in Michigan has remained higher than the rate in females between the years of 2012 and 2018. The rate for males and females is at its lowest point since 2016. That decrease is largely due to increased emphasis on the removal of duplicate chronic HBV cases in MDSS, particularly among women of childbearing age.

Chronic Hepatitis B—Race and Ethnicity

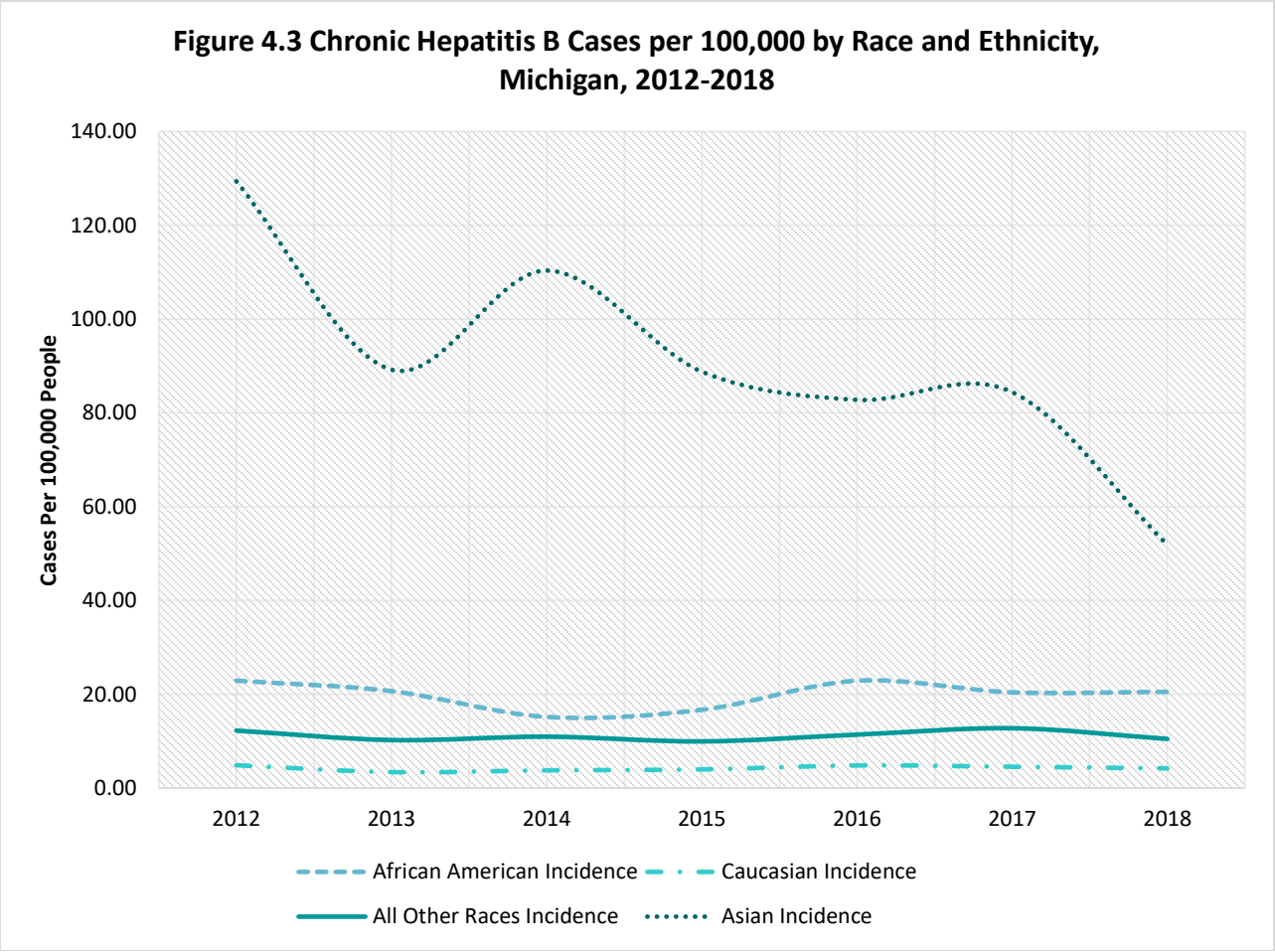
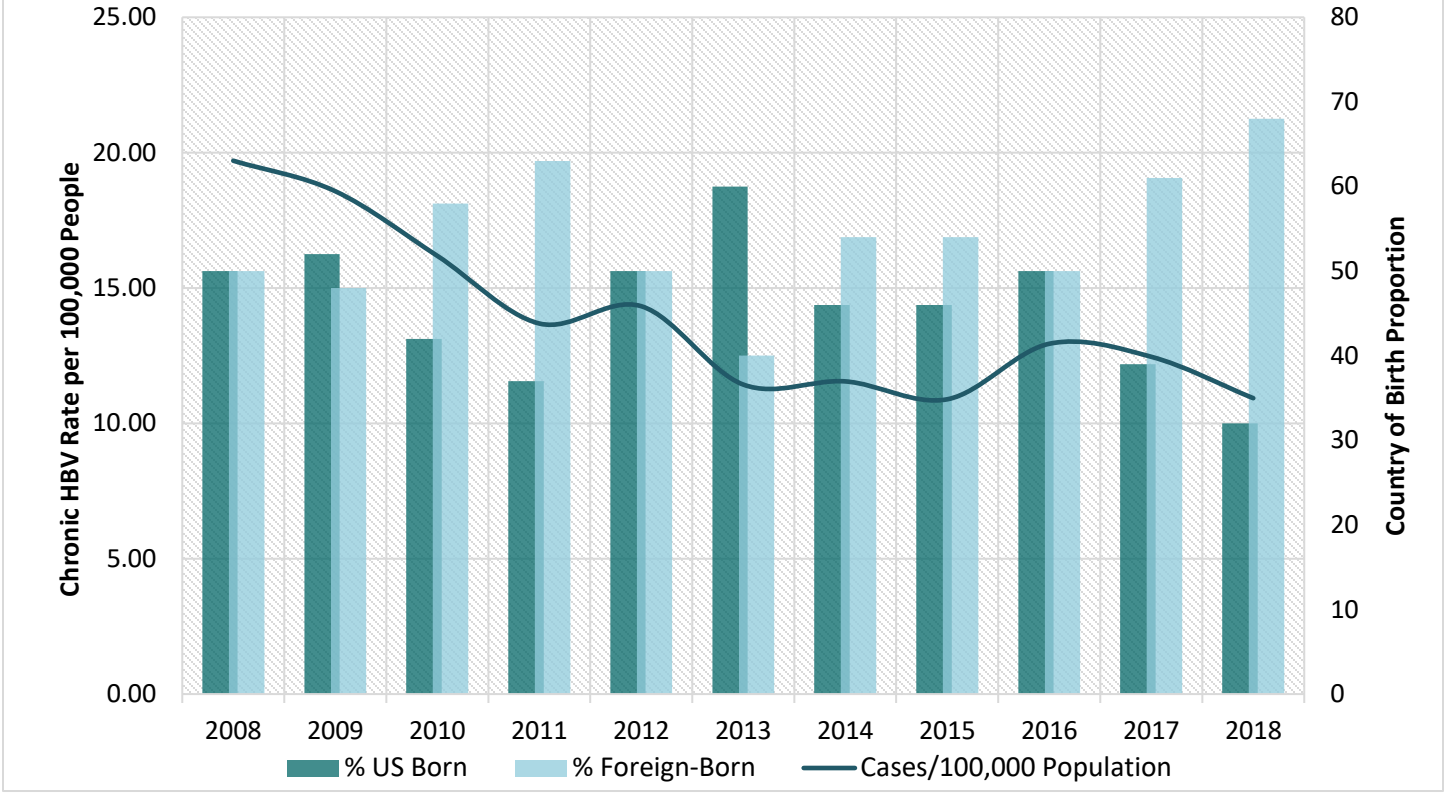


Table 4.3 Chronic Hepatitis B Cases per 100,000 by Race and Ethnicity, Michigan, 2014-2018

Year	African American	African American Incidence	American Indian	American Indian Incidence	Asian	Asian Incidence	Caucasian	Caucasian Incidence	Hispanic	Hispanic Incidence	Other	Other Incidence
2014	210	15.18	6	10.98	261	110.36	286	3.78	18	4.13	52	25.69
2015	231	16.69	8	14.63	210	88.80	302	3.99	13	2.98	48	23.71
2016	312	22.89	2	4.34	242	82.79	361	4.82	24	4.94	63	25.33
2017	275	20.41	2	4.66	246	84.44	340	4.55	18	3.66	84	30.56
2018	279	20.53	1	2.20	159	51.90	314	4.20	13	2.58	72	25.53

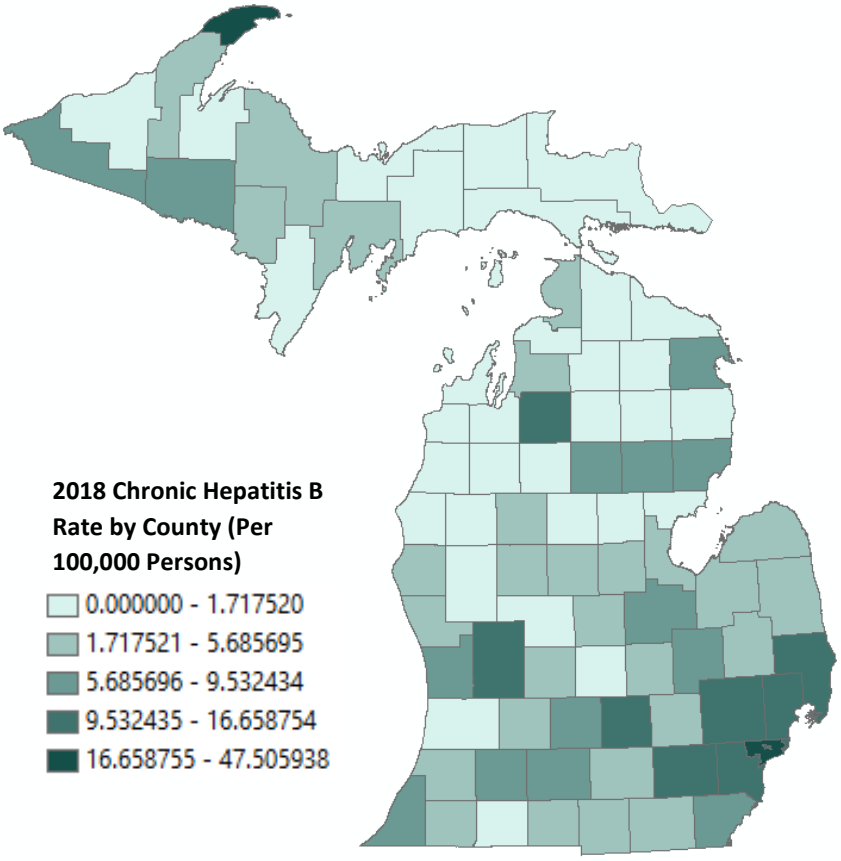
In 2018, Asians had the highest rate (51.90 per 100,000) of chronic HBV infection in Michigan, followed by African Americans (20.53 per 100,000). The Asian infection rate of 51.90 is 12.4 times higher than the Caucasian rate (4.20 cases per 100,000). Asian-Americans are the target of CDC's KNOW HEPATITIS B campaign due to that disparity.

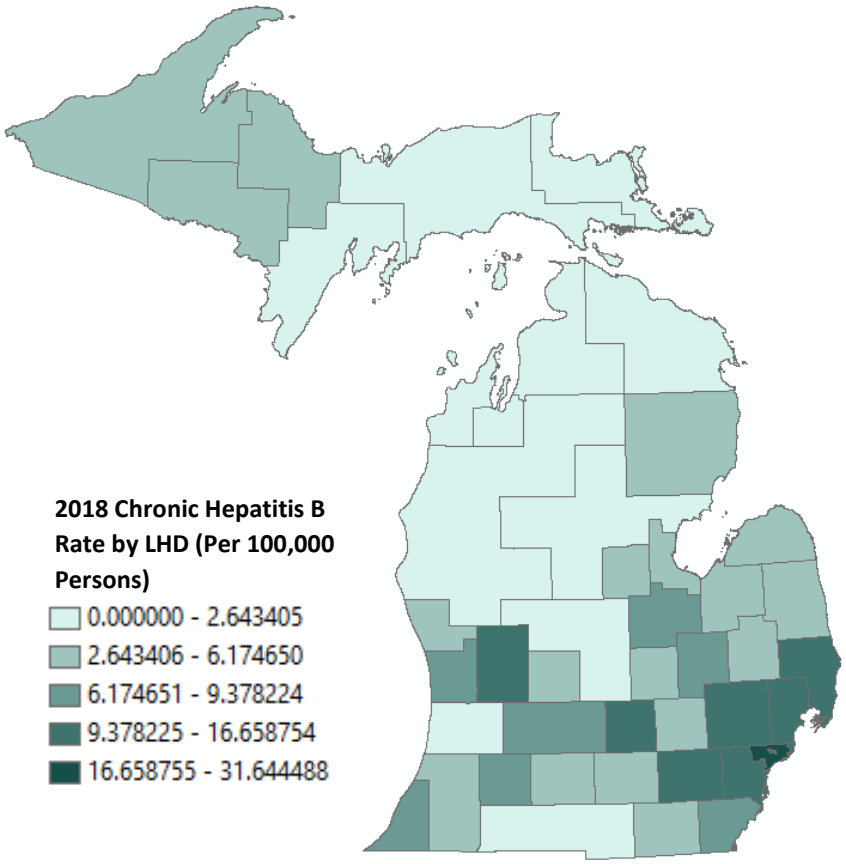
Figure 4.4 Chronic Hepatitis B Cases per 100,000 Population and Country of Birth in Michigan, 2008-2018



Hepatitis B is a vaccine preventable disease. While decreases in HBV have been observed in the US, foreign countries are still greatly impacted by HBV infection. To better understand the Michigan HBV population, we have categorized the proportion of cases that were born in the US versus foreign countries. When comparing the origin of birth among HBV infected individuals in Michigan, more people were born outside the United States than in the United States.

Chronic Hepatitis B Rate Maps by County and Local Health Jurisdiction





Acute Hepatitis C

Acute Hepatitis C—Incidence and Gender

Figure 5.1 Incidence of Acute Hepatitis C, Michigan and U.S., 2012-2018

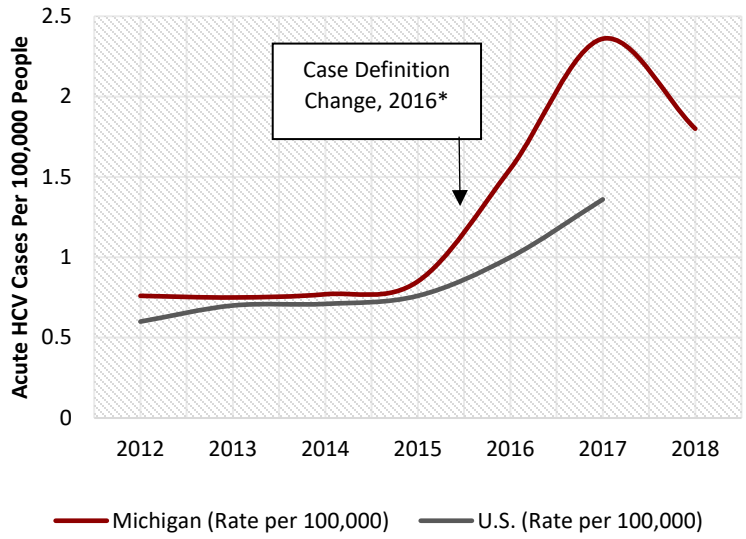


Table 5.1 Incidence of Acute Hepatitis C, Michigan and U.S., 2014-2018

Year	Michigan Cases	Michigan (Rate per 100,000)	U.S. (Rate per 100,000)
2014	76	0.77	0.71
2015	84	0.85	0.76
2016	154	1.55	1.00
2017	234	2.36	1.36
2018	179	1.8	N/A

The number of acute HCV cases in Michigan remained relatively stable from 2012 to 2014 but increased slightly in 2015 before nearly doubling in 2016, increasing rapidly in 2017, and decreasing in 2018. A CDC/CSTE acute HCV case definition change in January 2016 is at least partially responsible for this sharp increase, along with the concurrent HAV outbreak resulting in an increased ordering of hepatitis panels and, in turn, increased HCV detection. Michigan acute HCV infection rates have closely followed published national benchmarks. There are incidence maps of acute HCV by county and local health jurisdiction for 2018 located on page 34.

Figure 5.2 Incidence of Acute Hepatitis C by Gender, Michigan, 2012-2018

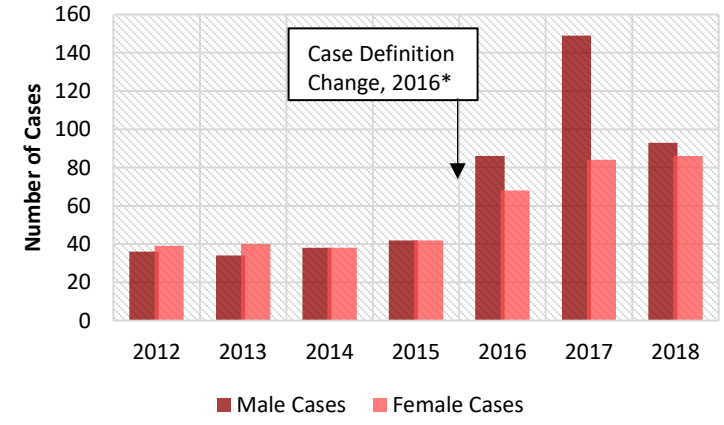


Table 5.2 Incidence of Acute Hepatitis C by Gender in Michigan, 2014-2018

Year	Male Cases	Male Incidence	Female Cases	Female Incidence
2014	38	0.78	38	0.75
2015	42	0.87	42	0.83
2016	86	1.76	68	1.35
2017	149	3.05	84	1.66
2018	93	1.9	86	1.7

Historically, the difference in acute HCV diagnoses between males and females was minimal in 2014 and 2015 but became more substantial from 2016 through 2017. In 2018 the difference in acute HCV diagnoses in males and females decreased from previous years, where males totaled approximately 1.1 more acute HCV diagnoses than females. Again, increases in case counts in 2016-2018 may be related to case counting methodology as a result of the change in case definition, as well as heightened awareness and testing due to the concurrent HAV outbreak in Michigan.

Acute Hepatitis C—Race and Ethnicity

Figure 5.3 Incidence of Acute Hepatitis C by Race and Ethnicity, Michigan, 2012-2018

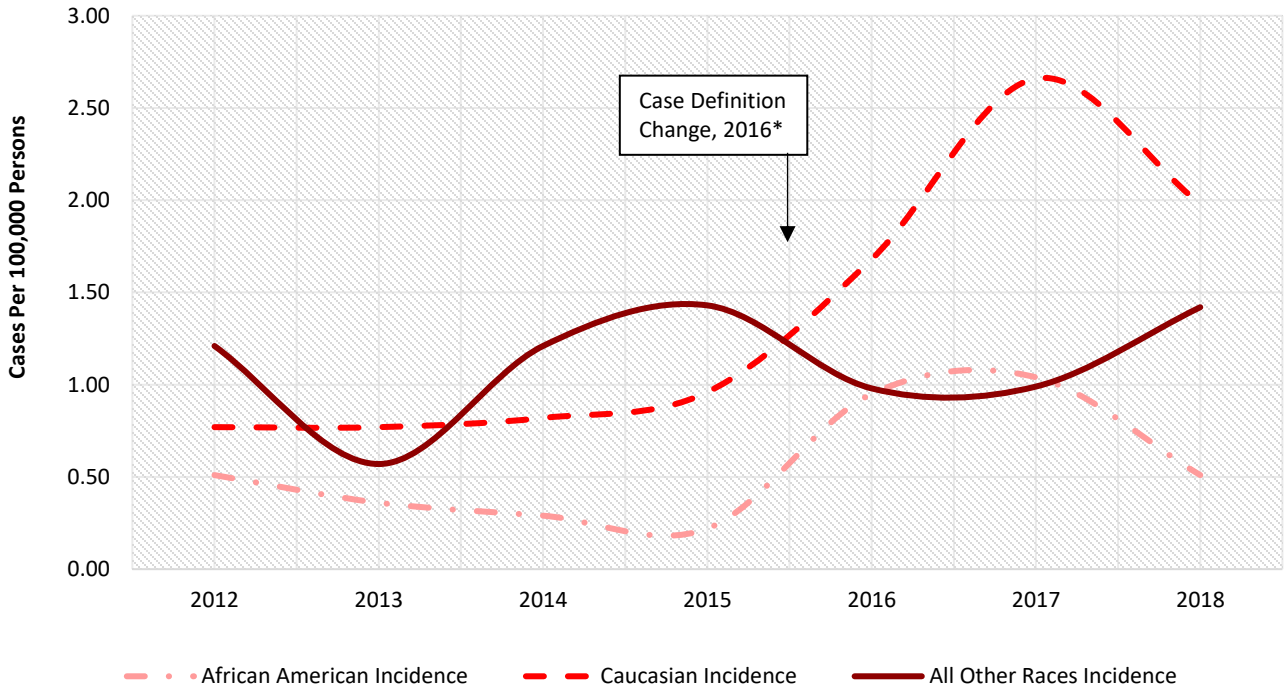


Table 5.3 Incidence of Acute Hepatitis C by Race and Ethnicity, Michigan, 2014-2018

Year	African American	African American Incidence	American Indian or Alaskan Native	American Indian/ Alaskan Native Incidence	Asian	Asian Incidence	Caucasian	Caucasian Incidence	Hispanic	Hispanic Incidence	Other	Other Incidence
2014	4	0.29	2	3.66	0	0.00	62	0.82	3	0.69	1	0.49
2015	3	0.22	2	3.66	1	0.42	73	0.96	5	1.15	1	0.49
2016	13	0.95	1	2.17	1	0.34	126	1.68	1	0.21	3	1.21
2017	14	1.04	1	2.33	1	0.34	199	2.66	8	1.63	1	0.36
2018	7	0.51	2	4.40	3	0.98	148	1.98	9	1.78	2	0.74

Just over 86% of all the acute HCV cases in 2018 were among Caucasians. Caucasians saw an increase from 0.96 cases per 100,000 in 2015 to 1.68 cases per 100,000 in 2016, to 2.66 cases per 100,000 in 2017. There was a decrease in 2018 to 1.98 cases per 100,000. Though Native Americans and Alaskan Natives comprise only a few cases of acute HCV each year, the relatively small population of this group in Michigan results in an incidence rate that is disproportionately high at 4.40 cases per 100,000. It should be noted that increases in case counts in these populations may be a result of the 2016 case definition change and hepatitis A outbreak.

Table 5.4a Completeness of Acute Hepatitis C Reports by Risk Behavior, Michigan, 2018 (n= 179)

Risk Behavior	Completed
Injection Drug User	92%
Used Street Drugs	89%
Hemodialysis	91%
Received Blood Products	90%
Received a Tattoo	89%
Accidental Needle Stick	82%
Contact of Person with Hepatitis C	90%
Other Surgery	83%
Oral Surgery or Dental Work	87%
Employed in Medical Field	90%
Employed as Public Safety Officer	89%
Incarceration Longer than 6 Months	89%
Any Part of Body Pierced (other than ear)	88%

Table 5.4a shows the percentage of acute HCV risk behavior questions that were completed by local health department staff in 2018. A risk behavior was considered completed if the question was marked as 'Yes', 'No', or 'Unknown'. Most questions were answered with a response rate of 88% or higher. This proportion has decreased when compared to the 90% completion percentage from 2017, however they remain are a significant increase from the 83% of case report questions completed in 2015 and a completion percentage of around 75% in 2012 (before viral hepatitis surveillance funding). According to the CDC, the national proportion for completeness of acute HCV case report forms was 47.5% in 2016.

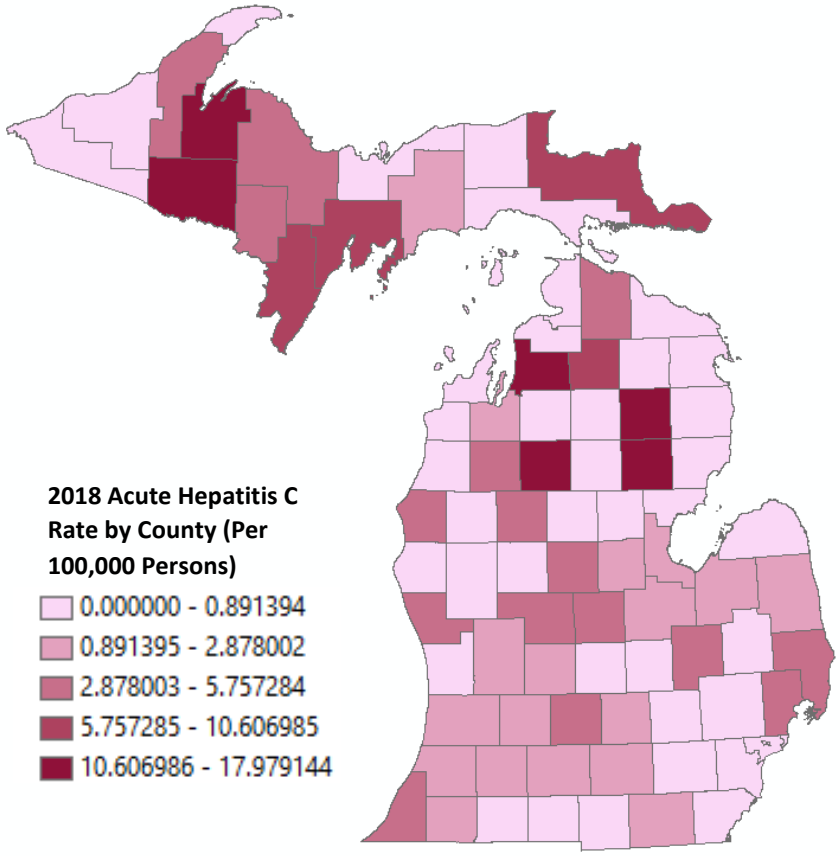
Table 5.4b Response of Completed Acute Hepatitis C Reports* by Risk Behavior, Michigan, 2018

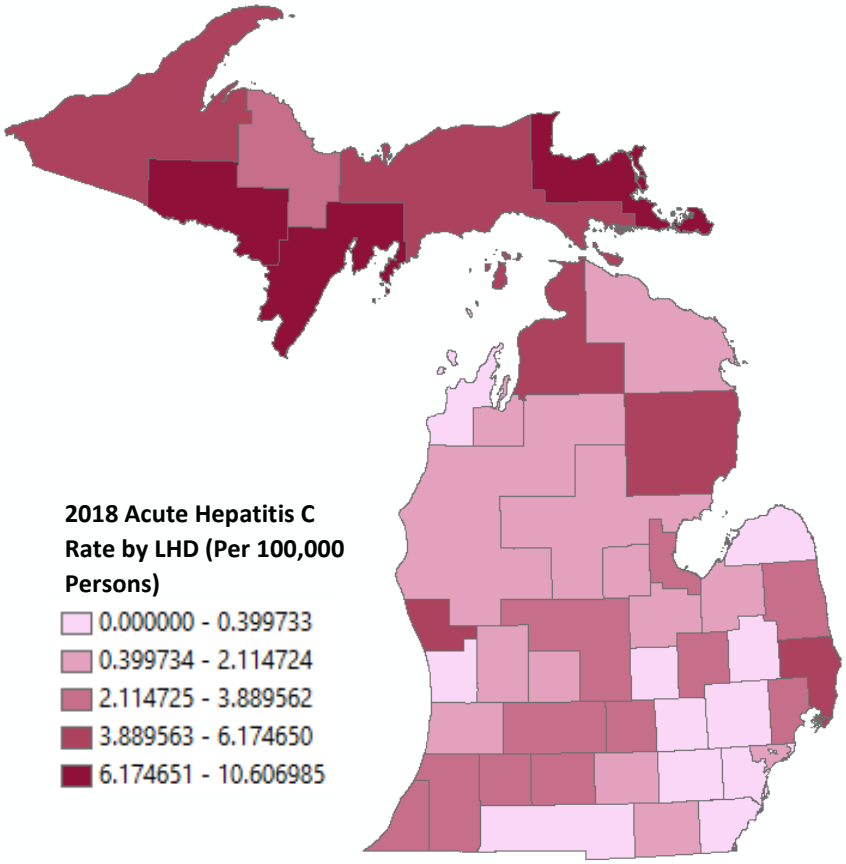
Risk Behavior	Yes*	No*	Unknown*	Yes Responses U.S. Wide 2014
Injection Drug User	56%	24%	21%	68.20%
Used Street Drugs	50%	20%	30%	-
Hemodialysis	2%	69%	29%	0.20%
Received Blood Products	5%	55%	40%	-
Received a Tattoo	26%	28%	46%	-
Accidental Needle Stick	5%	53%	42%	7.70%
Contact of Person with Hepatitis C	26%	19%	52%	-
Other Surgery	14%	43%	44%	12.20%
Oral Surgery or Dental Work	15%	35%	50%	-
Employed in Medical Field	4%	62%	34%	1.00%
Employed as Public Safety Officer	2%	63%	36%	-
Incarceration Longer than 6 Months	31%	25%	44%	-
Any Part of Body Pierced (other than ear)	10%	39%	51%	-

* Percentages calculated based upon those who completed the field; excludes missing data

Table 5.4b shows the responses among the completed questions by risk behavior. Injection drug use stands out as the predominant risk for acquiring HCV infection, as is reported in the literature, and similar to reports from previous years.

Acute Hepatitis C Rate Maps by County and Local Health Jurisdiction





Chronic Hepatitis C

Chronic Hepatitis C—Incidence and Gender

Figure 6.1 Chronic Hepatitis C Cases per 100,000 Persons in Michigan 2012-2018

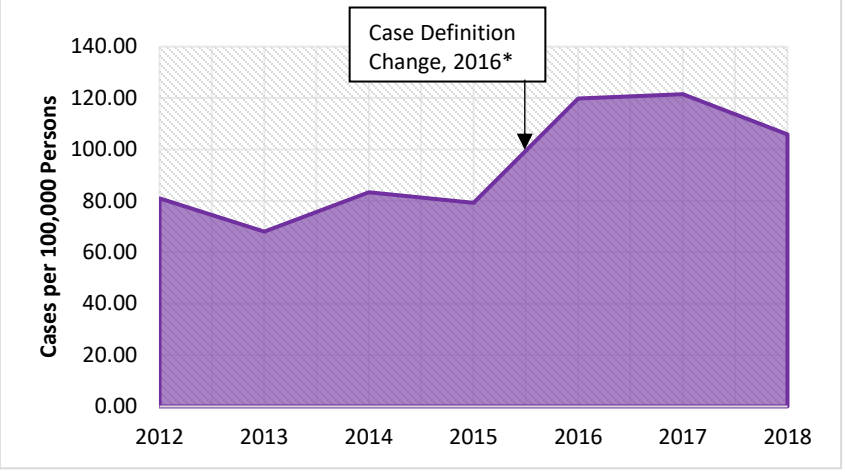


Table 6.1 Chronic Hepatitis C Cases per 100,000 Population in Michigan, 2014-2018

Year	Michigan Cases	Rate per 100,000
2014	8,233	83.30
2015	7,833	79.25
2016	11,883	119.76
2017	12,062	121.49
2018	10,545	105.85

In 2018 the rate of incident chronic HCV infections increased decreased 12.9% from 2017. The trend of newly reported chronic HCV infections remained relatively stable through 2015 but underwent a notable 51.1% increase in 2016 before stabilizing again in 2017, then decreasing again in 2018. A slight decrease in 2013 cases may be due to increased de-duplication efforts and removal of redundant cases by MDHHS Viral Hepatitis Surveillance staff. The 2016 increase may be due to the change in Chronic Hepatitis C case definition. There is no nationally available benchmark for comparing rates of chronic hepatitis.

Figure 6.2 Chronic Hepatitis C Cases per 100,000 Population by Gender in Michigan, 2012-2018

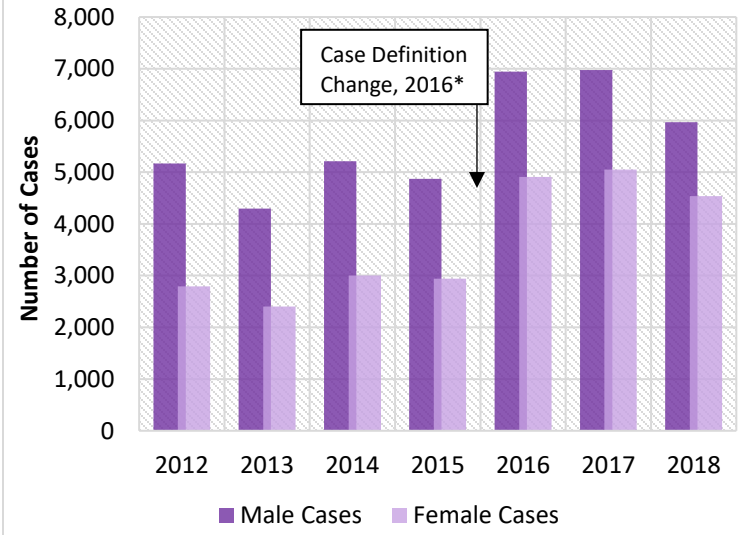


Table 6.2 Chronic Hepatitis C Cases per 100,000 Population by Gender in Michigan 2014-2018

Year	Male Cases	Male Incidence	Female Cases	Female Incidence
2014	5,215	107.57	3,000	59.58
2015	4,873	100.51	2,943	58.44
2016	6,946	142.42	4,906	97.23
2017	6,973	142.80	5,054	100.18
2018	5,969	121.64	4,540	89.81

Males account for the majority of chronic hepatitis C cases reported each year since 2012. In 2018, the rate of chronic hepatitis C reports was over 1.35 times higher in males than females. The marked increase in chronic cases reported in 2016 is likely representative of the change in the national HCV surveillance case definition.

Chronic Hepatitis C—Race and Ethnicity

Figure 6.3 Chronic Hepatitis C Cases per 100,000 by Race and Ethnicity in Michigan, 2012-2018

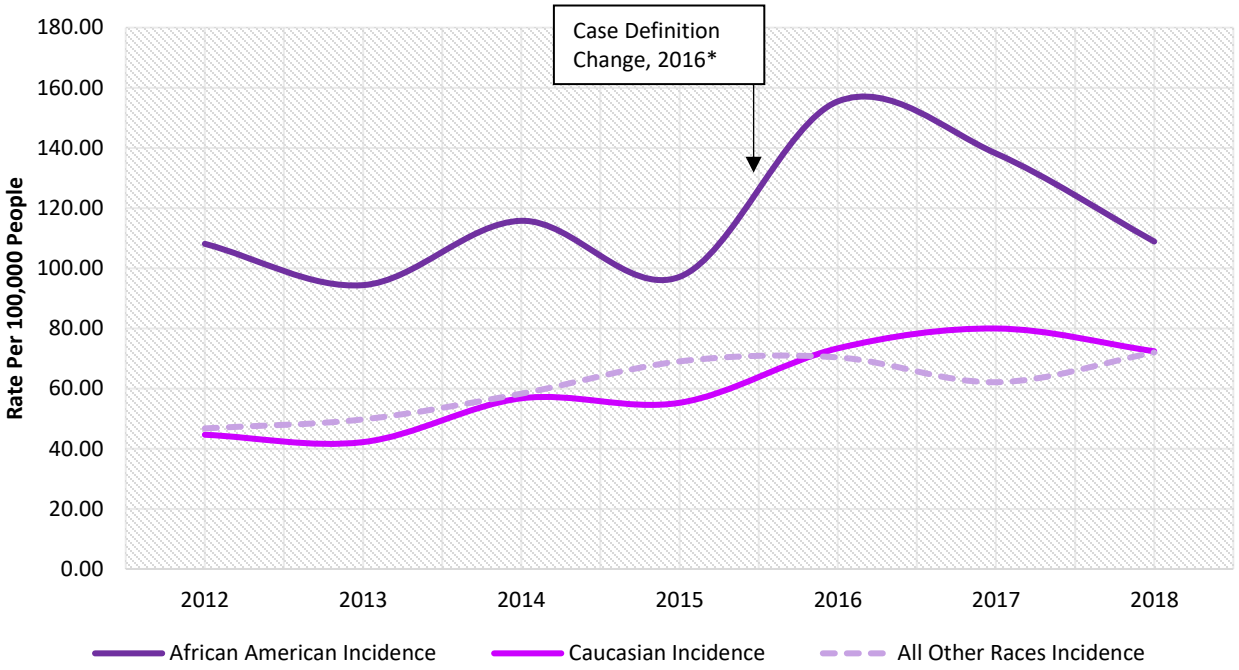


Table 6.3 Chronic Hepatitis C Cases per 100,000 by Race and Ethnicity in Michigan, 2014-2018

Year	African American	African American Incidence	American Indian / Alaskan Native	American Indian / Alaskan Native Incidence	Asian	Asian Incidence	Caucasian	Caucasian Incidence	Hispanic	Hispanic Incidence	Other	Other Incidence
2014	1,602	115.77	67	122.56	45	19.03	4,296	56.75	167	38.27	108	53.35
2015	1,344	97.13	86	157.32	44	18.61	4,183	55.26	144	33.00	136	67.18
2016	2,119	155.46	69	149.82	51	17.45	5,492	73.36	213	43.83	175	70.35
2017	1,861	138.15	99	230.67	62	21.28	5,977	79.96	231	47.01	295	105.12
2018	1,480	108.88	100	220.16	50	16.32	5,413	72.40	202	40.05	459	169.80

In 2018, American Indian/Alaskan Natives had the highest rate of chronic HCV infection (220.16 per 100,000) and are disproportionately affected compared to other racial groups. Increases in case counts and rates between 2015 and 2016-2018 may be the result of the change in the national HCV case definition.

Chronic Hepatitis C—Risk Behaviors

Table 6.4a Completeness of Chronic Hepatitis C Reports by Risk Behavior, Michigan, 2018 (n = 10,545)

Risk Behavior	Completed
Received Blood Transfusion Prior to 1992	54%
Received an Organ Transplant Prior to 1992	54%
Received Clotting Factor Concentrates Prior to 1992	54%
Hemodialysis	54%
Injection Drug User	56%
Incarcerated in Lifetime	54%
Treated for a Sexually Transmitted Disease in Lifetime	53%
Contact of Person with Hepatitis C	54%
Employed in Medical Field	54%

Table 6.4a shows the percentage of chronic hepatitis C risk behavior questions completed by local health department staff in 2018. A risk behavior was considered completed if the question was marked as 'Yes', 'No', or 'Unknown'. Most chronic hepatitis C epidemiologic information questions were completed on 54% of case reports. This proportion has decreased when compared with recent years. In 2012, before viral hepatitis surveillance funding, the chronic HCV risk factor completeness was less than 30%. There is no national comparison for completion of chronic hepatitis C case report forms.

Table 6.4b shows the responses among the completed questions by risk behavior. Injection drug use, incarceration, and being a contact of a person with hepatitis C were the most common risk behaviors associated with chronic hepatitis C.

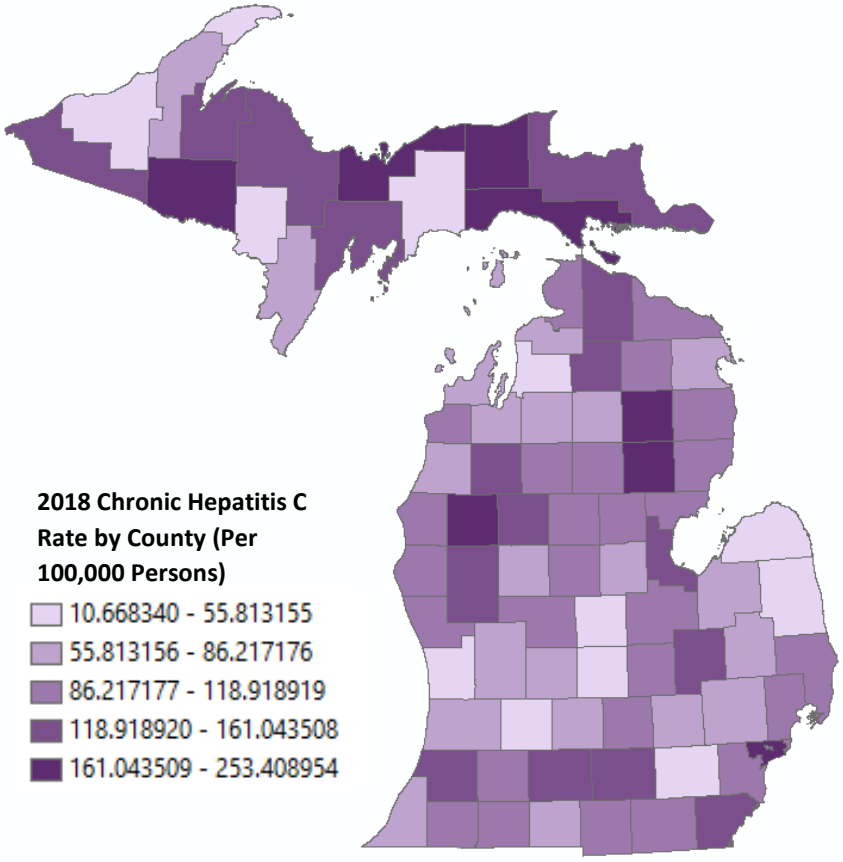
Table 6.4b Response of Completed Chronic Hepatitis C Reports* by Risk Behavior, Michigan, 2018

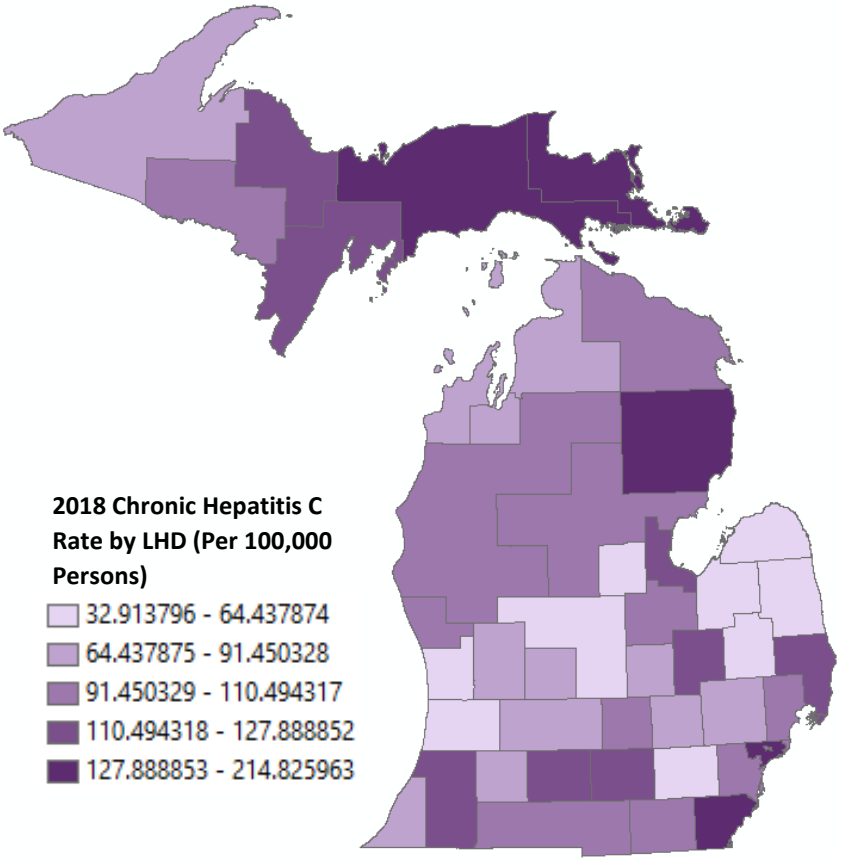
Risk Behavior	Yes*	No*
Received Blood Transfusion Prior to 1992	8%	92%
Received an Organ Transplant Prior to 1992	0%	100%
Received Clotting Factor Concentrates Prior to 1992	1%	99%
Hemodialysis	1%	99%
Injection Drug User	62%	38%
Incarcerated in Lifetime	61%	39%
Treated for a Sexually Transmitted Disease in Lifetime	29%	71%
Contact of Person with Hepatitis C	52%	48%
Employed in Medical Field	10%	90%

* Percentages calculated based upon those who completed the field; excludes missing/unknown data

Note: Risk factors and responses are not mutually exclusive

Chronic Hepatitis C Rate Maps by County and Local Health Jurisdiction





Hepatitis C Testing & Treatment

Hepatitis C—Testing and Genotype Data

Figure 7.1 CDC Recommended Testing Algorithm for Hepatitis C Virus Infection

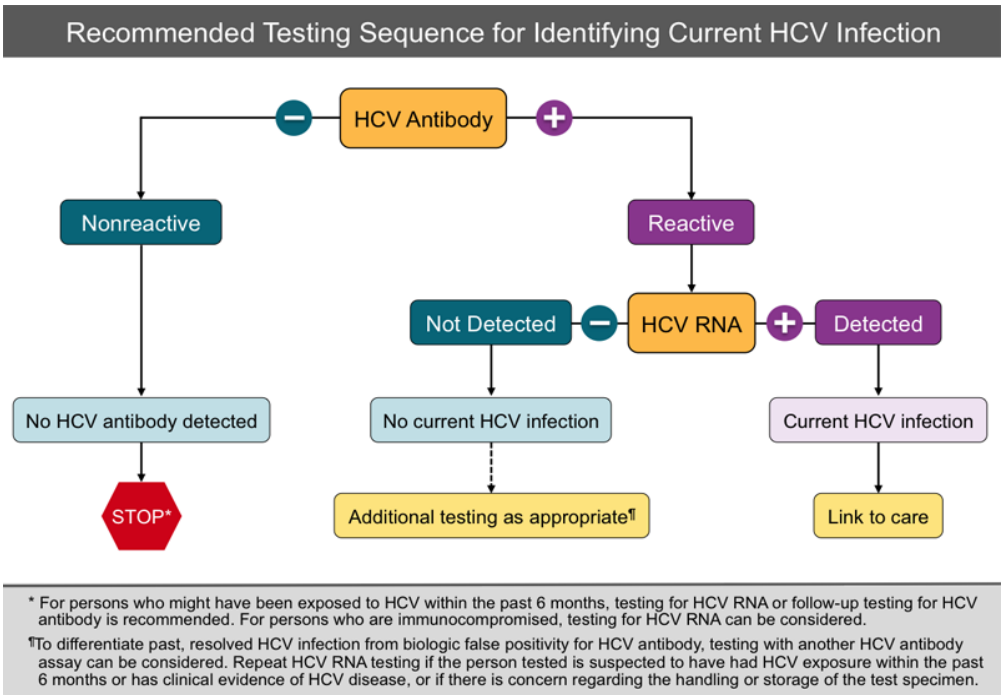
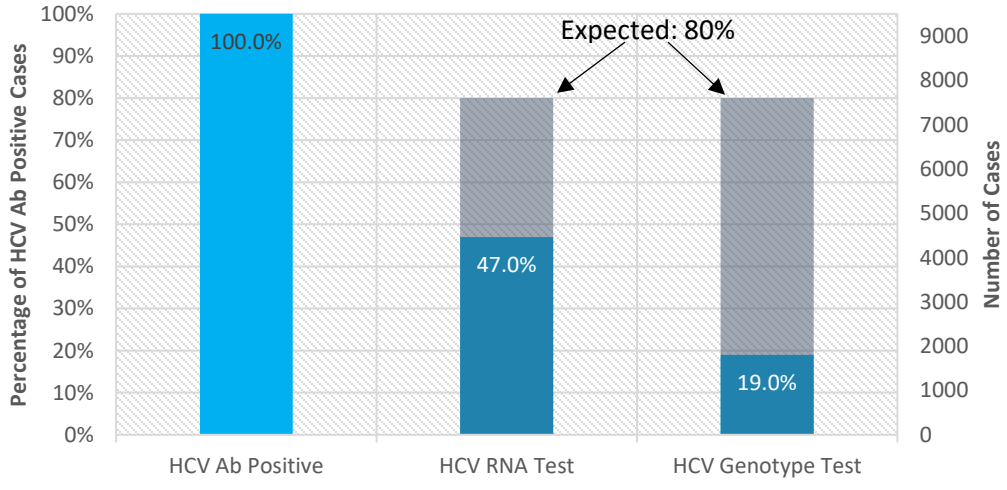


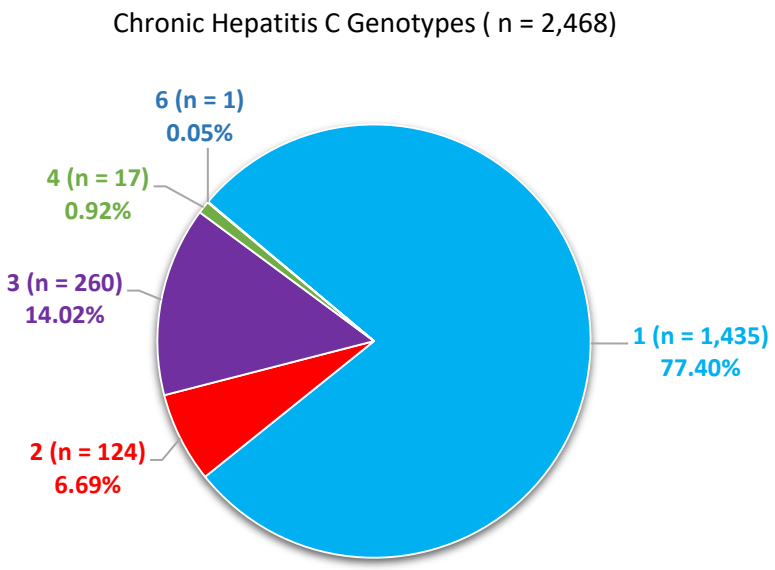
Figure 7.2 Number and Percentage of HCV Antibody Positive Cases with an HCV RNA or HCV Genotype Test, 2018



Of the 10,724 cases of acute, chronic, and perinatal HCV reported in Michigan in 2018, 9,749 (91%) cases were reported with a positive HCV antibody result. Of those cases, 47% were reported with positive HCV RNA test and even fewer (19%) were reported with genotype results. Negative HCV RNA tests are not reportable in Michigan. Since 20-25% of persons exposed to HCV clear infection, we would expect 75-80% of those with a positive HCV antibody to have a positive HCV RNA test, if the testing algorithm is being followed by all providers. These data suggest a gap in getting HCV antibody positive patients confirmatory testing and genotype testing which indicates engagement in follow-up for treatment.

All patients with a positive HCV RNA test should have a genotype test performed to help direct HCV treatment as some regimens are indicated for certain genotypes. Of the patients reported to MDSS with a positive HCV antibody, there was evidence of only 19% receiving an HCV genotype test, suggesting that many patients are not yet being evaluated for HCV therapy.

Figure 7.3 Prevalence of Genotypes of Chronic Hepatitis C Cases Reported, Michigan, 2018



A total of 1,802 chronic HCV patients had a genotype result reported to MDHHS in 2018. Of these, 79.63% were reported with genotype 1 infection (75.41% were subtype 1a and 16.66% were subtype 1b). Genotypes 3 and 2 made up the majority of non-genotype 1 specimens. The remaining specimens were either genotype 4 or 6, which made up 1% of all genotyped specimens in 2018.

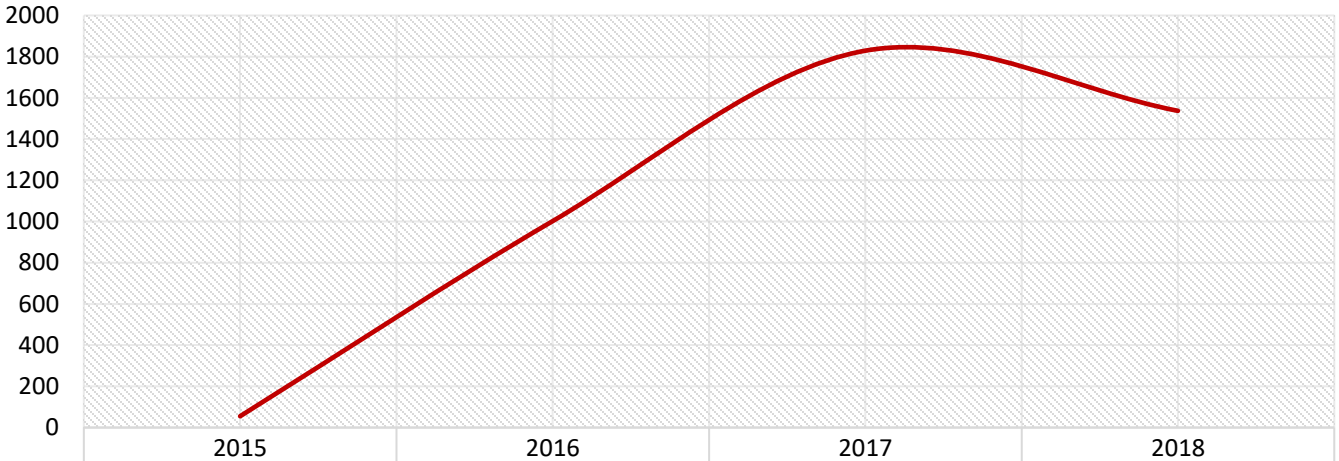
This pattern of genotypes is consistent with the expected annual proportions in Michigan. The data is also consistent with the national distribution, as the predominant genotypes nationwide are 1a, 1b, 2a, 2b, and 3a.

Viral Hepatitis Medicaid Data

There has been an explosion of new drugs approved to treat HCV over the last few years. In many instances, these direct acting antivirals can effectively cure a patient of their HCV infection, greatly reducing the risk of cirrhosis, hepatocellular carcinoma, and death. However, as previously described patients often need to go through a cascade of testing in order to have an HCV medication prescribed.

Figure 7.4 looks at the number of Michigan Medicaid patients prescribed various HCV treatments from 2015 to 2018. Recent data shows the Michigan Medicaid/CHIP covers approximately 2.3 million persons. With an estimated 1-2% HCV infection rate in the population, there would be 23,000-46,000 Medicaid insured persons with HCV infection. According to these data, with 4,423 unique persons treated for HCV, approximately 9-19% of the HCV-infected Medicaid population has been prescribed an HCV direct-acting antiviral. Again, the data suggest that increased efforts to test and treat HCV infection are needed to help reduce risk of future morbidity and mortality associated with chronic HCV infection. It is encouraging to see more patients being prescribed HCV medications and this trend is likely to continue as Medicaid reduces restrictions on HCV prior authorizations.

Figure 7.4 Total Number of Medicaid Members with Prescriptions, by Medication, 2015-2018



	2015	2016	2017	2018
Daklinza		68	4	
Epclusa		90	360	431
Harvoni	38	714	1191	578
Mavryet		1	67	462
Olysio	1			
Sovaldi	15	87	4	1
Technivie		1	3	
Viekira Pak	1	18	39	1
Vosevi			26	23
Zepatier		23	135	41
Grand Total	55	1002	1829	1537

Bureau of Labs (BOL) Hepatitis C Testing

The MDHHS Bureau of Laboratories (BOL) has historically performed testing for HCV antibody. In 2014, the virology lab began performing HCV RNA testing for all specimens testing positive for HCV antibody in recognition of CDC's HCV testing algorithm. The data below look at the number of tests conducted by the BOL, positivity rates, and the demographic characteristics of patients tested.

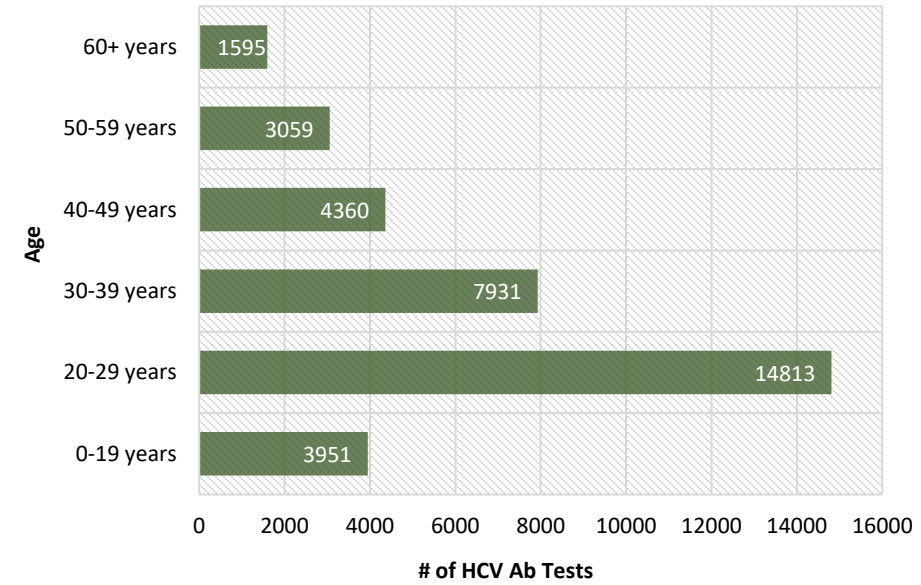
Some samples were deemed "unsatisfactory" because of poor shipping, packaging, or labeling and therefore not tested.

Table 7.1 BOL HCV Antibody Tests, 2014-2018

Year	# of Samples Tested	# of Unsatisfactory or Not Tested	# Negative	# Positive	% Positive
2014	3321	26	2935	286	8.88%
2015	3351	25	3156	195	5.82%
2016	6252	33	5975	277	4.43%
2017	7130	46	6849	281	3.94%
2018	8054	51	7683	320	3.97%

The number of HCV antibody tests conducted by the MDHHS BOL has remained relatively steady from 2014-2015. In 2016 there were approximately twice as many HCV screening tests performed compared to previous years. Testing continued to increase in 2017 and 2018, as MDHHS is continually engaged in efforts to increase HCV testing through BOL. HCV Ab positivity rates have continued to hover around 4-5%.

Figure 7.5 All HCV Antibody Tests by Age, 2012-2018



Of the 35,709 HCV Ab tests ran from 2012-2018, the majority of individuals tested were between 20-29 years old. The smallest proportion of tests were found amongst those 60 years of age and older, making up only 4% of all individuals tested for HCV Ab.

Table 7.2 BOL HCV PCR Testing, 2014-2018

Year	# of Samples Tested	# of Unsatisfactory or Not Tested	# Negative	# Positive	% Positive
2014	245	41	79	166	67.76%
2015	168	27	65	103	61.31%
2016	378	15	222	154	40.96%
2017	270	13	127	143	52.96%
2018	320	16	147	157	49.06%

Figure 7.6 BOL HCV PCR Testing by Year, 2014-2018

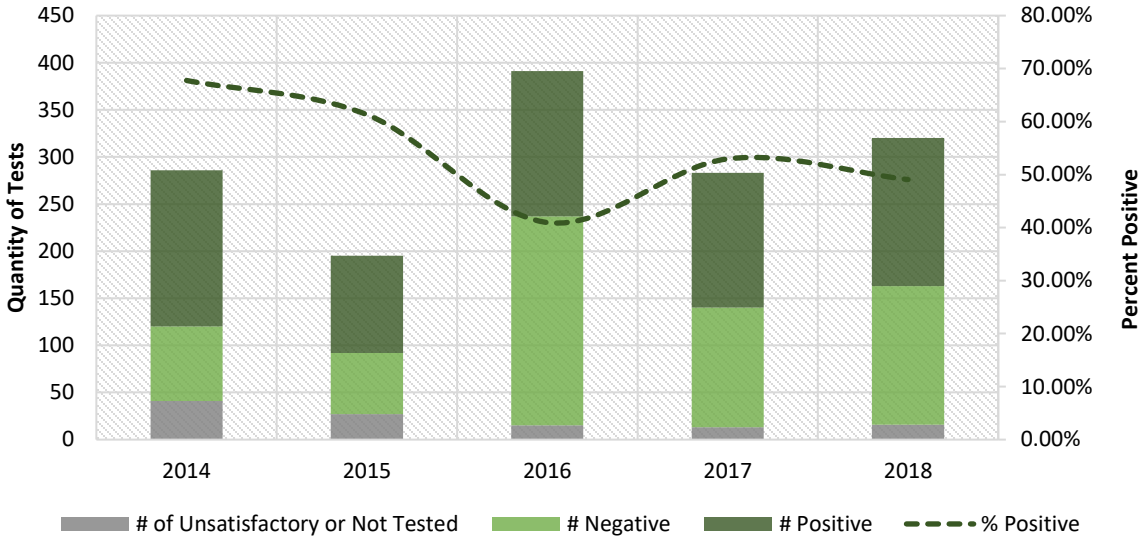
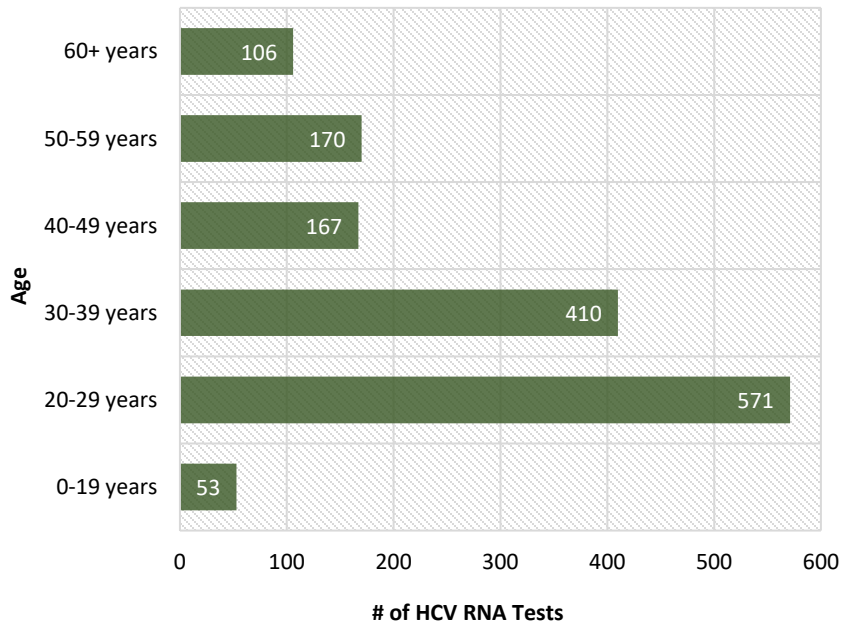


Figure 7.7 All HCV RNA Tests Stratified by Age, 2014-2018



The number of PCR tests conducted by the BOL has fluctuated from 2014 through 2018, with numbers in 2018 to a total of 320 tests analyzed. The percentage of tests that yielded positive results decreased from 61.3% in 2015 to 49.1% in 2018.

The number of HCV RNA tests and the positivity rate in 2016 as well as 2018 is likely the result of an increase in specimen submission from lower risk groups.

Of the 1,477 HCV RNA tests ran by BOL from 2014-2018, 38.7% of individuals were 20-29 years old. The smallest proportion of tests were found amongst those 0-19 years old (3.6%) and those 60 years of age and older (7.2%).

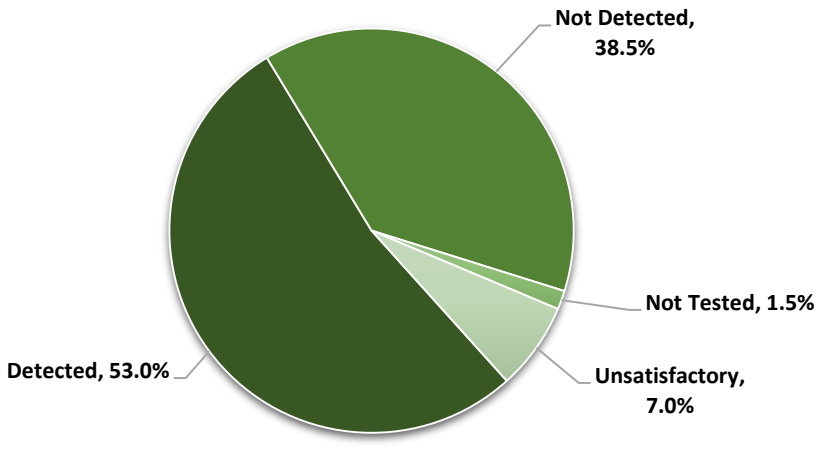
Table 7.3 BOL Patient Demographics for Patients Testing HCV Antibody/RNA Positive 2014-2018

Variable	n	%
N	1,342	
Sex		
Male	804	59.9%
Female	521	38.8%
Unknown	17	1.3%
Race		
American Indian/Alaskan Native	7	0.5%
Asian	4	0.3%
Black or African American	203	15.1%
Native Hawaiian/ Pacific Islander	1	0.1%
White or Caucasian	999	74.4%
Multiracial	6	0.4%
Other	17	1.3%
Unknown	107	8.0%
Age		
0-19	43	3.2%
20-29	515	38.4%
30-39	374	27.9%
40-49	155	11.5%
50-59	156	11.6%
60+	99	7.4%

There were 1,342 patients who tested positive for HCV antibody and/or RNA at BOL between 2014-2018. Just over half (59.9%) of individuals who tested positive were male. The majority (74.4%) of those who were positive were Caucasian, which was much higher than African Americans who only comprised 15.1% of positive test results. In addition, 38.4% of individuals who tested positive were 20-29 years old. This is much higher than the baby boomer population, which only accounted for about 11.6% of positive test results.

Many of our specimen submitters are local health department health clinics. These data may be indicative of the patient population who often utilizes local health departments for health services.

Figure 7.8 PCR Test Results following a Positive HCV Antibody Test 2014-2018

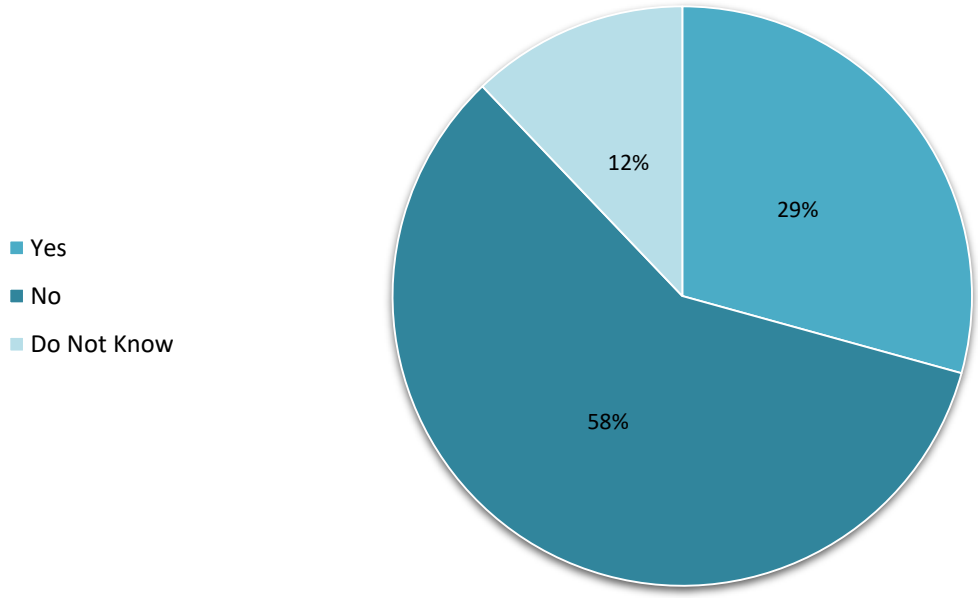


Of the 1,342 positive HCV screen tests, just over half (53.0%) had a positive PCR test result. About one-third of positive HCV screen tests were negative by PCR (38.5%).
Specimens are required to be shipped cold to be tested for HCV RNA. Any specimen not shipped cold would have unsatisfactory for HCV RNA testing.

Hepatitis C—MI Behavioral Risk Factor Survey Data

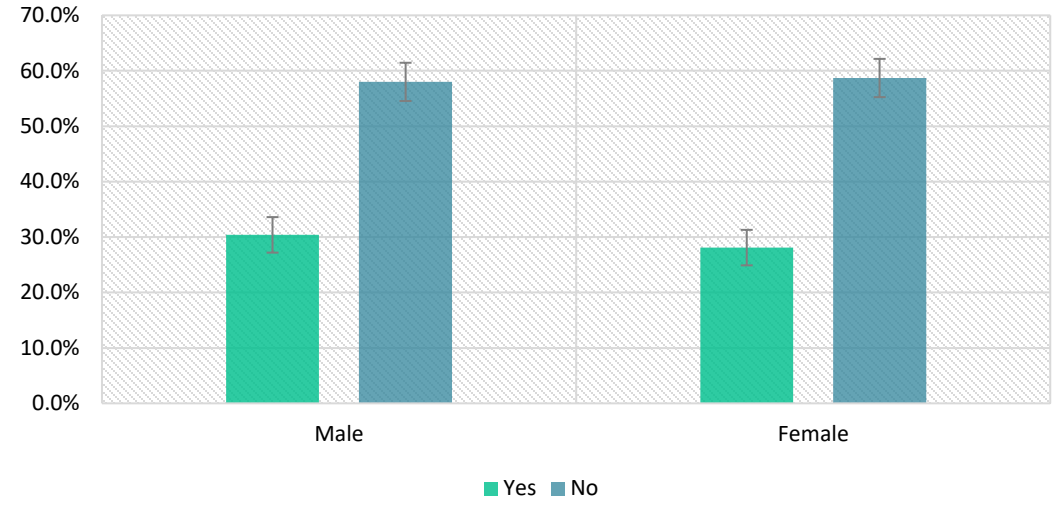
The Michigan Behavioral Risk Factor Surveillance System (MiBRFSS) is composed of annual, state-level telephone surveys of Michigan residents, aged 18 years and older. These annual state-level surveys also known as Michigan Behavioral Risk Factor Surveys (MiBRFS) act as the only source of state-specific, population-based estimates of the prevalence of various behaviors, medical conditions, and preventive health care practices among Michigan adults. The MDHHS Viral Hepatitis Unit added the question "Have you ever been tested for Hepatitis C Virus?" to the 2016 MIBRFS to determine demographic and behavioral factors associated with HCV testing. Data collected from the MiBRFS in 2016 (N=3,648) was stratified based on HCV testing status and analyzed by various socio-demographic and behavioral factors.
We hope to monitor trends in these data over time to determine if HCV testing is increasing. In addition, the information provided will help us develop targeted strategies to increase HCV testing.

Figure 8.1 MiBRFS "Have You Ever Been Tested for HCV?", 2016 (n=3,648)



A total of 2,689 participants responded to the question "Have you ever been tested for HCV" in the 2016 MiBRFS. Of these participants, 1,037 (29%) reported ever being tested for HCV while over half (58%, 2,159 participants) of respondents had never been tested for HCV. Not everyone is recommended to be tested for HCV. HCV testing is recommended for persons with a known HCV risk factor and those born between 1945 and 1965. When compared to the 2015 iteration of this survey, these results are nearly identical, only differing by a 1% decrease in the "Do Not Know" category.

Figure 8.2 MiBRFS "Ever tested for HCV?" by Sex, 2016



Ever being tested for HCV did not vary significantly between males and females who responded to the survey.

Table 8.1 MiBRFS "Ever tested for HCV?" by Race, 2016

Race	Yes	No
Caucasian	27.20% (25.0-29.5)	59.90% (57.5-62.3)
African American	39.90% (33.1-47.2)	50.40% (43.1-57.7)
Other/Multi-racial	44.60% (31.8-58.3)	44.30% (31.1-58.5)
Hispanic	25.80% (17.1-37.1)	65.10% (53.2-75.4)

Caucasians were less likely to have reported being tested for HCV (26.4%) compared to other racial groups. Hispanics were the most likely to have reported being tested (52.1%) compared to Caucasians and African Americans.

Table 8.2 MiBRFS "Ever tested for HCV?" by Age, 2016

Age	Yes	No
18-49 years	32.40% (29.2-35.9)	54.10% (50.4-57.6)
50-70 years	30.60% (27.7-33.6)	59.20% (56.0-62.2)
71+ years	12.90% (10.3-16.1)	73.50% (69.3-77.3)

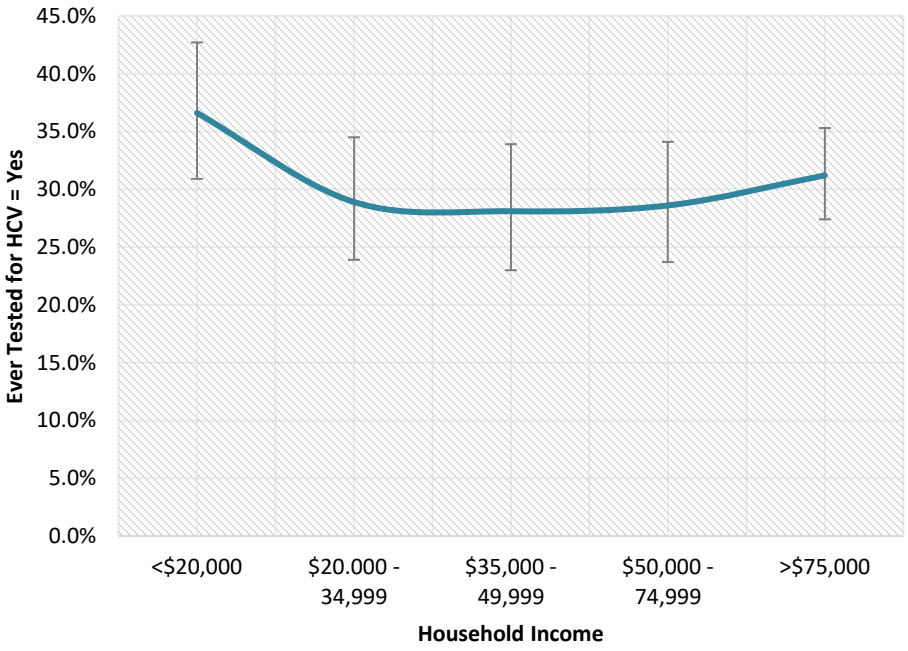
"Baby Boomers", persons approximately 50 to 70 years old at the time of the survey, were less likely to have reported ever being tested for HCV than those less than 50 years old (30.6% compared to 32.4%). Those over 70 years old were the least likely to report ever being tested for HCV (12.9%).
Future HCV screening campaigns may want to focus on the Baby Boomer birth cohort screening recommendation.

Table 8.3 MiBRFS "Ever tested for HCV?" by Insurance Type, 2016

	Private	Medicaid	Medicare	Healthy Michigan	Medicaid + Medicare	None
Yes	30.20% (27.4-33.1)	37.00% (29.1-45.7)	21.90% (18.6-25.5)	39.40% (27.2-53.0)	43.40% (33.0-54.4)	23.80% (17.3-31.9)
No	56.50% (53.4-59.6)	52.60% (44.0-61.1)	66.50% (62.6-70.2)	49.20% (36.2-62.3)	49.70% (39.3-60.1)	61.30% (51.9-69.9)

Not having insurance or having public insurance is often seen as a barrier to receiving HCV testing. However, according to the BRFSS survey, persons with Medicaid were more likely to be tested for HCV than those with private insurance. Of the public insurance options, members of both Medicare and Medicaid were the most likely to have ever been tested for HCV (43.4%). The proportion of persons with private health insurance that were tested for HCV (30.2%) was lower than public insurance, but higher than the uninsured population (23.8%). When compared to survey results from 2015 the Medicaid population that was tested for HCV decreased by nearly 23% while the other categories remained stable.

Figure 8.3 MiBRFS Ever tested for HCV? by Household Income, 2016

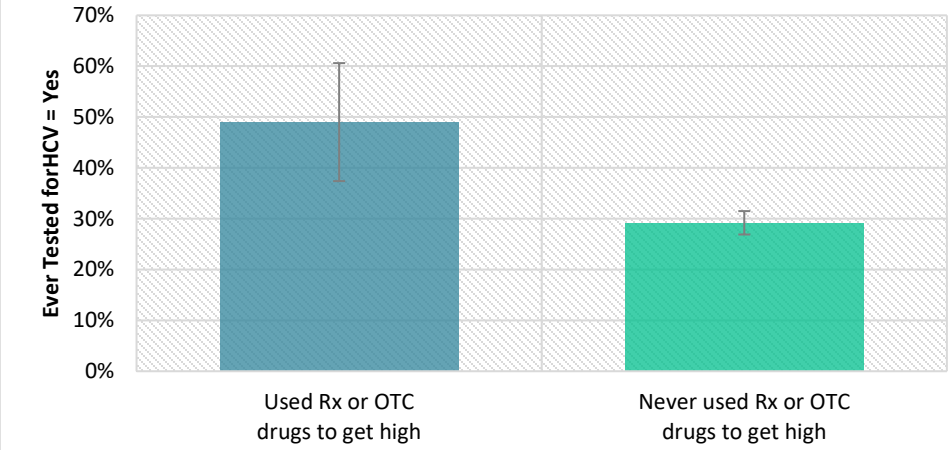


It is thought that those with lower income experience significant barriers to receiving diagnostic testing services.

However, according to the survey data, there was an inverse correlation between household income and likelihood of ever being tested for HCV. As household income increased, respondents became less likely to have been tested for HCV.

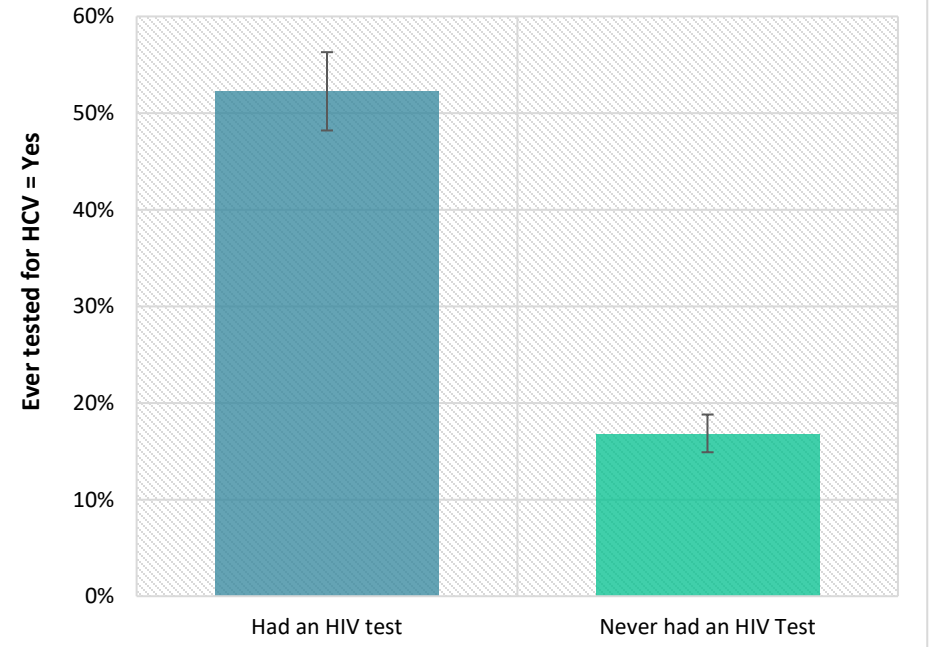
This might suggest that persons with higher income are less likely to have risk factors for HCV exposure compared to those with lower income and therefore are not indicated for HCV testing. But it also indicates that low income may not be a major barrier to HCV testing as the perception would suggest.

Figure 8.4 MiBRFS Ever been tested for HCV? by use of Prescription (Rx) or Over-the-counter (OTC) Drugs to get High, 2015



We have previously discussed the relationship between prescription opioid abuse, heroin use, and the risk of bloodborne pathogen transmission when sharing injection drug use equipment. These data show that those who reported ever "abusing" Rx or OTC drugs were more likely to have ever been tested for HCV (49% vs. 29%). Note that this data was not reported in the 2016 MiBRFSS.

Figure 8.5 MiBRFS Ever tested for HCV? by History of being tested for HIV, 2016



HIV and HCV share modes of transmission and many patients have risk factors for both HIV and HCV.

These data show that individuals who had an HIV test were more likely to have ever been tested for HCV than those who never had an HIV test. Of the persons surveyed who had an HIV test, 53% reported also being tested for HCV while only 19% of those that never had an HIV test had ever been tested for HCV.

The information suggests that co-location of HIV and HCV testing services may help increase HCV screening.

Focus Populations

Adults Under Forty (18-39 years of age)

Figure 9.1 Number of Chronic Hepatitis C Cases Reported to MDHHS by Year of Birth, 2018

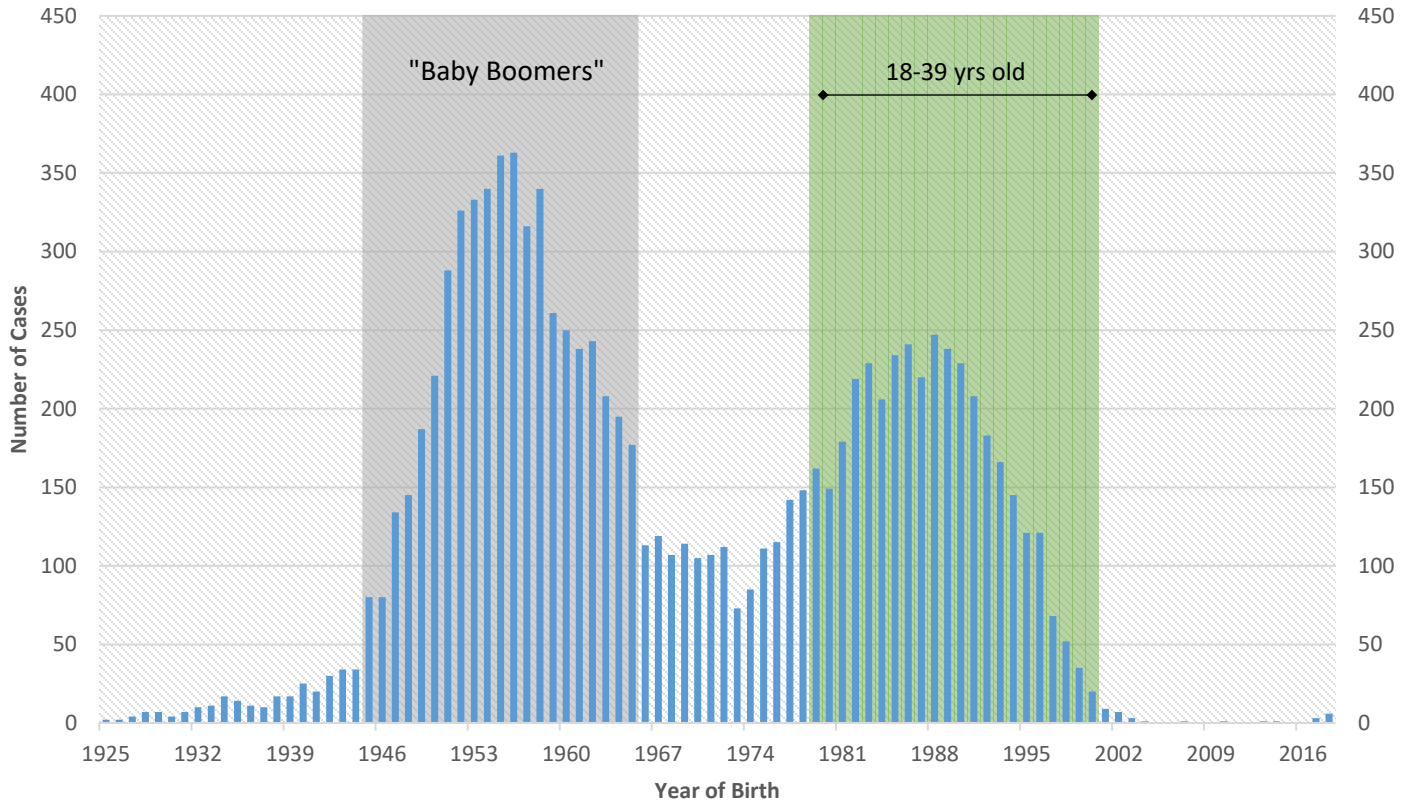


Figure 9.1 depicts the number of chronic HCV cases reported to MDHHS by birth year in 2018. “Baby Boomers”, those born between 1945 and 1965, are five times more likely than other adults to be infected with HCV according to national statistics. CDC now recommends one-time HCV testing of everyone born between 1945 and 1965. MDHHS data shows that the number of new chronic HCV diagnoses in persons born between 1945 and 1965 is the largest of any other birth cohort.

However, in recent years a second ‘peak’ of new chronic HCV diagnoses has developed in adults aged approximately 18-39. An emerging epidemic of HCV in adults under forty has been identified in areas across the US and in Michigan. The primary driver of this increase in HCV cases is sharing of injection drug equipment and works related to the concurrent opiate and heroin epidemics. For more information please see the next section.

Figure 9.2 Number of Chronic Hepatitis C Cases Reported to MDHHS by Year, 18-39 Years of Age, 2000-2018

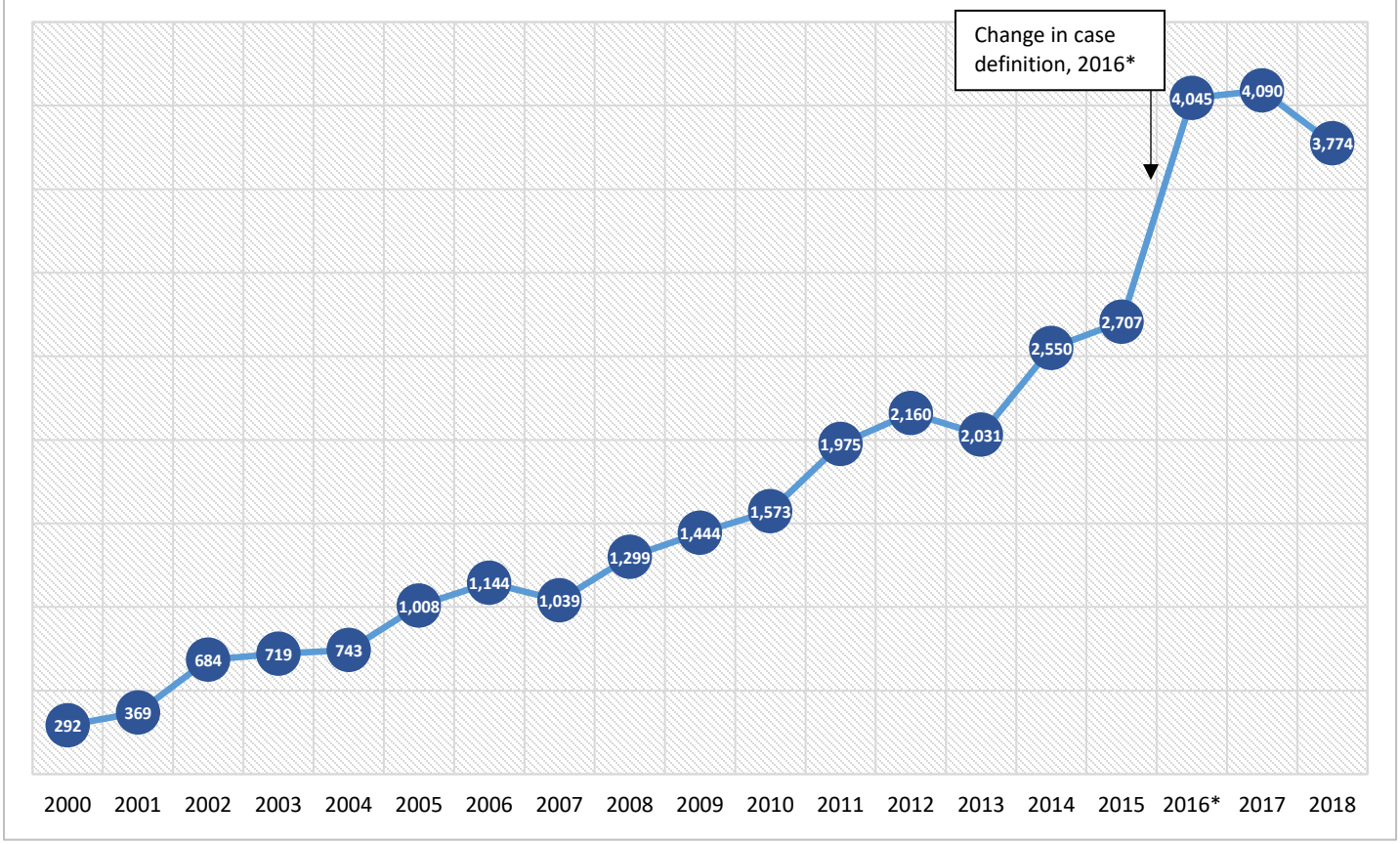


Table 9.1 Number and Percentage of Chronic Hepatitis C cases reported to MDHHS aged 18-39, 2009-2018

	2009	2010	2011	2012	2013	2014	2015	2016*	2017	2018
Total Cases	7,732	7,214	8,006	7,967	6,703	8,233	7,833	11,883	12,062	10,545
Number of Cases 18-39 Years Old	1,444	1,573	1,975	2,160	2,031	2,550	2,707	4,045	4,090	3,774
Percentage of Total Cases	19%	22%	25%	27%	30%	31%	35%	34%	34%	36%

Since 2000, the number of new HCV diagnoses among persons 18 to 39 years of age have increased every year, with the exception of 2013 and 2018 (Figure 9.2). More specifically, the number of cases has increased 200% between 2000 and 2018. The dramatic rise in new HCV diagnoses in this population from 2015 to 2016 can be largely explained by a change in the case definition. Table 9.1 shows that the proportion of all reported cases that were between the ages of 18 and 39 has been increasing over the past decade.

Table 9.2 Epidemiologic Summary of 2017 Chronic HCV Cases Aged 18-39 Years Old

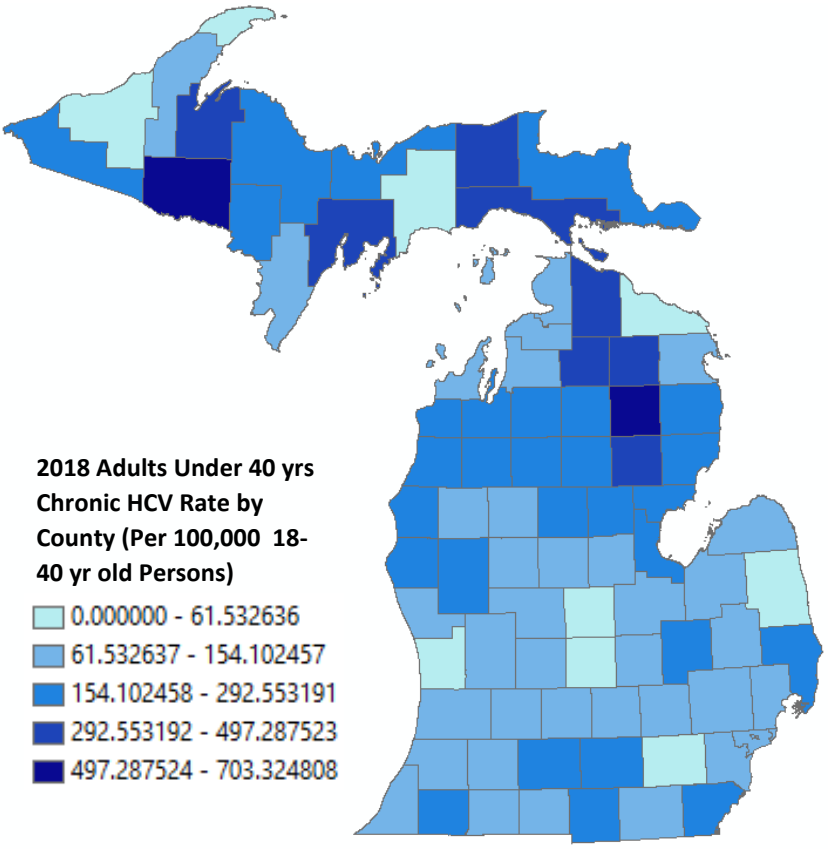
Age (n = 3,774)		
Median	30	
Mean	30.02	
Range	18 - 39	
Sex (n = 3,759)		**Rate per 100,000**
Female	1,776 (47.2%)	127.36
Male	1,983 (52.8%)	138.40
Race (n = 2,776)		**Rate per 100,000**
White	2,476 (89.2%)	112.79
Black	228 (8.2%)	48.07
American Indian	56 (2.0%)	191.07
Asian	16 (0.6%)	12.01
Hispanic Ethnicity (n = 2,270)		**Rate per 100,000**
Hispanic or Latino	97 (4.3%)	55.22
Not Hispanic or Latino	2,173 (95.7%)	81.80
Arab Ethnicity (n = 1,387)		**Rate per 100,000**
Arab Ethnicity	4 (0.3%)	Not Available
Non-Arab	1,383 (99.7%)	Not Available
History of IVDU (n = 1,580)		
Yes	1,294 (81.9%)	
No	286 (18.1%)	

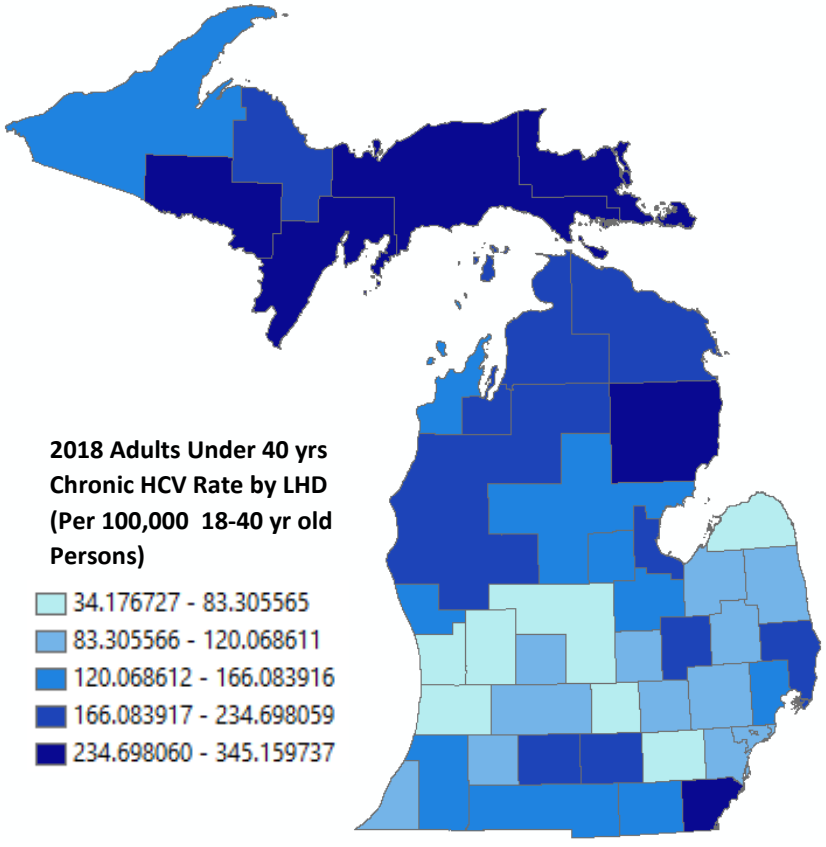
Previous studies conducted by MDHHS have shown injection drug use as the primary risk factor for HCV acquisition among those aged 18-39 years old. In many instances these clients reported sharing needles, syringes, and other injection drug works (such as cookers and cotton) which could have acted as vectors for HCV transmission. Increases in indicators of heroin and opioid use (see subsequent pages) are correlated with the rise in HCV cases in the 18-39 year old population (i.e. more substance use leading to more HCV transmission).

A demographic breakdown of the chronic HCV cases aged 18-39 years old who were diagnosed in 2018 (Table 9.2) shows that the vast majority were white, non-Hispanic, and non-Arab with an approximately even distribution of males and females. Where injection drug use information was available on these patients, 82.0% reported a history of IVDU.

Maps of the rates of 2018 chronic HCV cases among 18-39 year olds, 2018 heroin treatment admissions, and 2017 non-heroin opioid overdose deaths and heroin overdose deaths by county and local health jurisdiction can be found in the subsequent pages.

Adults Under Forty (18-39 years old) HCV Case Rate Maps by County and Local Health Jurisdiction





Drug Poisoning and Drug Treatment Data

Figure 10.1 Number Heroin Substance Abuse Treatments Admissions and Deaths in Michigan, 2000-2018

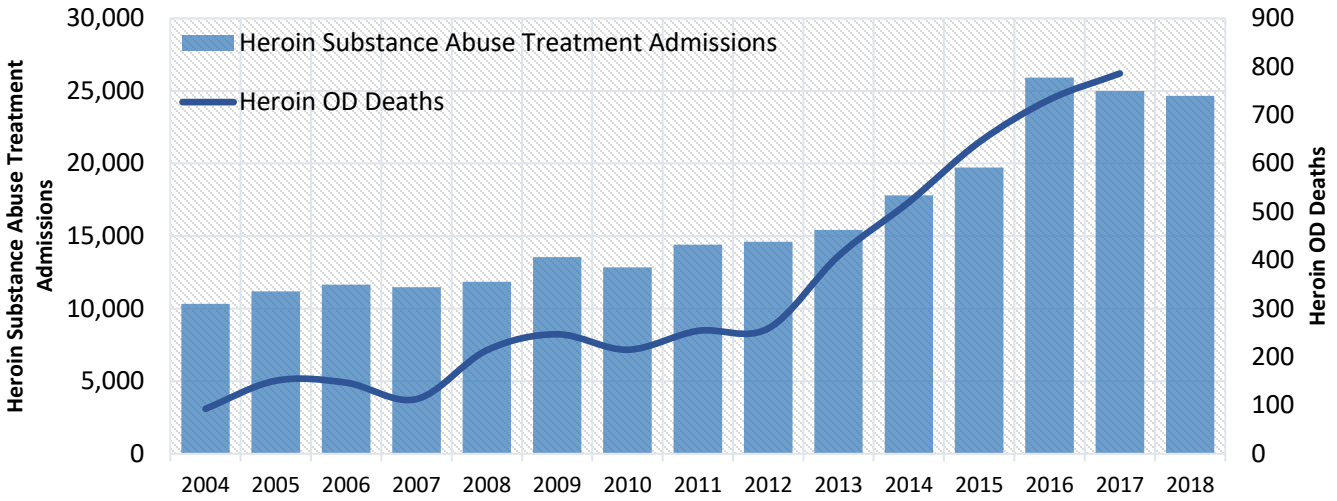


Table 10.1 Drug Overdose Deaths, Treatment Admissions and HCV in Michigan, 2009-2018

Year	All Drug Poisoning Deaths	Opioid OD Deaths	Heroin OD Deaths	Heroin Substance Abuse Treatment Admissions	Number of Chronic HepC Cases 18-39 Years Old
2009	1,416	424	247	13,548	1,444
2010	1,392	424	215	12,836	1,573
2011	1,359	368	254	14,413	1,975
2012	1,300	389	259	14,596	2,160
2013	1,535	432	409	15,419	2,031
2014	1,745	481	520	17,800	2,550
2015	1,991	634	644	19,728	2,707
2016	2,376	1,001	732	25,910	4,045
2017	2,686	1,229	786	24,994	4,090
2018	-	-	-	24,650	3,774

Table 10.1 depicts that Michigan has seen a parallel increase in the number of heroin overdose deaths and heroin substance abuse treatment admissions from 2000-2016. While overdose deaths continue to increase, number of treatment admissions decreased slightly from 2016 to 2018. Despite that decrease, treatment admissions still grew 173% from 9,023 in 2000 to 24,650 in 2018, while the number of heroin overdose deaths increased 783% from 89 in 2000 to 786 in 2017. Similarly, non-heroin opioid deaths have risen nearly every year from 74 in 2000 up by 1,561% to 1,229 in 2017. Total drug poisoning deaths rose 362% from 581 in 2000 to 2,686 in 2017.

Heroin overdose death data is obtained from Michigan death records. Drug poisoning deaths include those with ICD-10 primary or underlying cause code X40-44, X60-64, X85 and Y10-14. The drug causing the poisoning can be specified or unspecified. Heroin deaths are those that specify a related ICD-10 cause code of T40.1. Opioid deaths are those with specified ICD-10 codes T40.2-T40.4, with no mention of T40.1 (heroin). All deaths may have other underlying or related causes.

Heroin substance abuse treatment admissions are obtained from the Treatment Episode Dataset (TEDS). A heroin admission is defined as any admission where heroin is self-identified as one of the top five substances responsible for the admission. These numbers represent unique admissions and not unique patients as patients can be admitted multiple times at different facilities.

Emergency Department Syndromic Surveillance Data

Emergency department (ED) syndromic surveillance system data can also be used as an indicator for injection drug and substance use in the population.

Emergency Department visit data potentially related to injection drug use are obtained through the Michigan Syndromic Surveillance System (MSSS). MSSS reporting is voluntary and not all hospitals participate in submitting ED data. The MSSS has been estimated to cover 83% of Michigan's population. Data are obtained by creating ad hoc queries of chief complaints (details below).

It is certainly possible that ED-related injection drug use complaints may be missed by the query and/or that we may be counting some ED complaints that are unrelated to injection drug use. With these limitations in mind, MSSS data can be an effective tool for monitoring ED-trends in a population over time. It is important to note that MSSS data can be influenced by changes in the quality of health facility reporting which may change over time. One large health system modified reporting to a more detailed message in late 2017, which largely explains the increase since October of that year.

The following search terms are used to identify ED visits related to injection drug use:

OR: heroin heroine ivda ivdu idu "injection drug" opoid opiod opiate opioid suboxon fentan noloxone nalaxone naloxone narcan bupren speedball "speed ball" morphin "venous drug" methadone

NOT: epidural idual idue idus

The increase in the number of ED syndromic visits related to this query between 2013 and 2018 indicates that opioid and heroin related ED visits are on the rise.

Figure 11.1 Emergency Department Substance Abuse Encounters, Syndromic Surveillance System, Jan 2013-Dec 2018

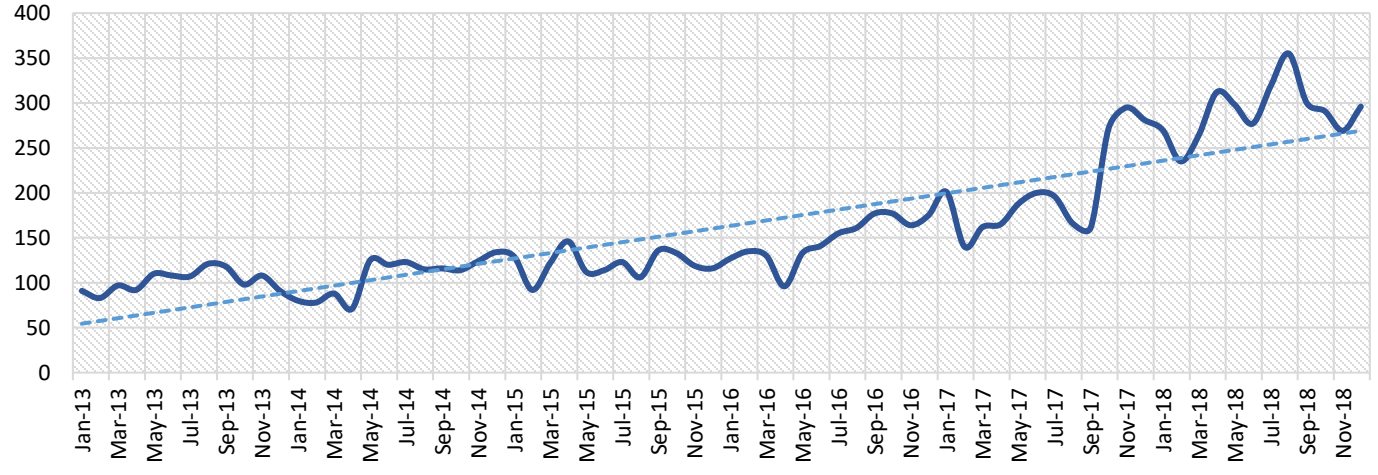
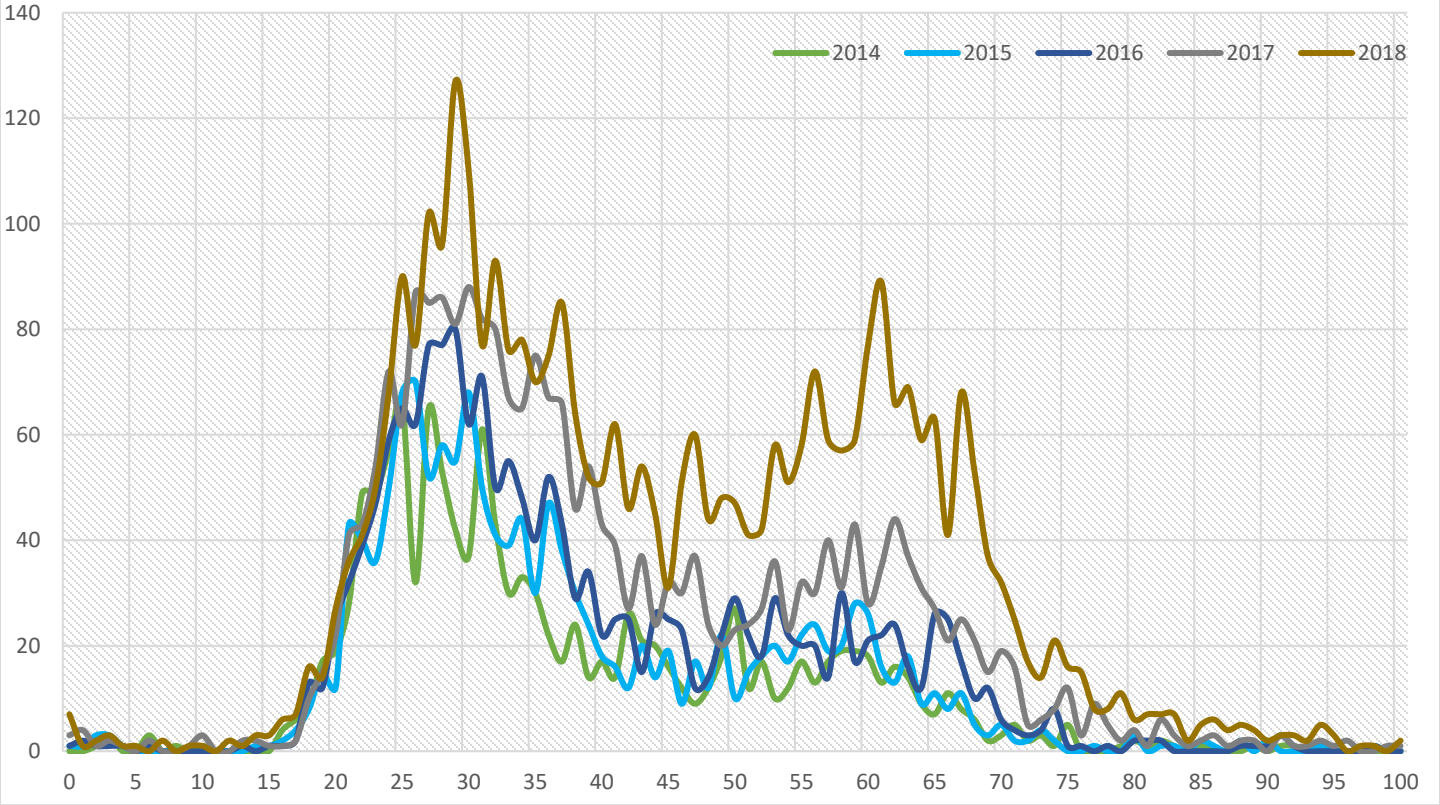
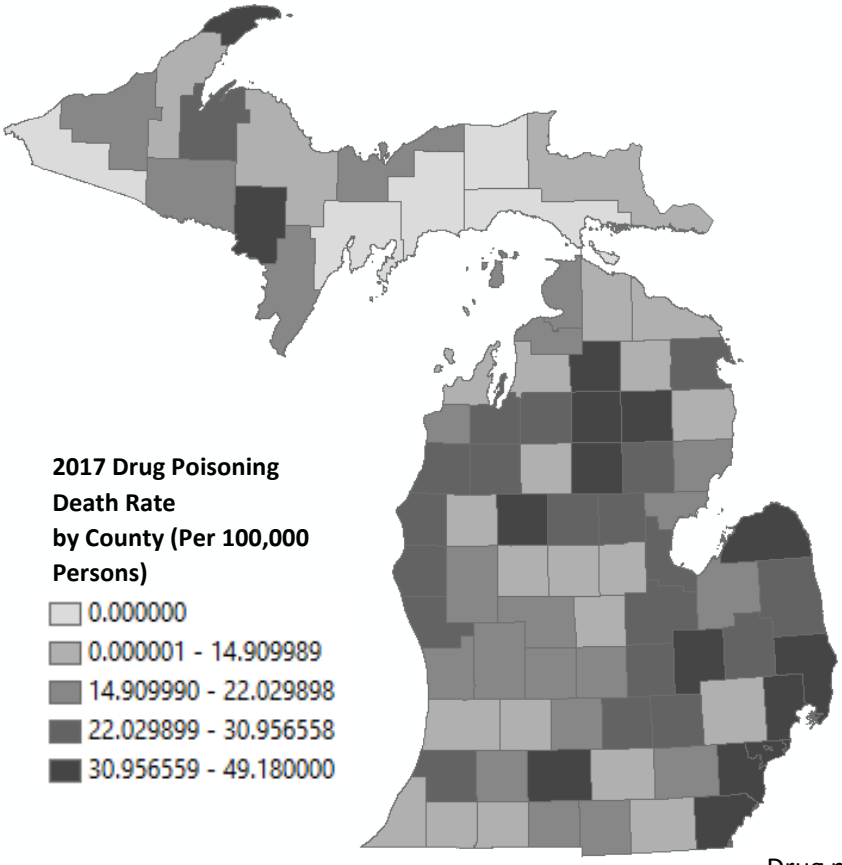


Figure 11.2 Emergency Department Substance Abuse Encounters, by Age Year, Syndromic Surevillance System, 2014-2018

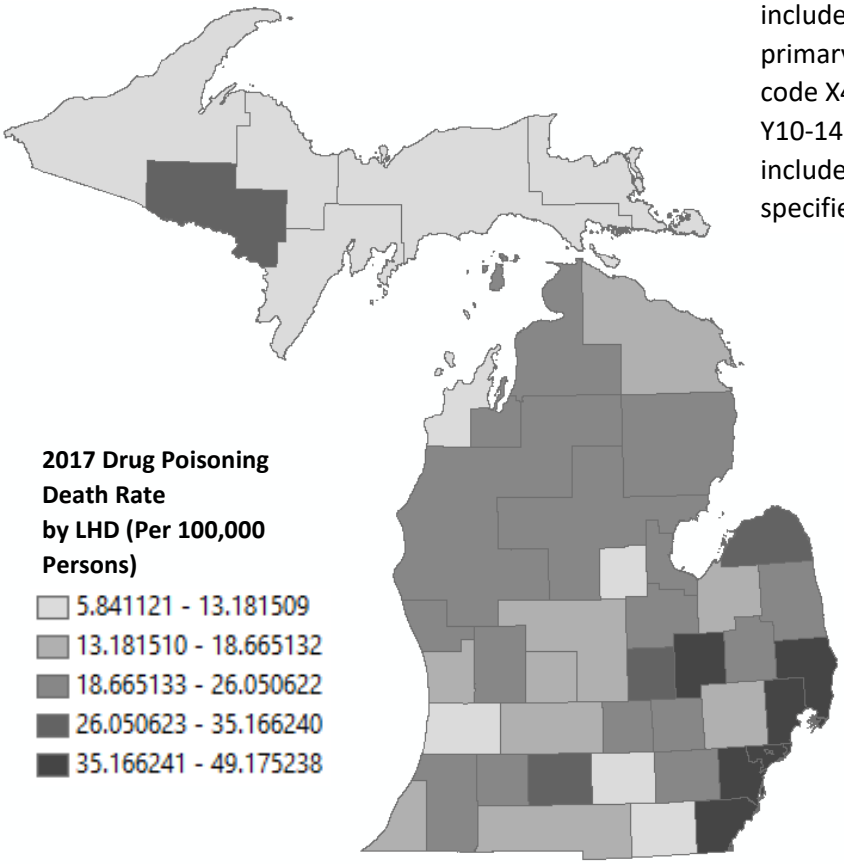


When stratifying by age, the ED encounters related to our query appeared to occur more frequently in the adults under forty (18-39 yr old) population than other age groups in years 2014 through 2018. This observation is consistent with trends and patterns of injection drug and opioid abuse in Michigan and subsequent risk for viral pathogens like HCV.

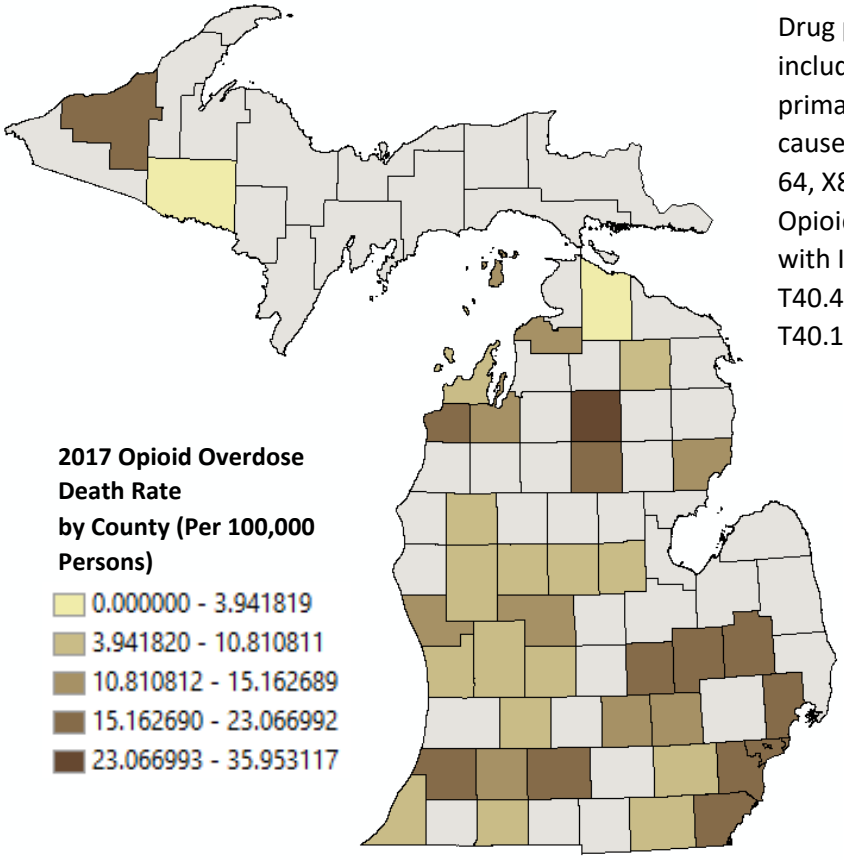
Total Drug Poisoning Death Rate Maps by County and Local Health Jurisdiction



Drug poisoning deaths include those with ICD-10 primary or underlying cause code X40-44, X60-64, X85 and Y10-14. These numbers include all specified and non-specified drugs.

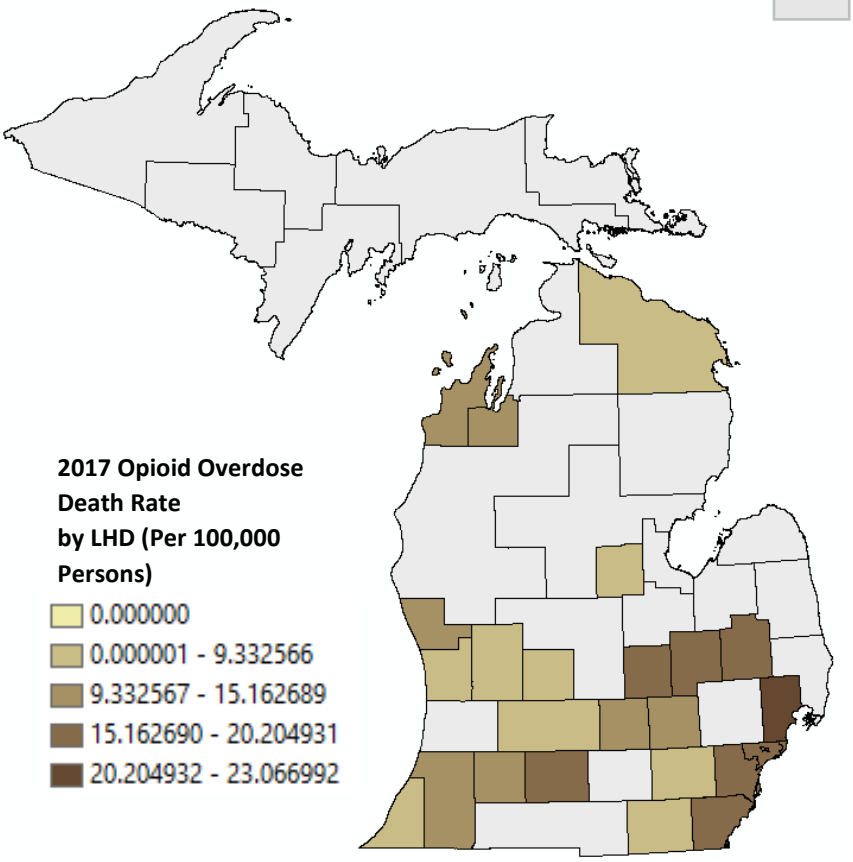


Opioid Overdose Death Rate Maps by County and Local Health Jurisdiction

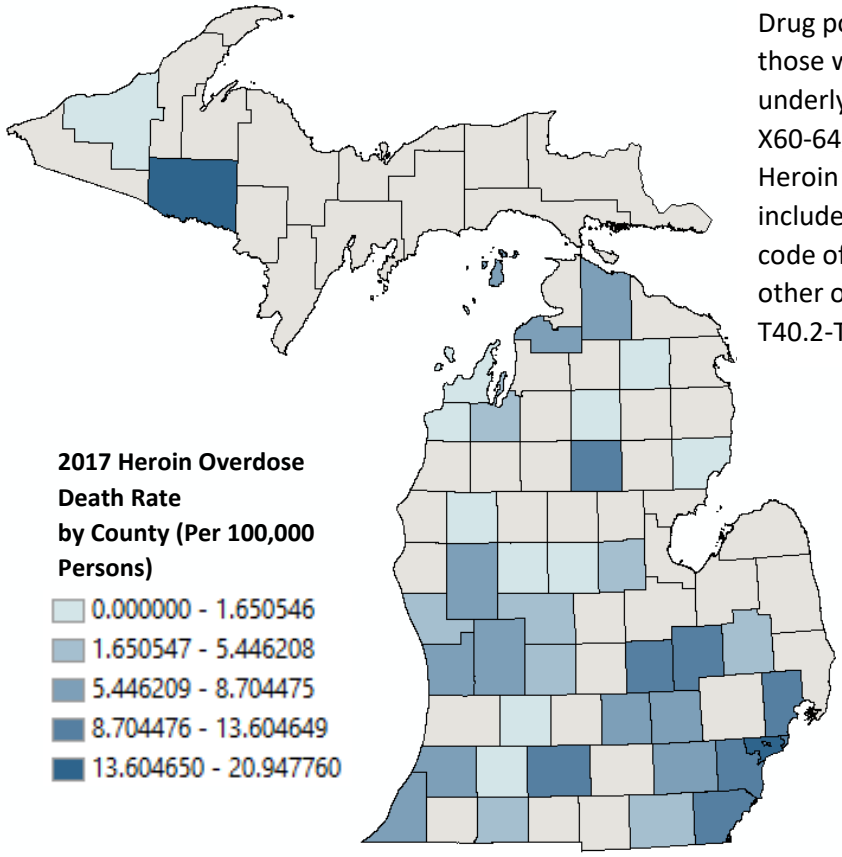


Drug poisoning deaths include those with ICD-10 primary or underlying cause code X40-44, X60-64, X85 and Y10-14. Opioid deaths are those with ICD-10 codes T40.2-T40.4, with no mention of T40.1 (heroin).

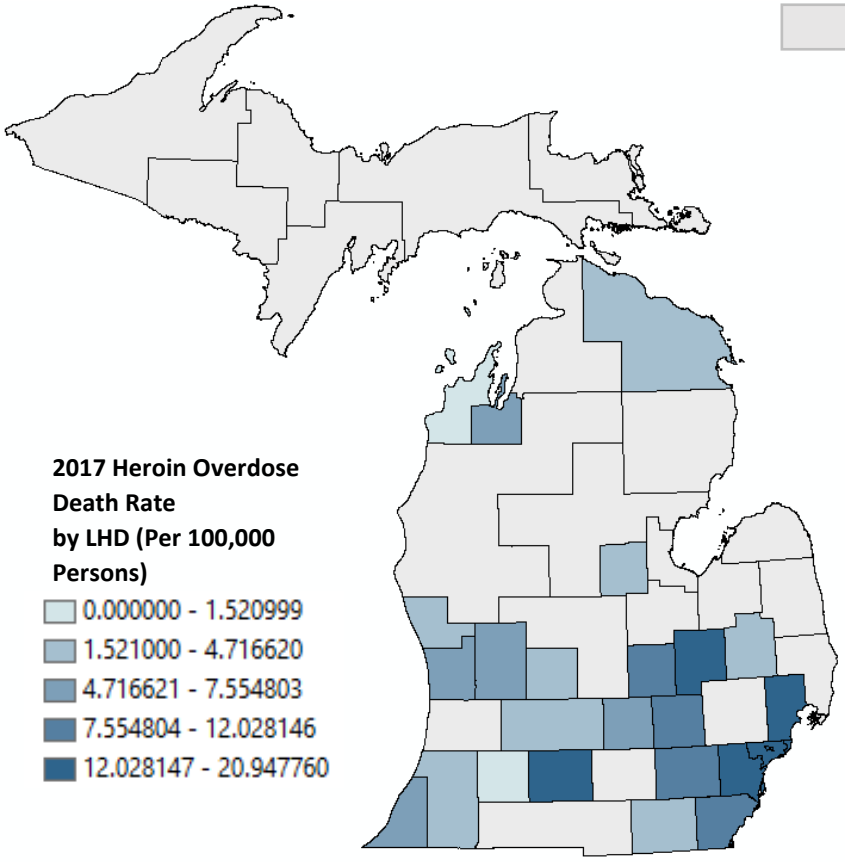
Data are suppressed if a drug is not specified in ≥80% of drug poisoning deaths



Heroin Overdose Death Rate Maps by County and Local Health Jurisdiction

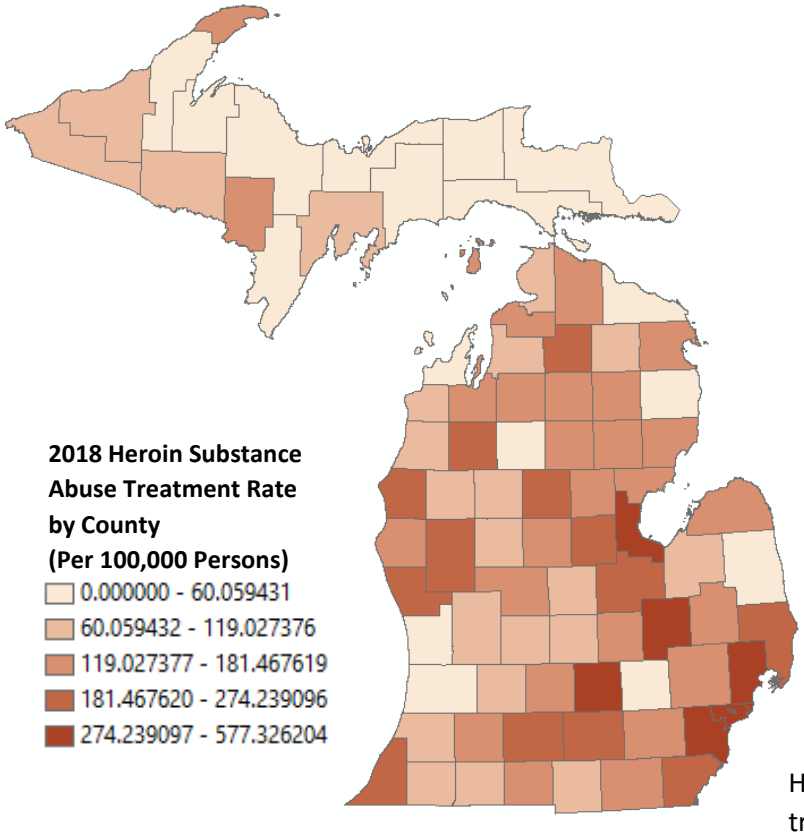


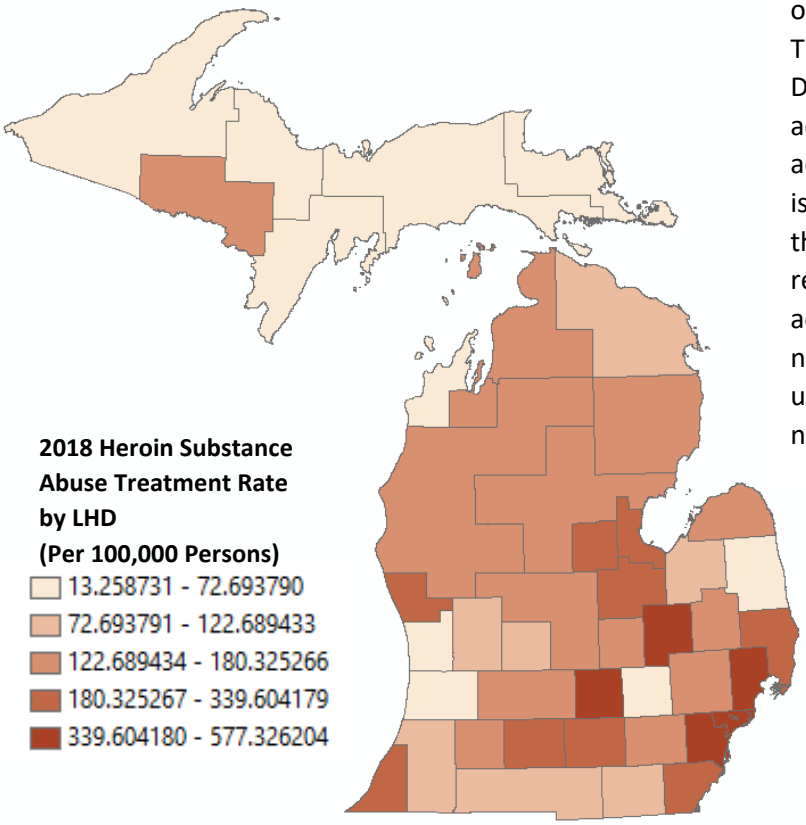
Drug poisoning deaths include those with ICD-10 primary or underlying cause code X40-44, X60-64, X85 and Y10-14. Heroin deaths are those that include a related ICD-19 cause code of T40. With or without other opioids (ICD-10 codes T40.2-T40.4)



Data are suppressed if a drug is not specified in ≥80% of drug poisoning deaths

Treatment Episode Data Sets (TEDS) Rate Maps by County and Local Health Jurisdiction



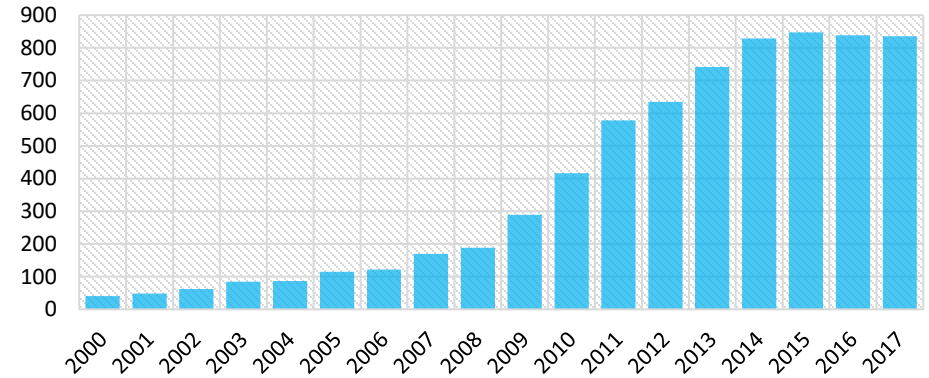


Heroin substance abuse treatment admissions are obtained from the Treatment Episode Dataset (TEDS). A heroin admission is any admission where heroin is self-identified as one of the top five substances responsible for the admission. These numbers represent unique admissions and not unique patients.

Neonatal Abstinence Syndrome (NAS)

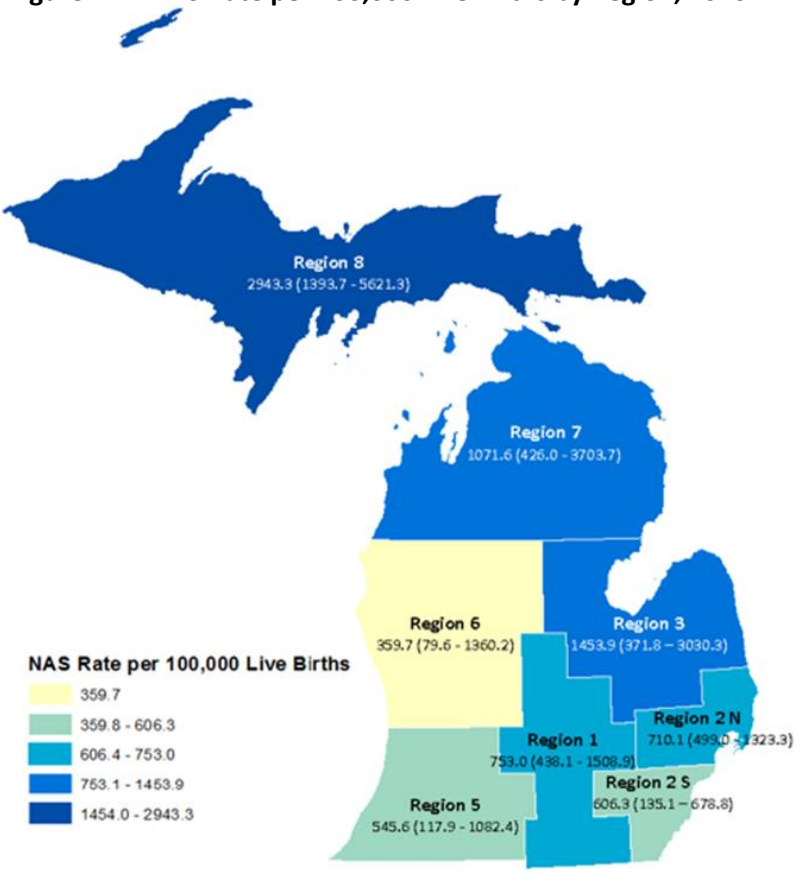
Neonatal Abstinence Syndrome (NAS) occurs in infants who are exposed to opioids in the womb, before birth. These infants are born addicted to opioids and experience withdrawal symptoms after delivery. NAS typically occurs 48-72 hours after birth and symptoms include tremors, high-pitched crying, seizures, feeding difficulties and temperature instability. Babies born with NAS may have additional health problems such as birth defects, low birth weight, small head circumference and developmental and behavioral disorders. Infants born with NAS often face extended stays in the hospital after birth. Trends in NAS and areas in which NAS is common may indicate heightened risks, especially among reproductive-age women, for things like HIV, HCV, and subsequent perinatal HCV transmission.

Figure 12.1 Rate of Treated Neonatal Abstinence Syndrome among Michigan Infants by Year, 2000-2017



NAS incidence has mirrored the increase in opioid abuse in Michigan (Figure 12.1). In 2000, the rate of treated NAS in Michigan infants (from the Michigan Inpatient Database) was 41.2 per 100,000 live births. The rate has increased steadily, peaking at a rate of 761.2 treated NAS cases per 100,000 live births in 2015, a 1747% increase.

Figure 12.2 NAS Rate per 100,000 Live Births by Region, 2016

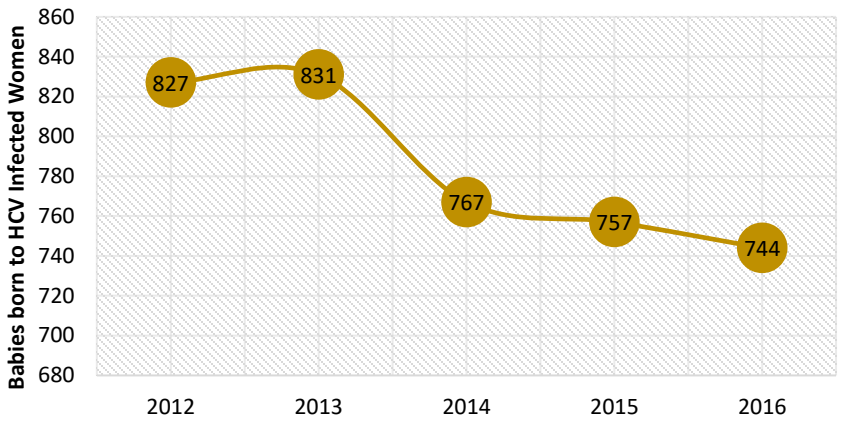


This map depicts the 2016 NAS rate per 100,00 in each of the perinatal regions in Michigan. Region 8, the upper peninsula, has the highest rate of NAS at 2943.3 infants per 100,000 live births, while Region 6 has the lowest at 359.7 per 100,000 live births. This map was prepared by the Maternal and Child Health Epidemiology Section at MDHHS using data from the MDHHS Division of Vital Records and Health Statistics.

Perinatal Hepatitis C

MDHHS conducted a review of birth records matched with HCV infected women in MI, based on mother's name, from 2012-2016. This review provided insight on trends in the rate of infants born to HCV infected mothers and allowed for comparison of demographics and risk factors between HCV infected mothers vs non-infected mothers.
Although national data indicates an upward trend in birth to HCV infected mothers, statewide data shows a 10% decrease from 2012 through 2016 (figure 13.1).

Figure 13.1 Number of babies born to HCV Infected Mothers in Michigan, 2012-2016



A review of birth records indicates that women who give birth and were reported to be HCV infected are generally more likely than the non-infected population to:

- Be 20-29 years old
- Be Caucasian, American Indian or Multiracial
- Seek less prenatal care
- Be less educated
- Use Medicaid as payment for care
- Smoke
- Drink Alcohol
- Be single
- Be tested for HIV
- Self-report HCV
- Be infected with Hepatitis B Virus
- Have previous sexually transmitted disease(s)

Table 13.1 Demographics from Michigan Birth Records, 2012-2016

	Mother Reported for HCV in MDSS?			
Maternal Characteristic	**Yes (n= 3,926)**		**No (n=563,559)**	
Age Group (in Years)				
<20	188	*4.79%*	36,039	*6.39%*
20-29	2,509	*63.91%*	302,683	*53.71%*
30-39	1,139	*29.01%*	211,160	*37.47%*
40-49	89	*2.27%*	3,597	*0.64%*
>50	1	*0.03%*	53	*0.01%*
Race				
American Indian	75	*1.91%*	2,280	*0.40%*
Asian	24	*0.61%*	22,359	*3.97%*
African American	411	*10.47%*	104,319	*18.51%*
Caucasian	3,228	*82.22%*	408,467	*72.48%*
Other	66	*1.68%*	17,568	*3.12%*
Multiple Race	106	*2.70%*	10,038	*1.78%*
Unknown	16	*0.41%*	1,307	*0.23%*
Prenatal Care Visits				
Less than 8 or no care	981	*24.99%*	60,229	*10.69%*
8 or greater	2,808	*71.52%*	488,174	*86.62%*
Education				
High school graduate or lower	3,500	*89.15%*	351,373	*62.35%*
Higher degree	366	*9.32%*	208,349	*36.97%*
Paysource				
Medicaid	3,038	*77.38%*	243,480	*43.20%*
Private Insurance	783	*19.94%*	304,548	*54.04%*
Smoking				
Yes	2630	*66.99%*	100,801	*17.89%*
No	1,255	*31.97%*	457,527	*81.19%*
Married				
Yes	891	*22.69%*	329,148	*58.41%*
No	3,028	*77.13%*	234,256	*41.57%*
Self-Reported HCV				
Yes	1170	*29.80%*	294	*0.05%*
No	2,689	*68.49%*	556,412	*98.73%*

It is estimated that perinatal HCV infection occurs in 5 to 15% of babies born to HCV infected women. The number of women of childbearing age infected with HCV continues to rise as a result of the opioid and heroin epidemics. In fact, the rate of HCV in women aged 15-44 has surpassed that of the rest of Michigan's female population (Figure 13.2). Perinatal HCV, therefore, is becoming an increasingly important public health issue. There is no intervention to reduce the risk of vertical transmission of HCV as there is with perinatal HBV. It is not recommended to treat pregnant women for HCV infection. However, HCV direct acting antivirals are now approved to treat children as young as 12 years old.

From 2009-2014 the US has experienced an 89% increase in present HCV infections in women at the time of birth, increasing from 1.8 to 3.4 instances per 1,000 births. Michigan was estimated to have a rate of 2.6-5.0 HCV infections among pregnant women for every 1,000 live births in 2014. That estimates approximate the number of incident perinatal HCV cases in MI in 2014 to be in the range of 15 to 85 cases per year.

The new case definition for perinatal hepatitis C established in 2018 states that a perinatal hepatitis C case is between the ages of 2 months and 36 months old and must have record of a positive HCV nucleic acid test (qualitative, quantitative, or genotype). Under this case definition, there were 34 instances of reported perinatal hepatitis C between 2012 and 2018, which is more than twice the number of perinatal HIV and HBV infections combined. The 34 perinatal HCV cases are likely an underestimation because an estimated 50-75% of the HCV infected population is undiagnosed, and infants are often not tested or tested inaccurately.

Figure 13.2 Number of Hepatitis C Cases per 100,000 Population, Women of Childbearing Age compared to Total Women, 2009-2018

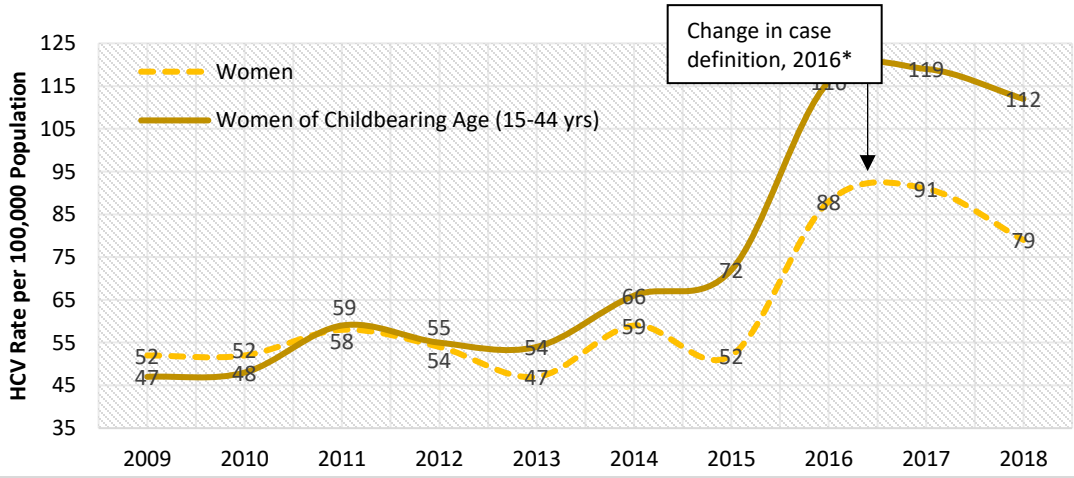
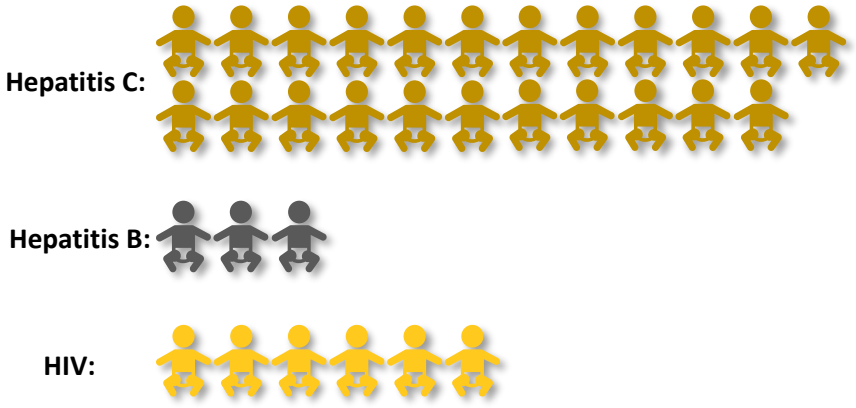


Figure 13.3 Identified Perinatal Infections, MDSS and eHARs, 2012-



Perinatal Hepatitis B

Perinatal HBV infection in a pregnant woman poses inherent risk to the infant at birth, as perinatal transmission is a known risk factor for HBV infection. CDC estimates the number of births to hepatitis B surface antigen (HBsAg) positive women by using prevalence of HBV infection by race/ethnicity as well as country of birth for mothers of infants. The current CDC estimation of expected birth to HBsAg positive women nationwide is 21,281 per year, and in the range of 317-468 per year in MI. However, less than half of the lower level of these estimated births are being identified.

Since 2016, MI has required physicians, health care providers and laboratories to report pregnancy status for all women of childbearing age (10 – 60 years of age). Identifying HBsAg-positive pregnant women prenatally is key in protecting babies from getting HBV. More than 98% of all babies, if treated appropriately, will be protected from getting HBV from their mothers. Hepatitis B (hepB) vaccine has been available in the U. S. since 1981 and has been proven to be safe and effective in preventing HBV transmission. CDC now recommends vaccination within 24 hours of birth for all medically stable babies, weighing more than 2,000 grams and born to HBsAg-negative women. CDC also recommends hepB vaccine and hepatitis B immune globulin (HBIG) within 12 hours of birth for all babies born to HBsAg-positive women.

The MDHHS Immunization Division Perinatal Hepatitis B Prevention Program (PHBPP)'s mission is to identify HBV infected pregnant women and coordinate proper care and treatment of the babies born to them. Even with our efforts to provide the appropriate prophylaxis, five babies born since 2010 were identified as being perinatally infected with HBV. From 2008 through 2011 the foreign-born proportion of women who were both infected and pregnant was 59% and increased to 74% in 2013-2014 before decreasing to 56% in 2015-2016. Furthermore, 43% of those women were identified as Asian/Pacific Islander in 2008-2011, increasing to 60% in 2013-2014 before decreasing to 41% in 2015-2016.

Figure 14.1 MI's Perinatal Hepatitis B Prevention Program (PHBPP), 2013-2017

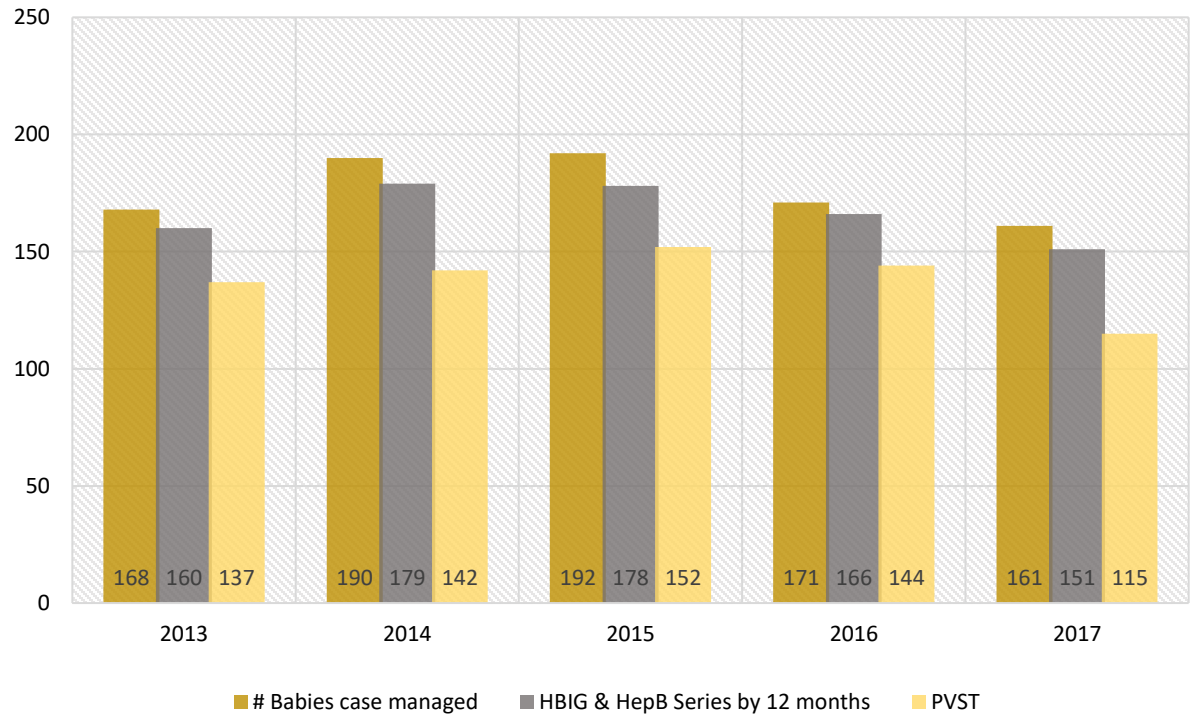


Table 14.1 Proportion of Infants Receiving HBV Treatment, Michigan and the United States, 2010-2016

	2013		2014		2015		2016		2017	
	MI	US	MI	US	MI	US	MI	US	MI	US
Percent of Infants Receiving PEP at Birth	100%	96%	100%	97%	99%	96%	99%	97%	100%	-
Percent of Infants with HBIG & Complete HepB Series by 12 Months	95%	84%	94%	82%	93%	83%	97%	82%	94%	-
Percent of Infants with PVST by End of Reporting Period 1	82%	65%	75%	64%	79%	63%	84%	64%	71%	-

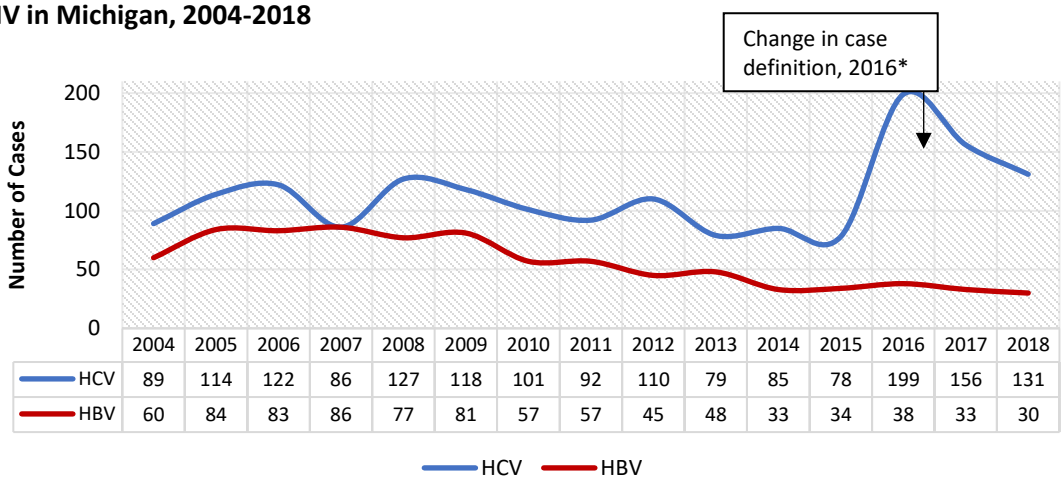
Infants who acquire HBV infection from their mothers at birth are 90% more likely to become chronically infected and 25% of these infants will have liver cancer or even die from the effects of having HBV. It is extremely important to identify all HBsAg-positive pregnant women prior to delivery so that their infants can receive HBIG and hepB vaccine within 12 hours of life for immediate protection against HBV. For life-long protection, these infants need at least two additional doses of hepB vaccine and a post-vaccination serologic test (PVST) at nine to twelve months of age. For more information, go to www.mi.gov/hepatitisB or call 800-964-4487.

The Michigan PHBPP consistently performs above the national average in care and treatment of infants born to HBV infected mothers, however there is room for improvement. It is extremely important to continue providing the appropriate prophylaxis to all infants, especially those born to HBsAg-positive women.

Hepatitis and HIV Co-infections

Positive health outcomes for individuals with HIV/HBV or HIV/HCV co-infections are significantly lower than individuals who are mono-infected with either of the viruses. In order to assess the burden of viral hepatitis and HIV co-infection in Michigan, MDHHS staff performed a match between HIV cases reported in the Enhanced HIV/AIDS Reporting System (eHARS) and viral hepatitis cases reported in the MDSS. Cases were matched by first name, last name and date of birth using Statistical Analysis System (SAS) 9.4, a software system for data analysis and report writing. Risk factors for HIV transmission were obtained from eHARS.

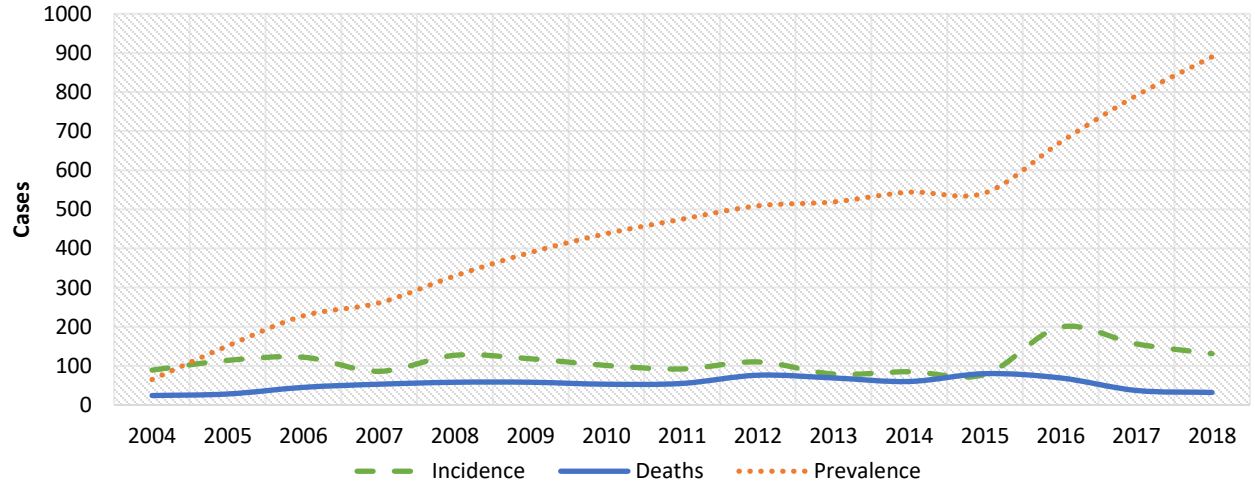
Figure 15.1 Count of Hepatitis B and Hepatitis C Cases Co-infected with HIV in Michigan, 2004-2018



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HCV	89	114	122	86	127	118	101	92	110	79	85	78	199	156	131
HBV	60	84	83	86	77	81	57	57	45	48	33	34	38	33	30

In general, the number of new HBV/HIV matches has trended downward in recent years. HIV/HCV matches also trended downward until 2016 when a new HCV case definition was instituted. This change is largely responsible for the increase in matches in 2016 and 2017. Individuals who are coinfected are living longer, largely because of improvements in linkage to care and highly effective drugs, resulting in increased prevalence of both co-infections (Figure 15.2). Tables 15.1 and 15.2 look at the demographic breakdown of both HBV/HIV and HCV/HIV co-infections. As one might suspect, HBV/HIV co-infection is more common among the MSM population and thus tends to be more male and younger in age. HCV/HIV co-infection is associated with intravenous drug use and follows the demographics of people who are living with HIV and inject drugs.

Figure 15.2 Prevalence of Diagnosed HCV-HIV Coinfections in Michigan, 2004 - 2018



Between 2004 and 2017, 816 people were reported in Michigan with HBV/HIV co-infection. Table 15.1 shows a breakdown of the HBV/HIV co-infected population in 2018. The 2018 cases are similar to the historical cases in regard to race and sex. MSM is the predominant risk factor in the HBV and HIV co-infected population with an age that tends to be over 30 years old.

Table 15.1 Hepatitis B and HIV Co-Infection Data in Michigan, 2018

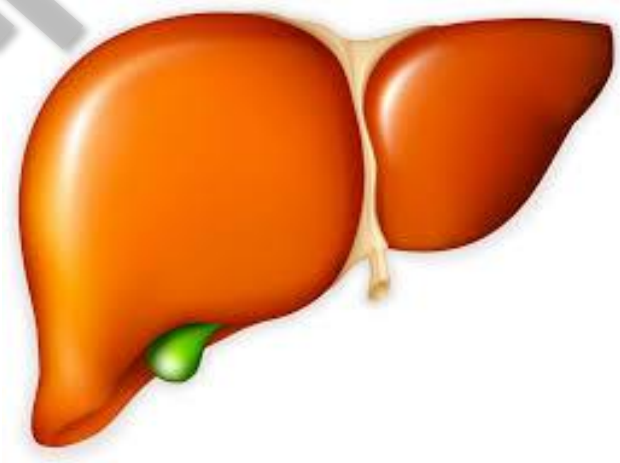
Variable	2018 HBV/HIV Co-infections		2004-2017 HBV/HIV Co-infections	
Total Co-infections	30		816	
Sex				
Male	26	*(86.7%)*	727	*(89.1%)*
Female	4	*(13.3%)*	89	*(10.9%)*
Unknown	0	*(0.0%)*	0	*(0.0%)*
Race				
Caucasian	11	*(36.7%)*	231	*(28.3%)*
Black or African American	16	*(53.3%)*	534	*(65.4%)*
Hispanic	0	*(0.0%)*	25	*(3.1%)*
Asian	1	*(3.3%)*	4	*(0.5%)*
American Indian or Alaskan Native	0	*(0.0%)*	1	*(0.1%)*
Multi/Other/Unknown	2	*(6.7%)*	21	*(2.6%)*
HIV Transmission Risk				
MSM	17	*(56.7%)*	491	*(60.2%)*
IDU	2	*(6.7%)*	75	*(9.2%)*
MSM/IDU	2	*(6.7%)*	43	*(5.3%)*
Blood Recipient	1	*(3.3%)*	4	*(0.5%)*
Heterosexual	3	*(10.0%)*	74	*(9.1%)*
Perinatal	0	*(0.0%)*	2	*(0.2%)*
Unknown/Undetermined	5	*(16.7%)*	127	*(15.6%)*
Age at Coinfection				
0-19	0	*(0.0%)*	8	*(1.0%)*
20-29	3	*(10.0%)*	93	*(11.4%)*
30-39	5	*(16.7%)*	202	*(24.8%)*
40-49	12	*(40.0%)*	292	*(35.8%)*
50-59	6	*(20.0%)*	160	*(19.6%)*
60+	4	*(13.3%)*	43	*(5.3%)*

Between 2004 and 2017, 1,556 people were reported in Michigan with HIV/HCV co-infection. Table 15.2 shows a breakdown of the HCV/HIV co-infected population in 2018. The 2018 cases are similar to the historical cases in regard to sex, but MSM was the predominant risk factor for HCV/HIV co-infection, and the age distribution has shifted slightly toward younger patients. In comparison, IDU was the predominant risk factor in the HCV and HIV co-infected population from 2004-2017, with an age generally over 30 years old. However, in recent years there has been a shift from IDU risk to MSM risk in this co-infected population. While sexual transmission of HCV is rare, it has been reported in HIV-infected MSM populations.

Table 15.2 Hepatitis C and HIV Co-Infection Data in Michigan, 2018

Variable	2018 HCV/HIV Co-infections		2004-2017 HCV/HIV Co-infections	
Total Co-infections	131		1,556	
Sex				
Male	93	*(71.0%)*	1,140	*(73.3%)*
Female	38	*(29.0%)*	407	*(26.2%)*
Unknown	0	*(0.0%)*	9	*(0.6%)*
Race				
Caucasian	60	*(45.8%)*	497	*(31.9%)*
Black or African American	61	*(46.6%)*	921	*(59.2%)*
Hispanic	5	*(3.8%)*	67	*(4.3%)*
Asian	1	*(0.8%)*	12	*(0.8%)*
American Indian or Alaskan Native	0	*(0.0%)*	1	*(0.1%)*
Multi/Other/Unknown	4	*(3.1%)*	58	*(3.7%)*
HIV Transmission Risk				
MSM	45	*(34.4%)*	364	*(23.4%)*
IDU	41	*(31.3%)*	636	*(40.9%)*
MSM/IDU	16	*(12.2%)*	197	*(12.7%)*
Blood Recipient	1	*(0.8%)*	42	*(2.7%)*
Heterosexual	16	*(12.2%)*	172	*(11.1%)*
Perinatal	0	*(0.0%)*	3	*(0.2%)*
Unknown/Undetermined	12	*(9.2%)*	142	*(9.1%)*
Age at Coinfection				
0-19	0	*(0.0%)*	11	*(0.7%)*
20-29	21	*(16.0%)*	114	*(7.3%)*
30-39	29	*(22.1%)*	217	*(13.9%)*
40-49	16	*(12.2%)*	446	*(28.7%)*
50-59	37	*(28.2%)*	562	*(36.1%)*
60+	28	*(21.4%)*	206	*(13.2%)*

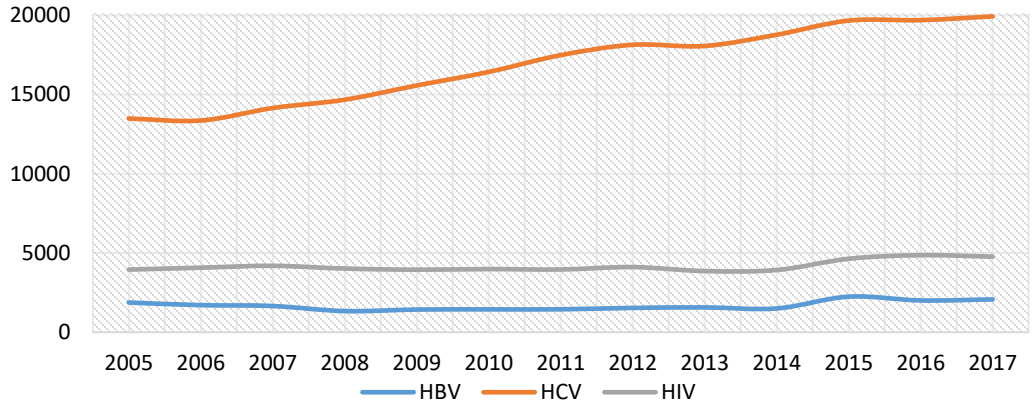
Viral Hepatitis Outcomes



Viral Hepatitis Hospitalizations and Liver Transplants

Trends in hospitalization totals are indicative of a marked increase in health complications as a result of HCV. Figure 16.1 indicates that hospitalizations attributed to HCV increased by nearly 46% from 2005 through 2017, while total hospitalizations due to HBV and HIV each stayed relatively steady. The magnitude of HCV-related hospitalizations is also staggering, at nearly four times as many admissions as HIV.

Figure 16.1 Hospitalizations Due to HBV, HCV and HIV, Michigan, 2005-2017

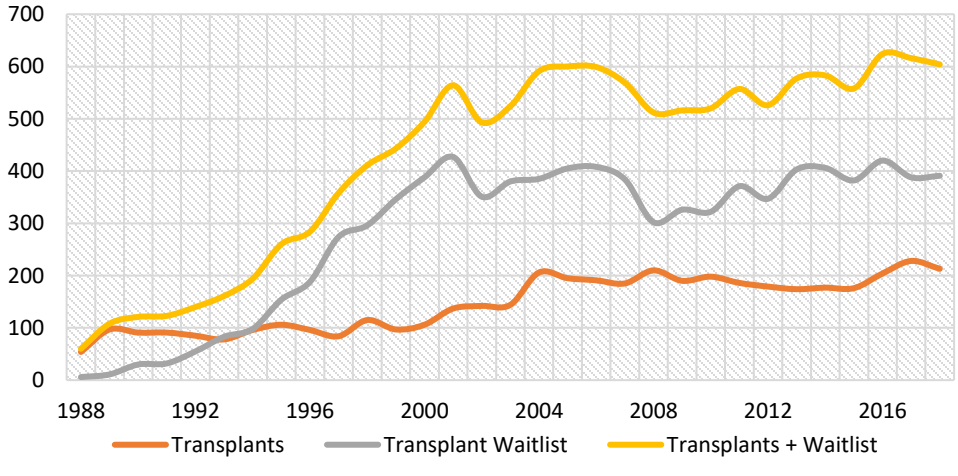


Note: Hospitalizations documenting hepatitis B include inpatient hospitalizations with ICD-9-CM codes for acute, chronic, or unspecified hepatitis B (07020, 07021, 07022, 07023, 07030, 07031, 07032, 07033, or V0261). Hospitalizations documenting hepatitis C include ICD-9-CM codes for acute, chronic, or unspecified hepatitis C (07041, 07044, 07054, 07059, 07070, 07071, or V0262). Hospitalizations documenting HIV include inpatient hospitalizations with ICD-9-CM codes 042, 07953, 79571, or V08.

Liver transplantation may be indicated for individuals with hepatocellular carcinoma (HCC). HBV and HCV infection increases the risk of development of HCC; therefore, trends in liver transplantation may be indicative of increasing disease progression and morbidity associated with long-term HBV and/or HCV infection. However, these data should be interpreted with caution as there are many other indicators for liver transplantation independent of viral hepatitis (e.g. alcoholic cirrhosis).

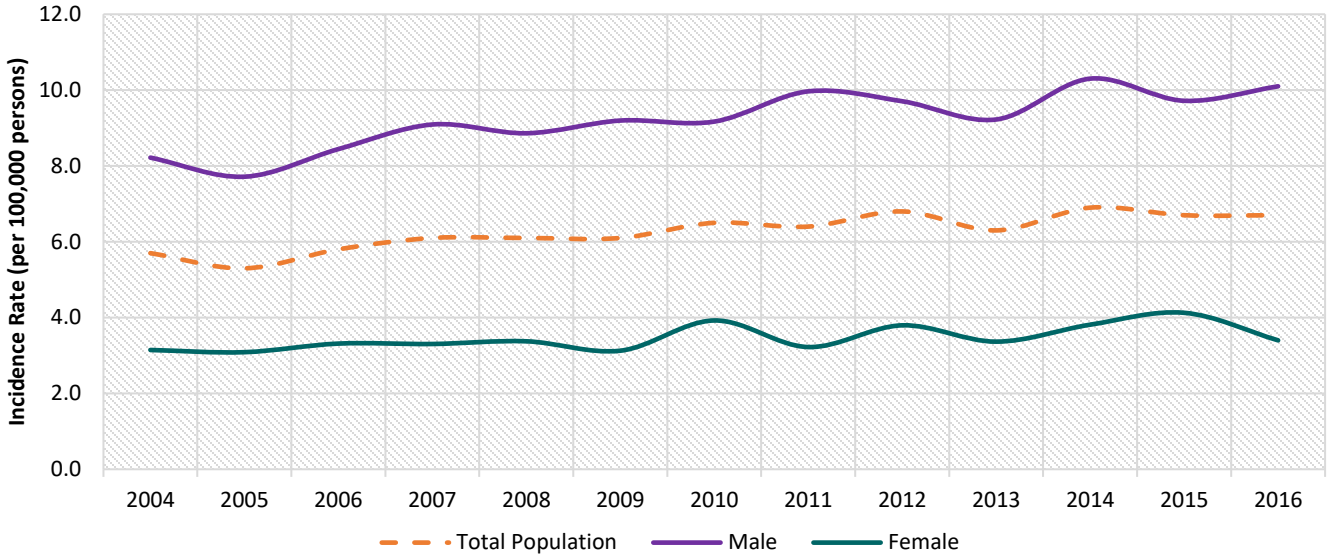
Counts of the number of individuals on the liver transplant waitlist and the number of liver transplants conducted in Michigan between 1988 and 2017 were requested through the United Network of Organ Sharing (UNOS, https://www.unos.org/).

Figure 16.2 Liver Transplants and Transplant Waitlist, Michigan, 1988-2017



Viral Hepatitis-Related Cancer & Mortality

Figure 16.3 Invasive Cancers of the Liver and Intrahepatic Bile Ducts in Michigan by Gender, 2004-2016



Viral hepatitis is a primary risk factor for the development of liver cancer. Figure 16.3 shows the age adjusted rate of liver and intrahepatic bile duct cancer by gender. The number of cases per year of liver and bile duct cancer have increased 32% between 2007 and 2016. African American males experience an incidence rate that is approximately 1.7 times higher, on average, than Caucasian males. The incidence rate for African American females tends to be similar to the state average, while Caucasian females have the lowest incidence rate of the specified race categories. Without improved efforts to test and treat persons with HBV and HCV infection, the rate of liver cancer may continue to rise, particularly as the population with greatest viral hepatitis prevalence ("Baby Boomers") ages.

Table 16.1 Incidence Rates of Invasive Cancers of the Liver and Intrahepatic Bile Ducts by Age-adjusted Rates of Race and Sex in Michigan, 2007-2016

Year of Diagnosis	Total		Caucasian Male		Caucasian Female		African American Male		African American Female	
	Incidence	Rate	Incidence	Rate	Incidence	Rate	Incidence	Rate	Incidence	Rate
2007	679	6.1	346	8.0	161	3.1	103	16.8	34	4.8
2008	688	6.1	344	7.6	168	3.1	107	19.0	41	5.3
2009	706	6.1	361	7.9	154	2.9	116	18.8	36	4.7
2010	780	6.5	387	8.0	197	3.6	114	18.2	47	6.3
2011	767	6.4	419	8.8	156	2.9	122	18.3	42	5.5
2012	852	6.8	404	8.0	196	3.5	152	22.4	48	5.8
2013	797	6.3	404	7.9	173	3.0	133	18.8	48	6.0
2014	884	6.9	472	9.1	203	3.6	133	19.4	45	5.2
2015	874	6.7	448	8.5	206	3.6	130	19.2	66	7.6
2016	896	6.7	502	9.3	179	3.0	112	15.4	55	6.1

Table 16.1 shows the rate of new cases of liver and intrahepatic bile duct cancer per year from 2007 to 2016 in Michigan per 100,000 people. The overall rate of liver and intrahepatic bile duct cancer in Michigan was 6.7 per 100,000 in 2016. African American males had an incidence rate of 15.4 per 100,000, which was 66% higher than that of Caucasian males (9.3 per 100,000). The incidence rate in African American females (6.1) was just over twice that of Caucasian females (3.0) in 2016.

Figure 16.4 Mortality Due to Invasive Cancer of the Liver and Intrahepatic Bile Ducts and Age-Adjusted Death Rates by Race and Sex in Michigan, 2008 - 2017

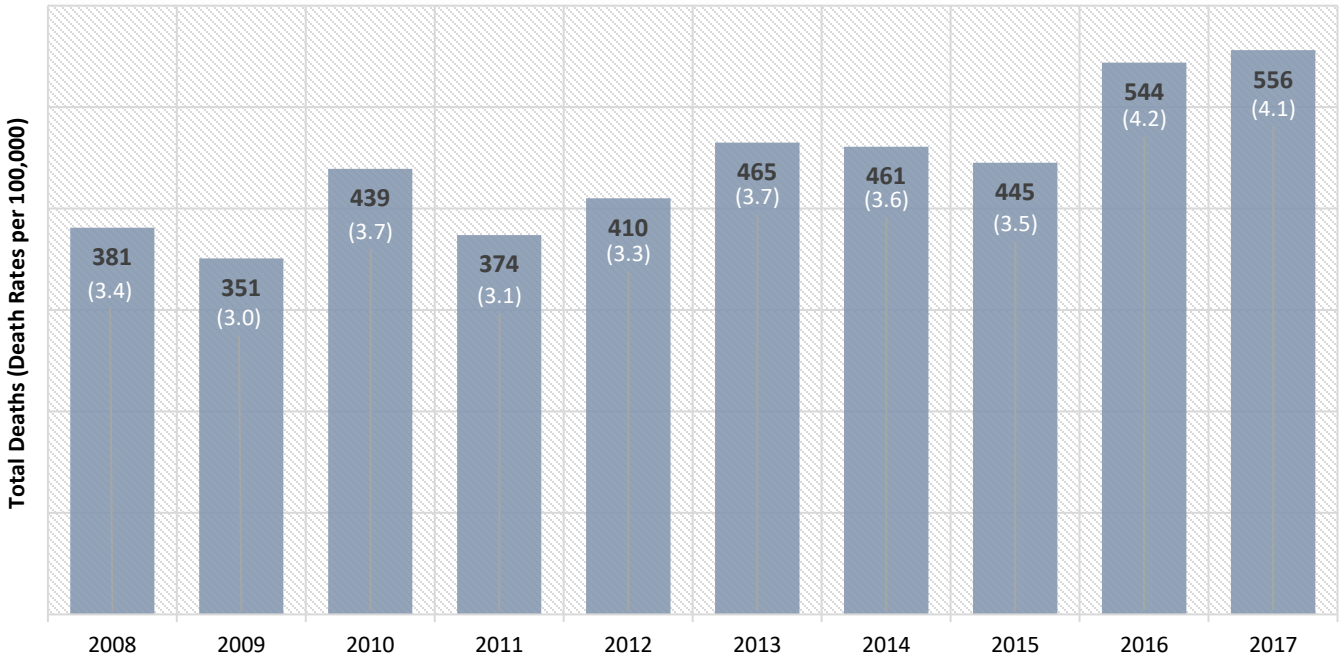


Figure 16.4 shows the number of deaths per year due to liver and intrahepatic bile duct cancer. This total has risen 46% from 2008 to 2017. Chronic infection with viral hepatitis, over time, can lead to liver cancer. As rates of liver cancer increase, we have observed a subsequent increase in mortality associated with liver cancer. Improved efforts to test and treat viral hepatitis infections may help reverse these trends.

Table 16.2 Numbers of Deaths Due to Invasive Cancer of the Liver and Intrahepatic Bile Ducts and Age-Adjusted Death Rates by Race and Sex in Michigan, 2008 - 2017

Year of Death	Total		Caucasian Male		Caucasian Female		African American Male		African American Female	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
2008	381	3.4	200	4.6	113	2.1	35	6	16	*
2009	351	3	170	3.8	84	1.6	58	9.3	15	*
2010	439	3.7	214	4.5	120	2.1	66	10.7	15	*
2011	374	3.1	197	4.1	91	1.6	63	10.2	17	*
2012	410	3.3	197	4.1	112	2	59	8.9	17	*
2013	465	3.7	227	4.5	129	2.2	65	9.3	27	3.4
2014	461	3.6	226	4.4	119	2.1	64	8.9	36	4.3
2015	445	3.5	218	4.2	121	2.1	60	9.9	26	3.1
2016	544	4.2	291	5.6	138	2.4	54	7.8	38	4.4
2017	556	4.1	293	5.4	156	2.5	64	8.7	23	2.5

Table 16.2 shows the death rate per 100,000 Michigan population due to cancer of the liver and intrahepatic bile ducts between 2008 and 2017. The liver and intrahepatic bile duct cancer mortality rate in Michigan in 2017 was 4.1 per 100,000. African American males show the highest death rates due to these cancers as rates have increased by 45% between 2008 and 2017. The death rate in African American males (8.7 per 100,000) is 61% higher than the rate in Caucasian males (5.4 per 100,000). The death rate in Caucasian males has increased by 17% between 2008 and 2017 while the death rate in Caucasian females has increased by 19%.

While not all liver cancers are a direct result of viral hepatitis, viral hepatitis remains a primary risk factor for development of liver cancer. These data highlight racial disparities in liver cancer data that may be reflective of disparities seen in viral hepatitis infection.

Figure 16.5 Deaths Due to Acute and Chronic HCV, Michigan, 2008-2017

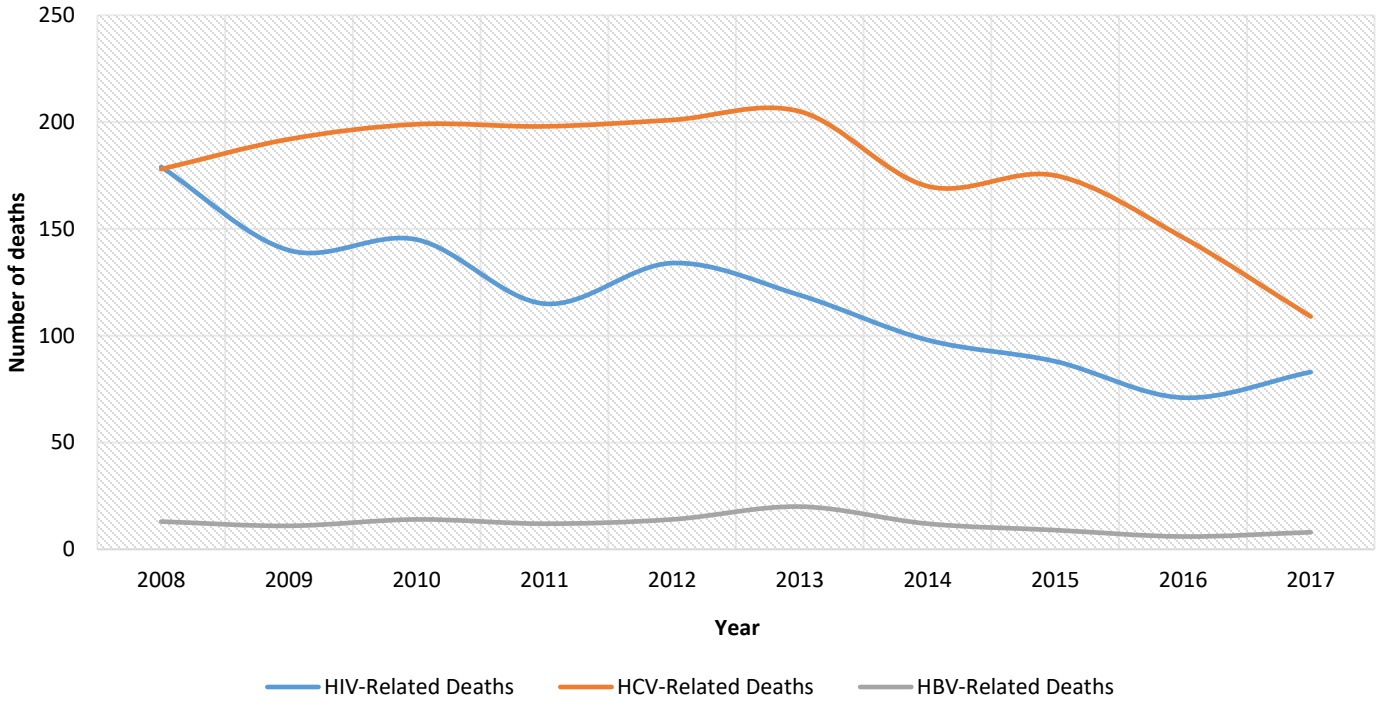


Figure 16.5 shows the number of deaths per year in Michigan residents between 2008 and 2017 due to acute and chronic HCV, according to death certificate data, in comparison to hepatitis B and HIV. The Vital Records and Health Statistics Section provides data on underlying causes of death in Michigan, which is classified using the Tenth Revision of the International Classification of Diseases (ICD-10).

In 2017 there were 109 deaths attributed to HCV in Michigan (ICD-10: B17.1, B18.2, B19.2). Between 2008 and 2017, deaths due to chronic HCV decreased by 63%, due to the introduction of new medications that treat HCV infections. From 2008 through 2017, HBV deaths (ICD-10: B16.2, B16.9, B18.1) decreased from 13 to 8, while HIV-related deaths (ICD-10: B20-B24) were reduced from 179 to 83.

Appendices

Appendix A1: County Hepatitis Data

County	Total Population	2018 Chronic HCV Cases	2018 Acute HCV Cases	2018 Chronic HBV Cases	2018 Acute HBV Cases	2018 Chronic HCV Rate*	2018 Acute HCV Rate*	2018 Chronic HBV Rate*	2018 Acute HBV Rate*
Alcona	10,351	10	0	0	0	96.61	0.00	0.00	0.00
Alger	9,121	17	0	0	1	186.38	0.00	0.00	10.96
Allegan	116,447	71	2	2	0	60.97	1.72	1.72	0.00
Alpena	28,462	23	0	2	0	80.81	0.00	7.03	0.00
Antrim	23,292	13	3	1	0	55.81	12.88	4.29	0.00
Arenac	15,045	16	0	0	0	106.35	0.00	0.00	0.00
Baraga	8,441	13	1	0	0	154.01	11.85	0.00	0.00
Barry	60,586	33	1	2	0	54.47	1.65	3.30	0.00
Bay	104,239	127	3	4	0	121.84	2.88	3.84	0.00
Benzie	17,573	20	0	0	1	113.81	0.00	0.00	5.69
Berrien	154,259	122	6	13	1	79.09	3.89	8.43	0.65
Branch	43,410	32	0	1	0	73.72	0.00	2.30	0.00
Calhoun	134,128	163	3	8	2	121.53	2.24	5.96	1.49
Cass	51,381	59	1	1	0	114.83	1.95	1.95	0.00
Charlevoix	26,139	16	0	0	1	61.21	0.00	0.00	3.83
Cheboygan	25,369	32	1	0	0	126.14	3.94	0.00	0.00
Chippewa	37,711	58	4	0	0	153.80	10.61	0.00	0.00
Clare	30,653	33	0	0	0	107.66	0.00	0.00	0.00
Clinton	78,443	37	0	1	0	47.17	0.00	1.27	0.00
Crawford	13,907	10	0	0	0	71.91	0.00	0.00	0.00
Delta	35,965	54	3	1	2	150.15	8.34	2.78	5.56
Detroit City	673,103	1,446	6	213	7	214.83	0.89	31.64	1.04
Dickinson	25,415	14	1	1	0	55.09	3.93	3.93	0.00
Eaton	109,027	94	5	10	1	86.22	4.59	9.17	0.92
Emmet	33,193	35	0	1	0	105.44	0.00	3.01	0.00
Genesee	407,385	521	13	38	13	127.89	3.19	9.33	3.19
Gladwin	25,234	25	0	0	1	99.07	0.00	0.00	3.96
Gogebic	15,342	23	0	1	0	149.92	0.00	6.52	0.00
Grand Traverse	91,807	71	1	1	1	77.34	1.09	1.09	1.09
Gratiot	41,018	19	2	1	0	46.32	4.88	2.44	0.00
Hillsdale	45,879	42	0	1	0	91.55	0.00	2.18	0.00
Houghton	36,305	21	2	1	0	57.84	5.51	2.75	0.00
Huron	31,280	17	0	1	0	54.35	0.00	3.20	0.00
Ingham	290,186	305	8	34	4	105.11	2.76	11.72	1.38
Ionia	64,291	49	1	3	0	76.22	1.56	4.67	0.00
Iosco	25,162	29	0	2	0	115.25	0.00	7.95	0.00
Iron	11,124	24	2	1	0	215.75	17.98	8.99	0.00
Isabella	71,063	82	3	2	1	115.39	4.22	2.81	1.41
Jackson	158,640	197	2	9	0	124.18	1.26	5.67	0.00
Kalamazoo	262,985	236	7	21	0	89.74	2.66	7.99	0.00
Kalkaska	17,634	13	0	2	0	73.72	0.00	11.34	0.00
Kent	648,594	454	11	71	0	70.00	1.70	10.95	0.00
Keweenaw	2,105	1	0	1	0	47.51	0.00	47.51	0.00

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts

County	Total Population	2018 Chronic HCV Cases	2018 Acute HCV Cases	2018 Chronic HBV Cases	2018 Acute HBV Cases	2018 Chronic HCV Rate*	2018 Acute HCV Rate*	2018 Chronic HBV Rate*	2018 Acute HBV Rate*
Lake	12,013	21	0	0	0	174.81	0.00	0.00	0.00
Lapeer	88,174	54	0	3	2	61.24	0.00	3.40	2.27
Leelanau	21,657	14	0	0	0	64.64	0.00	0.00	0.00
Lenawee	98,623	102	1	5	0	103.42	1.01	5.07	0.00
Livingston	189,651	139	0	10	0	73.29	0.00	5.27	0.00
Luce	6,358	12	0	0	0	188.74	0.00	0.00	0.00
Mackinac	10,712	20	0	0	0	186.71	0.00	0.00	0.00
Macomb	871,375	858	31	102	5	98.47	3.56	11.71	0.57
Manistee	24,427	19	0	0	0	77.78	0.00	0.00	0.00
Marquette	66,502	80	2	2	1	120.30	3.01	3.01	1.50
Mason	29,073	30	1	0	0	103.19	3.44	0.00	0.00
Mecosta	43,391	29	0	1	0	66.83	0.00	2.30	0.00
Menominee	23,046	17	2	0	0	73.77	8.68	0.00	0.00
Midland	83,411	50	1	3	0	59.94	1.20	3.60	0.00
Missaukee	14,998	15	2	0	1	100.01	13.34	0.00	6.67
Monroe	149,649	241	0	11	3	161.04	0.00	7.35	2.00
Montcalm	63,550	56	3	1	1	88.12	4.72	1.57	1.57
Montmorency	9,250	11	0	0	0	118.92	0.00	0.00	0.00
Muskegon	173,693	189	10	6	1	108.81	5.76	3.45	0.58
Newaygo	48,242	67	0	0	0	138.88	0.00	0.00	0.00
Oakland	1,250,836	1,022	5	169	13	81.71	0.40	13.51	1.04
Oceana	26,442	31	0	1	0	117.24	0.00	3.78	0.00
Ogemaw	20,981	38	3	2	0	181.12	14.30	9.53	0.00
Ontonagon	5,881	2	0	0	0	34.01	0.00	0.00	0.00
Osceola	23,260	28	1	1	0	120.38	4.30	4.30	0.00
Oscoda	8,287	21	1	0	0	253.41	12.07	0.00	0.00
Otsego	24,538	34	2	0	0	138.56	8.15	0.00	0.00
Ottawa	286,383	107	1	22	2	37.36	0.35	7.68	0.70
Presque Isle	12,791	12	0	0	0	93.82	0.00	0.00	0.00
Roscommon	23,895	25	0	2	2	104.62	0.00	8.37	8.37
Saginaw	191,934	182	3	18	1	94.82	1.56	9.38	0.52
St Clair	159,350	188	7	19	1	117.98	4.39	11.92	0.63
St Joseph	60,947	65	0	0	0	106.65	0.00	0.00	0.00
Sanilac	41,269	22	1	2	0	53.31	2.42	4.85	0.00
Schoolcraft	8,049	17	2	0	0	211.21	24.85	0.00	0.00
Shiawassee	68,446	57	0	3	1	83.28	0.00	4.38	1.46
Tuscola	52,764	34	1	3	0	64.44	1.90	5.69	0.00
Van Buren	75,353	92	2	4	0	122.09	2.65	5.31	0.00
Washtenaw	367,627	121	1	54	0	32.91	0.27	14.69	0.00
Wayne	1,080,513	1,158	3	180	8	107.17	0.28	16.66	0.74
Wexford	33,276	41	1	0	1	123.21	3.01	0.00	3.01
MDOC	39,666	544	0	14	0	1,371.45	0.00	35.29	0.00
State-wide†	9,962,311	10,545	179	1,089	79	105.85	1.80	10.93	0.79

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts

Appendix A2: Heroin Data by County

County	Total Population	18-39 Year Population	2018 18-39 Year HCV Cases	2018 Heroin Treatment Admissions	2017 Heroin Overdose Deaths	2018 18-39 Year HCV Rate*	2018 Heroin Treatment Admission Rate*	2017 Heroin Overdose Death Rate*
Alcona	10,351	1,610	3	3	0	186.34	28.98	0.00
Alger	9,121	2,197	6	2	0	273.10	21.93	0.00
Allegan	116,447	30,010	25	33	0	83.31	28.34	0.00
Alpena	28,462	6,512	10	41	1	153.56	144.05	3.51
Antrim	23,292	4,749	6	27	1	126.34	115.92	4.29
Arenac	15,045	3,238	8	22	1	247.07	146.23	6.65
Baraga	8,441	2,212	11	4	0	497.29	47.39	0.00
Barry	60,586	15,009	11	48	1	73.29	79.23	1.65
Bay	104,239	26,843	63	354	2	234.70	339.60	1.92
Benzie	17,573	3,770	7	12	0	185.68	68.29	0.00
Berrien	154,259	39,518	36	390	9	91.10	252.82	5.83
Branch	43,410	11,060	14	60	0	126.58	138.22	0.00
Calhoun	134,128	36,454	68	360	18	186.54	268.40	13.42
Cass	51,381	12,045	21	41	0	174.35	79.80	0.00
Charlevoix	26,139	5,691	7	32	2	123.00	122.42	7.65
Cheboygan	25,369	5,237	17	35	2	324.61	137.96	7.88
Chippewa	37,711	11,883	30	5	0	252.46	13.26	0.00
Clare	30,653	6,771	16	63	0	236.30	205.53	0.00
Clinton	78,443	21,127	13	76	5	61.53	96.89	6.37
Crawford	13,907	2,861	5	20	0	174.76	143.81	0.00
Delta	35,965	7,915	36	26	0	454.83	72.29	0.00
Detroit City	673,103	209,892	238	3,886	141	113.39	577.33	20.95
Dickinson	25,415	5,885	10	45	2	169.92	177.06	7.87
Eaton	109,027	30,160	39	173	7	129.31	158.68	6.42
Emmet	33,193	8,076	9	33	2	111.44	99.42	6.03
Genesee	407,385	108,389	202	1,624	53	186.37	398.64	13.01
Gladwin	25,234	5,122	9	31	1	175.71	122.85	3.96
Gogebic	15,342	3,760	11	11	0	292.55	71.70	0.00
Grand Traverse	91,807	24,170	45	122	5	186.18	132.89	5.45
Gratiot	41,018	12,625	5	48	0	39.60	117.02	0.00
Hillsdale	45,879	11,682	19	45	0	162.64	98.08	0.00
Houghton	36,305	13,286	10	12	0	75.27	33.05	0.00
Huron	31,280	6,767	5	45	2	73.89	143.86	6.39
Ingham	290,186	114,852	91	1,071	19	79.23	369.07	6.55
Ionia	64,291	18,950	17	60	3	89.71	93.33	4.67
Iosco	25,162	4,880	10	39	0	204.92	155.00	0.00
Iron	11,124	2,018	14	8	2	693.76	71.92	17.98
Isabella	71,063	32,495	43	103	0	132.33	144.94	0.00
Jackson	158,640	43,065	83	417	2	192.73	262.86	1.26
Kalamazoo	262,985	92,668	95	431	4	102.52	163.89	1.52
Kalkaska	17,634	4,210	7	32	0	166.27	181.47	0.00
Kent	648,594	206,533	157	659	49	76.02	101.60	7.55
Keweenaw	2,105	330	0	3	0	0.00	142.52	0.00

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts

County	Total Population	18-39 Year Population	2018 18-39 Year HCV Cases	2018 Heroin Treatment Admissions	2017 Heroin Overdose Deaths	2018 18-39 Year HCV Rate*	2018 Heroin Treatment Admission Rate*	2017 Heroin Overdose Death Rate*
Lake	12,013	2,356	2	10	0	84.89	83.24	0.00
Lapeer	88,174	21,463	24	159	3	111.82	180.33	3.40
Leelanau	21,657	4,221	5	7	0	118.46	32.32	0.00
Lenawee	98,623	26,342	38	121	4	144.26	122.69	4.06
Livingston	189,651	46,498	51	86	16	109.68	45.35	8.44
Luce	6,358	1,743	7	0	0	401.61	0.00	0.00
Mackinac	10,712	2,144	8	1	0	373.13	9.34	0.00
Macomb	871,375	238,976	321	4,158	113	134.32	477.18	12.97
Manistee	24,427	5,457	11	24	0	201.58	98.25	0.00
Marquette	66,502	21,824	40	33	0	183.28	49.62	0.00
Mason	29,073	6,703	11	75	2	164.11	257.97	6.88
Mecosta	43,391	14,945	12	43	0	80.29	99.10	0.00
Menominee	23,046	4,993	7	4	1	140.20	17.36	4.34
Midland	83,411	22,324	31	202	2	138.86	242.17	2.40
Missaukee	14,998	3,562	9	8	0	252.67	53.34	0.00
Monroe	149,649	37,954	104	328	18	274.02	219.18	12.03
Montcalm	63,550	16,838	20	112	2	118.78	176.24	3.15
Montmorency	9,250	1,593	5	9	0	313.87	97.30	0.00
Muskegon	173,693	48,020	74	464	7	154.10	267.14	4.03
Newaygo	48,242	11,758	25	97	4	212.62	201.07	8.29
Oakland	1,250,836	343,016	299	1,879	21	87.17	150.22	1.68
Oceana	26,442	6,216	11	33	0	176.96	124.80	0.00
Ogemaw	20,981	4,404	19	33	0	431.43	157.29	0.00
Ontonagon	5,881	804	0	7	0	0.00	119.03	0.00
Osceola	23,260	5,494	8	15	2	145.61	64.49	8.60
Oscoda	8,287	1,564	11	14	0	703.32	168.94	0.00
Otsego	24,538	5,943	22	56	1	370.18	228.22	4.08
Ottawa	286,383	90,705	31	172	20	34.18	60.06	6.98
Presque Isle	12,791	2,269	1	4	0	44.07	31.27	0.00
Roscommon	23,895	4,080	11	36	3	269.61	150.66	12.55
Saginaw	191,934	52,572	81	468	10	154.07	243.83	5.21
St Clair	159,350	38,886	77	437	28	198.01	274.24	17.57
St Joseph	60,947	15,511	21	70	2	135.39	114.85	3.28
Sanilac	41,269	9,414	9	30	0	95.60	43.83	0.00
Schoolcraft	8,049	1,541	2	2	0	129.79	3.79	0.00
Shiawassee	68,446	17,490	21	107	7	120.07	142.00	9.29
Tuscola	52,764	12,739	12	55	0	94.20	14.96	0.00
Van Buren	75,353	18,650	23	82	5	123.32	7.59	0.46
Washtenaw	367,627	144,121	56	498	32	38.86	135.46	8.70
Wayne	1,080,513	292,207	328	4,085	147	112.25	378.06	13.60
Wexford	33,276	8,220	21	70	1	255.47	210.36	3.01
MDOC	39,666	21,886	372	-	-	1,699.72	-	-
State-wide†	9,962,311	2,832,087	3,774	24,650	786	133.26	247.43	7.89

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts

Appendix B1: Hepatitis Data by Local Health Jurisdiction

Local Health Jurisdiction	Total Population	2018 Chronic HCV Cases	2018 Acute HCV Cases	2018 Chronic HBV Cases	2018 Acute HBV Cases	2018 Chronic HCV Rate*	2018 Acute HCV Rate*	2018 Chronic HBV Rate*	2018 Acute HBV Rate*
Allegan	116,447	71	2	2	0	60.97	1.72	1.72	0.00
Barry-Eaton	169,613	127	6	12	1	74.88	3.54	7.07	0.59
Bay	104,239	127	3	4	0	121.84	2.88	3.84	0.00
Benzie-Leelanau	39,230	34	0	0	1	86.67	0.00	0.00	2.55
Berrien	154,259	122	6	13	1	79.09	3.89	8.43	0.65
Branch-Hillsdale-St. Joseph	150,236	139	0	2	0	92.52	0.00	1.33	0.00
Calhoun	134,128	163	3	8	2	121.53	2.24	5.96	1.49
Central Michigan	189,150	209	4	5	4	110.49	2.11	2.64	2.11
Chippewa	37,711	58	4	0	0	153.80	10.61	0.00	0.00
Delta-Menominee	59,011	71	5	1	2	120.32	8.47	1.69	3.39
Detroit City	673,103	1,446	6	213	7	214.83	0.89	31.64	1.04
Dickinson-Iron	36,539	38	3	2	0	104.00	8.21	5.47	0.00
District Health Department #10	263,403	276	4	4	2	104.78	1.52	1.52	0.76
District Health Department #2	64,781	98	4	4	0	151.28	6.17	6.17	0.00
District Health Department #4	75,872	78	1	2	0	102.80	1.32	2.64	0.00
Genesee	407,385	521	13	38	13	127.89	3.19	9.33	3.19
Grand Traverse	91,807	71	1	1	1	77.34	1.09	1.09	1.09
Huron	31,280	17	0	1	0	54.35	0.00	3.20	0.00
Ingham	290,186	305	8	34	4	105.11	2.76	11.72	1.38
Ionia	64,291	49	1	3	0	76.22	1.56	4.67	0.00
Jackson	158,640	197	2	9	0	124.18	1.26	5.67	0.00
Kalamazoo	262,985	236	7	21	0	89.74	2.66	7.99	0.00
Kent	648,594	454	11	71	0	70.00	1.70	10.95	0.00
Lapeer	88,174	54	0	3	2	61.24	0.00	3.40	2.27
Lenawee	98,623	102	1	5	0	103.42	1.01	5.07	0.00
Livingston	189,651	139	0	10	0	73.29	0.00	5.27	0.00
Luce-Mackinac-Alger-Schoolcraft	34,240	66	2	0	1	192.76	5.84	0.00	2.92
Macomb	871,375	858	31	102	5	98.47	3.56	11.71	0.57
Marquette	66,502	80	2	2	1	120.30	3.01	3.01	1.50
Midland	83,411	50	1	3	0	59.94	1.20	3.60	0.00
Mid-Michigan	183,011	112	5	3	1	61.20	2.73	1.64	0.55
Monroe	149,649	241	0	11	3	161.04	0.00	7.35	2.00
Muskegon	173,693	189	10	6	1	108.81	5.76	3.45	0.58
Northwest Michigan	107,162	98	5	2	1	91.45	4.67	1.87	0.93
Oakland	1,250,836	1,022	5	169	13	81.71	0.40	13.51	1.04
Ottawa	286,383	107	1	22	2	37.36	0.35	7.68	0.70
Saginaw	191,934	182	3	18	1	94.82	1.56	9.38	0.52
Sanilac	41,269	22	1	2	0	53.31	2.42	4.85	0.00
Shiawassee	68,446	57	0	3	1	83.28	0.00	4.38	1.46
St Clair	159,350	188	7	19	1	117.98	4.39	11.92	0.63
Tuscola	52,764	34	1	3	0	64.44	1.90	5.69	0.00
Van Buren-Cass	126,734	151	3	5	0	119.15	2.37	3.95	0.00
Washtenaw	367,627	121	1	54	0	32.91	0.27	14.69	0.00
Wayne	1,080,513	1,158	3	180	8	107.17	0.28	16.66	0.74
Western Upper Peninsula	68,074	60	3	3	0	88.14	4.41	4.41	0.00
MDOC	39,666	544	0	14	0	1,371.45	0.00	35.29	0.00
Statewide†	9,962,311	10,545	179	1,089	79	105.85	1.80	10.93	0.79

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts

Appendix B2: Heroin Data by Local Health Jurisdiction

Local Health Jurisdiction	Total Population	18-39 Year Population	2018 18-39 Year HCV Cases	2018 Heroin Treatment Admissions	2017 Heroin Overdose Deaths	2018 18-39 Year HCV Rate*	2018 Heroin Treatment Admission Rate*	2017 Heroin Overdose Death Rate*
Allegan	116,447	30,010	25	33	0	83.31	28.34	0.00
Barry-Eaton	169,613	45,169	50	221	8	110.70	130.30	4.72
Bay	104,239	26,843	63	354	2	234.70	339.60	1.92
Benzie-Leelanau	39,230	7,991	12	19	0	150.17	48.43	0.00
Berrien	154,259	39,518	36	390	9	91.10	252.82	5.83
Branch-Hillsdale-St. Joseph	150,236	38,253	54	175	2	141.17	116.48	1.33
Calhoun	134,128	36,454	68	360	18	186.54	268.40	13.42
Central Michigan	189,150	57,200	95	270	7	166.08	142.74	3.70
Chippewa	37,711	11,883	30	5	0	252.46	13.26	0.00
Delta-Menominee	59,011	12,908	43	30	1	333.13	50.84	1.69
Detroit City	673,103	209,892	238	3,886	141	113.39	577.33	20.95
Dickinson-Iron	36,539	7,903	24	53	4	303.68	145.05	10.95
District Health Department #10	263,403	66,288	114	412	7	171.98	156.41	2.66
District Health Department #2	64,781	12,458	43	89	0	345.16	137.39	0.00
District Health Department #4	75,872	15,611	33	89	3	211.39	117.30	3.95
Genesee	407,385	108,389	202	1,624	53	186.37	398.64	13.01
Grand Traverse	91,807	24,170	45	122	5	186.18	132.89	5.45
Huron	31,280	6,767	5	45	2	73.89	143.86	6.39
Ingham	290,186	114,852	91	1,071	19	79.23	369.07	6.55
Ionia	64,291	18,950	17	60	3	89.71	93.33	4.67
Jackson	158,640	43,065	83	417	2	192.73	262.86	1.26
Kalamazoo	262,985	92,668	95	431	4	102.52	163.89	1.52
Kent	648,594	206,533	157	659	49	76.02	101.60	7.55
Lapeer	88,174	21,463	24	159	3	111.82	180.33	3.40
Lenawee	98,623	26,342	38	121	4	144.26	122.69	4.06
Livingston	189,651	46,498	51	86	16	109.68	45.35	8.44
Luce-Mackinac-Alger-Schoolcraft	34,240	7,625	23	5	0	301.64	14.60	0.00
Macomb	871,375	238,976	321	4,158	113	134.32	477.18	12.97
Marquette	66,502	21,824	40	33	0	183.28	49.62	0.00
Midland	83,411	22,324	31	202	2	138.86	242.17	2.40
Mid-Michigan	183,011	50,590	38	236	7	75.11	128.95	3.82
Monroe	149,649	37,954	104	328	18	274.02	219.18	12.03
Muskegon	173,693	48,020	74	464	7	154.10	267.14	4.03
Northwest Michigan	107,162	24,459	44	148	6	179.89	138.11	5.60
Oakland	1,250,836	343,016	299	1,879	21	87.17	150.22	1.68
Ottawa	286,383	90,705	31	172	20	34.18	60.06	6.98
Saginaw	191,934	52,572	81	468	10	154.07	243.83	5.21
Sanilac	41,269	9,414	9	30	0	95.60	72.69	0.00
Shiawassee	68,446	17,490	21	107	7	120.07	156.33	10.23
St Clair	159,350	38,886	77	437	28	198.01	274.24	17.57
Tuscola	52,764	12,739	12	55	0	94.20	104.24	0.00
Van Buren-Cass	126,734	30,695	44	123	5	143.35	97.05	3.95
Washtenaw	367,627	144,121	56	498	32	38.86	135.46	8.70
Wayne	1,080,513	292,207	328	4,085	147	112.25	378.06	13.60
Western Upper Peninsula	68,074	20,392	32	37	0	156.92	54.35	0.00
MDOC	39,666	21,886	372	-	-	1,699.72	-	-
Statewide†	9,962,311	2,832,087	3,774	24,650	786	133.26	247.43	7.89

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts

Appendix C1: Hepatitis Data by Region

Region	Total Population	2018 Chronic HCV Cases	2018 Acute HCV Cases	2018 Chronic HBV Cases	2018 Acute HBV Cases	2018 Chronic HCV Rate*	2018 Acute HCV Rate*	2018 Chronic HBV Rate*	2018 Acute HBV Rate*
1	1,079,913	992	18	74	6	91.86	1.67	6.85	0.56
3	1,105,516	1,146	26	76	17	103.66	2.35	6.87	1.54
5	959,496	873	22	52	3	90.99	2.29	5.42	0.31
6	1,520,648	1,176	31	108	5	77.34	2.04	7.10	0.33
7	442,208	404	10	9	7	91.36	2.26	2.04	1.58
8	302,077	373	19	8	4	123.48	6.29	2.65	1.32
2N	2,281,561	2,068	43	290	19	90.64	1.88	12.71	0.83
2S	2,270,892	2,966	10	458	18	130.61	0.44	20.17	0.79
MDOC	39,666	544	0	14	0	1,371.45	0.00	35.29	0.00
Statewide†	9,962,311	10,545	179	1,089	79	105.85	1.80	10.93	0.79

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts

Appendix C2: Heroin Data by Region

Region	Total Population	18-39 Year Population	2018 18-39 Year HCV Cases	2018 Heroin Treatment Admissions	2017 Heroin Overdose Deaths	2018 18-39 Year HCV Rate*	2018 Heroin Treatment Admission Rate*	2017 Heroin Overdose Death Rate*
1	1,079,913	323,841	360	2,144	60	111.17	198.53	5.56
3	1,105,516	281,329	487	3,079	74	173.11	278.51	6.69
5	959,496	270,925	314	1,515	39	115.90	157.90	4.06
6	1,520,648	467,784	427	1,906	89	91.28	125.34	5.85
7	442,208	100,621	198	568	18	196.78	128.45	4.07
8	302,077	82,535	192	163	5	232.63	53.96	1.66
2N	2,281,561	620,878	697	6,474	162	112.26	283.75	7.10
2S	2,270,892	684,174	726	8,797	338	106.11	387.38	14.88
MDOC	39,666	21,886	372	-	-	1,699.72	-	-
Statewide†	9,962,311	2,832,087	3,774	24,650	786	133.26	247.43	7.89

*Rates are calculated per 100,000 persons in the population

†Due to cases without a defined jurisdiction, state-wide totals may include cases that were not included in jurisdiction counts