2015
Hepatitis B and C Surveillance Report

Viral Hepatitis Surveillance and Prevention Unit

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Summary

Table 1. Summary of Demographic Information by Type of Hepatitis, Michigan, 2015

Variable	Acute Hepatitis B	% Acute Hepatitis B	Chronic Hepatitis B	% Chronic Hepatitis B	Acute Hepatitis C	% Acute Hepatitis C	Chronic Hepatitis C	% Chronic Hepatitis C
n	61	100%	1076	100%	84	100%	7833	100%
Sex								
Male	38	62%	645	60%	42	50%	4873	62%
Female	23	38%	431	40%	42	50%	2943	38%
Unknown	0	0%	0	0%	0	0%	17	0%
Race and Ethnicity								
Caucasian	43	70%	302	28%	73	87%	4183	53%
Black or African American	11	18%	231	21%	3	4%	1344	17%
Hispanic	0	0%	13	1%	5	6%	144	2%
Asian	2	3%	210	20%	1	1%	44	1%
American Indian or Alaskan Native	0	0%	8	1%	2	2%	86	1%
Other	1	2%	48	4%	1	1%	136	2%
Unknown	4	7%	277	26%	4	5%	2040	26%
Age (years)								
Mean	49		46		35		48	
Median	50		45		31		52	
Range	24 - 91		0 - 91		14 - 71		0 - 120	
0-19	0	0%	34	3%	5	6%	118	2%
20-29	2	3%	144	13%	33	39%	1368	17%
30-39	17	28%	236	22%	20	24%	1263	16%
40-49	11	18%	223	21%	9	11%	837	11%
50-59	18	30%	211	20%	13	15%	1995	25%
60+	13	21%	228	21%	4	5%	2248	29%
Unknown	0	0%	0	0%	0	0%	4	0%

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 chronic hepatitis C infection in 2015, while acute hepatitis C diagnoses were evenly split between males and females. There are some noticeable 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 have a large majority of the acute hepatitis C cases, accounting for over 85% of cases reported. 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.

Viral Hepatitis Data Summary

This report presents hepatitis B and C data collected from case reports submitted to MDSS for calendar year 2015. 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 61 cases of acute hepatitis B infection reported in Michigan in 2015 for a rate of 0.60 cases per 100,000 people. This is below the national rate of acute HBV infection (1.00 per 100,000).
- The rate of acute hepatitis B infection has decreased in Michigan nearly every year since 2008, likely a sign of successful vaccination programs.
- Case follow-up and completion of epidemiological risk factors was completed for 91% of acute hepatitis B cases in 2015.
- There was no risk factor that was predominantly shared between 2015 acute hepatitis B cases.

Chronic Hepatitis B

- There were 1,076 new chronic hepatitis B diagnoses reported in Michigan in 2015 for a rate of 10.89 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 88.80 per 100,000, compared to the state average of 10.89.

Acute Hepatitis C

- There were 84 cases of acute hepatitis C reported in Michigan in 2015 for a rate of 0.85 cases per 100,000 people. This is higher than rates reported in 2013 (0.75) and 2014 (0.77).
- The average age of acute hepatitis C cases, 35 years old, was much younger than the other hepatitis case classifications.
- Case follow-up and completion of epidemiological risk factors was completed for about 83% of acute hepatitis C cases in 2013.
    - Where data were available, injection drug use was reported by 61% of acute hepatitis C cases.

Hepatitis C, Past or Present (Chronic)

- There were 7,833 new chronic hepatitis C diagnoses reported in Michigan in 2015 for a rate of 79.25 cases per 100,000 people.
- The rate of hepatitis C, past or present is almost twice as high in Michigan males (100.51 per 100,000) versus females (58.44 per 100,000).
- American Indians and Alaskan Natives (157.32 per 100,000) and African Americans (97.13 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 83% of chronic hepatitis C cases in 2015, up from 62% in 2014.
    - Where data were available, injection drug use was a factor shared by 66% of cases. Incarceration was a risk factor in 12% of cases.
- 74% of chronic hepatitis C cases were reported with genotype 1 infection, 17% with genotype 3, and 8% with genotype 2.

Special Populations

Hepatitis C in Young Adults

- From 2005-2015, the number of cases of chronic hepatitis C among persons aged 18 -29 years has increased over 302%.
- Injection drug use in 18-29 year olds was reported in 86.7% of hepatitis C patients.
- During this time frame there have been concurrent increasing trends in heroin abuse. Between 2000 and 2015 there has been a:
    - 118% increase in Michigan heroin substance abuse treatment admissions
    - 484% increase in Michigan heroin overdose deaths

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

- From 2004-2015, there were 839 persons in Michigan reported with Hepatitis B/HIV co-infection.
    - 87.0% 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 47.8%
- From 2004-2015, there were 1,191 persons in Michigan reported with Hepatitis C/HIV co-infection.
    - 69.4% of these persons are male.
    - The primary modes of HIV transmission in the HIV/HCV co-infection group were IDU at 40.8% and MSM at 30.6%
- Incidence of HBV/HIV co-infections and HIV/HCV co-infection has continued to decline. As a result of better HIV linkage to care and treatment, these individuals are living longer lives and thus prevalence of both HBV/HIV coinfection and HCV/HIV coinfection are increasing.

Viral Hepatitis Outcomes

Viral Hepatitis and Liver Cancer

- The overall incidence rate for liver cancer in Michigan has increased by 33% between 2004 and 2013.
- The liver cancer rate among African American males (18.8 cases per 100,000) is more than twice that among Caucasian males (7.9 cases per 100,000).
- The overall liver cancer mortality rate has increased by 39% between 2004 and 2014 in Michigan.
- In 2014, the Michigan liver cancer mortality rate was over twice as high in African-American males(8.9 per 100,000) as it was in Caucasian males (4.4 per 100,000).

Viral Hepatitis-Related Mortality

- There were 170 deaths attributed to chronic hepatitis C in Michigan in 2014.
- Deaths due to chronic hepatitis C alone increased by 62% between 2004 and 2014.

Background and Technical Notes

Viral Hepatitis Surveillance

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 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, hepatitis D and hepatitis E are all reported in MDSS, this report will highlight acute and chronic hepatitis B and C surveillance. 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. Special populations, such as cases younger than 30 years old or with certain risk factors, may be targeted for surveillance by using MDSS queries which enable surveillance staff to download lists of cases of interest from MDSS for follow-up.

BACKGROUND

"Hepatitis" means inflammation of the liver and also refers to a group of viruses that infect the liver. The most common types of viral hepatitis are hepatitis A, hepatitis B, and hepatitis C. 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. Hepatitis A is transmitted from person to person via ingestion food and water contaminated with human waste while hepatitis B and C are both bloodborne infections. Many persons infected with hepatitis B or hepatitis C are unaware they are infected. Unlike Hepatitis A, both hepatitis B and hepatitis C viruses 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. An estimated 4.4 million Americans are living with chronic hepatitis; most do not know they are infected.

Hepatitis B

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, 800,000-1.4 million persons are estimated to be infected with the virus, most of whom are unaware of their infection status. Worldwide, more than 240 million people have chronic hepatitis B infection and about 600,000 people die every year due to the acute or chronic consequences of hepatitis B.

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

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 Hepatitis C is by avoiding behaviors that can spread the disease, especially injection drug use.

The incubation period for hepatitis C 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 hepatitis C virus 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 estimated 3.2 million chronically infected persons nationwide, HCV infection is the most common blood-borne infection in the United States. Worldwide, about 150 million people are chronically infected with HCV, and more than 350,000 people die every year from hepatitis C-related liver diseases.

Since no vaccine is available for preventing hepatitis C 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 Hepatitis C direct acting antivirals have few side effects and 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 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. Cases can be entered into MDSS either electronically or manually. 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 NETSS, 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, 2015 and December 31, 2015 in MDSS.

Local Health Jurisdiction Structure

The state of Michigan is divided into eight public health preparedness regions which are serviced by 45 health jurisdictions comprised of 84 county health departments. 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 Michigan Department of Health and Human Services provides expert consultation, reference level diagnostic laboratory services, and support to local health departments. Michigan has four public health laboratories capable of responding to biological or chemical public health emergencies. The Laboratory Response Network is a partnership between government and private organizations.

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. 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 2015. In general, this is not necessarily reflective of the true number of new infections that occurred in 2015 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 2015. 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.

Like many reportable diseases, cases of viral hepatitis are largely under-reported. CDC estimates suggest that only about 8-10% of acute hepatitis B and 15-17% of acute hepatitis C 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, 1.25 million individuals (about 0.3% of the US population) and 3.2 million (about 1% of the US population) are infected with hepatitis B and C respectively. Extrapolating that to the Michigan population, we would then expect approximately 30,000 Michiganders to be infected and living with HBV and 99,000 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. While we attempted to remove all MDOC cases from LHD case counts, counties that have correctional facilities within their boundaries may have a higher number of HCV cases than would be expected (e.g. Jackson County).

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 2012 Case Definitions

- Acute Hepatitis B
- Chronic Hepatitis B
- Acute Hepatitis C
- Chronic Hepatitis C, 2016

Michigan Viral Hepatitis Case Report Forms

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

Michigan Census and Demographics

Population by Age, Gender & Education

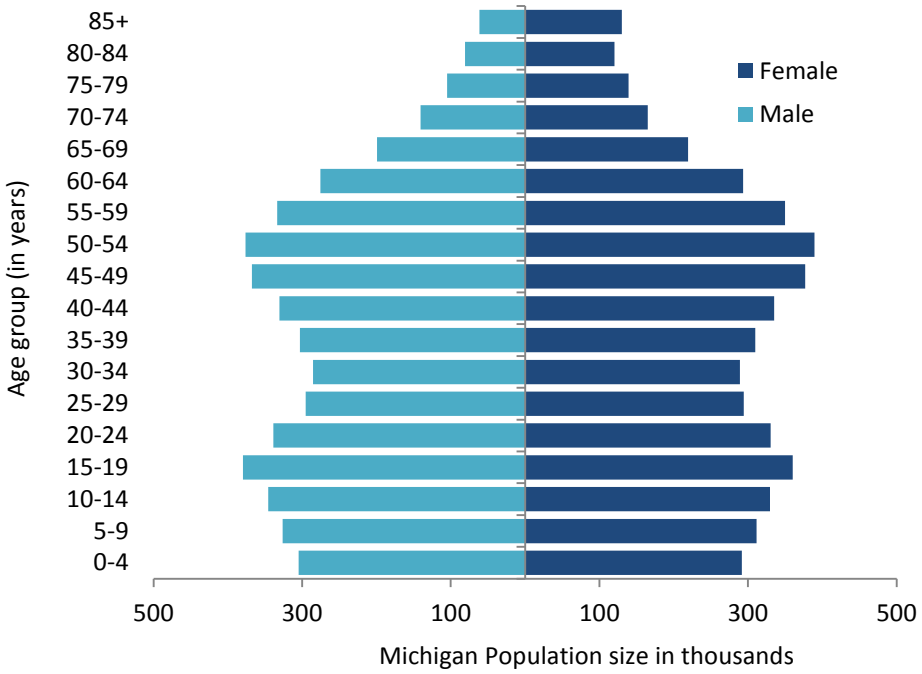


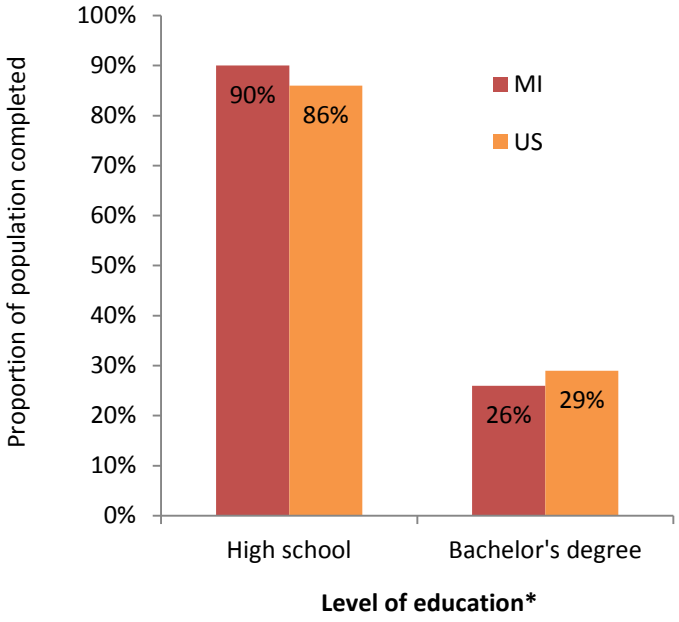
Figure 1.1 Age and sex: Michigan, 2010

The total population in Michigan in 2010 was 9,883,640 and was the 8th most populous state in the nation. Michigan's population decreased 0.6% from 2000. Persons born between 1945 through 1965, amounted to 1,183,954 persons or 12 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 80% of the total population was greater than eighteen years old, and residents greater than age sixty-five comprised 14% of the total population. The median age was thirty-nine years old.

Figure 1.2 Level of education: Michigan and the U.S., 2009-2013

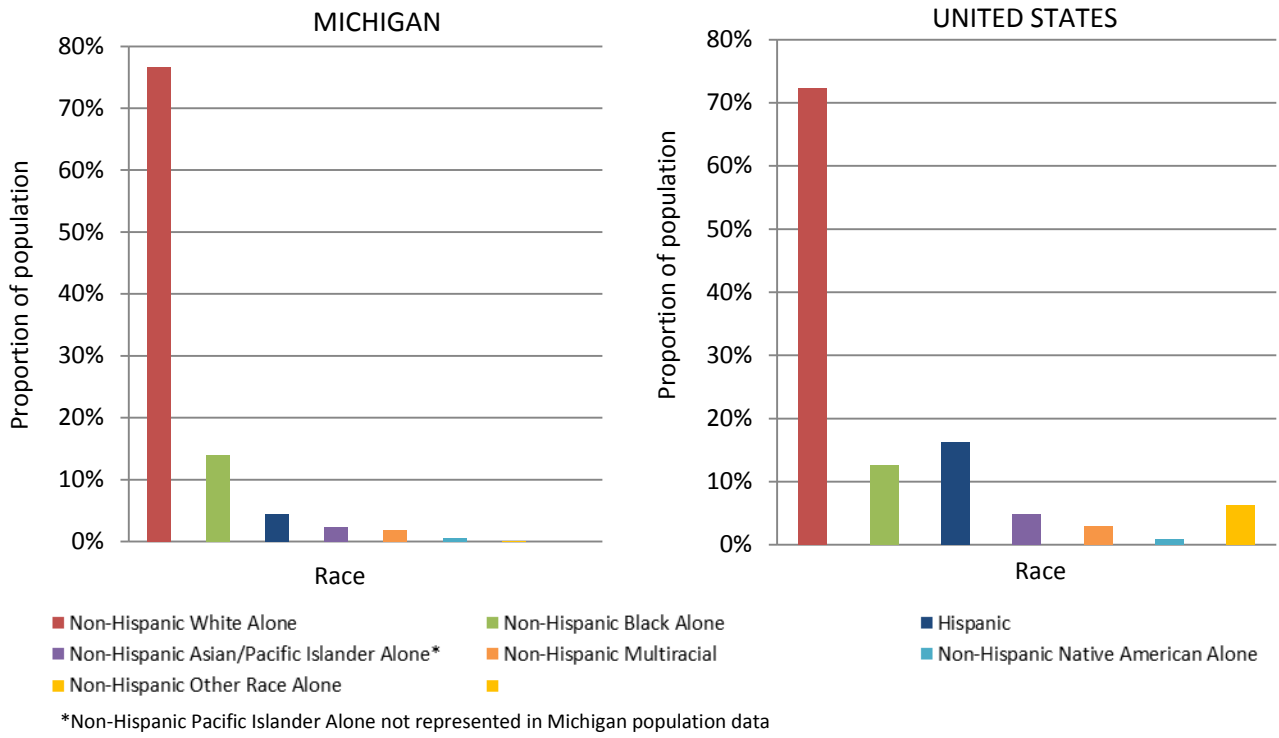
Looking at those aged twenty-five years and older, 90% of Michigan's population completed high school, more than the national population at 86%. A higher percentage of the national population, however, completed a Bachelor's degree than in Michigan alone.

*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



*Non-Hispanic Pacific Islander Alone not represented in Michigan population data

Figure 1.3 Race and ethnicity: Michigan and the U.S., 2010

According to the 2010 Census, the racial and ethnic composition of the state is 76.6 percent non-Hispanic white; 14 percent black; 4.4 percent Hispanic; 2.4 percent non-Hispanic Asian alone; 2.6 percent multiracial or other race. Nationally, the population of non-Hispanic white is 62.6 percent of the total, and the Hispanic population is 17.1 percent. The proportion of male and females within each racial/ethnic group is similar. Between 2000 and 2010, there was a 34.7 percent rise in Michigan's Hispanic population and a 34.5 percent increase in the non-Hispanic Asian alone population.

	2000 Census		2010 Census		Years 2000-2010	
Race	**Population Count**	**Percent of Total**	**Population Count**	**Percent of Total**	**Change**	**Percent Change**
Total Population	9,938,444	100.00%	9,883,640	100.00%	-54,804	-0.60%
White Alone	7,806,691	78.60%	7,569,939	76.60%	-236,752	-3.00%
Black Alone	1,402,047	14.10%	1,383,756	14.00%	-18,291	-1.30%
Hispanic	323,877	3.30%	436,358	4.40%	112,481	34.70%
Asian Alone	175,311	1.80%	236,490	2.40%	61,179	34.90%
Multiracial	163,487	1.60%	190,396	1.90%	26,909	16.50%
Native American Alone	53,421	0.50%	54,665	0.60%	1,244	2.30%
Other Race Alone	11,465	0.10%	9,866	0.10%	-1,599	-13.90%
Pacific Islander Alone	2,145	0.00%	2,170	0.00%	25	1.20%

Table 1.4 Population by race: Michigan, 2000-2010

Source: The United States Census Bureau

Poverty, Income & Health Insurance

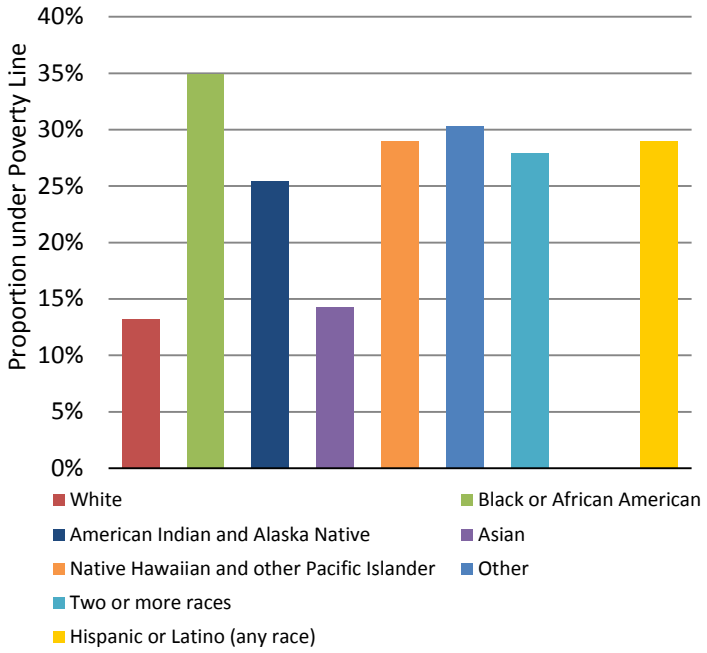


Figure 1.4 Population under the poverty line by race: Michigan, 2009-2013

The poverty line is determined at a national level each year. In 2013 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 2013 (35%), with almost 500,000 individuals in poverty. The white population had the lowest percentage of poverty (about 13%) but the largest number of impoverished individuals (over 1 million). The American Indian and Alaska Native, Native Hawaiian and Pacific Islander, and the Hispanic or Latino populations showed similar percentages under the poverty line (25-30%).

Figure 1.5 Health insurance coverage, Michigan and the U.S., 2013

A slightly higher percentage of Michigan's population (about 88%) in 2013 had some type of health insurance whether it be private or public coverage, than the U.S. population (about 85%). A smaller proportion of individuals in Michigan (about 11%) had no health insurance at all compared to the U.S. (about 15%).

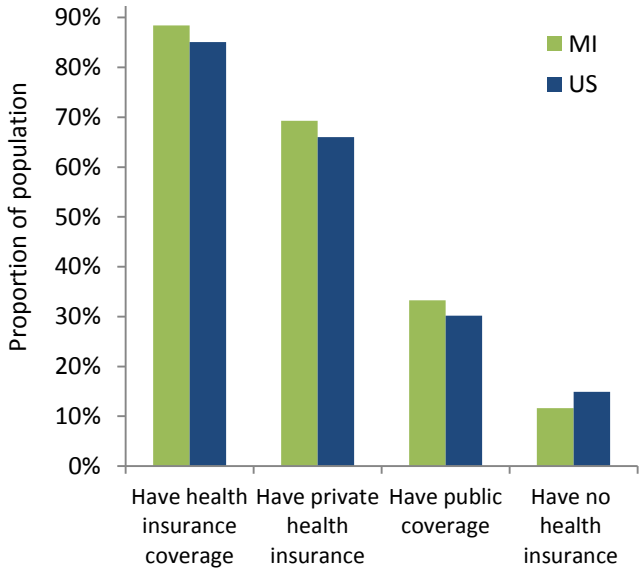
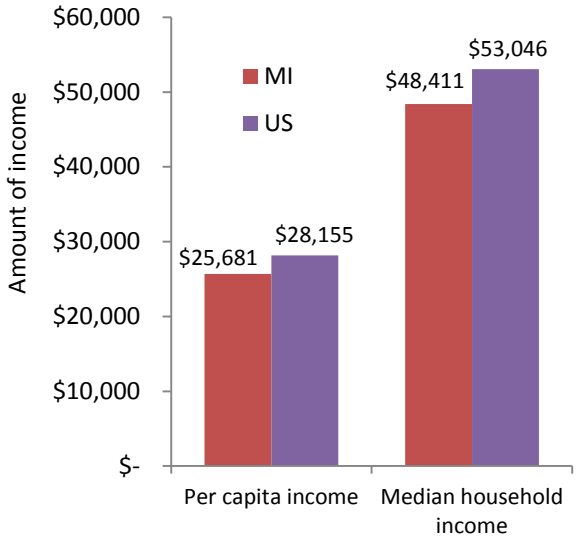


Figure 1.6 Income: Michigan and the U.S., 2013

The Michigan population had overall lower levels of income than that of the U.S. population. The average per capita income for Michigan ($25,681) was 8% lower than the U.S. average ($28,155), and the median household income for Michigan ($48,411) was approximately 9% below the national's median ($53,046).



Source: The United States Census Bureau

Acute Hepatitis B

Acute Hepatitis B

Figure 2.1 Incidence of Acute Hepatitis B in Michigan and United States, 2011-2015

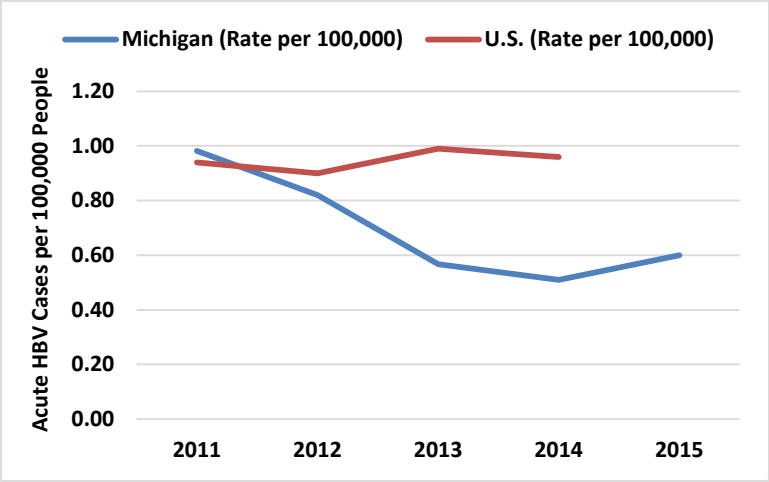


Table 2.1 Incidence of Acute Hepatitis B, Michigan and United States, 2011-2015

Year	Michigan Cases	Michigan (Rate per 100,000)	U.S. (Rate per 100,000)
2011	97	0.98	0.94
2012	81	0.82	0.90
2013	56	0.57	0.99
2014	50	0.51	0.96
2015	61	0.60	N/A

The incidence of acute hepatitis B has decreased in Michigan from 2011 through 2014, increasing only slightly in 2015. Decreases in acute hepatitis B diagnoses in Michigan and nationally are likely the result of increases in hepatitis B vaccination. With more individuals in the community protected against the virus, new infections have decreased.

Figure 2.2 Number of Acute Hepatitis B Cases by Gender in Michigan, 2011-2015

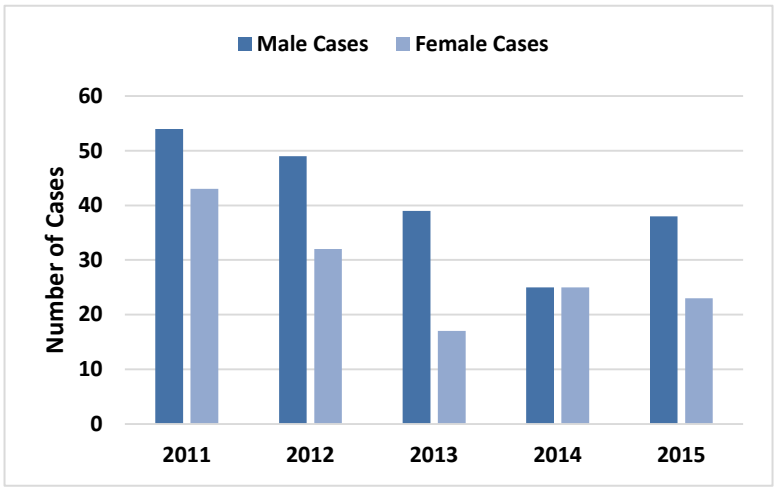


Table 2.2 Incidence and Number of Cases of Acute Hepatitis B by Gender in Michigan, 2011-

Year	Male Cases	Male Incidence	Female Cases	Female Incidence
2011	54	1.11	43	0.85
2012	49	1.01	32	0.64
2013	39	0.80	17	0.34
2014	25	0.52	25	0.50
2015	38	0.78	23	0.46

The incidence of acute hepatitis B has decreased for both sexes from 2011 to 2014, but increased slightly among males in 2015. Incidence of acute hepatitis B was higher in males than in females between the years of 2011 and 2015, except during 2014, when incidence in males was equal to the incidence in females.

Figure 2.3 Incidence of Acute Hepatitis B by Race in Michigan, 2011-2015

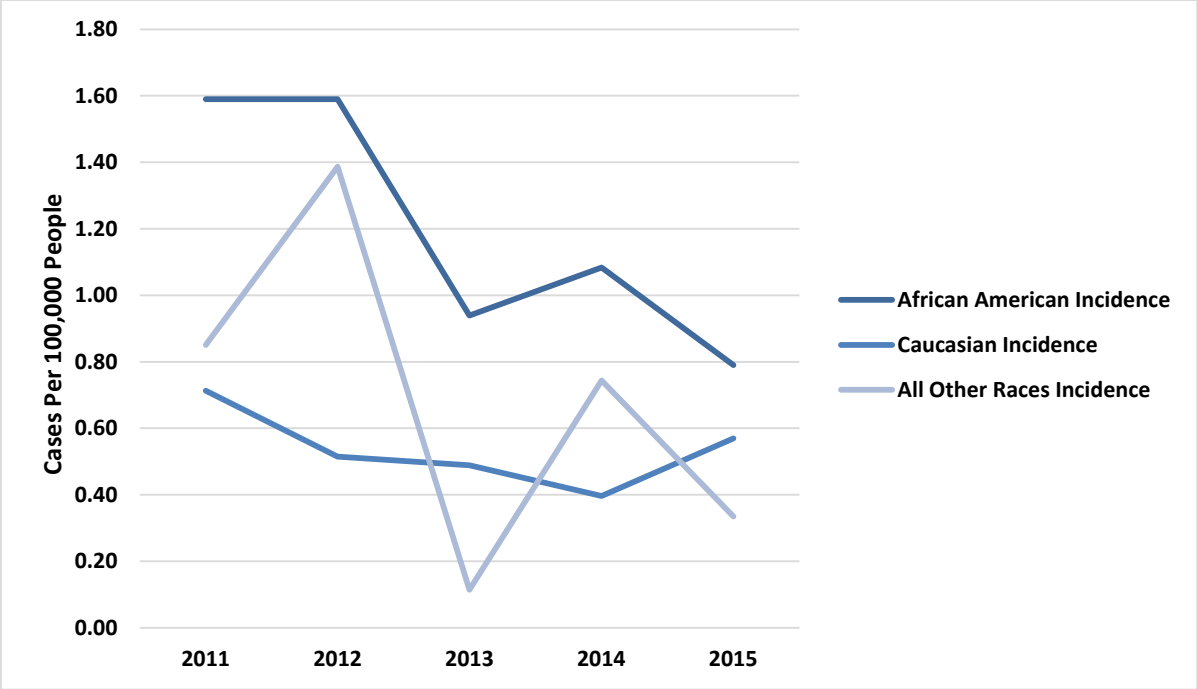


Table 2.3 Incidence of Acute Hepatitis B by Race and Ethnicity in Michigan, 2011-2015

	African American	African American Incidence	American Indian	American Indian Incidence	Asian	Asian Incidence	Caucasian	Caucasian Incidence	Hispanic	Hispanic Incidence	Other	Other Incidence
2011	22	1.59	0	0.00	4	1.69	54	0.71	1	0.23	3	1.48
2012	22	1.59	1	1.83	6	2.54	39	0.52	3	0.69	1	0.49
2013	13	0.94	0	0.00	0	0.00	37	0.49	2	0.46	0	0.00
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

Asians have the greatest incidence of acute hepatitis B in Michigan. Incidence of acute hepatitis B has decreased in every racial and ethnic groups, aside from Asians and Caucasians, between 2011 and 2015. The largest increase from 2014 to 2015 was seen in Asians where the incidence went from 0.42 in 2014 to 0.85 cases per 100,000 populations in 2015. In 2015, the rate of acute hepatitis B was highest for Asians and African Americans. The rate of acute hepatitis B was lowest for Hispanics and American Indian or Alaskan Natives.

Acute Hepatitis B

Table 2.4a Completeness of Acute Hepatitis B Reports* by Risk Behavior in Michigan, 2015 (n = 61)

Risk Behavior	Completed
Injection Drug User	92%
Used Street Drugs	90%
Hemodialysis	93%
Received Blood Products	92%
Received a Tattoo	93%
Accidental Needle Stick	77%
Contact of Person with Hepatitis B	93%
Other Surgery	89%
Oral Surgery or Dental Work	92%
Employed in Medical Field	93%
Employed as Public Safety Officer	92%
Incarceration Longer than 6 Months	89%
Any Part of Body Pierced (other than ear)	93%

Table 2.4a shows the percentage of acute hepatitis B 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 hepatitis B epidemiologic information questions were completed for 91% of case reports. This is an increase from the 70% of acute hepatitis B questions completed in the year 2012 and similar to case follow-up rates reported in 2013. According to the CDC, the national average for completeness of acute hepatitis B case report forms was 58% in 2014.

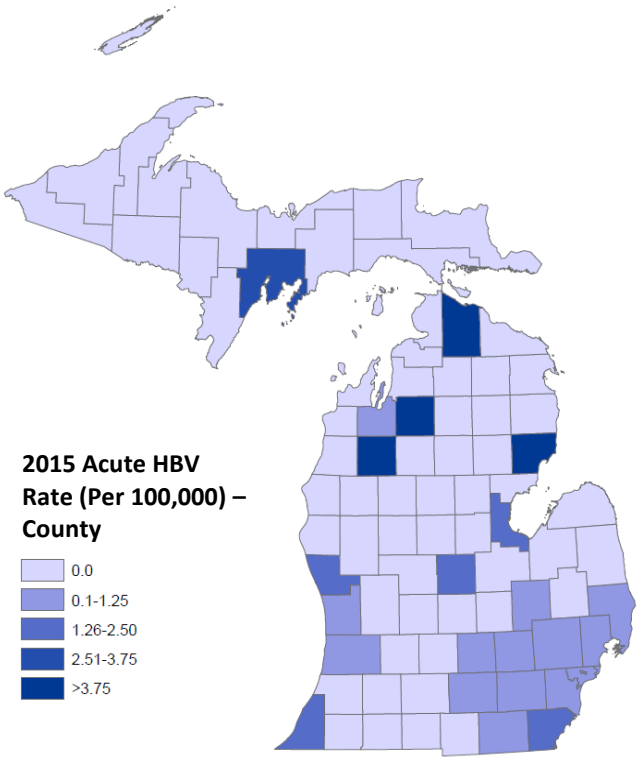
Table 2.4b Response of Completed Acute Hepatitis B Reports* by Risk Behavior in Michigan, 2015

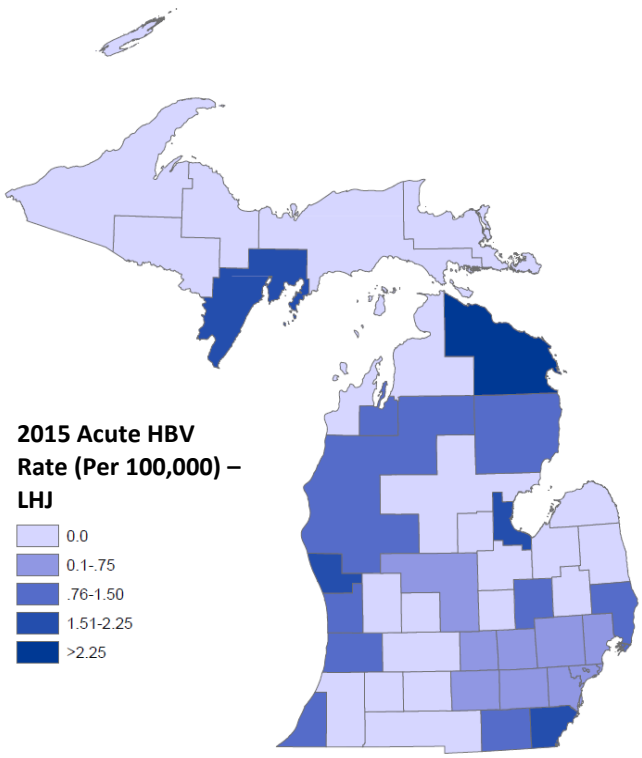
Risk Behavior	Yes*	No*	Unknown*	Yes Responses U.S. Wide 2014
Injection Drug User	16%	73%	11%	25.8%
Used Street Drugs	27%	64%	9%	-
Hemodialysis	0%	91%	9%	0.2%
Received Blood Products	5%	79%	16%	0.1%
Received a Tattoo	25%	58%	18%	-
Accidental Needle Stick	6%	68%	26%	4.9%
Contact of Person with Hepatitis B	7%	47%	46%	3.9%
Other Surgery	19%	67%	15%	10.8%
Oral Surgery or Dental Work	23%	57%	20%	-
Employed in Medical Field	4%	79%	18%	0.3%
Employed as Public Safety Officer	2%	86%	13%	-
Incarceration Longer than 6 Months	7%	70%	22%	-
Any Part of Body Pierced (other than ear)	9%	70%	21%	-

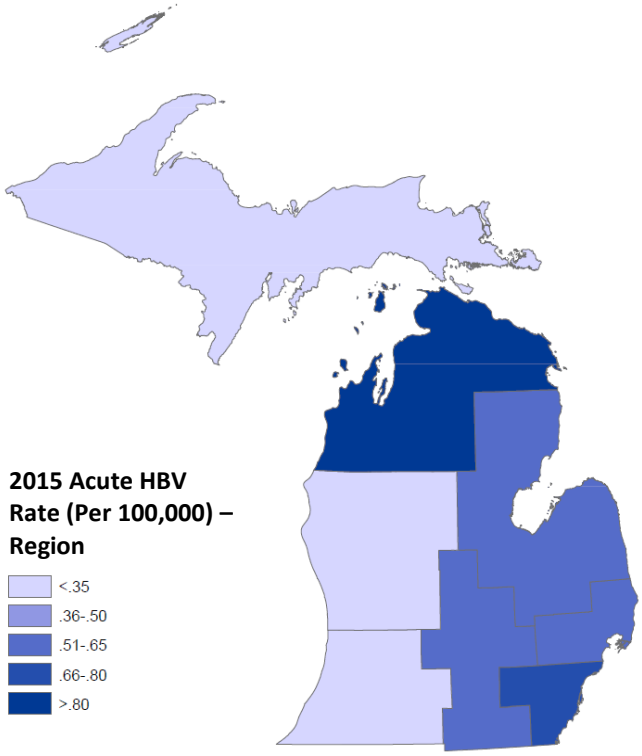
Table 2.4b shows the hepatitis B acquisition risk factors reported by clients in the 6 weeks to 6 months prior to onset of symptoms. Receiving a tattoo was the most common potential exposure, with 'Yes' being selected on 25% of cases with completed risk behavior questions. No 2015 acute HBV cases were receiving hemodialysis and only 6% had an accidental needle stick.

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

Rate Maps: Acute HBV Rates by County, Local Health Jurisdiction, and Region







Chronic Hepatitis B

Chronic Hepatitis B

Figure 3.1 Chronic Hepatitis B Cases per 100,000 Persons, Michigan, 2011-2015

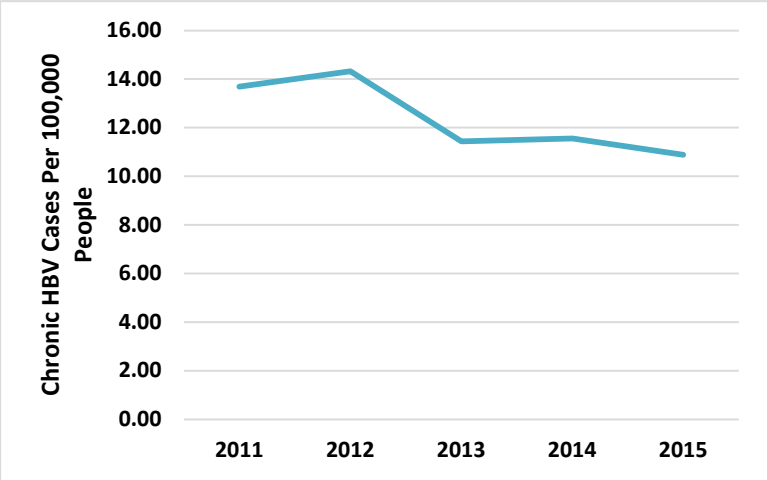


Table 3.1 Chronic Hepatitis B Cases per 100,000 Persons, Michigan, 2011-2015

Year	Michigan Cases	Rate per 100,000
2011	1353	13.69
2012	1416	14.33
2013	1130	11.43
2014	1142	11.55
2015	1076	10.89

The number of new chronic hepatitis B diagnoses peaked in 2012, and then largely decreased. A map of 2015 chronic hepatitis B rates by county, local health jurisdictions, and region is located on page 25. There is no national benchmark for comparing rates of chronic hepatitis B infection. Decreases in 2013, 2014, and 2015 cases may be due to increased de-duplication efforts and removal of redundant cases, on the part of MDHHS Viral Hepatitis Surveillance staff. This trend may also represent the impact of HBV vaccination.

Figure 3.2 Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2011-2015

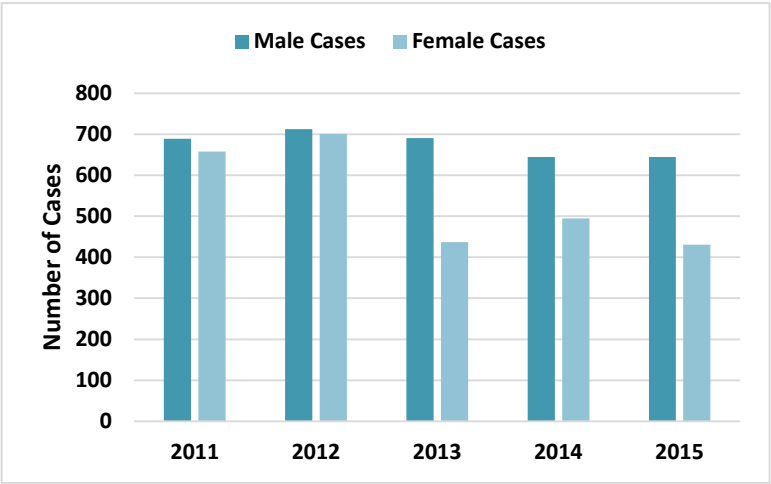


Table 3.2 Chronic Hepatitis B Cases per 100,000 Population by Gender in Michigan, 2011-2015

Year	Male	Male Incidence	Female	Female Incidence
2011	689	14.21	658	13.07
2012	713	14.71	701	13.92
2013	691	14.25	437	8.68
2014	645	13.30	495	9.83
2015	645	13.30	431	8.56

The rate of chronic hepatitis B reporting in Michigan has remained higher among males in comparison to females between the years of 2011 and 2015. The rate for males peaked in 2012, the rate for females also peaked in 2012. The drop in female cases from 2012 to 2013 is largely due to increased emphasis on the removal of duplicate chronic hepatitis B cases, particularly among women of childbearing age.

Chronic Hepatitis B

Table 3.3 Chronic Hepatitis B Cases per 100,000 by Race and Ethnicity, Michigan, 2004-2014

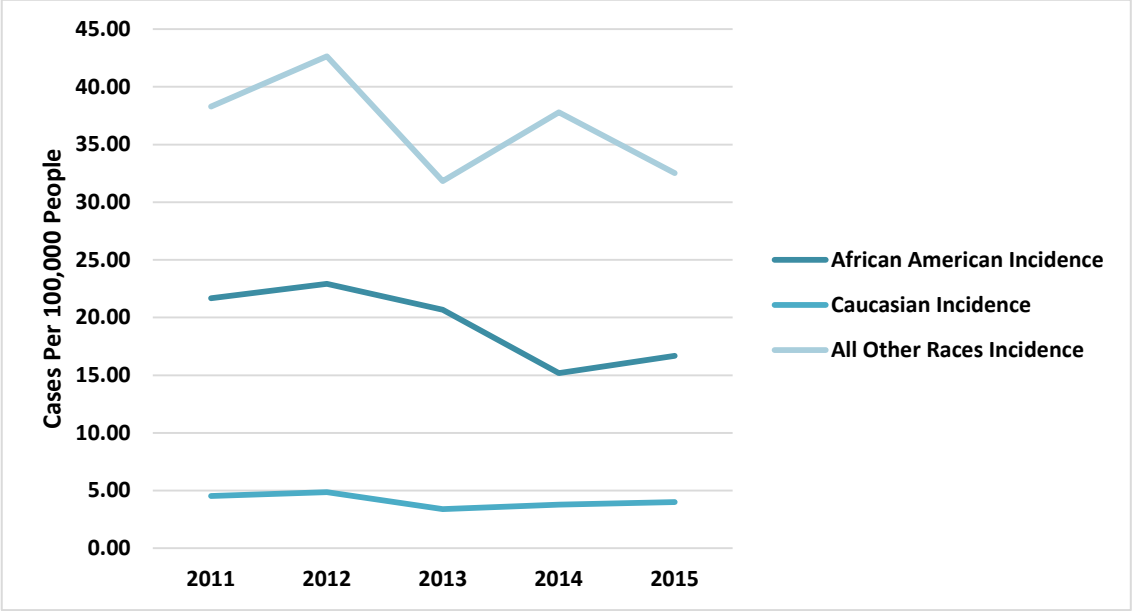
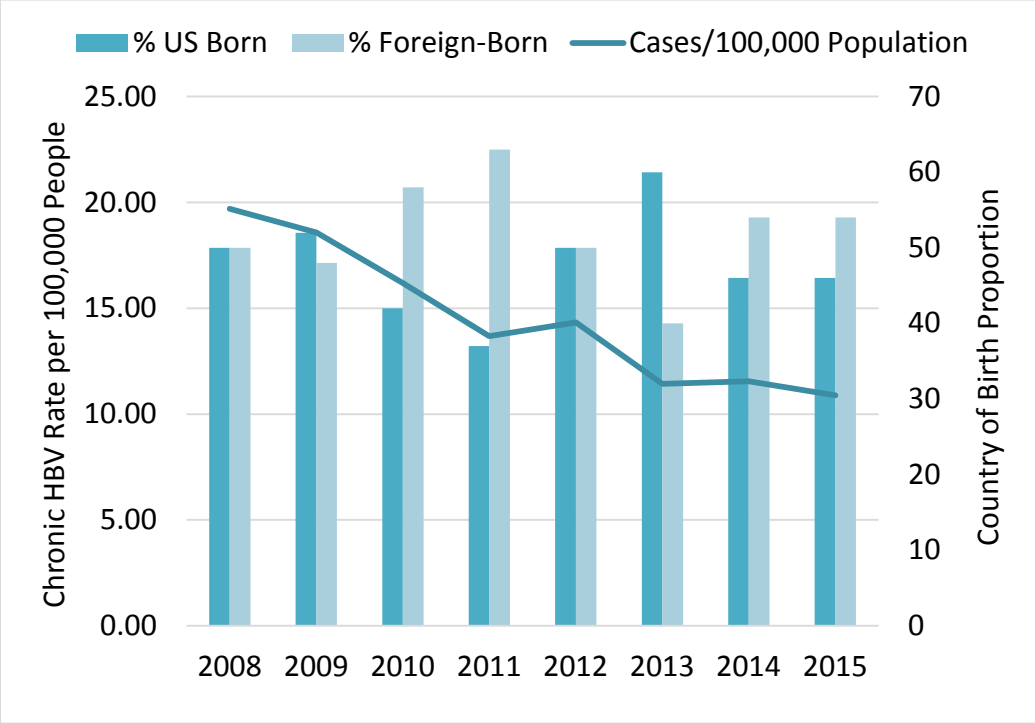


Figure 3.3 Chronic Hepatitis B Cases per 100,000 by Race and Ethnicity, Michigan, 2011-2015

	African American	African American Incidence	American Indian	American Indian Incidence	Asian	Asian Incidence	Caucasian	Caucasian Incidence	Hispanic	Hispanic Incidence	Other	Other Incidence
2011	300	21.68	5	9.15	259	109.52	343	4.53	17	3.90	62	30.63
2012	317	22.91	1	1.83	306	129.39	369	4.87	8	1.83	76	37.54
2013	286	20.67	5	9.15	211	89.22	257	3.40	14	3.21	52	25.69
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

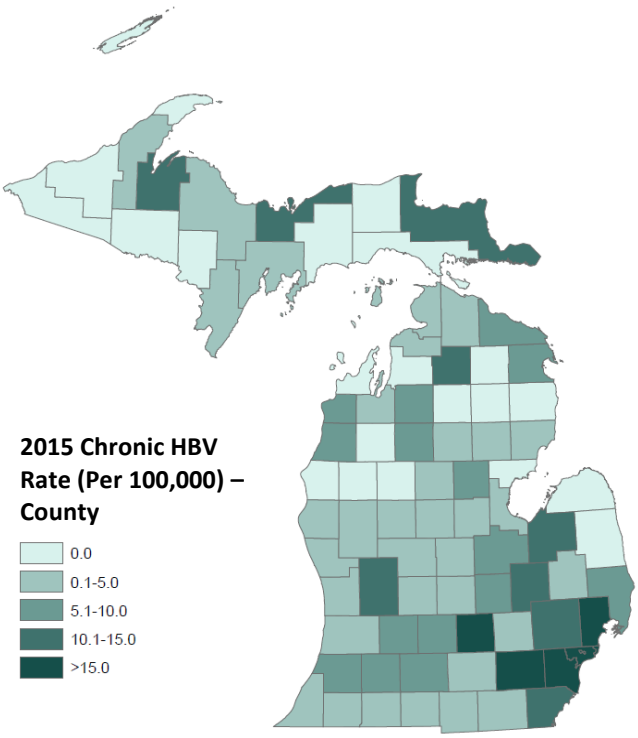
Asians have the highest rate of chronic hepatitis B infection in Michigan, followed by African Americans. In 2015 the rate of chronic hepatitis B in Asians was 88.80 per 100,000. That rate is 22.3 times higher than the 2015 Caucasian rate (3.99 cases per 100,000) and 5.32 times higher than the 2015 African American rate (16.69 cases per 100,000). As explained earlier, Asians have the highest rate of hepatitis B in the US, so this racial-disparity in the Michigan data was expected. Asian-Americans are the target of CDC's K**NO**W HEPATITIS B campaign.

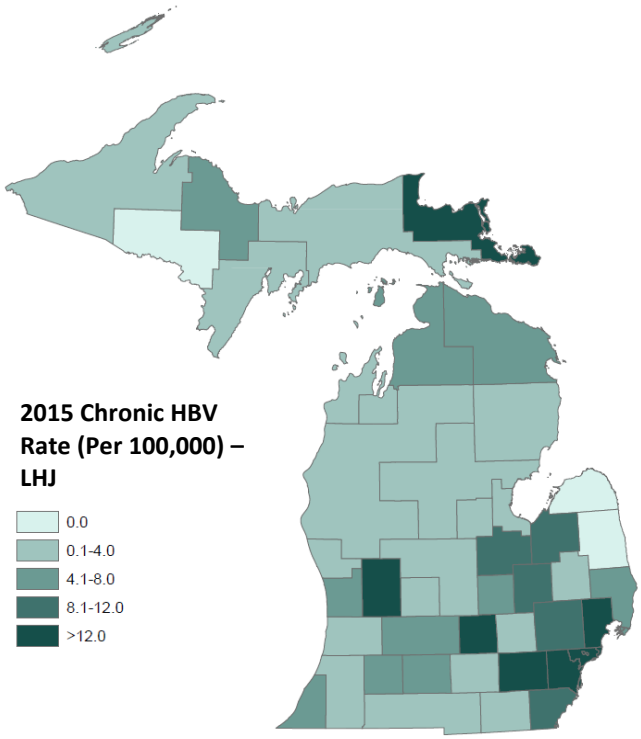
Figure 3.4 Chronic Hepatitis B Cases per 100,000 Population and Country of Birth in Michigan, 2008-2015

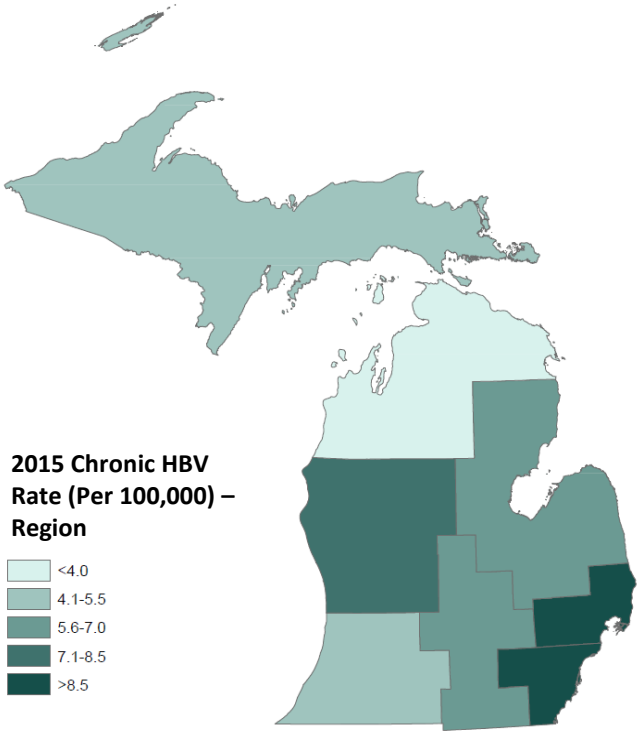


The rate of chronic hepatitis B cases in Michigan has continued to decline since 2008. When comparing the origin of birth among individuals, more people infected with hepatitis B were born outside the United States than in the United States. This is not surprising since hepatitis B is common in many countries, particularly in Asia.

Rate Maps: Chronic HBV Rates by County, Local Health Jurisdiction, and Region







Acute Hepatitis C

Acute Hepatitis C

Figure 4.1 Incidence of Acute Hepatitis C, Michigan and U.S., 2011-2015

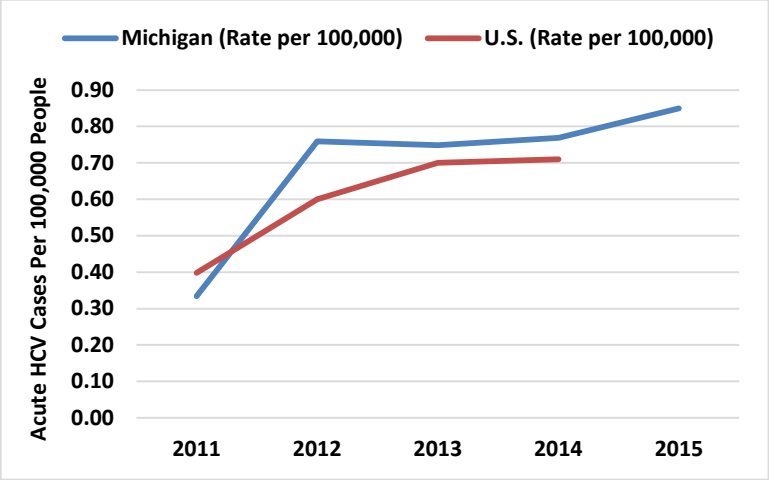


Table 4.1 Incidence of Acute Hepatitis C, Michigan and U.S., 2011-2015

Year	Michigan Cases	Michigan (Rate per 100,000)	U.S. (Rate per 100,000)
2011	33	0.33	0.40
2012	75	0.76	0.60
2013	74	0.75	0.70
2014	76	0.77	0.71
2015	84	0.85	N/A

In years prior to enhanced MDHHS case review, there likely were errors in reporting that resulted in an inflated number of acute HCV cases. In subsequent years, cases not meeting the definition were correctly reclassified and therefore our confirmed cases have decreased. The national rate of acute cases of hepatitis C remained relatively stable, hovering between 0.25 and 0.31 cases per 100,000 population from 2004 through 2010. In comparison, the incidence rate of acute hepatitis C in Michigan varied considerably between the years of 2004 and 2014, averaging 0.80 cases per 100,000. This may be explained by changes in surveillance procedures during that time period. In 2009, MDHHS staff began reviewing reported cases of acute hepatitis C to determine if they met the CDC/CSTE case definition. A CDC/CSTE acute HCV case definition change in January 2012 is most likely responsible for the sharp increase in acute HCV cases reported nationally and to MDHHS in 2012 and beyond. The number of acute hepatitis C cases in Michigan stayed relatively stable from 2012 to 2014, but increasing slightly in 2015. There are incidence maps of acute hepatitis C by county, local health jurisdiction, and region in 2015 located on page 30.

Figure 4.2 Incidence of Acute Hepatitis C by Gender, Michigan, 2011-2015

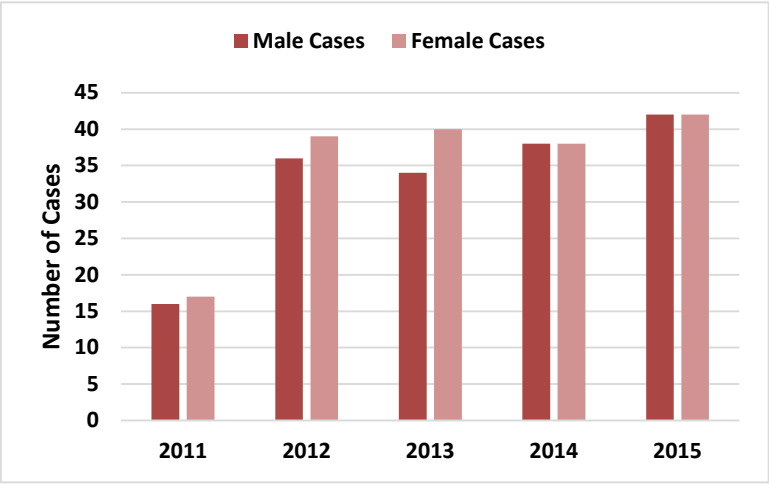


Table 4.2 Incidence of Acute Hepatitis C by Gender in Michigan, 2011-2015

Year	Male	Male Incidence	Female	Female Incidence
2011	16	0.33	17	0.34
2012	36	0.74	39	0.77
2013	34	0.70	40	0.79
2014	38	0.78	38	0.75
2015	42	0.87	42	0.83

Since 2011 the difference in acute HCV diagnoses between males and females has been minimal. Historically the number of male cases had always been greater than the number of female cases of acute hepatitis C.

Figure 4.3 Incidence of Acute Hepatitis C by Race and Ethnicity, Michigan, 2004-2014

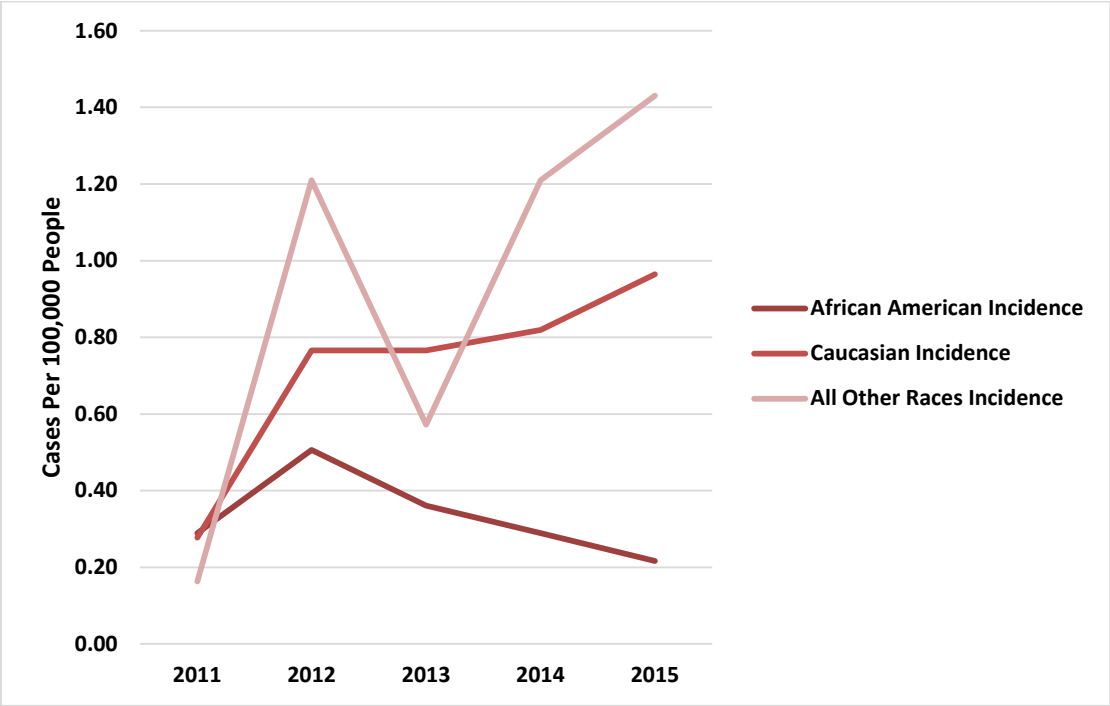


Table 4.3 Incidence of Acute Hepatitis C by Race and Ethnicity, Michigan, 2004-2014

	African American	African American Incidence	American Indian	American Indian Incidence	Asian	Asian Incidence	Caucasian	Caucasian Incidence	Hispanic	Hispanic Incidence	Other	Other Incidence
2011	4	0.29	0	0.00	1	0.42	21	0.28	1	0.23	0	0.00
2012	7	0.51	2	3.66	0	0.00	58	0.77	3	0.69	1	0.49
2013	5	0.36	1	1.83	0	0.00	58	0.77	2	0.46	0	0.00
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

Incidence of acute hepatitis C in Michigan has decreased in African Americans, from a high of 0.29 cases per 100,000 in 2011 to a rate of 0.22 cases per 100,000 in 2015. Though Native Americans make up only a few cases of acute HCV each year, due to the relatively few Native Americans who live in Michigan, the incidence rate for Native Americans and Alaskan Natives is disproportionately high at 3.66 cases per 100,000. This observation is consistent with national acute HCV racial/ethnic trends published by CDC.

Table 4.4a Completeness of Acute Hepatitis C Reports by Risk Behavior, Michigan, 2015

Risk Behavior	Completed
Injection Drug User	92%
Used Street Drugs	85%
Hemodialysis	85%
Received Blood Products	85%
Received a Tattoo	83%
Accidental Needle Stick	79%
Contact of Person with Hepatitis C	83%
Other Surgery	79%
Oral Surgery or Dental Work	82%
Employed in Medical Field	83%
Employed as Public Safety Officer	83%
Incarceration Longer than 6 Months	81%
Any Part of Body Pierced (other than ear)	83%

Table 3.4a shows the percentage of acute hepatitis C risk behavior questions that were completed by local health disease investigators in 2015. A risk behavior was considered completed if the question was marked as 'Yes', 'No', or 'Unknown'. Most questions were answered with an 83% response rate. This is a significant increase from the 77% of case report questions completed in 2013. According to the CDC, the national average for completeness of acute hepatitis C case report forms was 57% in 2014.

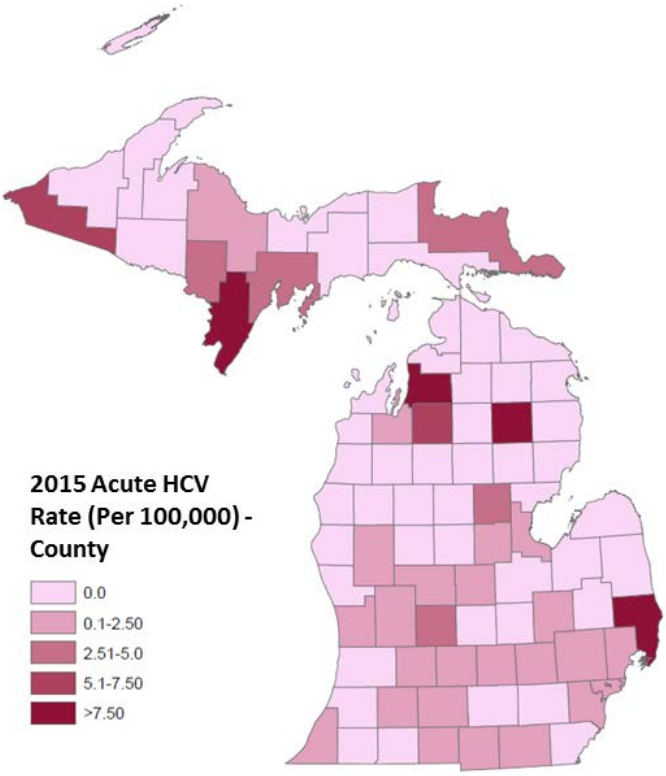
Table 4.4b Response of Completed Acute Hepatitis C Reports* by Risk Behavior, Michigan, 2015

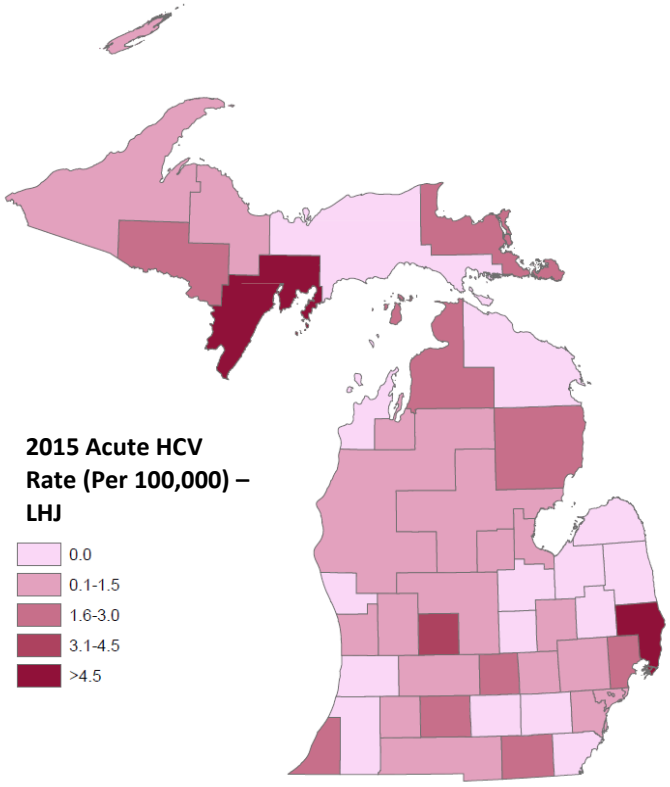
Risk Behavior	Yes*	No*	Unknown*	Yes Responses U.S. Wide 2014
Injection Drug User	51%	32%	17%	68.2%
Used Street Drugs	44%	27%	30%	-
Hemodialysis	3%	68%	30%	0.2%
Received Blood Products	8%	55%	37%	-
Received a Tattoo	34%	23%	43%	-
Accidental Needle Stick	0%	55%	45%	7.7%
Contact of Person with Hepatitis C	31%	23%	46%	-
Other Surgery	26%	36%	38%	12.2%
Oral Surgery or Dental Work	23%	30%	46%	-
Employed in Medical Field	1%	63%	36%	1.0%
Employed as Public Safety Officer	0%	66%	34%	-
Incarceration Longer than 6 Months	12%	43%	46%	-
Any Part of Body Pierced (other than ear)	9%	41%	50%	-

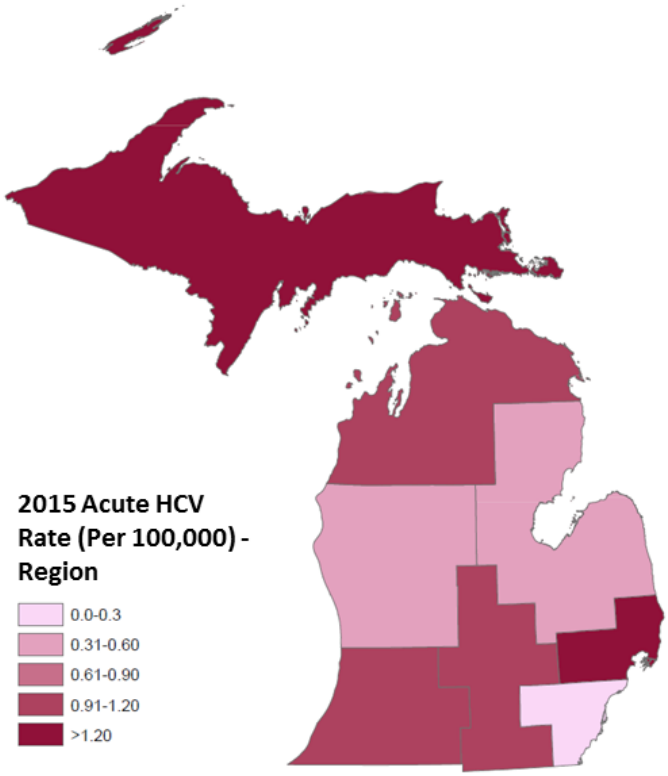
* Percentages calculated based upon those who completed the field; excludes missing data
Note: Risk factors and responses are not mutually exclusive

Table 3.4b 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. Only 3% of acute HCV cases reported being a hemodialysis patient.

Rate Maps: Acute HCV Rates by County, Local Health Jurisdiction, and Region







Chronic Hepatitis C

Chronic Hepatitis C

Figure 5.1 Chronic Hepatitis C Cases per 100,000 Persons in Michigan 2011-2015

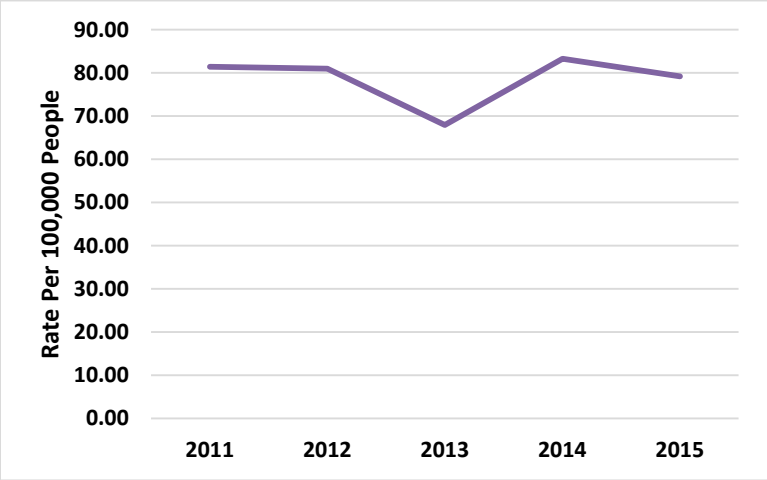


Table 5.1 Chronic Hepatitis C Cases per 100,000 Population in Michigan, 2011-2015

Year	Michigan Cases	Rate per 100,000
2011	8050	81.45
2012	8005	80.99
2013	6719	67.98
2014	8233	83.30
2015	7833	79.25

There is no nationally available benchmark for comparing rates of chronic hepatitis. Decreases in 2013 cases may be due to increased de-duplication efforts, and removal of redundant cases, on the part of MDHHS Viral Hepatitis Surveillance staff. Rates are currently stable with ~8,000 new diagnoses being reported per year (80 per 100,000).

Figure 5.2 Chronic Hepatitis C Cases per 100,000 Population by Gender in Michigan, 2011-2015

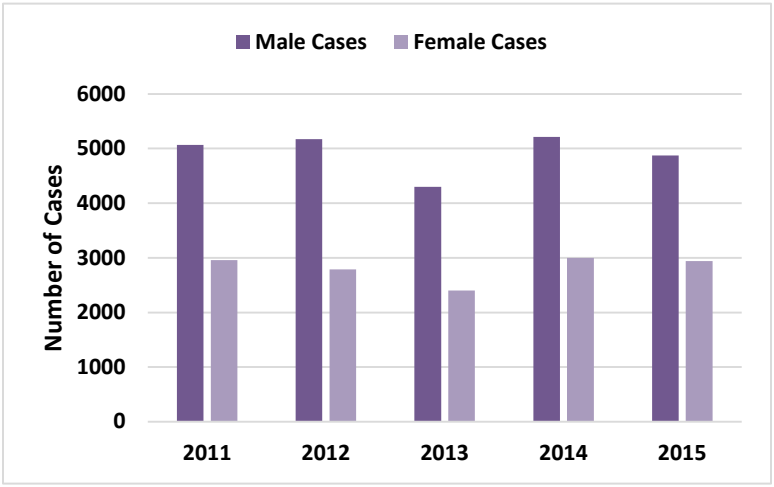


Table 5.2 Chronic Hepatitis C Cases per 100,000 Population by Gender in Michigan 2011-2015

Year	Male	Male Incidence	Female	Female Incidence
2011	5065	104.47	2959	58.76
2012	5170	106.64	2791	55.43
2013	4299	88.67	2400	47.66
2014	5215	107.57	3000	59.58
2015	4873	100.51	2943	58.44

Males account for the majority of chronic hepatitis C cases. In 2015, the rate of chronic hepatitis C reports was 1.72 times higher in males than females.

Figure 5.3 Chronic Hepatitis C Cases per 100,000 by Race and Ethnicity in Michigan, 2004-2014

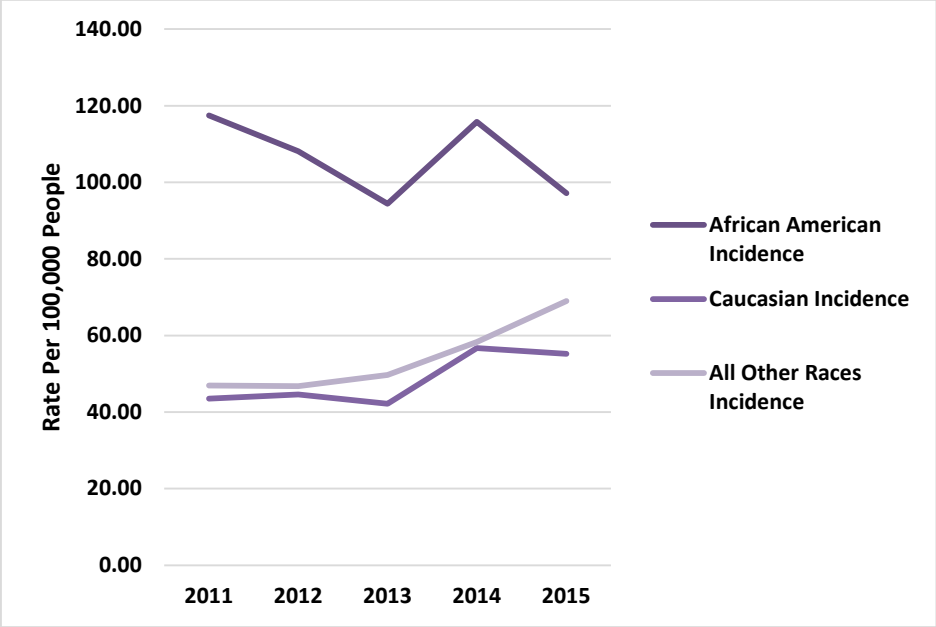


Table 5.3 Chronic Hepatitis C Cases per 100,000 by Race and Ethnicity in Michigan, 2004-2014

	African American	African American Incidence	American Indian	American Indian Incidence	Asian	Asian Incidence	Caucasian	Caucasian Incidence	Hispanic	Hispanic Incidence	Other	Other Incidence
2011	1625	117.43	53	96.95	24	10.15	3297	43.55	102	23.38	116	57.30
2012	1496	108.11	58	106.10	35	14.80	3379	44.64	103	23.60	86	42.48
2013	1306	94.38	67	122.56	23	9.73	3194	42.19	97	22.23	90	44.46
2014	1602	115.77	67	122.56	45	19.03	4296	56.75	167	38.27	108	53.35
2015	1344	97.13	86	157.32	44	18.61	4183	55.26	144	33.00	136	67.18

In 2015, American Indian/Alaskan Natives have the highest rate of chronic hepatitis C infection, followed by African Americans, Caucasians, Hispanics and then Asians. The rate of chronic hepatitis C infection in American Indian/Alaskan Natives has increased since 2011, the highest increase among races/ethnicities. Only African Americans have experienced a decrease in chronic hepatitis C infection rate during the 2011 to 2015 time period. The rise in chronic HCV rates is not believed to be due to new infections but rather the diagnosis of older chronic infections, perhaps identified due to increases in testing and awareness.

Table 5.4a Completeness of Chronic Hepatitis C Reports by Risk Behavior, Michigan, 2015

Risk Behavior	Completed
Received Blood Transfusion Prior to 1992	70%
Received an Organ Transplant Prior to 1992	69%
Received Clotting Factor Concentrates Prior to 1992	70%
Hemodialysis	69%
Injection Drug User	71%
Incarcerated in Lifetime	67%
Treated for a Sexually Transmitted Disease in Lifetime	67%
Contact of Person with Hepatitis C	69%
Employed in Medical Field	68%

Table 5.4a shows the percentage of chronic hepatitis C risk behavior questions completed by local health department disease investigators in 2014. 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 69% of case reports. This is up from 28% in 2012, 38% in 2013, and 62% in 2014. There is no national comparison for completion of chronic hepatitis C case report forms.

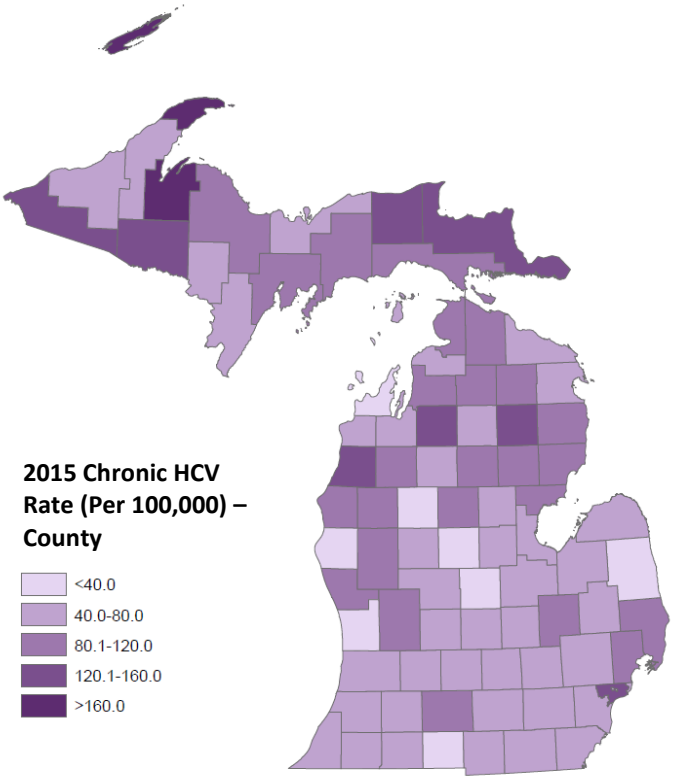
Table 5.4b Response of Completed Chronic Hepatitis C Reports by Risk Behavior, Michigan, 2015

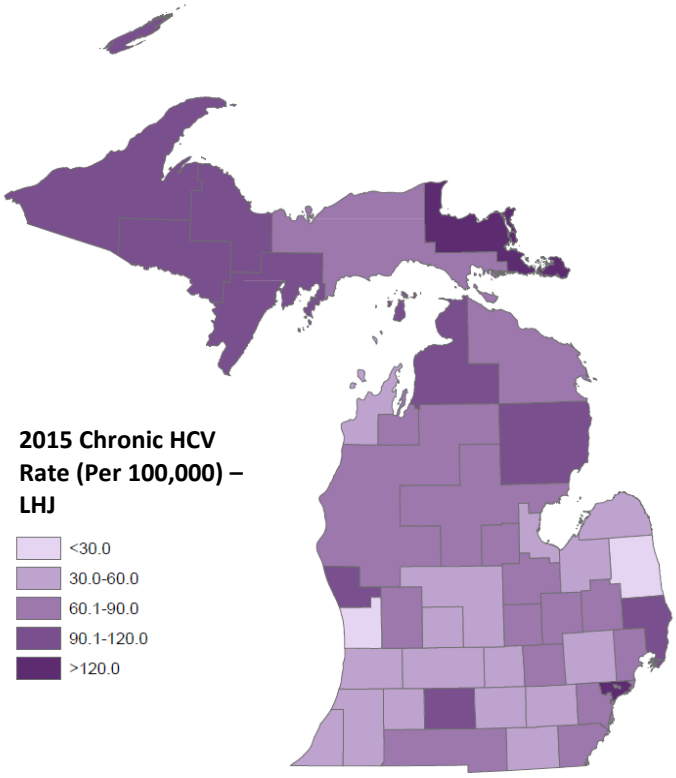
Risk Behavior	Yes*	No*	Unknown*
Received Blood Transfusion Prior to 1992	5%	38%	58%
Received an Organ Transplant Prior to 1992	0%	50%	50%
Received Clotting Factor Concentrates Prior to 1992	0%	42%	57%
Hemodialysis	0%	51%	48%
Injection Drug User	34%	18%	48%
Incarcerated in Lifetime	26%	17%	57%
Treated for a Sexually Transmitted Disease in Lifetime	9%	26%	65%
Contact of Person with Hepatitis C	17%	13%	70%
Employed in Medical Field	4%	39%	57%

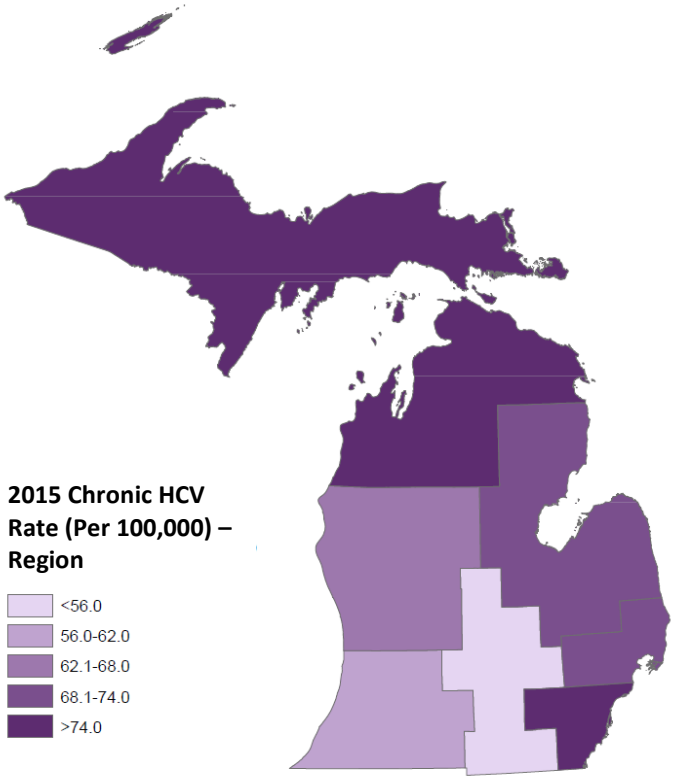
Table 5.4b shows the responses among the completed questions by risk behavior. Injection drug use, incarceration, and being a contact of a person with hepatitis C were the most common risk behaviors associated with chronic hepatitis C.

* Percentages calculated based upon those who completed the field; excludes missing data
Note: Risk factors and responses are not mutually exclusive

Rate Maps: Chronic HCV Rates by County, Local Health jurisdiction, and Region







Hepatitis C Testing & Algorithm

Figure 6.1 CDC Recommended Testing Algorithm for Hepatitis C Virus Infection

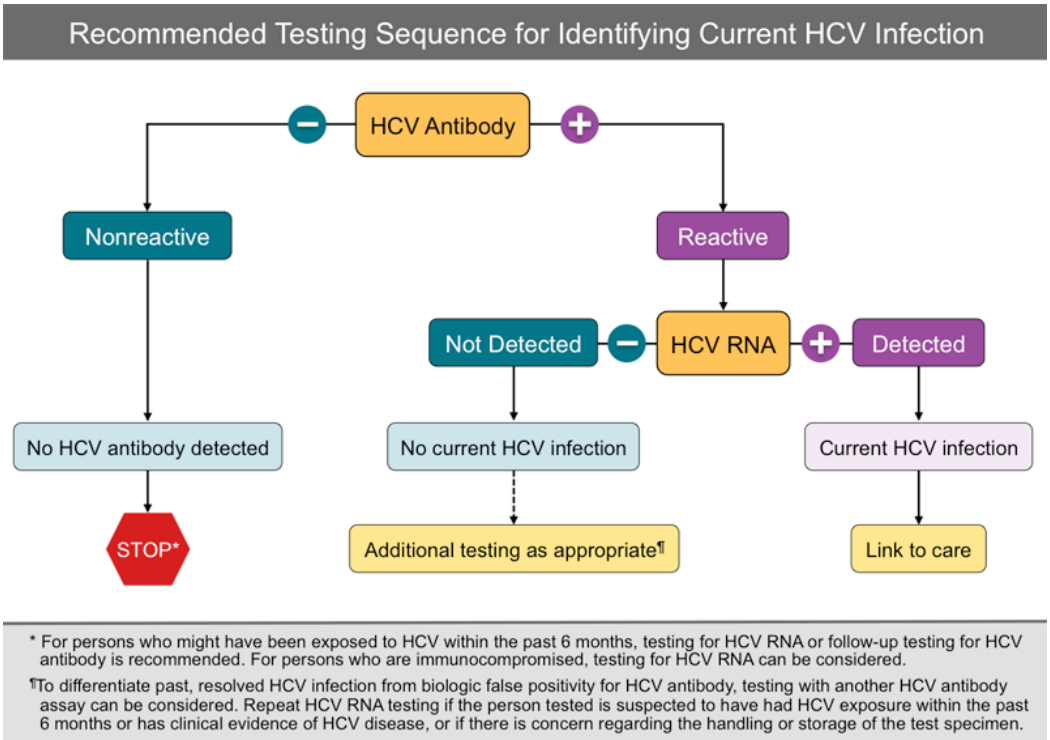
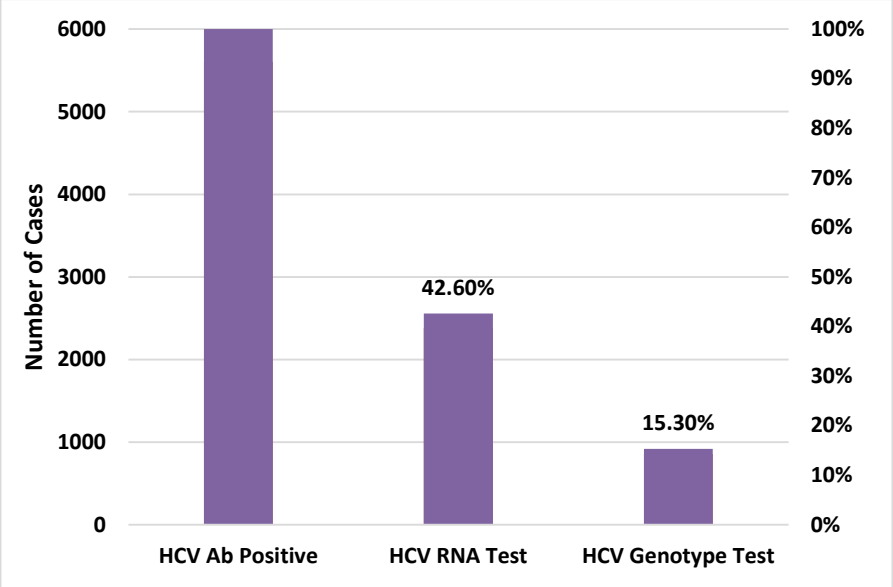
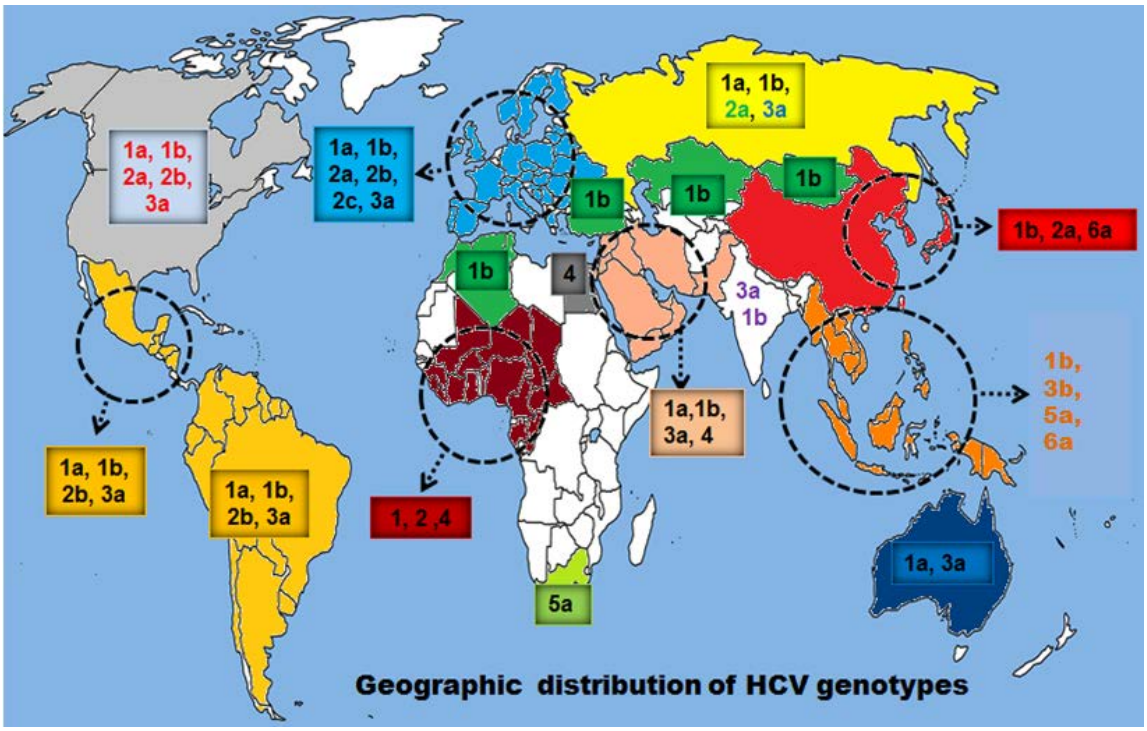


Figure 6.2 Number and Percentage of HCV Antibody Positive Cases with an HCV RNA or HCV Genotype Test, 2015



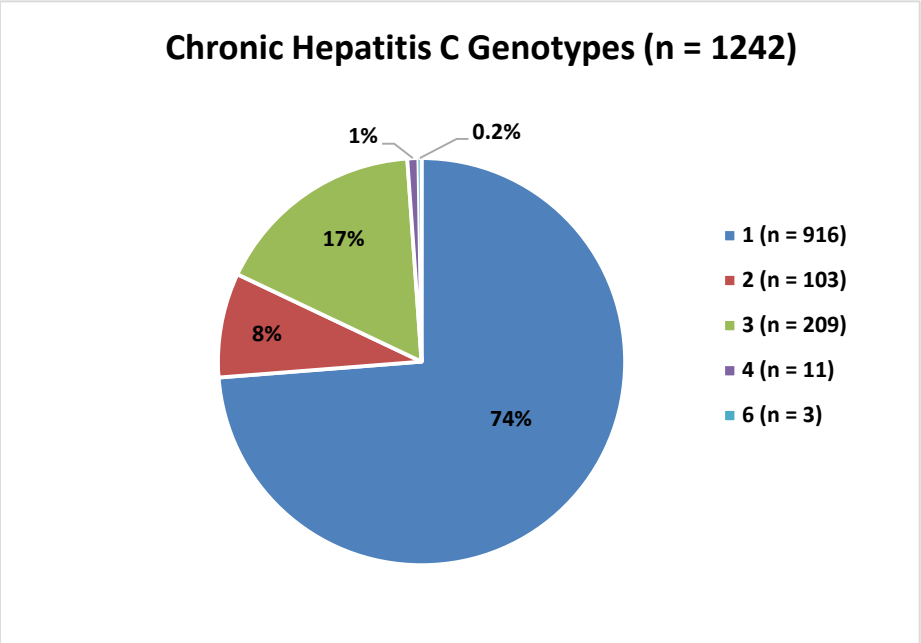
Of the 7919 cases of acute and chronic hepatitis C reported in Michigan in 2015, about 6000 cases were reported with positive HCV antibody results. Of those 7919 cases only 42.6% were reported with positive HCV RNA results and even fewer (15.3%) were reported with genotype results. Since genetic testing can be an indicator of treatment, these results suggest only a small portion of the infected population is being treated for hepatitis C.

Figure 6.3 Geographic Distribution of Hepatitis C Genotypes



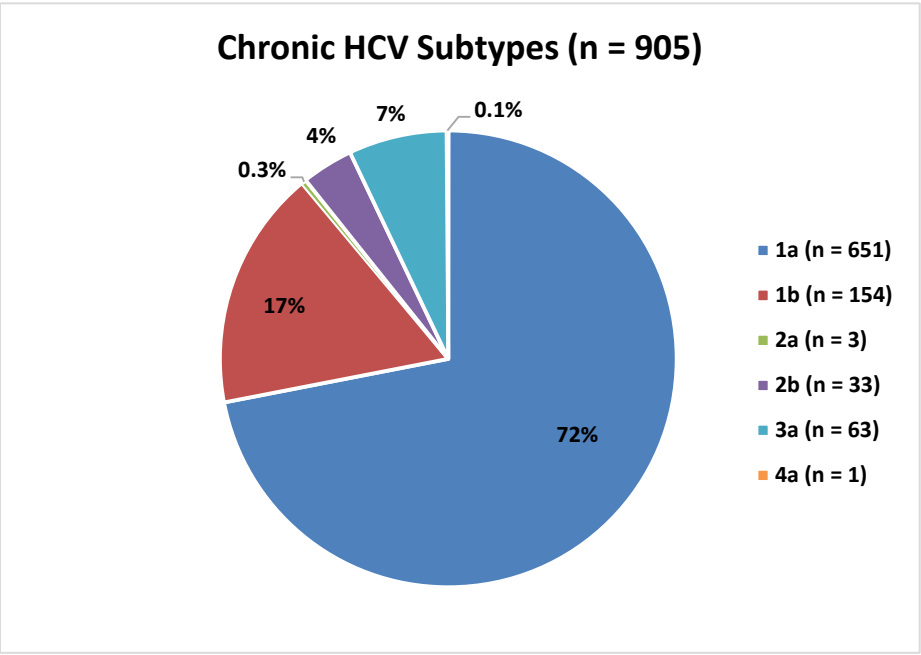
There are six different genotypes of hepatitis C. Figure 6.3 shows the global distribution of these genotypes and their subtypes. In the United States, genotypes 1, 2, and 3, are the most common. In Michigan genotypes 1a and 1b account for 89% of reported genotypes. See Figures 6.4 and 6.5 for more details.

Figure 6.4 Prevalence of Genotypes of Chronic Hepatitis C Cases Reported, Michigan, 2015



A total of 1,242 chronic HCV patients had a genotype reported to MDHHS in 2015. Of these, 74% were reported with genotype 1 infection (72% subtype 1a and 17% subtype 1b). Genotyping of Hepatitis C positive patients helps direct clinicians regarding treatment options. Our data does not represent the whole population of Hepatitis C patients tested in Michigan in 2015.

Figure 6.5 Prevalence of Genotype Subtypes of Chronic Hepatitis C Cases Reported, Michigan, 2015



A total of 1,202 chronic HCV patients had a genotype reported to MDHHS in 2015. Of these, 74% were reported with genotype 1 infection (72% subtype 1a and 17% subtype 1b). Genotyping of Hepatitis C positive patients helps direct clinicians regarding treatment options. Our data does not represent the whole population of Hepatitis C patients tested in Michigan in 2015.

Special Populations

Figure 7.1 Number of Chronic Hepatitis C Cases Reported to MDHHS by Year of Birth, 2015

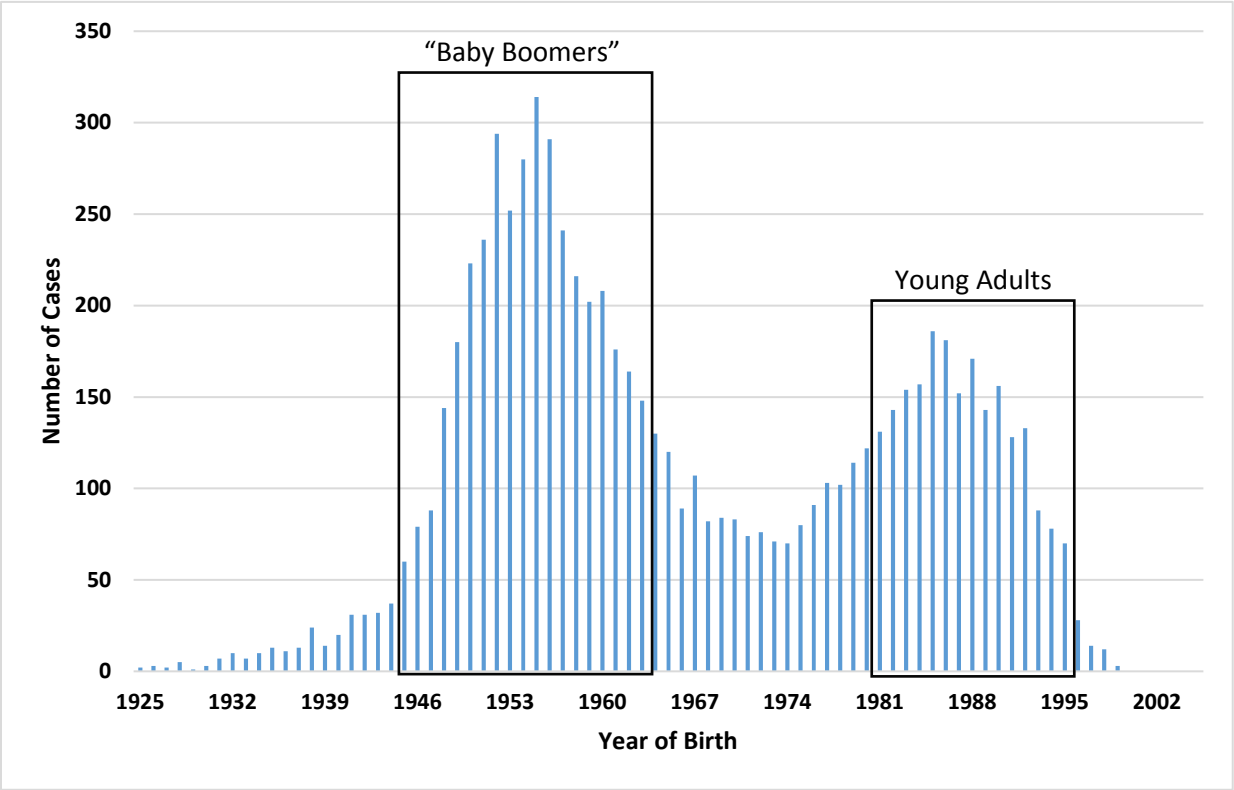


Figure 7.1 depicts the number of chronic hepatitis C cases reported to MDHHS by birth year in 2014. "Baby Boomers," those born between 1945 and 1965, are five times more likely than other adults to be infected with hepatitis C according to national statistics. CDC now recommends one-time hepatitis C testing of everyone born between 1945 and 1965. MDHHS data shows that the number of new chronic hepatitis C diagnoses in persons born between 1945 and 1965 is greater than any other birth cohort.

A second smaller 'peak' of new chronic hepatitis C diagnoses exists in young adults aged approximately 18-29. An emerging epidemic of HCV in young adults has been identified in areas across the US and it is reasonable to assume that Michigan is not exempt from this observation. 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 7.2 Number of Chronic Hepatitis C Cases Reported to MDHHS aged 18-29, 2000-2015

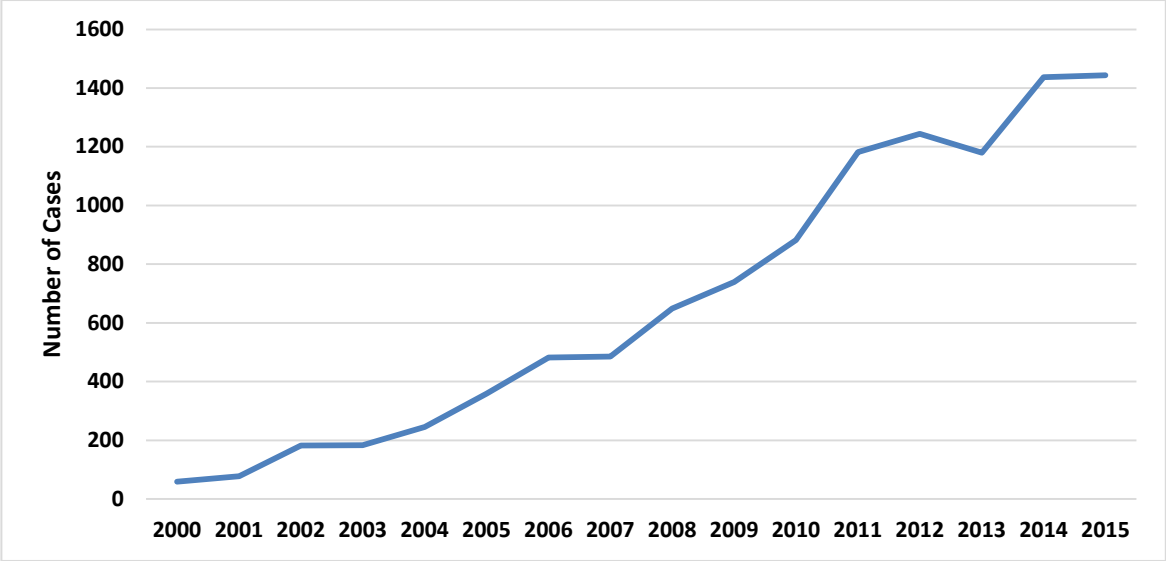


Table 7.1 Number and Percentage of Chronic Hepatitis C cases reported to MDHHS aged 18-29, 2000-2015

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Cases	1498	2486	4296	4638	5169	7347	8117	6998	8464	7732	7214	8006	7967	6703	8233	7833
Number of Cases 18-29 Years Old	59	78	182	184	246	359	482	486	649	739	882	1182	1244	1180	1437	1444
Percentage of Total Cases	4%	3%	4%	4%	5%	5%	6%	7%	8%	10%	12%	15%	16%	18%	17%	18%

The number of chronic hepatitis C diagnoses among persons 18 to 29 years of age have increased nearly year-over-year since 2000 (Figure 7.2). Between 2004 and 2015, the number of cases has increased 156% per year between 2000 and 2015.

Table 7.2 Epidemiologic Summary of 2015 Chronic HCV Cases Aged 18-29 Years Old

Age (n = 1444)		
Median	25	
Mean	24.85	
Range	18 - 29	
Sex (n = 1440)		**Rate per 100,000**
Female	643 (44.7%)	83.06
Male	797 (55.3%)	100.97
Race (n = 1129)		**Rate per 100,000**
White	1026 (90.9%)	83.99
Black	61 (5.4%)	23.71
American Indian	30 (2.7%)	243.31
Asian	12 (1.1%)	24.38
Hispanic Ethnicity (n = 874)		**Rate per 100,000**
Hispanic or Latino	20 (2.3%)	22.88
Non-Hispanic or Latino	854 (97.7%)	54.62
Arab Ethnicity (n = 627)		**Rate per 100,000**
Arab Ethnicity	3 (0.5%)	Not Available
Non-Arab	624 (99.5%)	Not Available
History of IVDU (n = 750)		
Yes	650 (86.7%)	
No	100 (13.3%)	

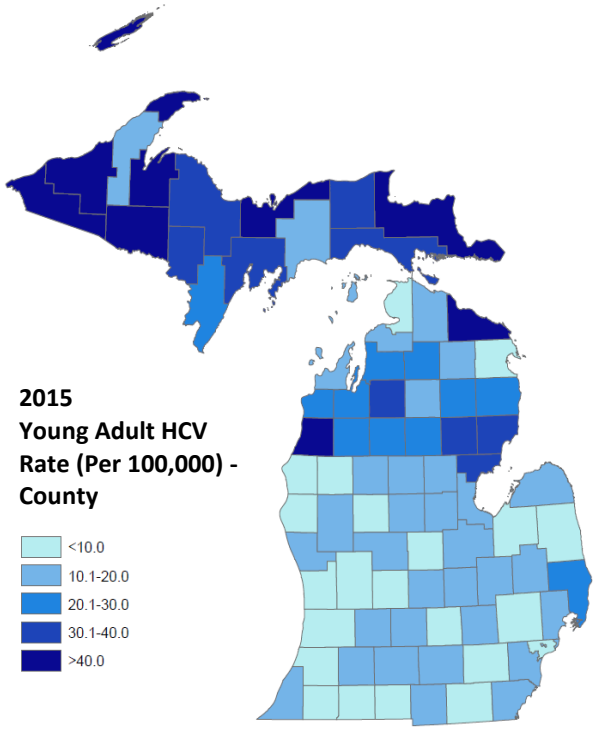
Previous studies conducted by MDHHS have shown injection drug use as the primary risk factor for HCV acquisition among those aged 18-29 years old. In many instances these clients reported sharing needles, syringes, and other injection drug works (such as cookers and cotton) which could have acted as vectors for HCV transmission. Increases in heroin overdoses and heroin substance abuse treatment admissions likely represents an increase in heroin use, which may explain the rise in HCV cases in the young adult population.

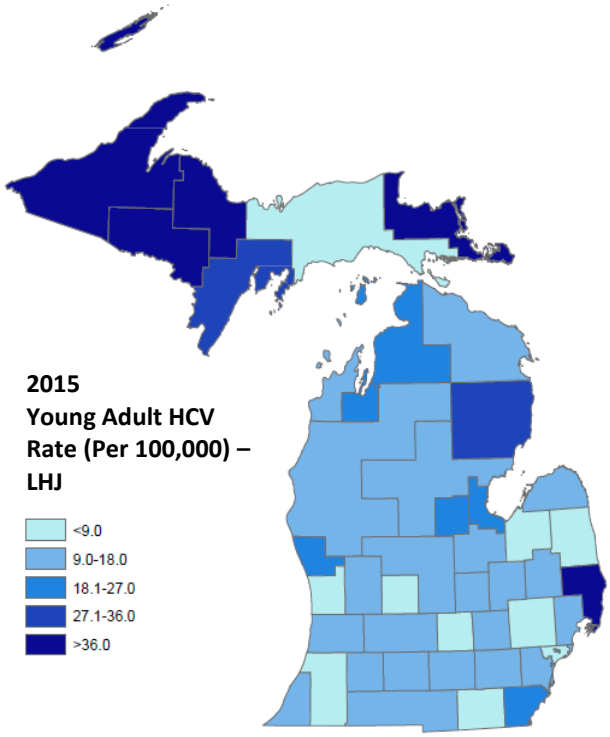
A demographic breakdown of the chronic HCV cases aged 18-29 years old who were diagnosed in 2015 (Table 7.2) shows that the vast majority were white, non-Hispanic, and non-Arab with an approximately 50/50 split between males and females. Where injection drug use information was available on these clients, 86.7% reported a history of IVDU.

Maps of the rates of 2015 chronic HCV cases among 18-29 year olds, 2015 heroin treatment admissions, and 2014 heroin overdose deaths by county can be found below. More detailed information on hepatitis C infection in young adults can be found on the MDHHS viral hepatitis website and in the links below:

Young Adults with Hepatitis C Study Summary Report
Young Adults with Hepatitis C Study Fact Sheet
Emerging Epidemic of Hepatitis C Virus Infections Among Young Non-Urban Persons who Inject Drugs in the United States, 2006–2012. *Clin Infect Dis*. Aug 2014

Rate Maps: Young Adult HCV Cases by County, Local Health Jurisdiction, and Region





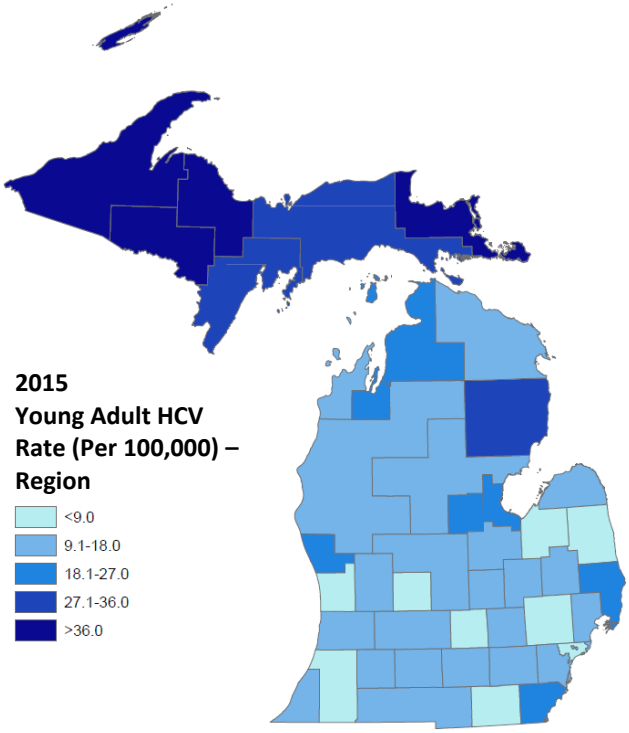


Figure 7.3 Number Heroin Substance Abuse Treatments Admissions and Deaths in Michigan, 2000-2015

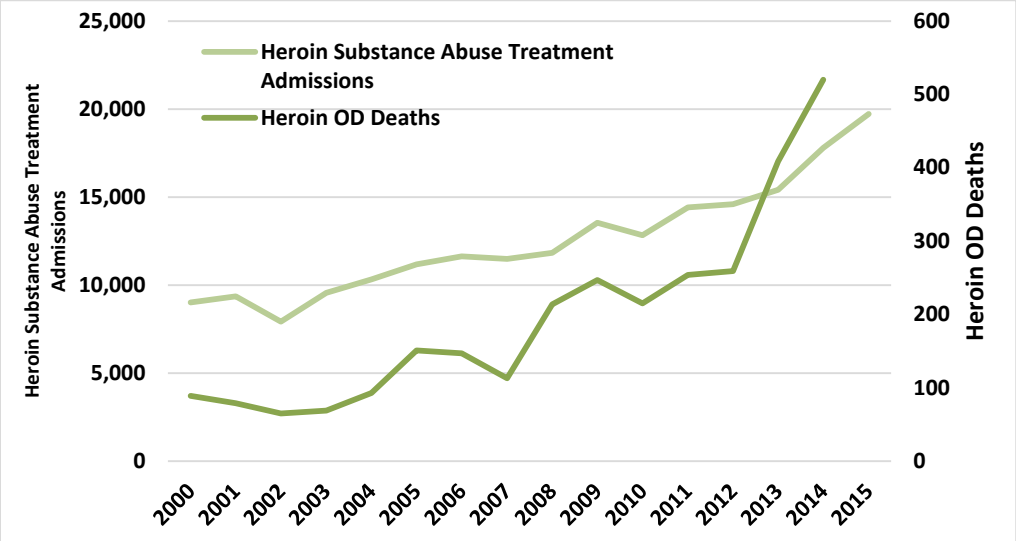
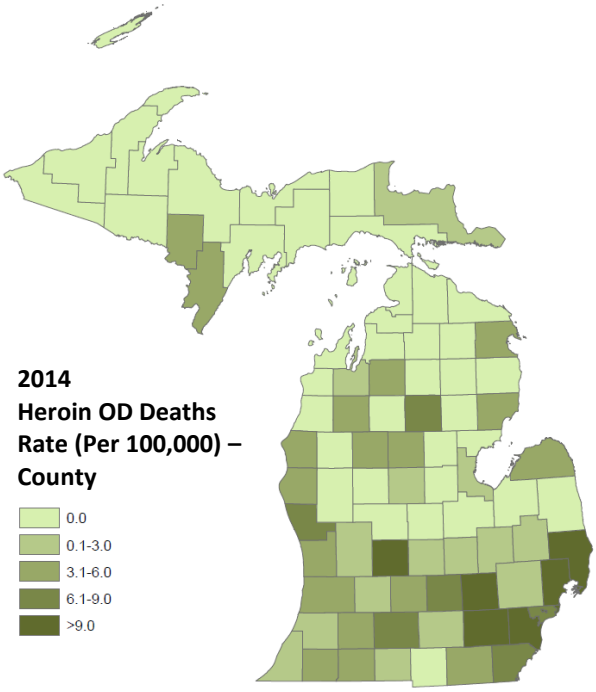


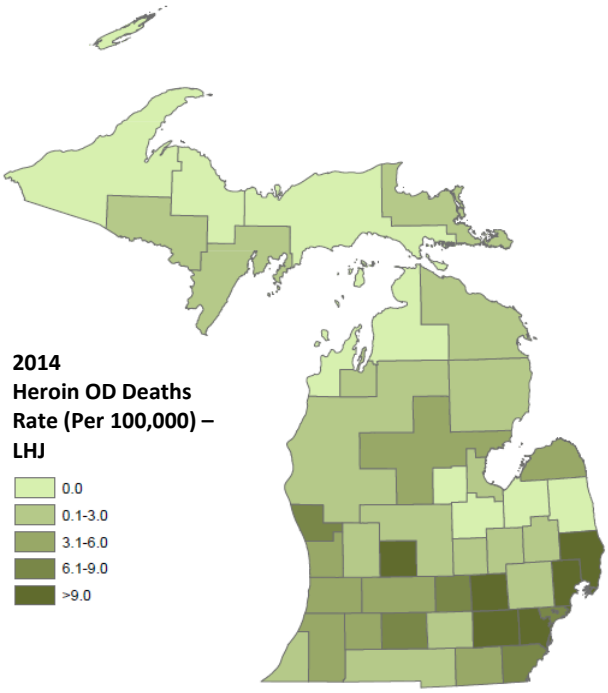
Table 7.3 Number Heroin Substance Abuse Treatments Admissions and Deaths in Michigan, 2000-2015

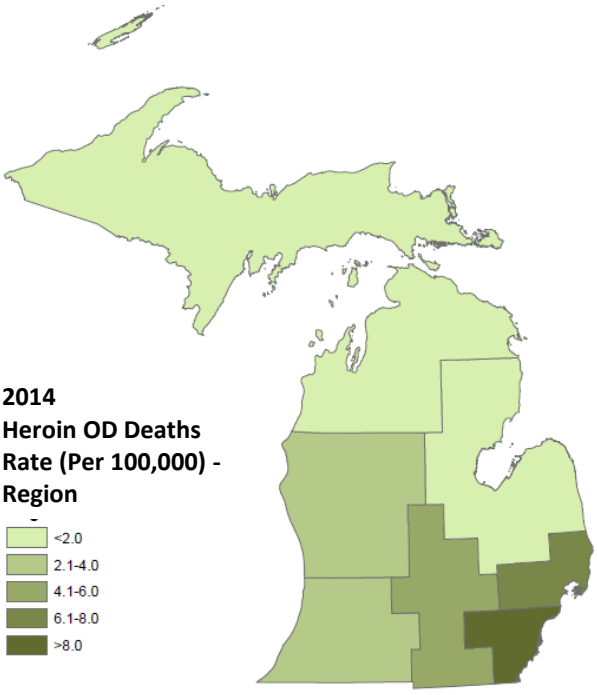
Year	Heroin OD Deaths	Heroin Substance Abuse Treatment Admissions	Number of Hepatitis C Cases 18-29 Years Old
2000	89	9,023	59
2001	79	9,367	78
2002	65	7,921	182
2003	69	9,558	184
2004	93	10,331	246
2005	151	11,182	359
2006	147	11,642	482
2007	113	11,481	486
2008	214	11,843	649
2009	247	13,548	739
2010	215	12,836	882
2011	254	14,413	1182
2012	259	14,596	1244
2013	409	15,419	1180
2014	520	17,800	1437
2015	-	19,728	1444

Table 7.3 depicts that, over this same time frame, Michigan has seen a parallel increase in the number of heroin overdose deaths and heroin substance abuse treatment admissions. Heroin substance abuse treatment admissions grew from 9,023 in 2000 to 19,728 in 2015 while the number of heroin overdose deaths increased from 89 in 2000 to 520 in 2014.

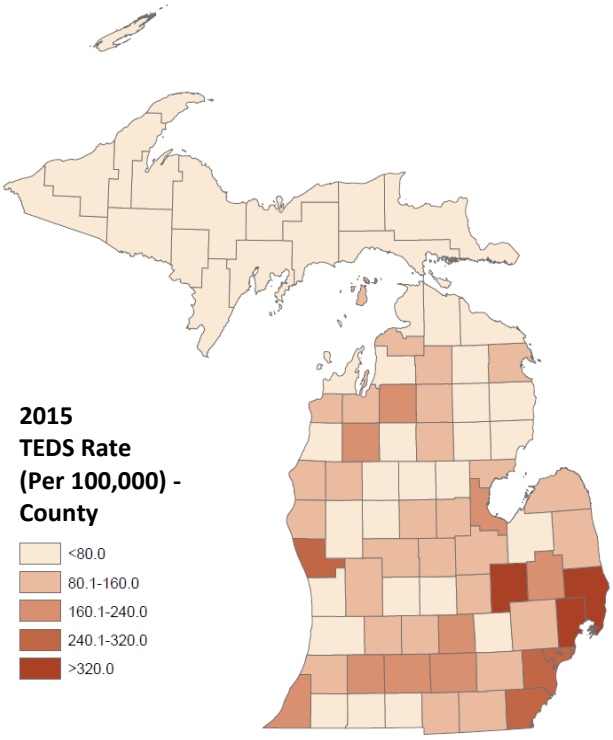
Rate Maps: Heroin Overdose Deaths by County, Local Health Jurisdiction, and Region

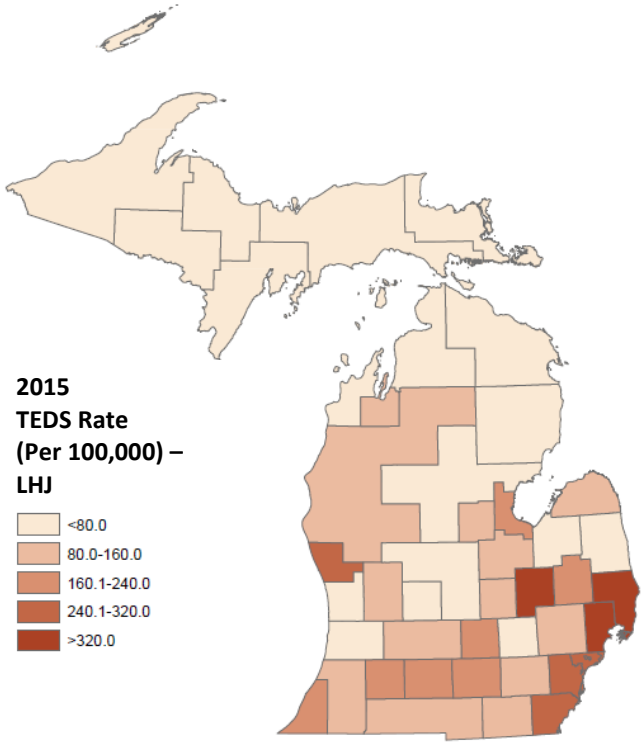


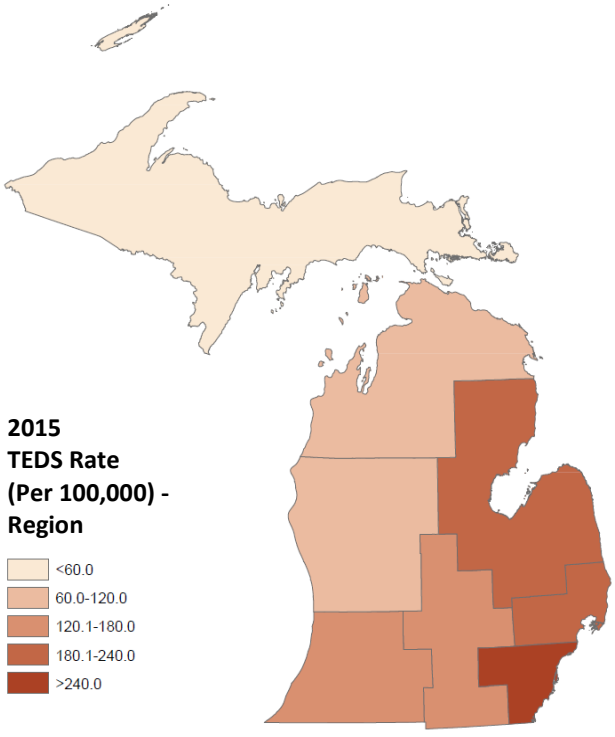




Rate Maps: Treatment Episode Data Sets (TEDS) Data by County, Local Health Jurisdiction, and Region



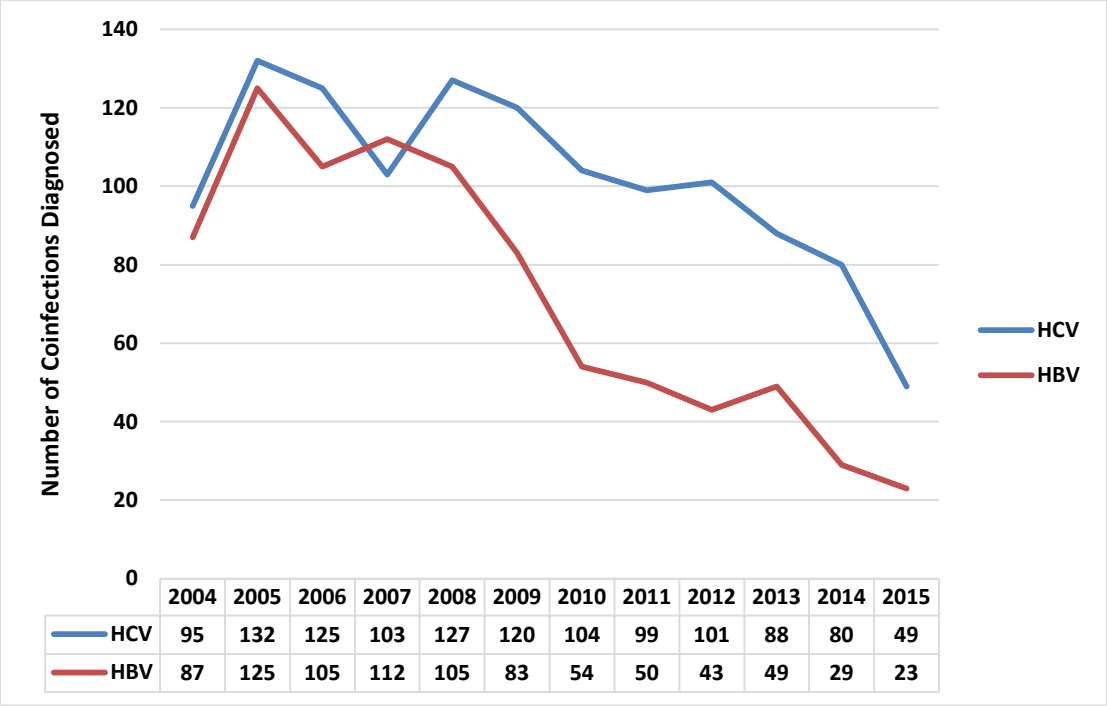




HIV and Hepatitis Co-infections

Health outcomes for individuals with HIV/HBV or HIV/HCV co-infections are worse than individuals 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 cross-match between HIV cases reported in eHARS and viral hepatitis cases reported in the MDSS. Cases were matched by first name, last name and date of birth using LinkPlus, a probabilistic record-linkage software program publicly available from the CDC. Risk factors for HIV transmission were obtained from eHARS.

Figure 8.1 Count of Hepatitis B and Hepatitis C Cases Co-infected with HIV in Michigan, 2004-2015



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
HCV	95	132	125	103	127	120	104	99	101	88	80	49
HBV	87	125	105	112	105	83	54	50	43	49	29	23

The number of new matches for HBV/HIV and HCV/HIV co-infection have gone down in recent years. However, since most of these individuals are living longer (largely because of improvements in HIV linkage to care and viral suppression) prevalence of both co-infections has increased (Figure 8.2). Tables 8.1 and 8.2 look at the demographic breakdown of both HBV/HIV and HCV/HIV co-infections. As one might suspect, HBV/HIV 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 of the demographics of intravenous drug users infected with HIV.

HIV and Hepatitis B Co-infection

Between 2004 and 2015, 839 people were reported in Michigan with HBV/HIV co-infection. Table 8.1 shows a breakdown of the HBV/HIV co-infected population in 2015. The 2015 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 8.1 Hepatitis B and HIV Co-Infection Data in Michigan, 2015

Variable	2015 HBV/HIV Co-Infections	2004-2014 HBV/HIV Co-Infections
n	23	816
Sex		
Male	20 (87.0%)	717 (87.9%)
Female	3 (13.0%)	99 (12.1%)
Unknown	0 (0.0%)	0 (0.0%)
Race		
Caucasian	11 (47.8%)	207 (25.4%)
Black or African American	11 (47.8%)	546 (66.9%)
Hispanic	1 (4.3%)	24 (2.9%)
Asian	0 (0.0%)	0 (0.0%)
American Indian or Alaskan Native	0 (0.0%)	13 (3.2%)
Multi/Other/Unknown	0 (0.0%)	26 (3.2%)
HIV Transmission Risk		
MSM	11 (47.8%)	473 (58.0%)
IDU	0 (0.0%)	88 (10.8%)
MSM/IDU	0 (0.0%)	36 (4.4%)
Blood Recipient	0 (0.0%)	8 (1.0%)
Heterosexual	0 (0.0%)	37 (10.3%)
Perinatal	0 (0.0%)	1 (0.1%)
Unknown/Undetermined	12 (52.2%)	126 (15.4%)
Age at Coinfection		
0-19	1 (4.3%)	7 (0.9%)
20-29	4 (17.4%)	101 (12.4%)
30-39	4 (17.4%)	223 (27.3%)
40-49	5 (21.7%)	287 (35.2%)
50-59	5 (21.7%)	151 (18.5%)
60+	2 (8.7%)	44 (5.4%)

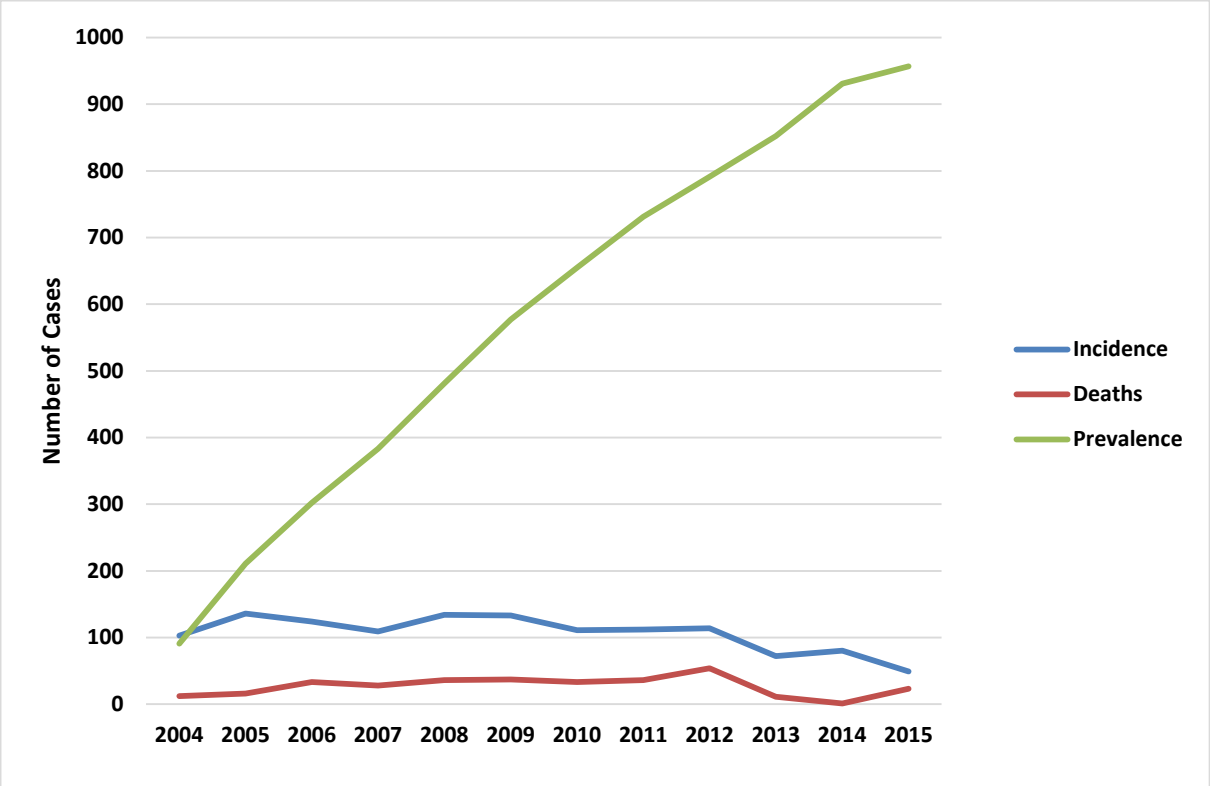
HIV and Hepatitis C Co-infection

Between 2004 and 2015, 1191 people were reported in Michigan with HIV/HCV co-infection. Table 8.1a shows a breakdown of the HCV/HIC co-infected population in 2015. The 2015 cases are similar to the historical cases in regard to race and sex. IDU is the predominant risk factor in the HCV and HIV co-infected population though with an age generally over 30 years old. Despite seeing large increases in the number of HCV diagnoses in individuals less than 30 years old in Michigan, we have not yet seen increases in HIV in this population.

Table 8.2 Hepatitis C and HIV Co-Infection Data in Michigan, 2015

Variable	2015 HCV/HIV Co-Infections	2004-2014 HCV/HIV Co-Infections
n	49	1142
Sex		
Male	34 (69.4%)	811 (71.0%)
Female	15 (30.9%)	323 (28.3%)
Unknown	0 (0.0%)	8 (0.7%)
Race		
Caucasian	18 (36.7%)	317 (27.8%)
Black or African American	23 (46.9%)	708 (62.0%)
Hispanic	5 (10.2%)	42 (3.7%)
Asian	0 (0.0%)	15 (1.3%)
American Indian or Alaskan Native	0 (0.0%)	2 (0.2%)
Multi/Other/Unknown	3 (6.1%)	58 (5.1%)
HIV Transmission Risk		
MSM	15 (30.6%)	208 (18.2%)
IDU	20 (40.8%)	497 (43.5%)
MSM/IDU	1 (2.0%)	136 (11.9%)
Blood Recipient	3 (6.1%)	39 (3.4%)
Heterosexual	5 (10.2%)	138 (12.1%)
Perinatal	0 (0.0%)	2 (0.2%)
Unknown/Undetermined	5 (10.2%)	122 (10.7%)
Age at Coinfection		
0-19	0 (0.0%)	7 (0.6%)
20-29	5 (10.2%)	52 (4.6%)
30-39	7 (14.3%)	142 (12.4%)
40-49	9 (18.4%)	365 (32.0%)
50-59	20 (40.8%)	452 (39.6%)
60+	8 (16.3%)	124 (10.9%)

Figure 8.2 Prevalence of Diagnosed HCV-HIV Coinfections in Michigan, 2004 - 2015



Viral Hepatitis Outcomes

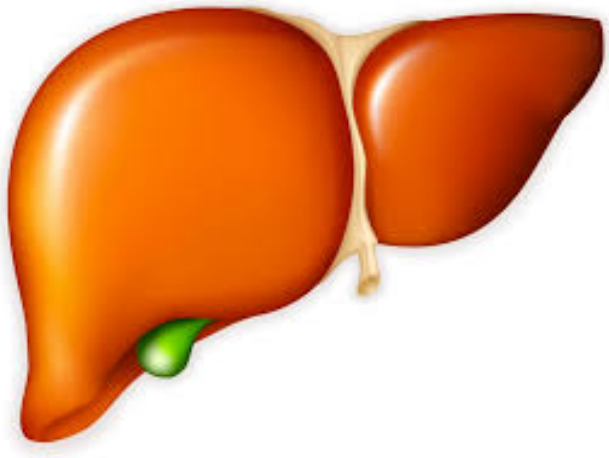
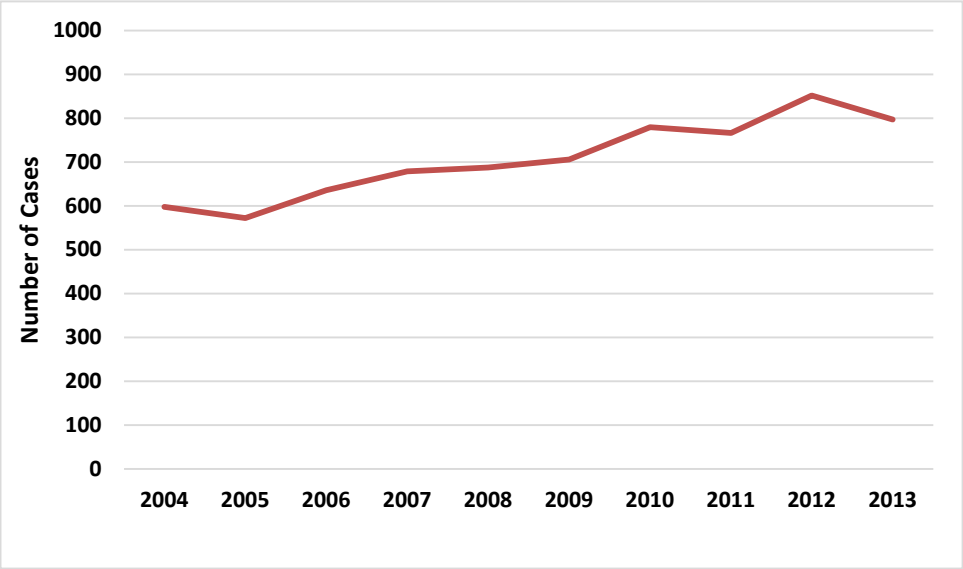


Figure 9.1 Invasive Cancers of the Liver and Intrahepatic Bile Ducts in Michigan, 2004-2013



Viral hepatitis is a primary risk factor for the development of liver cancer. Figure 9.1 shows the number of cases of liver and bile duct cancer per year from 2004 to 2013. The number of cases per year of liver and bile duct cancer have increased 33% between 2004 and 2013. We expect that trends in the incidence of liver cancer will follow trends in the incidence of viral hepatitis, although perhaps lagging behind by several years in the absence of treatment.

Table 9.1 Incidence Rates of Invasive Cancers of the Liver and Intrahepatic Bile Ducts by Age-adjusted Rates of Race and Sex in Michigan, 2004-2013

Year of	Total		White Male		White Female		Black Male		Black Female	
Diagnosis	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
2004	598	5.7	299	7.2	149	2.9	87	16.0	34	5.0
2005	572	5.3	290	6.9	142	2.8	80	13.5	36	5.2
2006	636	5.8	324	7.5	146	2.9	91	15.3	44	6.3
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

Table 9.1 shows the rate of new cases of liver and intrahepatic bile duct cancer per year from 2004 to 2013 in Michigan per 100,000 people. The overall rate of liver and intrahepatic bile duct cancer in Michigan was 6.3 per 100,000 in 2013. African American males have an incidence rate of 18.8 per 100,000, which is 138% higher than that of Caucasian males (7.9 per 100,000).

Figure 9.2 Mortality Due to Invasive Cancer of the Liver and Intrahepatic Bile Ducts and Age-Adjusted Death Rates by Race and Sex in Michigan, 2004 - 2014

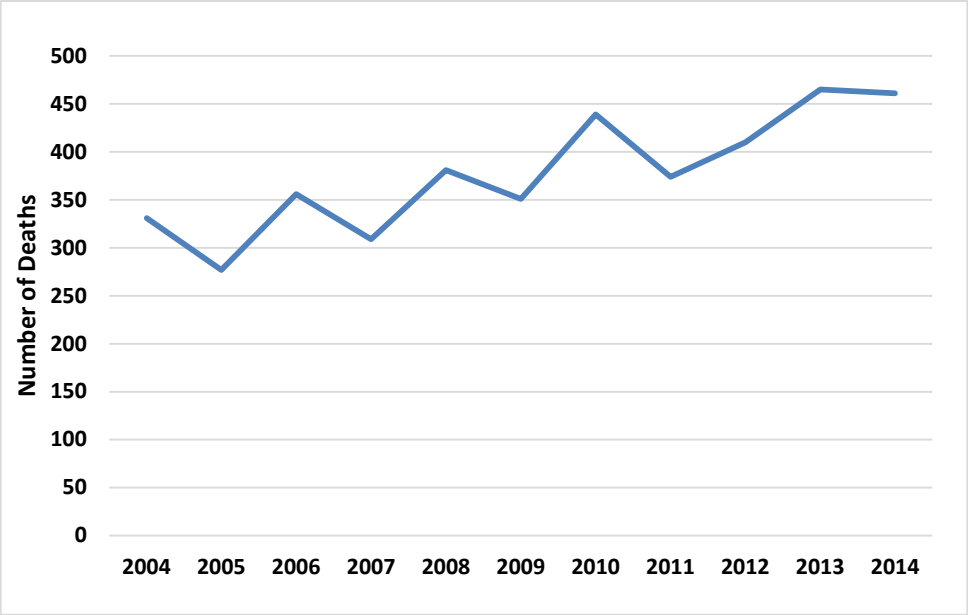


Figure 9.2 shows the number of deaths per year due to cancer of the liver and intrahepatic bile ducts. The number of deaths per year has risen 39% from 2004 to 2014.

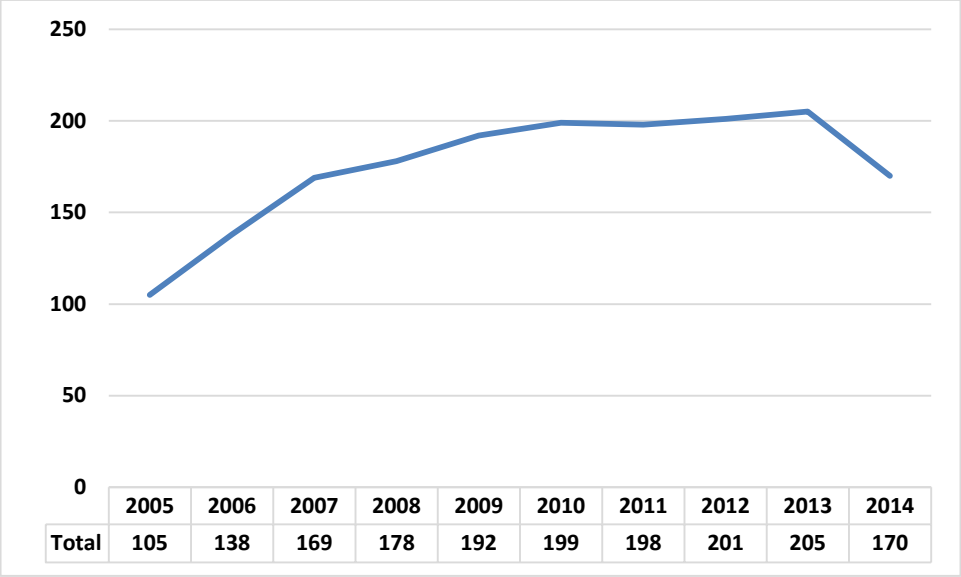
Table 9.2 Numbers of Deaths Due to Invasive Cancer of the Liver and Intrahepatic Bile Ducts and Age-Adjusted Death Rates by Race and Sex in Michigan, 2004 - 2014

Year of	Total		White Male		White Female		Black Male		Black Female	
Death	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
2004	331	3.1	158	3.8	100	2.0	37	6.6	13	*
2005	277	2.6	139	3.3	76	1.5	39	7.0	11	*
2006	356	3.3	180	4.3	95	1.9	47	8.4	21	2.9
2007	309	2.8	150	3.5	85	1.6	40	6.5	18	*
2008	381	3.4	200	4.6	113	2.1	35	6.0	16	*
2009	351	3.0	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	2.0	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

Table 9.2 shows the death rate per 100,000 Michigan population due to cancer of the liver and intrahepatic bile ducts between 2004 and 2014. The liver and intrahepatic bile duct cancer mortality rate in Michigan in 2014 was 3.6 per 100,000. African American males show the highest death rates due to these cancers and rates have increased between 2004 and 2014. The death rate for African American males has increased 35% over this time period. The death rate in African American males (8.9 per 100,000) is 102% higher than the rate in Caucasian males (4.4 per 100,000). The death rate in Caucasian males has increased by 16% during between 2004 and 2014 while the death rate in Caucasian females has increased by only 5%.

Source: 2004 - 2014 Michigan Resident Death Files, Michigan Department of Health and Human Services, Division for Vital Records and Health Statistics

Figure 9.3 Deaths Due to Acute and Chronic Hepatitis C, Michigan, 2005-2014



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	105	138	169	178	192	199	198	201	205	170

Figure 9.3 shows the number of deaths per year in Michigan residents between 2005 and 2014 due to chronic hepatitis C according to death certificate data. The Vital Records and Health Statistics Section provides data on underlying causes of death in Michigan. Data on underlying causes of death is classified using the Tenth Revision of the International Classification of Diseases (ICD-10). In 2014 there were 170 deaths attributed to chronic hepatitis C in Michigan. Between 2005 and 2014, deaths due to chronic hepatitis C increased by 62%. The number of deaths decreased between 2013 and 2014, perhaps due to the introduction of new medications that treat hepatitis C. We will continue to monitor the number of deaths due to chronic hepatitis C per year in the future and hope that this trend continues.

Source: Vital Records and Health Statistics Section, Michigan Department of Health and Human Services

Appendices

Appendix A1:
County Hepatitis Data

County	Population	2015 Chronic HCV Cases	2015 Acute HCV Cases	2015 Chronic HBV Cases	2015 Acute HBV Cases	2015 Chronic HCV Rate*	2015 Acute HCV Rate*	2015 Chronic HBV Rate*	2015 Acute HBV Rate*
Alcona	10942	9	0	0	0	82.25	0.00	0.00	0.00
Alger	9601	7	0	1	0	72.91	0.00	10.42	0.00
Allegan	111408	64	0	4	1	57.45	0.00	3.59	0.90
Alpena	29598	23	0	2	0	77.71	0.00	6.76	0.00
Antrim	23580	22	2	0	0	93.30	8.48	0.00	0.00
Arenac	15899	16	0	0	0	100.64	0.00	0.00	0.00
Baraga	8860	17	0	1	0	191.87	0.00	11.29	0.00
Barry	59173	32	1	3	0	54.08	1.69	5.07	0.00
Bay	107771	62	1	2	2	57.53	0.93	1.86	1.86
Benzie	17525	11	0	1	0	62.77	0.00	5.71	0.00
Berrien	156813	92	3	7	2	58.67	1.91	4.46	1.28
Branch	45248	18	1	1	0	39.78	2.21	2.21	0.00
Calhoun	136146	125	3	10	0	91.81	2.20	7.35	0.00
Cass	52293	24	0	1	0	45.90	0.00	1.91	0.00
Charlevoix	25949	20	0	1	0	77.07	0.00	3.85	0.00
Cheboygan	26152	28	0	1	2	107.07	0.00	3.82	7.65
Chippewa	38520	58	1	5	0	150.57	2.60	12.98	0.00
Clare	30926	28	0	1	0	90.54	0.00	3.23	0.00
Clinton	75382	32	0	3	0	42.45	0.00	3.98	0.00
Crawford	14074	7	0	0	0	49.74	0.00	0.00	0.00
Delta	37069	38	1	1	1	102.51	2.70	2.70	2.70
Detroit City	713777	1008	1	189	5	141.22	0.14	26.48	0.70
Dickinson	26168	20	1	0	0	76.43	3.82	0.00	0.00
Eaton	107759	49	1	7	0	45.47	0.93	6.50	0.00
Emmet	32694	36	0	1	0	110.11	0.00	3.06	0.00
Genesee	425790	358	2	43	4	84.08	0.47	10.10	0.94
Gladwin	25692	18	1	2	0	70.06	3.89	7.78	0.00
Gogebic	16427	25	1	0	0	152.19	6.09	0.00	0.00
Grand Traverse	86986	63	1	2	1	72.43	1.15	2.30	1.15
Gratiot	42476	15	1	2	1	35.31	2.35	4.71	2.35
Hillsdale	46688	30	1	1	0	64.26	2.14	2.14	0.00
Houghton	36628	17	0	1	0	46.41	0.00	2.73	0.00
Huron	33118	14	0	0	0	42.27	0.00	0.00	0.00
Ingham	280895	122	6	44	2	43.43	2.14	15.66	0.71
Ionia	63905	29	2	2	0	45.38	3.13	3.13	0.00
Iosco	25887	21	0	1	1	81.12	0.00	3.86	3.86
Iron	11817	15	0	0	0	126.94	0.00	0.00	0.00
Isabella	70311	16	0	3	0	22.76	0.00	4.27	0.00
Jackson	160248	83	0	5	1	51.79	0.00	3.12	0.62

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

†State wide rates do not include the MDOC population in the denominator

Appendix A1:
County Hepatitis Data

County	Population	2015 Chronic HCV Cases	2015 Acute HCV Cases	2015 Chronic HBV Cases	2015 Acute HBV Cases	2015 Chronic HCV Rate*	2015 Acute HCV Rate*	2015 Chronic HBV Rate*	2015 Acute HBV Rate*
Kalamazoo	250331	108	1	19	0	43.14	0.40	7.59	0.00
Kalkaska	17153	25	1	1	1	145.75	5.83	5.83	5.83
Kent	602622	493	2	74	0	81.81	0.33	12.28	0.00
Keweenaw	2156	5	0	0	0	231.91	0.00	0.00	0.00
Lake	11539	11	0	0	0	95.33	0.00	0.00	0.00
Lapeer	88319	55	0	1	0	62.27	0.00	1.13	0.00
Leelanau	21708	8	0	0	0	36.85	0.00	0.00	0.00
Lenawee	99892	58	2	2	1	58.06	2.00	2.00	1.00
Livingston	180967	111	1	5	1	61.34	0.55	2.76	0.55
Luce	6631	9	0	0	0	135.73	0.00	0.00	0.00
Mackinac	11113	9	0	0	0	80.99	0.00	0.00	0.00
Macomb	840978	684	16	132	6	81.33	1.90	15.70	0.71
Manistee	24733	34	0	2	0	137.47	0.00	8.09	0.00
Marquette	67077	66	1	3	0	98.39	1.49	4.47	0.00
Mason	28705	25	0	0	0	87.09	0.00	0.00	0.00
Mecosta	42798	31	0	1	0	72.43	0.00	2.34	0.00
Menominee	24029	19	2	1	0	79.07	8.32	4.16	0.00
Midland	83629	56	1	2	0	66.96	1.20	2.39	0.00
Missaukee	14849	9	0	1	0	60.61	0.00	6.73	0.00
Monroe	152021	98	0	16	3	64.46	0.00	10.52	1.97
Montcalm	63342	36	1	1	0	56.83	1.58	1.58	0.00
Montmorency	9765	9	0	0	0	92.17	0.00	0.00	0.00
Muskegon	172188	177	0	6	3	102.79	0.00	3.48	1.74
Newaygo	48460	43	1	2	0	88.73	2.06	4.13	0.00
Oakland	1202362	651	2	140	6	54.14	0.17	11.64	0.50
Oceana	26570	6	0	1	0	22.58	0.00	3.76	0.00
Ogemaw	21699	25	0	1	0	115.21	0.00	4.61	0.00
Ontonagon	6780	3	0	0	0	44.25	0.00	0.00	0.00
Osceola	23528	9	0	0	0	38.25	0.00	0.00	0.00
Oscoda	8640	11	1	0	0	127.31	11.57	0.00	0.00
Otsego	24164	26	0	3	0	107.60	0.00	12.42	0.00
Ottawa	263801	75	2	11	2	28.43	0.76	4.17	0.76
Presque Isle	13376	10	0	1	0	74.76	0.00	7.48	0.00
Roscommon	24449	28	0	1	0	114.52	0.00	4.09	0.00
Saginaw	200169	150	0	19	0	74.94	0.00	9.49	0.00
St Clair	163040	169	13	11	2	103.66	7.97	6.75	1.23
St Joseph	61295	45	0	2	0	73.42	0.00	3.26	0.00
Sanilac	43114	5	0	0	0	11.60	0.00	0.00	0.00
Schoolcraft	8485	7	0	0	0	82.50	0.00	0.00	0.00
Shiawassee	70648	44	0	5	0	62.28	0.00	7.08	0.00
Tuscola	55729	30	0	6	0	53.83	0.00	10.77	0.00
Van Buren	76258	38	0	4	0	49.83	0.00	5.25	0.00
Washtenaw	344791	181	0	58	2	52.50	0.00	16.82	0.58
Wayne	1106807	769	3	177	8	69.48	0.27	15.99	0.72
Wexford	32735	32	0	0	2	97.75	0.00	0.00	6.11
MDOC	44113	662	3	18	0	1500.69	6.80	40.80	0.00
State-wide†	9883640	7827	84	1075	60	79.19	0.85	10.88	0.61

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

†State wide rates do not include the MDOC population in the denominator

Appendix A2:
County Heroin Data

County	Population	2015 Young Adult (18-29) HCV Cases	2015 Heroin Treatment Admissions	2014 Heroin Overdose Deaths	2015 Young Adult (18-29) HCV Rate*	2015 Heroin Treatment Admission Rate*	2014 Heroin Overdose Death Rate*
Alcona	10942	3	5	0	27.42	45.70	0.00
Alger	9601	5	2	0	52.08	20.83	0.00
Allegan	111408	11	45	5	9.87	40.39	4.49
Alpena	29598	1	33	1	3.38	111.49	3.38
Antrim	23580	7	15	0	29.69	63.61	0.00
Arenac	15899	5	13	0	31.45	81.77	0.00
Baraga	8860	6	5	0	67.72	56.43	0.00
Barry	59173	9	61	1	15.21	103.09	1.69
Bay	107771	21	207	2	19.49	192.07	1.86
Benzie	17525	4	16	0	22.82	91.30	0.00
Berrien	156813	19	339	4	12.12	216.18	2.55
Branch	45248	4	33	1	8.84	72.93	2.21
Calhoun	136146	19	263	9	13.96	193.17	6.61
Cass	52293	2	39	2	3.82	74.58	3.82
Charlevoix	25949	4	21	0	15.41	80.93	0.00
Cheboygan	26152	5	13	0	19.12	49.71	0.00
Chippewa	38520	23	12	1	59.71	31.15	2.60
Clare	30926	4	13	1	12.93	42.04	3.23
Clinton	75382	8	29	1	10.61	38.47	1.33
Crawford	14074	2	15	0	14.21	106.58	0.00
Delta	37069	13	7	0	35.07	18.88	0.00
Detroit City	713777	47	5774‡	45	6.58	317.15	6.30
Dickinson	26168	9	13	1	34.39	49.68	3.82
Eaton	107759	13	98	5	12.06	90.94	4.64
Emmet	32694	3	17	0	9.18	52.00	0.00
Genesee	425790	62	1805	11	14.56	423.92	2.58
Gladwin	25692	4	18	0	15.57	70.06	0.00
Gogebic	16427	16	11	0	97.40	66.96	0.00
Grand Traverse	86986	20	88	1	22.99	101.17	1.15
Gratiot	42476	1	34	0	2.35	80.05	0.00
Hillsdale	46688	6	70	0	12.85	149.93	0.00
Houghton	36628	4	10	0	10.92	27.30	0.00
Huron	33118	4	33	1	12.08	99.64	3.02
Ingham	280895	17	526	24	6.05	187.26	8.54
Ionia	63905	3	38	6	4.69	59.46	9.39
Iosco	25887	10	15	1	38.63	57.94	3.86
Iron	11817	6	7	0	50.77	59.24	0.00
Isabella	70311	8	57	2	11.38	81.07	2.84
Jackson	160248	23	338	2	14.35	210.92	1.25
Kalamazoo	250331	29	449	8	11.58	179.36	3.20
Kalkaska	17153	6	29	1	34.98	169.07	5.83
Kent	602622	56	654	17	9.29	108.53	2.82

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

†State wide rates do not include the MDOC population in the denominator

‡Includes both Wayne County and City of Detroit

Appendix A2:
County Heroin Data

County	Population	2015 Young Adult (18-29) HCV Cases	2015 Heroin Treatment Admissions	2014 Heroin Overdose Deaths	2015 Young Adult (18-29) HCV Rate*	2015 Heroin Treatment Admission Rate*	2014 Heroin Overdose Death Rate*
Keweenaw	2156	4	0	0	185.53	0.00	0.00
Lake	11539	1	11	0	8.67	95.33	0.00
Lapeer	88319	12	175	1	13.59	198.15	1.13
Leelanau	21708	3	9	0	13.82	41.46	0.00
Lenawee	99892	5	93	4	5.01	93.10	4.00
Livingston	180967	20	93	17	11.05	51.39	9.39
Luce	6631	2	1	0	30.16	15.08	0.00
Mackinac	11113	4	5	0	35.99	44.99	0.00
Macomb	840978	133	2793	108	15.81	332.11	12.84
Manistee	24733	12	19	0	48.52	76.82	0.00
Marquette	67077	25	27	0	37.27	40.25	0.00
Mason	28705	2	26	1	6.97	90.58	3.48
Mecosta	42798	3	12	0	7.01	28.04	0.00
Menominee	24029	7	1	1	29.13	4.16	4.16
Midland	83629	16	116	0	19.13	138.71	0.00
Missaukee	14849	3	5	0	20.20	33.67	0.00
Monroe	152021	28	475	12	18.42	312.46	7.89
Montcalm	63342	9	51	0	14.21	80.52	0.00
Montmorency	9765	1	6	0	10.24	61.44	0.00
Muskegon	172188	34	449	11	19.75	260.76	6.39
Newaygo	48460	9	32	0	18.57	66.03	0.00
Oakland	1202362	105	1553	21	8.73	129.16	1.75
Oceana	26570	1	28	1	3.76	105.38	3.76
Ogemaw	21699	7	5	0	32.26	23.04	0.00
Ontonagon	6780	3	5	0	44.25	73.75	0.00
Osceola	23528	4	7	1	17.00	29.75	4.25
Oscoda	8640	2	3	0	23.15	34.72	0.00
Otsego	24164	7	21	0	28.97	86.91	0.00
Ottawa	263801	7	167	11	2.65	63.31	4.17
Presque Isle	13376	6	7	0	44.86	52.33	0.00
Roscommon	24449	5	26	2	20.45	106.34	8.18
Saginaw	200169	32	244	0	15.99	121.90	0.00
St Clair	163040	37	812	15	22.69	498.04	9.20
St Joseph	61295	6	48	2	9.79	78.31	3.26
Sanilac	43114	1	46	0	2.32	106.69	0.00
Schoolcraft	8485	1	3	0	11.79	35.36	0.00
Shiawassee	70648	9	98	1	12.74	138.72	1.42
Tuscola	55729	2	27	0	3.59	48.45	0.00
Van Buren	76258	3	106	2	3.93	139.00	2.62
Washtenaw	344791	33	526	37	9.57	152.56	10.73
Wayne	1106807	111	5774‡	117	10.03	317.15	10.57
Wexford	32735	8	60	1	24.44	183.29	3.05
MDOC	44113	198	-	-	448.85	N/A	N/A
State-wide†	9883640	1443	19459	519	14.60	196.88	5.25

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

†State wide rates do not include the MDOC population in the denominator

‡Includes both Wayne County and City of Detroit

Appendix B1: Local Health Department Hepatitis Data

Local Health Jurisdiction	Population	2015 Chronic HCV Cases	2015 Acute HCV Cases	2015 Chronic HBV Cases	2015 Acute HBV Cases	2015 Chronic HCV Rate*	2015 Acute HCV Rate*	2015 Chronic HBV Rate*	2015 Acute HBV Rate*
Allegan	111408	64	0	4	1	57.45	0.00	3.59	0.90
Barry-Eaton	166932	81	2	10	0	48.52	1.20	5.99	0.00
Bay	107771	62	1	2	2	57.53	0.93	1.86	1.86
Benzie-Leelanau	39233	19	0	1	0	48.43	0.00	2.55	0.00
Berrien	156813	92	3	7	2	58.67	1.91	4.46	1.28
Branch-Hillsdale-St. Joseph	153231	93	2	4	0	60.69	1.31	2.61	0.00
Calhoun	136146	125	3	10	0	91.81	2.20	7.35	0.00
Central Michigan	190805	115	1	7	0	60.27	0.52	3.67	0.00
Chippewa	38520	58	1	5	0	150.57	2.60	12.98	0.00
Delta-Menominee	61098	57	3	2	1	93.29	4.91	3.27	1.64
Detroit City	713777	1008	1	189	5	141.22	0.14	26.48	0.70
Dickinson-Iron	37985	35	1	0	0	92.14	2.63	0.00	0.00
District Health Department #10	261616	223	2	8	3	85.24	0.76	3.06	1.15
District Health Department #2	67168	66	2	2	1	98.26	2.98	2.98	1.49
District Health Department #4	78891	70	0	4	2	88.73	0.00	5.07	2.54
Genesee	425790	358	2	43	4	84.08	0.47	10.10	0.94
Grand Traverse	86986	63	1	2	1	72.43	1.15	2.30	1.15
Huron	33118	14	0	0	0	42.27	0.00	0.00	0.00
Ingham	280895	122	5	44	2	43.43	1.78	15.66	0.71
Ionia	63905	29	2	2	0	45.38	3.13	3.13	0.00
Jackson	160248	83	0	5	1	51.79	0.00	3.12	0.62
Kalamazoo	250331	108	1	19	0	43.14	0.40	7.59	0.00
Kent	602622	493	2	74	0	81.81	0.33	12.28	0.00
Lapeer	88319	55	0	1	0	62.27	0.00	1.13	0.00
Lenawee	99892	58	2	2	1	58.06	2.00	2.00	1.00
Livingston	180967	111	1	5	1	61.34	0.55	2.76	0.55
Luce-Mackinac-Alger-Schoolcraft	35830	32	0	1	0	89.31	0.00	2.79	0.00
Macomb	840978	684	16	132	6	81.33	1.90	15.70	0.71
Marquette	67077	66	1	3	0	98.39	1.49	4.47	0.00
Midland	83629	56	1	2	0	66.96	1.20	2.39	0.00
Mid-Michigan	181200	83	2	6	1	45.81	1.10	3.31	0.55
Monroe	152021	98	0	16	3	64.46	0.00	10.52	1.97
Muskegon	172188	177	0	6	3	102.79	0.00	3.48	1.74
Northwest Michigan	106387	104	2	5	0	97.76	1.88	4.70	0.00
Oakland	1202362	651	2	140	6	54.14	0.17	11.64	0.50
Ottawa	263801	75	2	11	2	28.43	0.76	4.17	0.76
Saginaw	200169	150	0	19	0	74.94	0.00	9.49	0.00
Sanilac	43114	5	0	0	0	11.60	0.00	0.00	0.00
Shiawassee	70648	44	0	5	0	62.28	0.00	7.08	0.00
St Clair	163040	169	13	11	2	103.66	7.97	6.75	1.23
Tuscola	55729	30	0	6	0	53.83	0.00	10.77	0.00
Van Buren-Cass	128551	62	0	5	0	48.23	0.00	3.89	0.00
Washtenaw	344791	181	0	58	2	52.50	0.00	16.82	0.58
Wayne	1106807	769	3	177	8	69.48	0.27	15.99	0.72
Western Upper Peninsula	70851	67	1	2	0	94.56	1.41	2.82	0.00
MDOC	44113	662	3	18	0	1500.69	6.80	40.80	0.00
Statewide†	9883640	7827	84	1075	60	79.19	0.85	10.88	0.61

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

†State wide rates do not include the MDOC population in the denominator

Appendix B2: Local Health Department Heroin Data

Local Health Jurisdiction	Population	2015 Young Adult (18-29) HCV Cases	2015 Heroin Treatment Admissions	2014 Heroin Overdose Deaths	2015 Young Adult (18-29) HCV Rate*	2015 Heroin Treatment Admission Rate*	2014 Heroin Overdose Death Rate*
Allegan	111408	11	45	5	9.87	40.39	4.49
Barry-Eaton	166932	22	159	6	13.18	95.25	3.59
Bay	107771	21	207	2	19.49	192.07	1.86
Benzie-Leelanau	39233	7	25	0	17.84	63.72	0.00
Berrien	156813	19	339	4	12.12	216.18	2.55
Branch-Hillsdale-St. Joseph	153231	16	151	3	10.44	98.54	1.96
Calhoun	136146	19	263	9	13.96	193.17	6.61
Central Michigan	190805	30	134	6	15.72	70.23	3.14
Chippewa	38520	23	12	1	59.71	31.15	2.60
Delta-Menominee	61098	20	8	1	32.73	13.09	1.64
Detroit City	713777	47	5772‡	45	6.58	317.04	6.30
Dickinson-Iron	37985	15	20	1	39.49	52.65	2.63
District Health Department #10	261616	47	237	4	17.97	90.59	1.53
District Health Department #2	67168	22	28	1	32.75	41.69	1.49
District Health Department #4	78891	13	59	1	16.48	74.79	1.27
Genesee	425790	62	1805	11	14.56	423.92	2.58
Grand Traverse	86986	20	88	1	22.99	101.17	1.15
Huron	33118	4	33	1	12.08	99.64	3.02
Ingham	280895	17	526	24	6.05	187.26	8.54
Ionia	63905	3	38	6	4.69	59.46	9.39
Jackson	160248	23	338	2	14.35	210.92	1.25
Kalamazoo	250331	29	449	8	11.58	179.36	3.20
Kent	602622	56	654	17	9.29	108.53	2.82
Lapeer	88319	12	175	1	13.59	198.15	1.13
Lenawee	99892	5	93	4	5.01	93.10	4.00
Livingston	180967	20	93	17	11.05	51.39	9.39
Luce-Mackinac-Alger-Schoolcraft	35830	12	11	0	33.49	30.70	0.00
Macomb	840978	133	2793	108	15.81	332.11	12.84
Marquette	67077	25	27	0	37.27	40.25	0.00
Midland	83629	16	116	0	19.13	138.71	0.00
Mid-Michigan	181200	18	114	1	9.93	62.91	0.55
Monroe	152021	28	475	12	18.42	312.46	7.89
Muskegon	172188	34	449	11	19.75	260.76	6.39
Northwest Michigan	106387	21	74	0	19.74	69.56	0.00
Oakland	1202362	105	1553	21	8.73	129.16	1.75
Ottawa	263801	7	167	11	2.65	63.31	4.17
Saginaw	200169	32	244	0	15.99	121.90	0.00
Sanilac	43114	1	46	0	2.32	106.69	0.00
Shiawassee	70648	9	98	1	12.74	138.72	1.42
St Clair	163040	37	812	15	22.69	498.04	9.20
Tuscola	55729	2	27	0	3.59	48.45	0.00
Van Buren-Cass	128551	5	145	4	3.89	112.80	3.11
Washtenaw	344791	33	526	37	9.57	152.56	10.73
Wayne	1106807	111	5772‡	117	10.03	317.04	10.57
Western Upper Peninsula	70851	33	31	0	46.58	43.75	0.00
MDOC	44113	198	-	-	448.85	-	-
Statewide†	9883640	1443	19459	519	14.60	196.88	5.25

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

†State wide rates do not include the MDOC population in the denominator

‡Includes both Wayne County and City of Detroit

Appendix C1:
Region Hepatitis Data

Region	Population	2015 Chronic HCV Cases	2015 Acute HCV Cases	2015 Chronic HBV Cases	2015 Acute HBV Cases	2015 Chronic HCV Rate*	2015 Acute HCV Rate*	2015 Chronic HBV Rate*	2015 Acute HBV Rate*
1	1064955	544	12	74	6	51.08	1.13	6.95	0.56
3	1146398	830	6	77	7	72.40	0.52	6.72	0.61
5	948965	546	9	51	3	57.54	0.95	5.37	0.32
6	1448695	979	8	102	5	67.58	0.55	7.04	0.35
7	439490	391	4	17	6	88.97	0.91	3.87	1.37
8	311361	315	7	13	1	101.17	2.25	4.18	0.32
2N	2206380	1504	31	283	14	68.17	1.41	12.83	0.63
2S	2317396	2056	4	440	18	88.72	0.17	18.99	0.78
MDOC	44113	662	3	18	0	1500.69	6.80	40.80	0.00
Statewide†	9883640	7827	84	1075	60	79.19	0.85	10.88	0.61
***Rates are calculated per 100,000 persons in the population**									
†State wide rates do not include the MDOC population in the denominator									

Appendix C2:
Region Heroin Data

Region	Population	2015 Young Adult (18-29) HCV Cases	2015 Heroin Treatment Admissions	2014 Heroin Overdose Deaths	2015 Young Adult (18-29) HCV Rate*	2015 Heroin Treatment Admission Rate*	2014 Heroin Overdose Death Rate*
1	1064955	102	1379	54	9.58	129.49	5.07
3	1146398	181	2712	16	15.79	236.57	1.40
5	948965	102	1383	34	10.75	145.74	3.58
6	1448695	141	1545	51	9.73	106.65	3.52
7	439490	97	400	6	22.07	91.01	1.37
8	311361	128	109	3	41.11	35.01	0.96
2N	2206380	275	5158	144	12.46	233.78	6.53
2S	2317396	219	6773	211	9.45	292.27	9.11
MDOC	44113	198	-	-	448.85	-	-
Statewide†	9883640	1443	19459	519	14.60	196.88	5.25

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

†State wide rates do not include the MDOC population in the denominator