

2014 Hepatitis B and C Surveillance Report



Viral Hepatitis Surveillance and Prevention Unit

Table of Contents

Viral Hepatitis Data Summary	4
Table 1.1 Summary of Demographic Information by Type of Hepatitis, Michigan, 2014.....	4
Executive Summary.....	6
Background and Technical Notes.....	8
Michigan Census Data	13
Figure 1.2 Age and sex: Michigan, 2010	14
Figure 1.3 Level of education: Michigan and the U.S., 2009-2013	14
Figure 1.4 Race and ethnicity: Michigan and the U.S., 2010	15
Table 1.4 Population by race: Michigan, 2000-2010	15
Figure 1.5 Population under the poverty line by race: Michigan, 2009-2013	16
Figure 1.6 Health insurance coverage, Michigan and the U.S., 2013	16
Figure 1.7 Income: Michigan and the U.S., 2013	16
Acute Hepatitis B Data Summary	17
Table 2.1: Incidence of Acute Hepatitis B, Michigan and U.S., 2004-2014	18
Figure 2.1: Incidence of Acute Hepatitis B, Michigan and U.S., 2004-2014	18
Table 2.2: Incidence of Acute Hepatitis B by Gender, Michigan, 2004-2014	19
Figure 2.2: Incidence of Acute Hepatitis B by Gender, Michigan, 2004-2014	19
Table 2.3: Incidence of Acute Hepatitis B by Race and Ethnicity, Michigan, 2004-2014	20
Figure 2.3: Incidence of Acute Hepatitis B by Race and Ethnicity, Michigan, 2004-2014	20
Table 2.4a: Completeness of Acute Hepatitis B Reports by Risk Behavior, Michigan, 201	21
Table 2.4b: Response of Completed Acute Hepatitis B Reports by Risk Behavior, Michigan, 2014	21
Chronic Hepatitis B Data Summary.....	22
Figure 3.1: Chronic Hepatitis B Cases per 100,000 Population, Michigan, 2004-2014.....	23
Table 3.1: Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2004-2014.....	23
Figure 3.2: Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2004-2014.....	24
Table 3.2: Chronic Hepatitis B Cases per 100,000 Population by Race and Ethnicity, Michigan, 2004-2014.....	24
Table 3.3 Chronic Hepatitis B Cases per 100,000 by Race and Ethnicity, Michigan, 2004-2014	25
Figure 3.3: Chronic Hepatitis B Cases per 100,000 Population by Race and Ethnicity, Michigan, 2004-2014.....	25
Acute Hepatitis C Data Summary.....	26
Table 4.1: Incidence of Acute Hepatitis C, Michigan and U.S., 2004-2014.....	27
Figure 4.1: Incidence of Acute Hepatitis C, Michigan and U.S., 2004-2014.....	27
Table 4.2: Incidence of Acute Hepatitis C by Gender, Michigan, 2004-2014.....	28
Figure 4.2: Incidence of Acute Hepatitis C by Gender, Michigan, 2004-2014.....	28
Table 4.3: Incidence of Acute Hepatitis C by Race and Ethnicity, Michigan, 2004-2014.....	29
Figure 4.3: Incidence of Acute Hepatitis C by Race and Ethnicity, Michigan, 2004-2014.....	29
Table 4.4a: Completeness of Acute Hepatitis C Reports by Risk Behavior, Michigan, 2014.....	30
Table 4.4b: Response of Completed Acute Hepatitis C Reports by Risk Behavior, Michigan, 2014.....	30
Chronic Hepatitis C Data Summary.....	31
Figure 5.1: Chronic Hepatitis B Cases per 100,000 Population, Michigan, 2004-2014.....	32
Figure 5.1 Chronic Hepatitis C Cases per 100,000 Population, Michigan, 2004-2014	32
Table 5.2: Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2004-2014.....	33
Figure 5.2: Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2004-2014.....	33
Table 5.3: Chronic Hepatitis B Cases per 100,000 Population by Race and Ethnicity, Michigan, 2004-2014.....	34
Figure 5.3: Chronic Hepatitis C Cases per 100,000 Population by Race and Ethnicity, Michigan, 2004-2014.....	34
Table 5.4a: Completeness of Chronic Hepatitis C Reports by Risk Behavior, Michigan, 2014.....	35
Table 5.4b: Response of Completed Acute Hepatitis C Reports by Risk Behavior, Michigan, 2014.....	35
Figure 5.5 Prevalence of Genotypes of Chronic Hepatitis C Cases Reported, Michigan, 2014	36
Figure 5.6 Prevalence of Genotypes of Chronic Hepatitis C Cases, United States, 2014	36

Table of Contents

Figure 5.7: Number of Chronic Hepatitis C Cases Reported to MDHHS by Year of Birth, 2004-2014.....	37
Table 5.7 Number and Percentage of Chronic Hepatitis C cases reported to MDHHS aged 18-29, 2000-2014	37
Special Populations.....	38
Hepatitis C in Young Adults	39
Figure 6.1 Number of Chronic Hepatitis C cases reported to MDHHS aged 18-29, 2000-2014	39
Table 6.2 Heroin Substance Abuse Treatment Admissions and Heroin Overdose Deaths, 2000-2013.....	39
Figure 6.2 Heroin Substance Abuse Treatment Admissions and Heroin Overdose Deaths, 2000-2013.....	40
Table 6.3 Epi Summary of 2014 Chronic HCV Cases Aged 18-29	40
Viral Hepatitis and HIV Co-Infection.....	42
Table 8.1: Hepatitis B/ HIV Co-Infection Incidence, Michigan, 2004-2014.....	42
Figure 8.2a: Hepatitis B and HIV Co-Infection Data, Michigan, 2014.....	43
Figure 8.2b: Hepatitis C and HIV Co-Infection Data, Michigan, 2014.....	44
Viral Hepatitis Outcomes	45
Viral Hepatitis and Liver Cancer.....	46
Figure 9.1 Age-adjusted incidence rates of liver cancer by race and sex, Michigan, 2003-2011.....	46
Figure 9.2 Age-adjusted death rates liver cancer by race and sex, Michigan, 2003-2012.....	46
Liver Transplant	48
Figure 10.1 Incidence of liver transplants and transplant waitlist patients, Michigan, 1988- 2013	48
Table 10.1 Incidence of liver transplants and transplant waitlist patients, Michigan, 1988- 2013.....	49
Viral Hepatitis-Related Mortality.....	50
Figure 11.1: Deaths Due to Acute and Chronic Hepatitis C, Michigan, 2003-2012.....	50
Figure 11.2: Mortality directly and indirectly attributed to viral hepatitis, Michigan, Michigan, 2003-2012	51
Appendices.....	53
Appendix A1: Hepatitis Data by County	54
Appendix A2: Heroin Data by County.....	57
Appendix B1: Hepatitis Data by Local Health Jurisdiction	60
Appendix B2: Heroin Data by Local Health Jurisdiction	62
Appendix C1: Hepatitis Data by Region	64
Appendix C2: Heroin Data by Region.....	65
Appendix D: Rate Maps	66
Acute Hepatitis B Rate Maps.....	66
Acute Hepatitis C Rate Maps.....	67
Chronic Hepatitis B Rate Maps.....	68
Chronic Hepatitis C Rate Maps.....	69
Young Adult HCV and Heroin Substance Abuse Treatment Admission and Overdose Death Rate Maps.....	70

Summary



Viral Hepatitis Data Summary

Table 1.1. Summary of Demographic Information by Type of Hepatitis, Michigan, 2014

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	50	100%	1141	100%	76	100%	8233	100%
Sex								
Male	25	50.0%	645	56.5%	38	50.0%	5215	63.3%
Female	25	50.0%	495	43.4%	38	50.0%	3000	36.4%
Unknown	0	0.0%	1	0.1%	0	0.0%	18	0.2%
Race or Ethnicity								
Caucasian	31	62.0%	285	25.0%	60	78.9%	4237	51.5%
Black or African American	16	32.0%	208	18.2%	4	5.3%	1581	19.2%
Hispanic	1	2.0%	18	1.6%	3	3.9%	167	2.0%
Asian	1	2.0%	259	22.7%	0	0.0%	45	0.5%
American Indian or Alaskan Native	1	2.0%	5	0.4%	3	3.9%	67	0.8%
Other	0	0.0%	51	4.5%	1	1.3%	137	1.7%
Unknown	1	2.0%	333	29.2%	8	10.5%	2166	26.3%
Age								
Mean	46		46		35		48	
Median	46		46		32		52	
Range	(28-71)		(0-93)		(0-68)		(0-103)	
0-19	0	0.0%	30	2.6%	3	3.9%	116	1.4%
20-29	4	8.0%	177	15.5%	30	39.5%	1365	16.6%
30-39	10	20.0%	227	19.9%	20	26.3%	1122	13.6%
40-49	18	36.0%	213	18.7%	9	11.8%	981	11.9%
50-59	11	22.0%	259	22.7%	8	10.5%	2484	30.2%
60+	7	14.0%	234	20.5%	6	7.9%	2153	26.2%
Unknown	0	0.0%	1	0.1%	0	0.0%	12	0.1%

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 2014, 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 75% 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.

This report presents hepatitis B and C data collected from case reports submitted to MDSS for calendar year 2014. 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 50 cases of acute hepatitis B infection reported in Michigan in 2014 for a rate of 0.51 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 every year since 2008, likely a sign of successful vaccination programs.
- Case follow-up and completion of epidemiological risk factors was completed for 90% of acute hepatitis B cases in 2013.
- There was no risk factor that was commonly shared between 2014 acute hepatitis B cases.

Chronic Hepatitis B

- There were 1,141 new chronic hepatitis B diagnoses reported in Michigan in 2014 for a rate of 11.55 cases per 100,000 people.
- Males have shown higher rates of Chronic Hepatitis B than females since 2004.
- Asian-Americans are disproportionately affected by chronic hepatitis B with an infection rate of 110.36 per 100,000, compared to the state average of 11.55.

Acute Hepatitis C

- There were 76 cases of acute hepatitis C reported in Michigan in 2014 for a rate of 0.77 cases per 100,000 people. This is similar to rates reported in 2012 (0.76) and 2013 (0.75). The Michigan acute HCV rate is similar to that of nation (0.70 per 100,000)
- 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 89% of acute hepatitis C cases in 2013.
 - Where data were available, injection drug use was reported by 69.8% of acute hepatitis C cases.

Hepatitis C, Past or Present (Chronic)

- There were 8,233 new chronic hepatitis C diagnoses reported in Michigan in 2014 for a rate of 83.30 cases per 100,000 people.
- The rate of hepatitis C, past or present is almost twice as high in Michigan males (107.57 per 100,000) versus females (59.58 per 100,000).
- American Indians and Alaskan Natives (122.6 per 100,000) and African Americans (115.77 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 62% of chronic hepatitis C cases in 2014, up from 38% in 2013.
 - Where data were available, injection drug use was a factor shared by 64.9% of cases. Incarceration was a risk factor in 67.3% of cases.
- 75% of chronic hepatitis C cases were reported with genotype 1 infection, 14% with genotype 3, and 10% with genotype 2.

Special Populations

Hepatitis C in Young Adults

- From 2004-2014, the number of cases of chronic hepatitis C among persons aged 18 -29 years has increased over 484%.
- Injection drug use in 18-29 year olds was reported in 87.2% of hepatitis C patients.
- During this time frame there have been concurrent increasing trends in heroin abuse. Between 2000 and 2013 there has been a:
 - 71% increase in Michigan heroin substance abuse treatment admissions
 - 280% increase in Michigan heroin overdose deaths

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

- From 2004-2014, there were 842 persons in Michigan reported with Hepatitis B/HIV co-infection.
 - 89.7% 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 44.8%, intravenous drug use (IDU) at 13.8% and heterosexual contact at 13.8%.
- From 2004-2014, there were 1,174 persons in Michigan reported with Hepatitis C/HIV co-infection.
 - 73% of these persons are male.
 - The primary modes of HIV transmission in the HIV/HCV co-infection group were IDU at 35.0%, MSM at 30.0% and heterosexual contact 15.0%.
- Incidence of HBV/HIV co-infections have been increasing while HIV/HCV co-infection incidence has remained fairly stable. 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 remained mostly stable, increasing only by 3% between 2003 and 2011.
- The liver cancer rate among African American males (17.8 cases per 100,000) is more than twice that among Caucasian males (8.1 cases per 100,000).
- The overall liver cancer mortality rate has increased by 27% between 2003 and 2012 in Michigan.
- In 2012, the Michigan liver cancer mortality rate was over twice as high in African-American males (8.8 per 100,000) as it was in Caucasian males (4.1 per 100,000).

Liver Transplant

- The number of liver transplants conducted in Michigan was 923, up from 398 in 1988.
- The number of individuals on the liver transplant waitlist in Michigan has grown from 30 in 1990 to 401 in 2013.

Viral Hepatitis-Related Mortality

- Mortality directly due to viral hepatitis has increased by 36% between 2003 and 2012.
- Deaths due to acute and chronic hepatitis C alone increased by 116% between 2003 and 2012.

Background and Technical Notes

Two horizontal bars are positioned below the section header. The top bar is dark blue and the bottom bar is green. Both bars span the width of the page.

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 Appendix A). Cases of acute and chronic hepatitis B and C are reported via MDSS using standardized CDC case report forms (see Appendix A).

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 8. Data includes cases with referral dates between January 1, 2014 and December 31, 2014 in MDSS. A frozen data set containing all 2013 cases was created on 04/30/2014.

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

2000 and 2010 Census data were used to calculate all of the rates throughout the annual report. 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- 2014. 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 2014. In general, this is not necessarily reflective of the true number of new infections that occurred in 2014 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 2014. 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](#)
- [Hepatitis C, Past or Present](#)

Michigan Viral Hepatitis Case Report Forms

- [Acute Hepatitis B](#)
- [Chronic Hepatitis B](#)
- [Acute Hepatitis C](#)
- [Chronic Hepatitis C](#)

Michigan Census and Demographics

Two horizontal bars, one dark blue and one green, stacked vertically.

Population by Age, Gender & Education

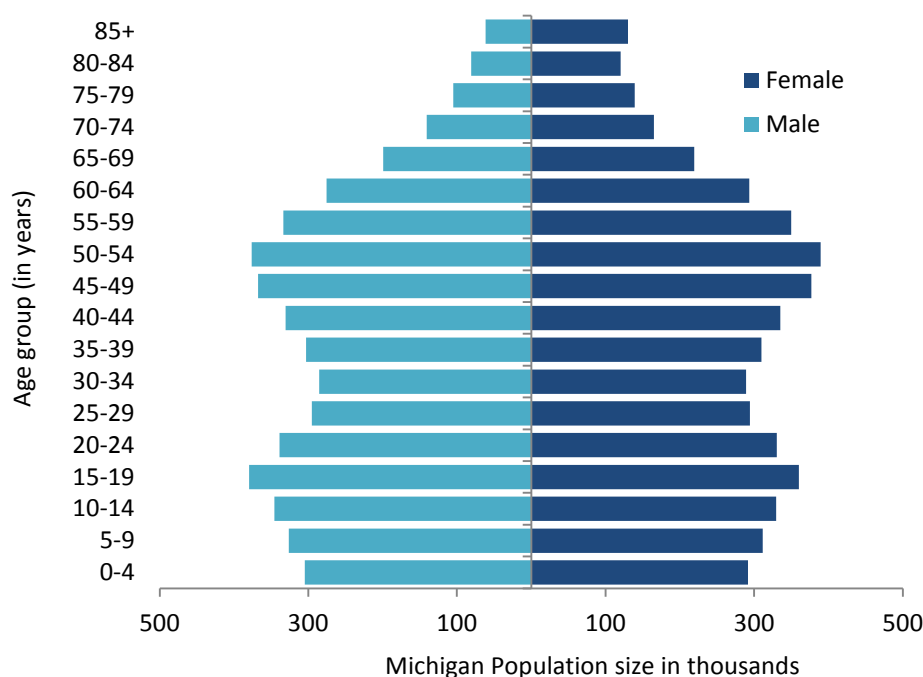


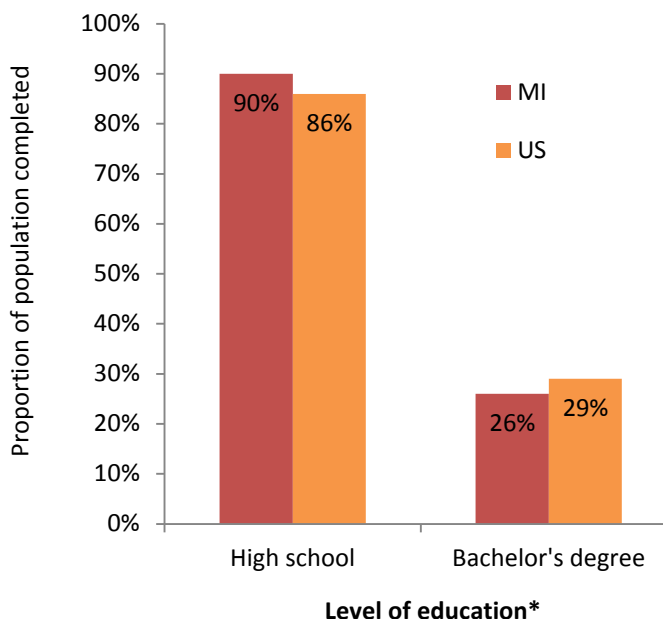
Figure 1.2 Age and sex: Michigan, 2010

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 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 1.3 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

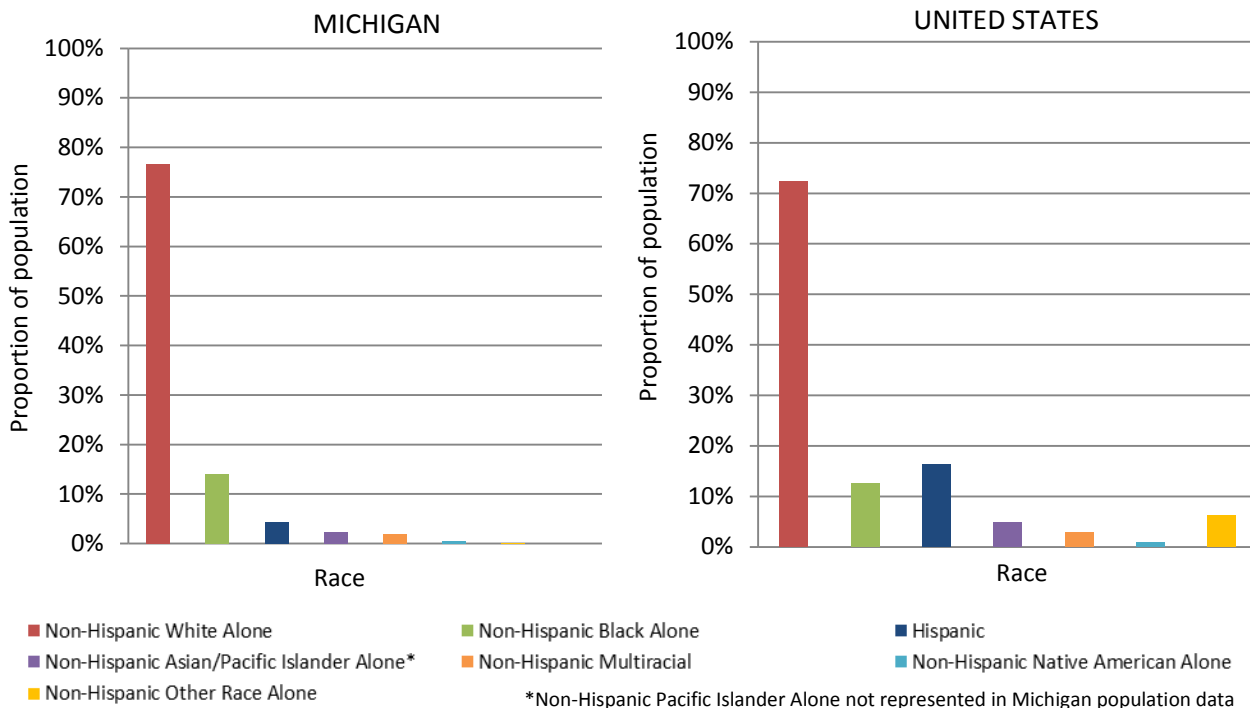


Figure 1.4 Race and ethnicity: Michigan and the U.S., 2010

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.

Race	2000 Census		2010 Census		Years 2000-2010	
	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

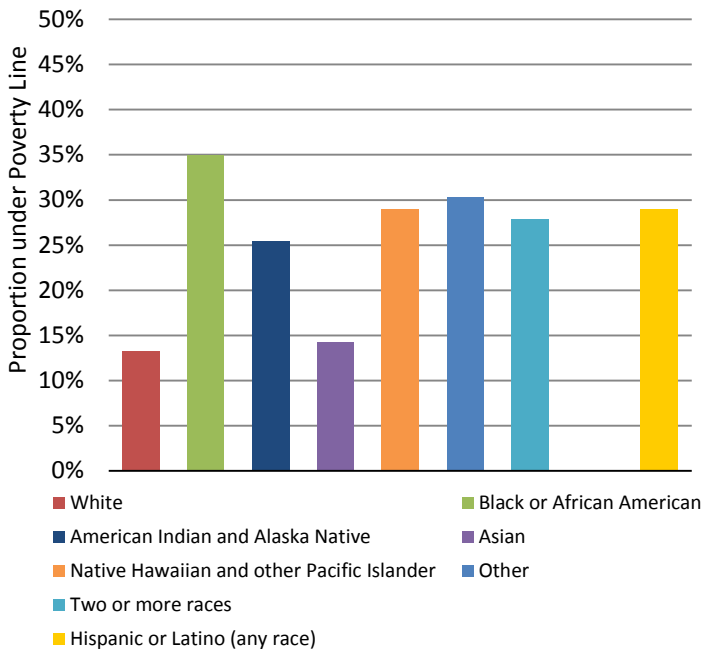


Figure 1.5 Population under the poverty line by race: Michigan, 2009-2013

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 1.6 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%).

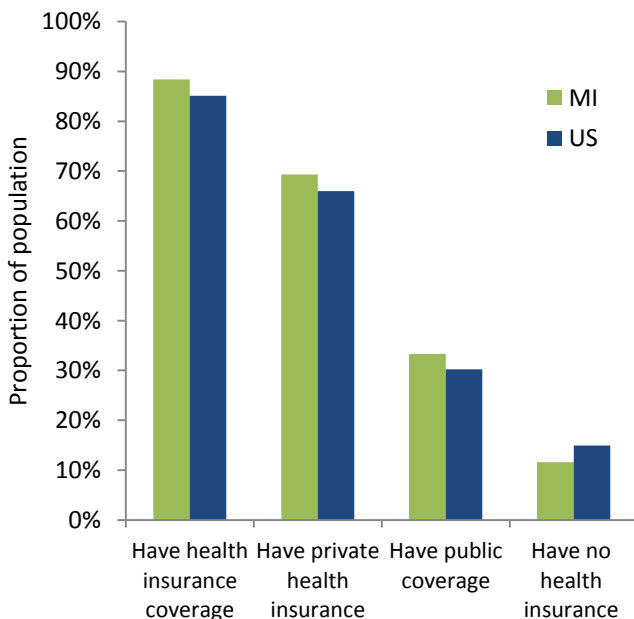
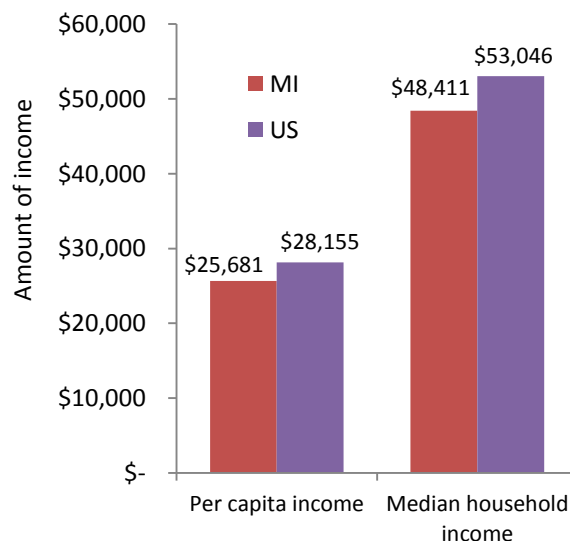


Figure 1.7 Income: Michigan and the U.S., 2013

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

Table 2.1 Incidence* of Acute Hepatitis B, Michigan and U.S., 2004-2014

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
U.S.	2.21	1.95	1.69	1.61	1.43	1.20	1.09	0.94	0.90	1.00	N/A
Michigan	2.39	1.69	1.42	1.16	1.45	1.34	1.15	0.98	0.82	0.57	0.51

*Incidence per 100,000

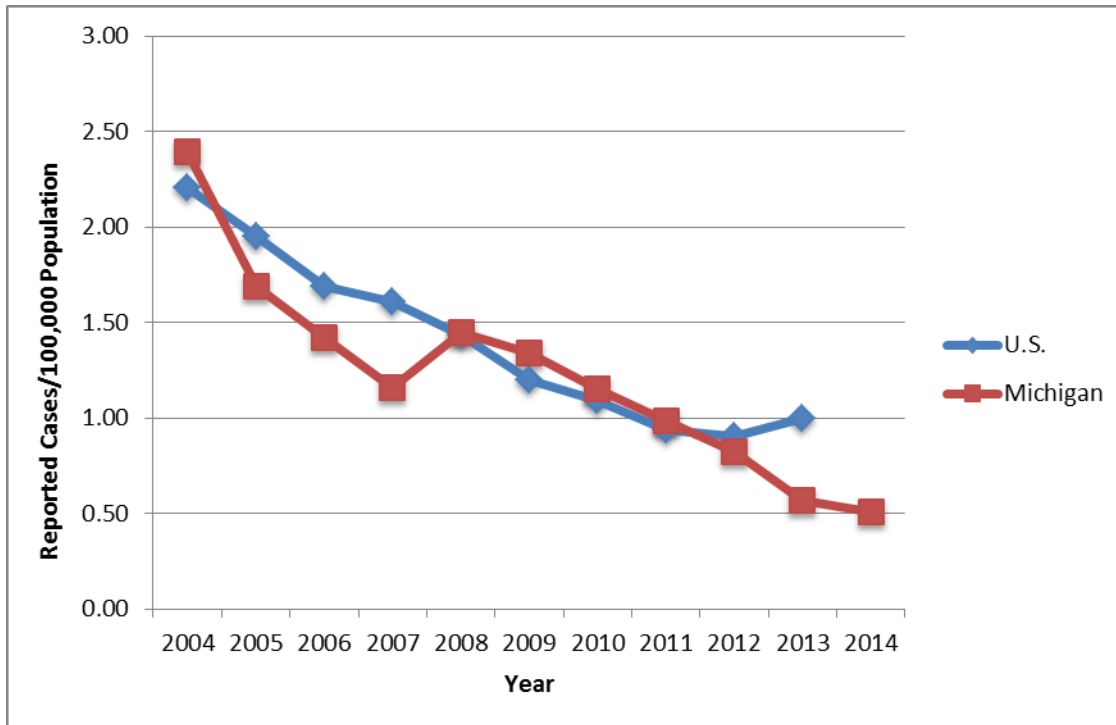


Figure 2.1 Incidence of Acute Hepatitis B, Michigan and U.S., 2004-2014

The incidence of acute hepatitis B has decreased in Michigan from 2004 through 2014. The incidence of acute cases of hepatitis B decreased by 79% overall from 2004 to 2014 in Michigan. Nationally incidence of acute hepatitis B increased slightly in 2013. 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. Appendix A1 contains an incidence map of acute hepatitis B by county, local health jurisdiction, and region in 2014.

Acute Hepatitis B

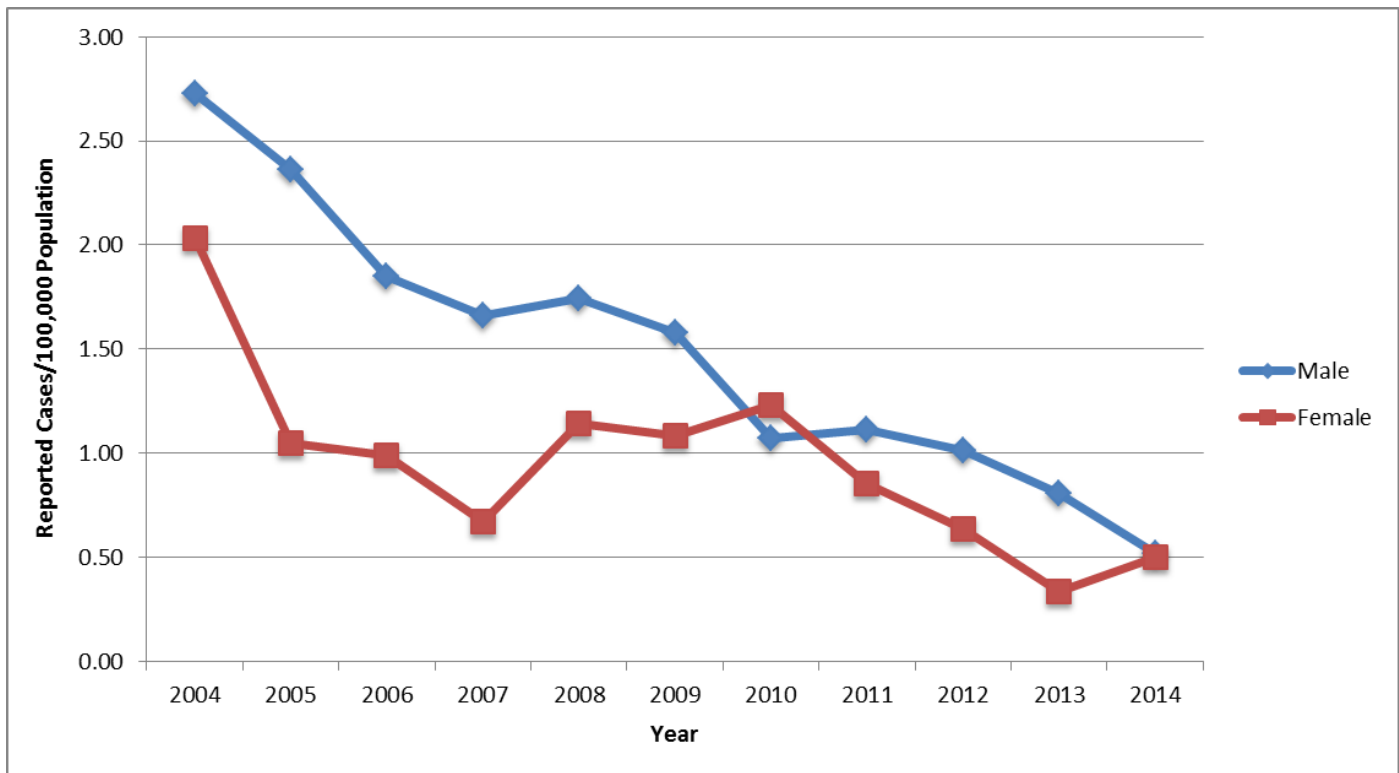
Table 2.2 Incidence* of Acute Hepatitis B by Gender, Michigan, 2004-2014

Year	Male	Female
2004	2.73	2.03
2005	2.36	1.05
2006	1.85	0.99
2007	1.66	0.67
2008	1.74	1.15
2009	1.58	1.09
2010	1.07	1.23
2011	1.11	0.85
2012	1.01	0.64
2013	0.80	0.34
2014	0.52	0.50

*Incidence per 100,000

The incidence of acute hepatitis B has decreased for both sexes from 2004 to 2014. In 2014 the incidence of hepatitis B in females was seen to increase for the first time since 2009. Incidence of acute hepatitis B was higher in males than in females between the years of 2004 and 2013, except during 2010, when incidence in females exceeded incidence in males. In 2014, the rate for males was approximately the same as that for females (0.52 cases and 0.50 cases per 100,000, respectively).

Figure 2.2 Incidence of Acute Hepatitis B by Gender, Michigan, 2004-2014



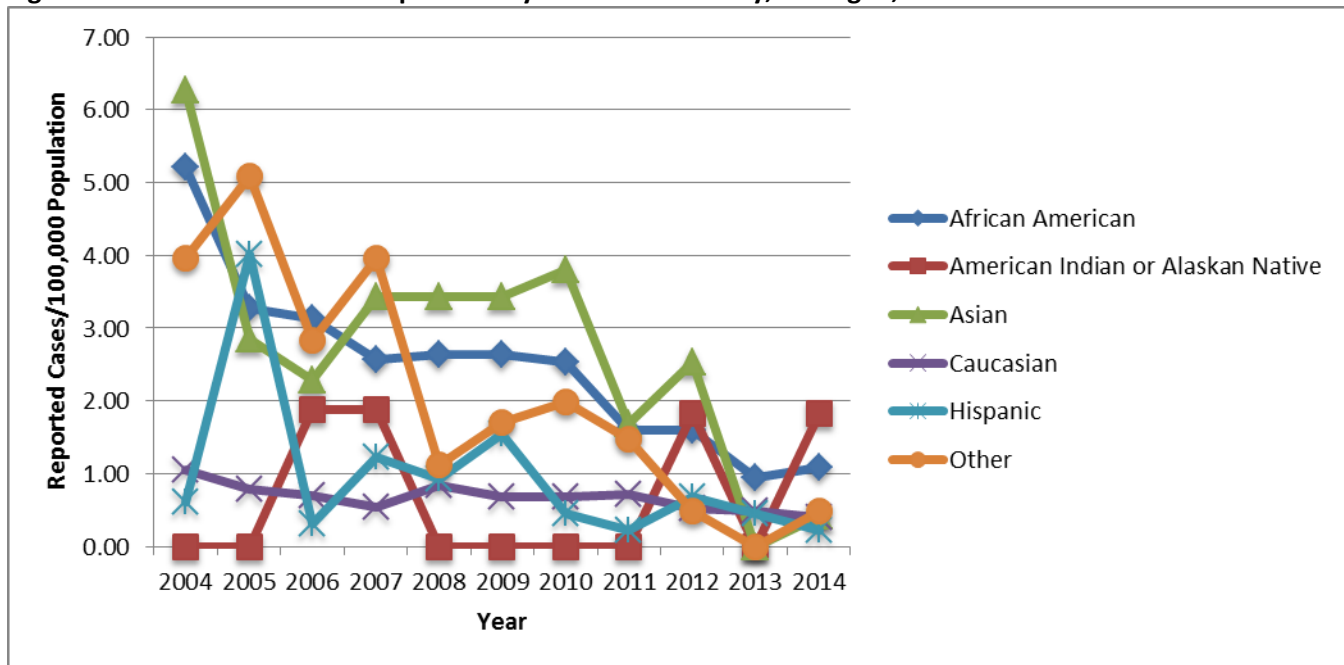
Acute Hepatitis B

Table 2.3 Incidence* of Acute Hepatitis B by Race and Ethnicity, Michigan, 2004-2014

Year	African American Incidence	African American Cases	American Indian or Alaskan Native Incidence	American Indian or Alaskan Native Cases	Asian Incidence	Asian Cases	Caucasian Incidence	Caucasian Cases	Hispanic Incidence	Hispanic Cases	Other Incidence	Other Cases
2004	5.21	73	0.00	0	6.27	11	1.05	82	0.62	2	3.95	7
2005	3.28	46	0.00	0	2.85	5	0.78	61	4.01	13	5.08	9
2006	3.14	44	1.87	1	2.28	4	0.69	54	0.31	1	2.82	5
2007	2.57	36	1.87	1	3.42	6	0.54	42	1.24	4	3.95	7
2008	2.64	37	0.00	0	3.42	6	0.83	65	0.93	3	1.13	2
2009	2.64	37	0.00	0	3.42	6	0.68	53	1.54	5	1.69	3
2010	2.53	35	0.00	0	3.81	9	0.67	51	0.46	2	1.98	4
2011	1.59	22	0.00	0	1.69	4	0.71	54	0.23	1	1.48	3
2012	1.59	22	1.83	1	2.54	6	0.52	39	0.69	3	0.49	1
2013	0.94	13	0.00	0	0.00	0	0.49	37	0.46	2	0.00	0
2014	1.08	15	1.83	1	0.42	1	0.40	30	0.23	1	0.49	1

*Incidence per 100,000

Figure 2.3 Incidence of Acute Hepatitis B by Race and Ethnicity, Michigan, 2004-2014



African Americans and Caucasians 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 American Indian or Alaskan Natives, between 2004 and 2014. However there has been an increase in acute hepatitis B diagnoses in American Indian or Alaskan Native, Asian, and African American races from 2013 to 2014. The largest increase from 2013 to 2014 was seen in Asians where the incidence went from 0.0 in 2013 to 0.42 cases per 100,000 populations in 2014. In 2014, the rate of acute hepatitis B was highest for African American and American Indian or Alaskan Natives. The rate of acute hepatitis B was lowest for Hispanics.

Acute Hepatitis B

Table 2.4a Completeness of Acute Hepatitis B Reports* by Risk Behavior, Michigan, 2014

Risk Behavior	Completed
Injection Drug User	47/50 (94%)
Used Street Drugs	45/50 (90%)
Hemodialysis	47/50 (94%)
Received Blood Products	47/50 (94%)
Received a Tattoo	47/50 (94%)
Accidental Needle Stick	45/50 (90%)
Contact of Person with Hepatitis B	46/50 (92%)
Other Surgery	46/50 (92%)
Oral Surgery or Dental Work	47/50 (94%)
Employed in Medical Field	47/50 (94%)
Employed as Public Safety Officer	46/50 (92%)
Incarceration Longer than 6 Months	47/50 (94%)
Any Part of Body Pierced (other than ear)	47/50 (94%)

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 on 90% of case reports. This is a sizable 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 60% in 2013.

Table 2.4b Response of Completed Acute Hepatitis B Reports* by Risk Behavior, Michigan, 2014

Risk Behavior	Yes*	No*	Unknown*
Injection Drug User	5/47 (11%)	34/47 (72%)	8/47 (17%)
Used Street Drugs	6/45 (13%)	30/45 (67%)	9/45 (20%)
Hemodialysis	0/47 (0%)	41/47 (87%)	6/47 (13%)
Received Blood Products	5/47 (11%)	35/47 (74%)	7/47 (15%)
Received a Tattoo	13/47 (28%)	25/47 (53%)	9/47 (19%)
Accidental Needle Stick	0/45 (0%)	37/45 (82%)	8/45 (18%)
Contact of Person with Hepatitis B	3/46 (7%)	17/46 (37%)	26/46 (57%)
Other Surgery	10/46 (22%)	28/46 (61%)	8/46 (17%)
Oral Surgery or Dental Work	12/47 (26%)	25/47 (53%)	10/47 (21%)
Employed in Medical Field	3/47 (6%)	38/47 (81%)	6/47 (13%)
Employed as Public Safety Officer	1/46 (2%)	39/46 (85%)	6/46 (13%)
Incarceration Longer than 6 Months	3/47 (6%)	36/47 (77%)	8/47 (17%)
Any Part of Body Pierced (other than ear)	5/47 (11%)	33/47 (70%)	9/47 (19%)

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

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 28% of cases with completed risk behavior questions. No 2014 acute HBV cases were receiving hemodialysis or had an accidental needle stick.

Chronic Hepatitis B

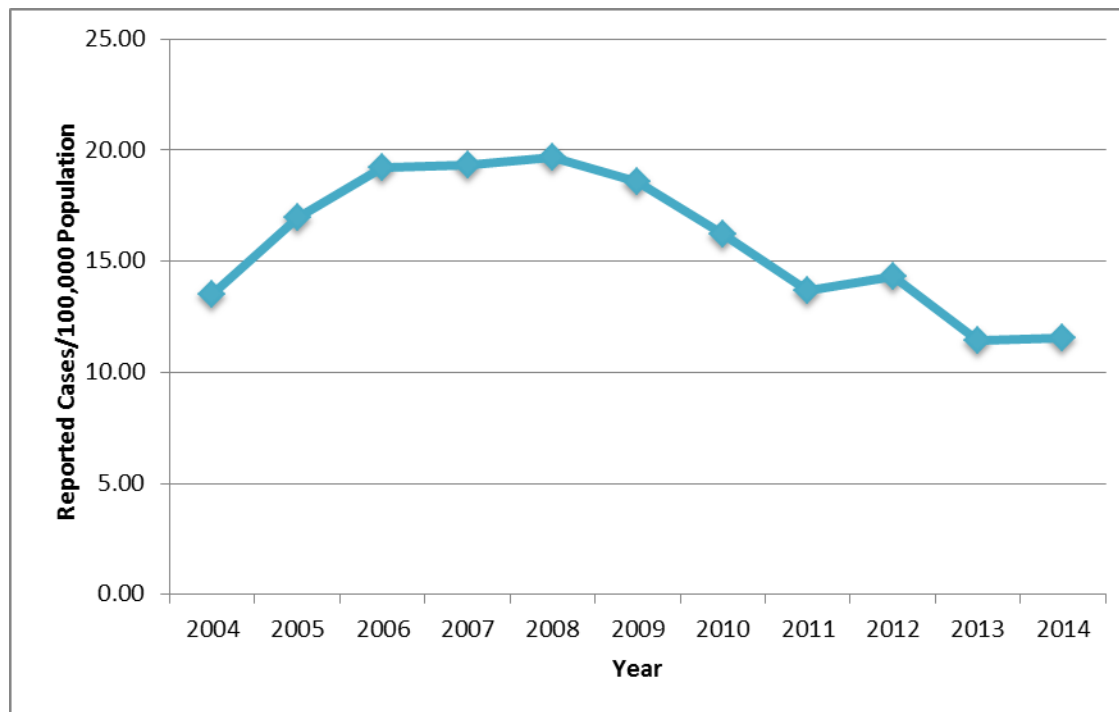


Chronic Hepatitis B

Table 3.1 Chronic Hepatitis B Cases per 100,000 Persons, Michigan, 2004-2014

Year	Cases/100,000 Population
2004	13.49
2005	16.95
2006	19.20
2007	19.33
2008	19.70
2009	18.57
2010	16.19
2011	13.69
2012	14.33
2013	11.43
2014	11.55

Figure 3.1 Chronic Hepatitis B Cases per 100,000 Persons, Michigan, 2004-2014



The number of new chronic hepatitis B diagnoses peaked in 2008, and then largely decreased. Appendix D contains a map of 2014 chronic hepatitis B rates by county, local health jurisdictions, and region. There is no national benchmark for comparing rates of chronic hepatitis B infection. Decreases in 2013 and 2014 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.

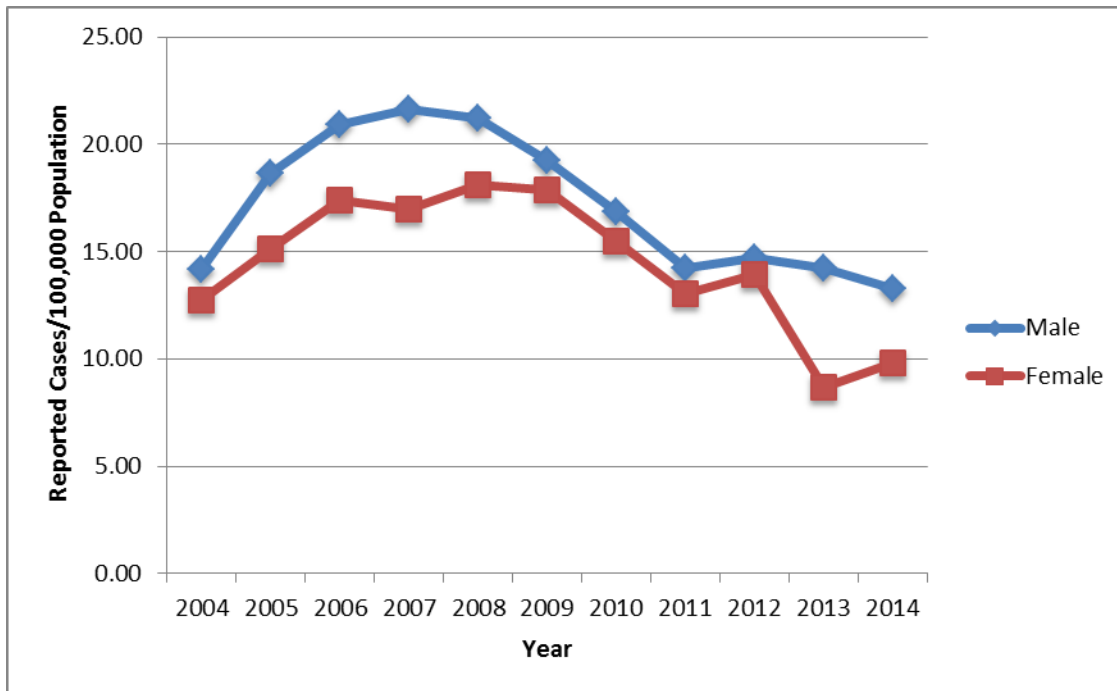
Chronic Hepatitis B

Table 3.2 Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2004-2014

Year	Male	Female
2004	14.18	12.73
2005	18.65	15.14
2006	20.93	17.39
2007	21.63	16.96
2008	21.24	18.10
2009	19.27	17.87
2010	16.85	15.47
2011	14.21	13.07
2012	14.71	13.92
2013	14.25	8.68
2014	13.30	9.83

The rate of chronic hepatitis B reporting in Michigan has remained higher among males in comparison to females between the years of 2004 and 2014. The rate for males peaked in 2007, while the rate for females peaked in 2008. 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.

Figure 3.2 Chronic Hepatitis B Cases per 100,000 Population by Gender, Michigan, 2004-2014

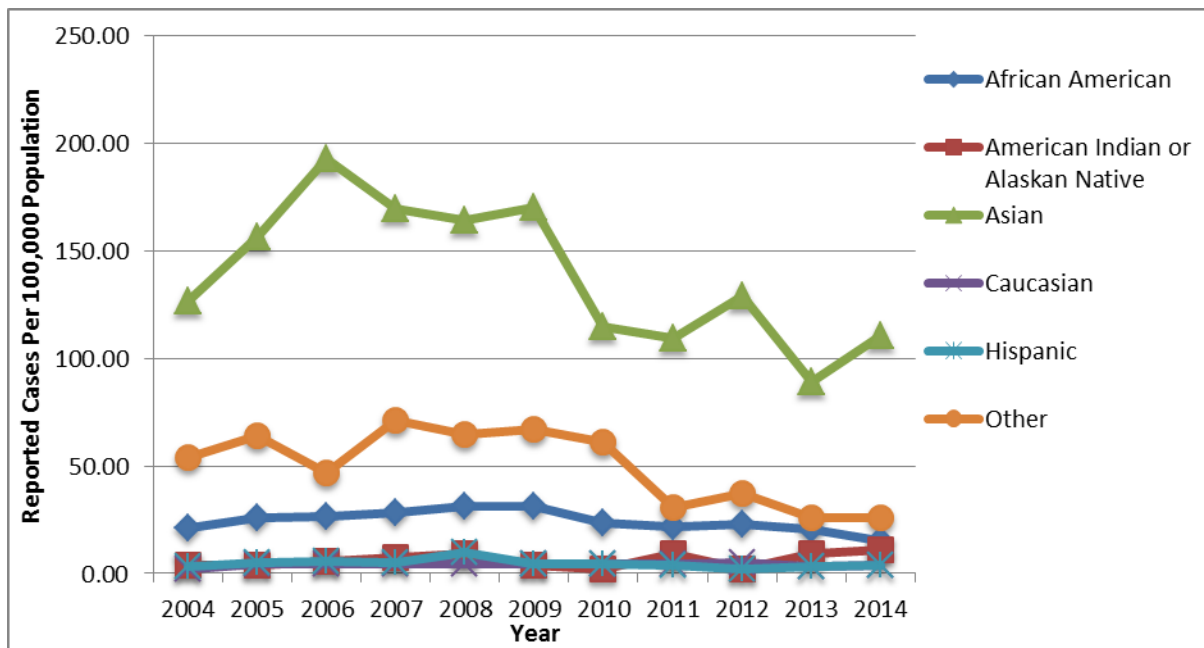


Chronic Hepatitis B

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

Year	African American	American Indian or Alaskan Native	Asian	Caucasian	Hispanic	Other
2004	20.90	3.74	126.63	2.33	3.09	54.21
2005	25.68	3.74	156.86	4.27	4.94	64.37
2006	26.68	5.62	192.80	4.74	5.56	46.87
2007	28.03	7.49	169.98	4.39	5.25	71.15
2008	31.53	9.36	164.28	4.59	9.57	64.94
2009	31.03	3.74	170.55	4.36	4.63	67.19
2010	23.27	1.83	114.59	4.61	4.35	61.26
2011	21.68	9.15	109.52	4.53	3.90	30.63
2012	22.91	1.83	129.39	4.87	1.83	37.54
2013	20.67	9.15	89.22	3.40	3.21	25.69
2014	15.18	10.98	110.36	3.78	4.13	25.69

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



Asians have the highest rate of chronic hepatitis B infection in Michigan, followed by African Americans. In 2014 the rate of chronic hepatitis B in Asians was 110.36 per 100,000. That rate is 29.2 times higher than the 2014 Caucasian rate (3.78 cases per 100,000) and 7.27 times higher than the 2014 African American rate (15.18 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 **KNOW** HEPATITIS B campaign.

Acute Hepatitis C



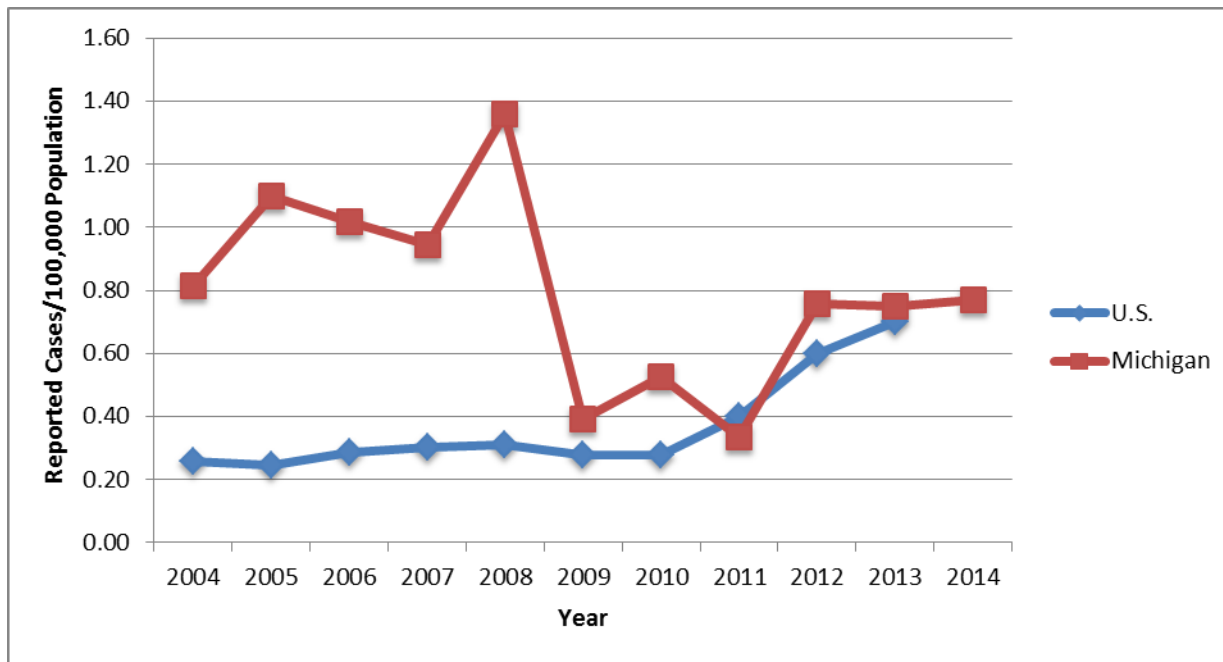
Acute Hepatitis C

Table 4.1 Incidence of Acute Hepatitis C, Michigan and U.S., 2004-2014

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
U.S.	0.26	0.25	0.28	0.30	0.31	0.28	0.28	0.40	0.60	0.70	N/A
Michigan	0.82	1.10	1.02	0.95	1.36	0.39	0.53	0.33	0.76	0.75	0.77

*Incidence per 100,000

Figure 4.1 Incidence of Acute Hepatitis C, Michigan and U.S., 2004-2014



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. 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. 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. Appendix C contains an incidence map of acute hepatitis C by county, local health jurisdiction, and region in 2014.

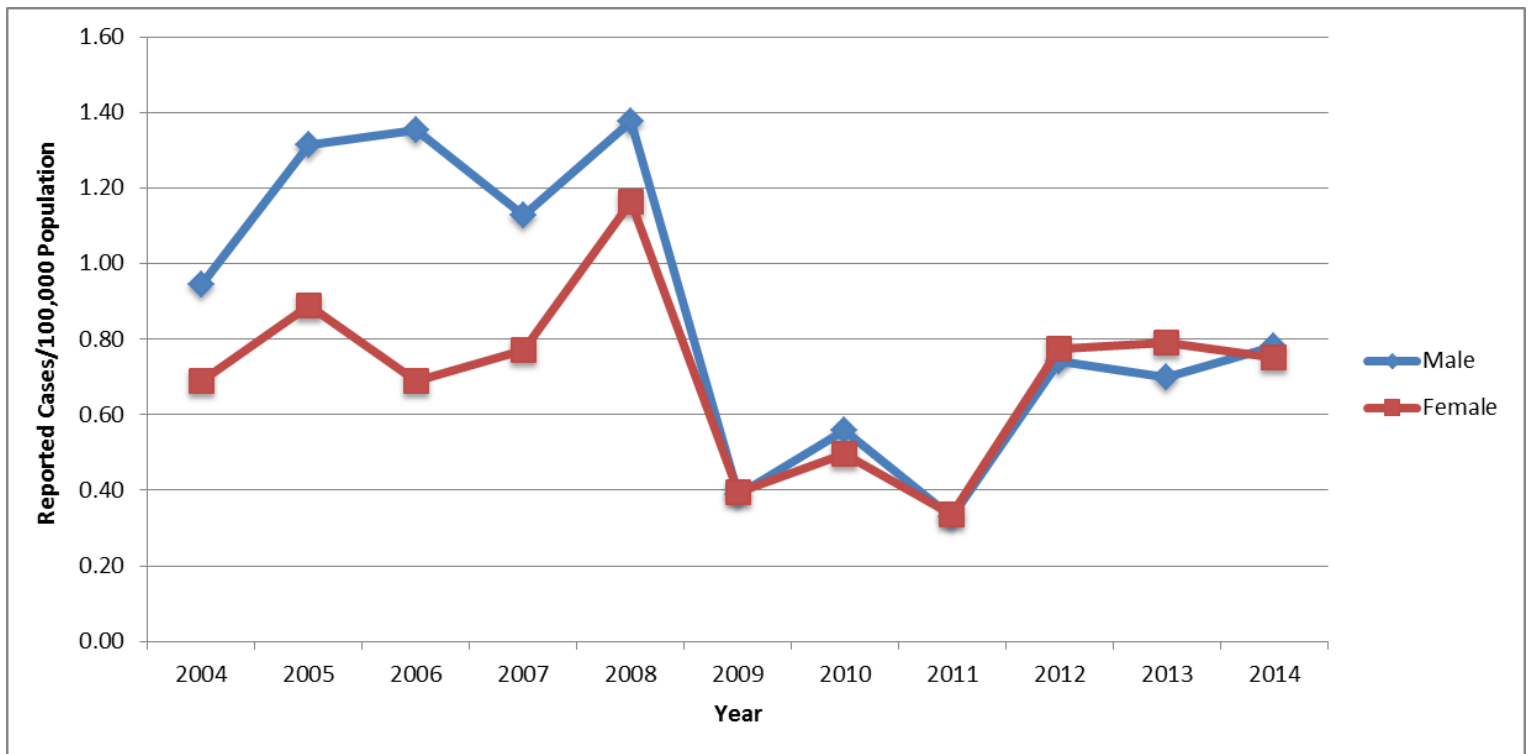
Acute Hepatitis C

Table 4.2 Incidence of Acute Hepatitis C by Gender, Michigan, 2004-2014

Year	Male	Female
2004	0.94	0.69
2005	1.31	0.89
2006	1.35	0.69
2007	1.13	0.77
2008	1.37	1.16
2009	0.39	0.39
2010	0.56	0.50
2011	0.33	0.34
2012	0.74	0.77
2013	0.70	0.79
2014	0.78	0.75

Prior to 2009, incidence rates of acute hepatitis C in Michigan were markedly higher among males than females. However, since 2009 the difference in acute HCV diagnoses between males and females has been minimal.

Figure 4.2 Incidence of Acute Hepatitis C by Gender, Michigan, 2004-2014



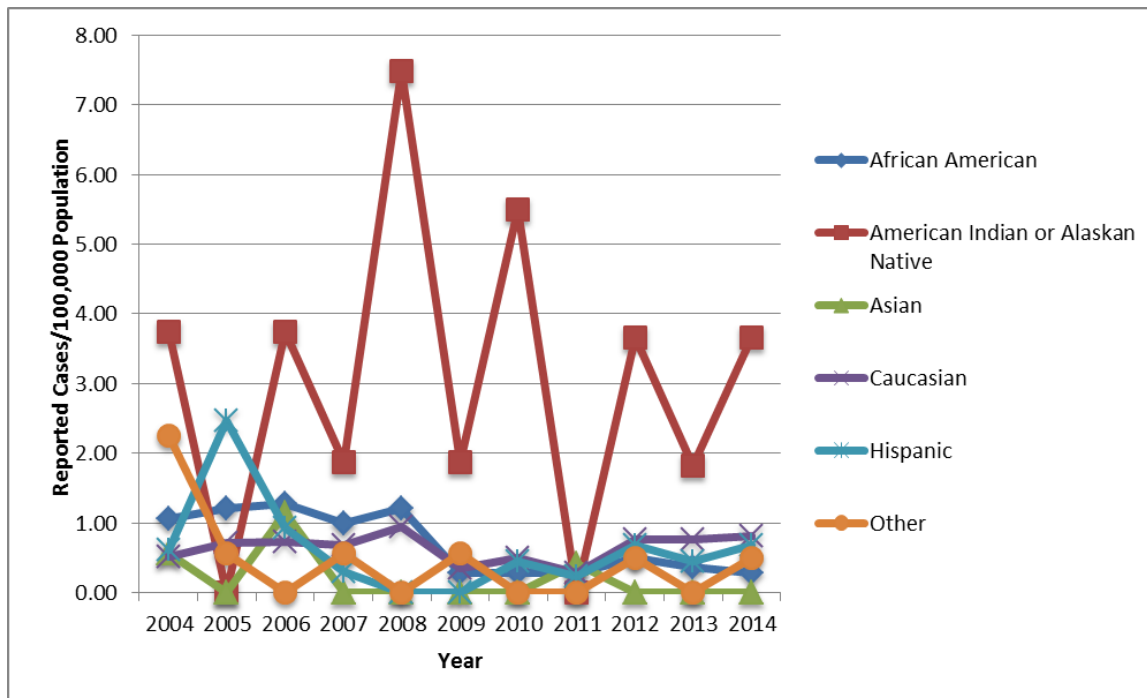
Acute Hepatitis C

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

Year	African American Incidence	African American Cases	American Indian or Alaskan Native Incidence	American Indian or Alaskan Native Cases	Asian Incidence	Asian Cases	Caucasian Incidence	Caucasian Cases	Hispanic Incidence	Hispanic Cases	Other Incidence	Other Cases
2004	1.07	15	3.74	2	0.57	1	0.51	40	0.62	2	2.26	4
2005	1.21	17	0.00	0	0.00	0	0.72	56	2.47	8	0.56	1
2006	1.28	18	3.74	2	1.14	2	0.73	57	0.93	3	0.00	0
2007	1.00	14	1.87	1	0.00	0	0.68	53	0.31	1	0.56	1
2008	1.21	17	7.49	4	0.00	0	0.95	74	0.00	0	0.00	0
2009	0.29	4	1.87	1	0.00	0	0.35	27	0.00	0	0.56	1
2010	0.29	4	5.49	3	0.00	0	0.50	38	0.46	2	0.00	0
2011	0.29	4	0.00	0	0.42	1	0.28	21	0.23	1	0.00	0
2012	0.51	7	3.66	2	0.00	0	0.77	58	0.69	3	0.49	1
2013	0.36	5	1.83	1	0.00	0	0.77	58	0.46	2	0.00	0
2014	0.29	4	3.66	2	0.00	0	0.82	62	0.69	3	0.49	1

*Incidence per 100,000

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



Incidence of acute hepatitis C in Michigan has decreased in African Americans, from a high of 1.28 cases per 100,000 in 2006 to a rate of 0.29 cases per 100,000 in 2014. 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.

Acute Hepatitis C

Table 4.4a Completeness of Acute Hepatitis C Reports by Risk Behavior, Michigan, 2014

Risk Behavior	Completed
Injection Drug User	73/76 (96%)
Used Street Drugs	68/76 (89%)
Hemodialysis	70/76 (92%)
Received Blood Products	72/76 (95%)
Received a Tattoo	73/76 (96%)
Accidental Needle Stick	69/76 (91%)
Contact of Person with Hepatitis C	69/76 (91%)
Other Surgery	66/76 (87%)
Oral Surgery or Dental Work	70/76 (92%)
Employed in Medical Field	70/76 (92%)
Employed as Public Safety Officer	71/76 (93%)
Incarceration Longer than 6 Months	69/76 (91%)
Any Part of Body Pierced (other than ear)?	70/76 (92%)

Table 3.4a shows the percentage of acute hepatitis C risk behavior questions that were completed by local health disease investigators in 2014. A risk behavior was considered completed if the question was marked as 'Yes', 'No', or 'Unknown'. Most questions were answered with an over 90% 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 58% in 2013.

Table 4.4b Response of Completed Acute Hepatitis C Reports* by Risk Behavior, Michigan, 2014

Risk Behavior	Yes*	No*	Unknown*
Injection Drug User	44/73(60%)	19/73(26%)	10/73(14%)
Used Street Drugs	34/68(50%)	18/68(26%)	16/68(24%)
Hemodialysis	0/70(0%)	55/70(79%)	15/70(21%)
Received Blood Products	5/72(7%)	48/72(67%)	19/72(26%)
Received a Tattoo	31/73(42%)	17/73(23%)	25/73(34%)
Accidental Needle Stick	4/69(6%)	38/69(55%)	27/69(39%)
Contact of Person with Hepatitis C	23/69(33%)	14/69(20%)	32/69(46%)
Surgery Other than Oral	20/66(30%)	22/66(33%)	24/66(36%)
Oral Surgery or Dental Work	12/70(17%)	28/70(40%)	30/70(43%)
Employed in Medical Field	2/70(3%)	47/70(67%)	21/70(30%)
Employed as Public Safety Officer	0/71(0%)	48/71(68%)	23/71(32%)
Incarceration Longer than 6 Months	16/69(23%)	27/69(39%)	26/69(38%)
Any Part of Body Pierced (other than ear)?	8/70(11%)	30/70(43%)	32/70(46%)

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

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. As with acute HBV, no acute HCV case reported being a hemodialysis patient.

Chronic Hepatitis C



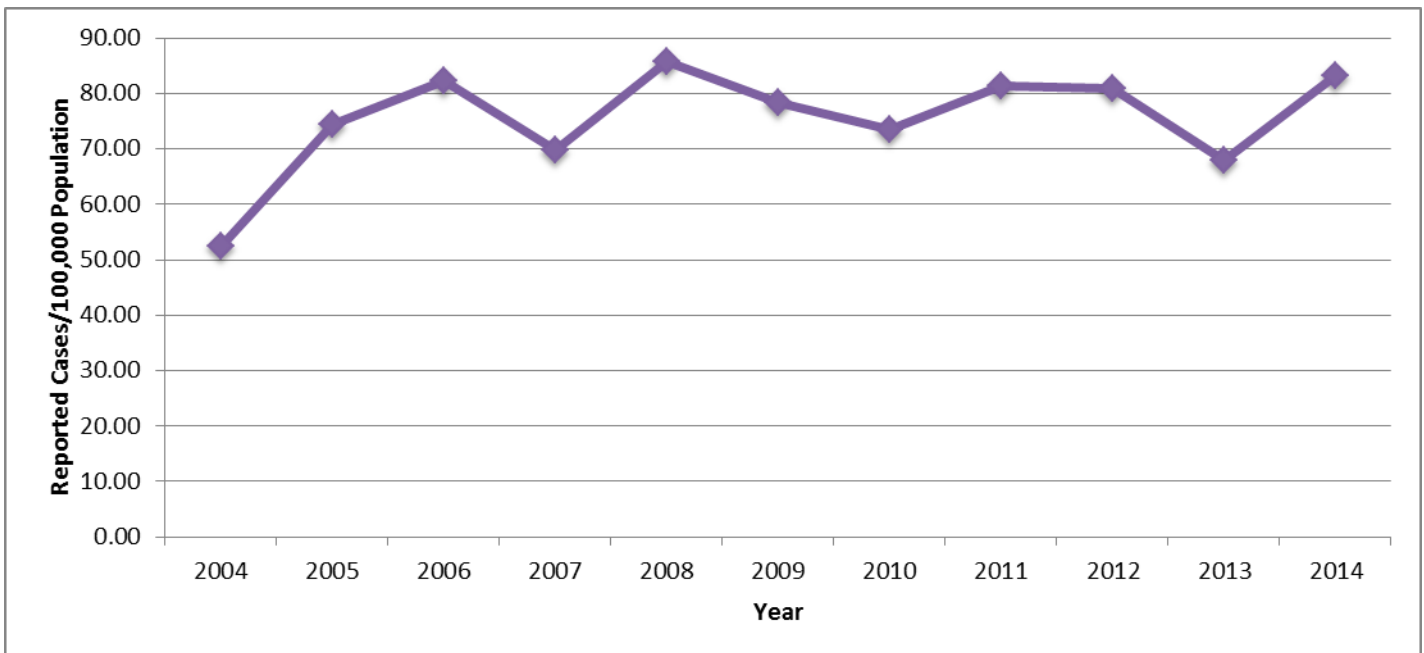
Chronic Hepatitis C

Figure 5.1 Chronic Hepatitis C Cases per 100,000 Persons, Michigan 2004-2014

Year	Rate Per 100,000 Population
2004	52.40
2005	74.44
2006	82.31
2007	69.82
2008	85.67
2009	78.31
2010	73.49
2011	81.45
2012	80.99
2013	67.98
2014	83.30

Reported cases of chronic hepatitis C in Michigan have increased 59% between 2004 and 2014. 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.

Figure 5.1 Chronic Hepatitis C Cases per 100,000 Population, Michigan, 2004-2014



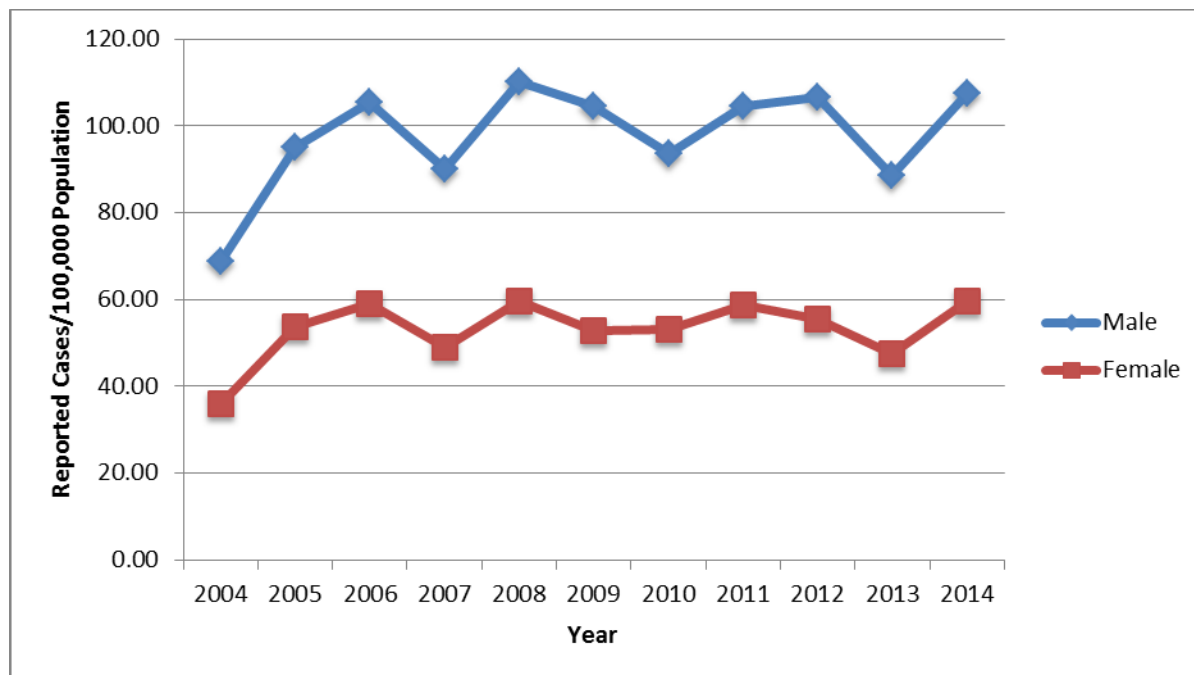
Chronic Hepatitis C

Table 5.2 Chronic Hepatitis C Cases per 100,000 Population by Gender, Michigan 2004-2014

Year	Male	Female
2004	68.89	36.09
2005	95.13	53.64
2006	105.31	58.99
2007	90.09	49.10
2008	110.11	59.76
2009	104.39	52.71
2010	93.64	53.12
2011	104.47	58.76
2012	106.64	55.43
2013	88.67	47.66
2014	107.57	59.58

Males account for the majority of chronic hepatitis C cases. In 2014, the rate of chronic hepatitis C reports was 1.81 times higher in males than females. Between 2004 and 2014, the rate of new chronic hepatitis C diagnoses increased by 56% in males and 65% in females.

Figure 5.2 Chronic Hepatitis C Cases per 100,000 Population by Gender, Michigan, 2004-2014

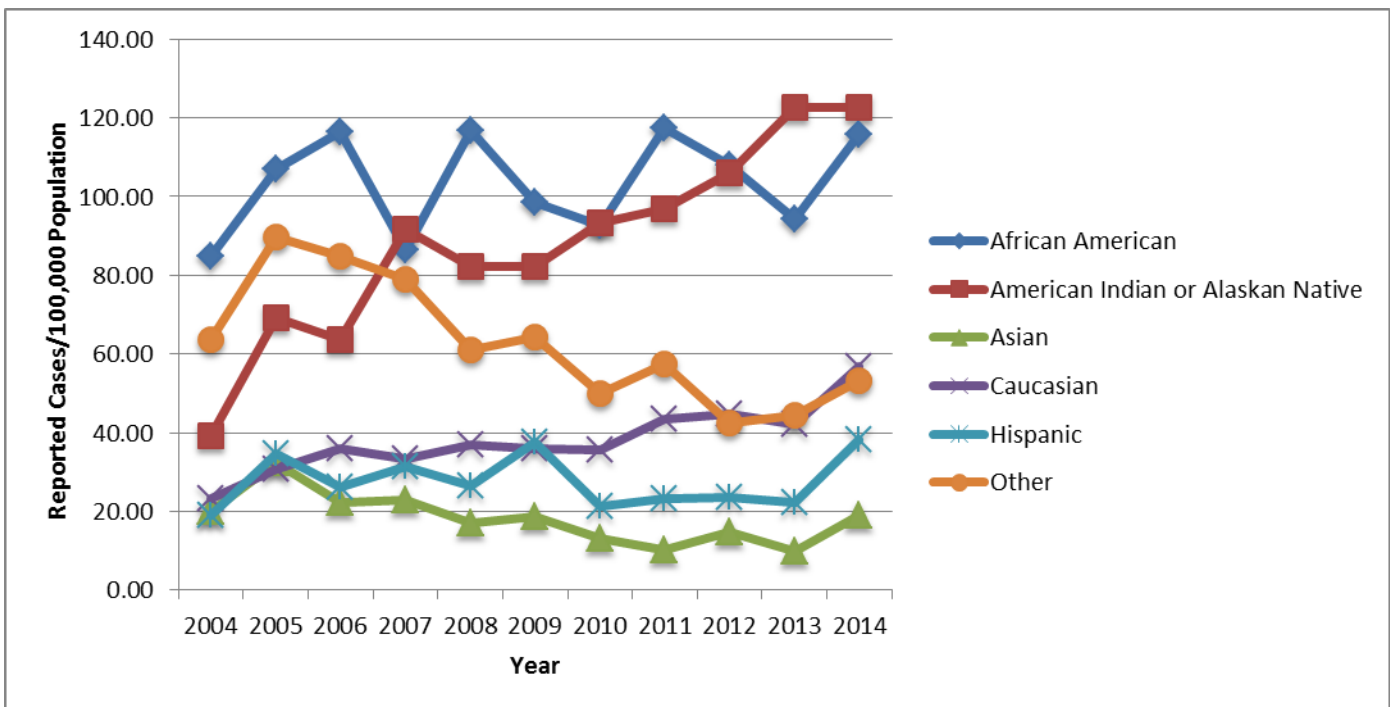


Chronic Hepatitis C

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

Year	African American Rate Per 100,000	African American Cases	American Indian or Alaskan Native Rate Per 100,000	American Indian or Alaskan Native Cases	Asian Rate Per 100,000	Asian Cases	Caucasian Rate Per 100,000	Caucasian Cases	Hispanic Rate Per 100,000	Hispanic Cases	Other Rate Per 100,000	Other Cases
2004	84.88	1190	39.31	21	19.96	35	23.16	1808	19.14	62	63.81	113
2005	106.99	1500	69.26	37	32.51	57	30.65	2393	34.58	112	89.78	159
2006	116.54	1634	63.65	34	22.25	39	36.07	2816	26.24	85	84.70	150
2007	86.45	1212	91.72	49	22.82	40	33.23	2594	31.49	102	79.05	140
2008	116.62	1635	82.36	44	17.11	30	37.07	2894	26.55	86	60.98	108
2009	98.43	1380	82.36	44	18.82	33	35.88	2801	37.67	122	64.37	114
2010	92.50	1280	93.30	51	13.11	31	35.68	2701	21.31	93	49.89	101
2011	117.43	1625	96.95	53	10.15	24	43.55	3297	23.38	102	57.30	116
2012	108.11	1496	106.10	58	14.80	35	44.64	3379	23.60	103	42.48	86
2013	94.38	1306	122.56	67	9.73	23	42.19	3194	22.23	97	44.46	90
2014	115.77	1602	122.56	67	19.03	45	56.75	4296	38.27	167	53.35	108

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



In 2014, 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 212% between 2004 and 2014, the highest increase among races/ethnicities. Only Asians have experienced a decrease in chronic hepatitis C infection rate during the 2004 to 2014 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.

Chronic Hepatitis C

Table 5.4a Completeness of Chronic Hepatitis C Reports by Risk Behavior, Michigan, 2014

Risk Behavior	Completed
Received Blood Transfusion Prior to 1992	5304/8233 (64%)
Received an Organ Transplant Prior to 1992	5278/8233 (64%)
Received Clotting Factor Concentrates Prior to 1992	5281/8233 (64%)
Hemodialysis	5279/8233 (64%)
Injection Drug User	5336/8233 (65%)
Incarcerated in Lifetime	5287/8233 (64%)
Treated for a Sexually Transmitted Disease in Lifetime	5073/8233 (62%)
Contact of Person with Hepatitis C	5295/8233 (64%)
Employed in Medical Field	5218/8233 (63%)

Table 5.4b Response of Completed Chronic Hepatitis C Reports by Risk Behavior, Michigan, 2014

Risk Behavior	Yes*	No*	Unknown*
Received Blood Transfusion Prior to 1992	244/5304 (5%)	1944/5304 (37%)	3116/5304 (58%)
Received an Organ Transplant Prior to 1992	5/5278 (<1%)	2526/5278 (48%)	2747/5278 (52%)
Received Clotting Factor Concentrates Prior to 1992	15/5281 (<1%)	2217/5281 (42%)	3049/5281 (58%)
Hemodialysis	34/5279 (<1%)	2570/5279 (49%)	2675/5279 (51%)
Injection Drug User	1781/5336 (33%)	963/5336 (18%)	2592/5336 (49%)
Incarcerated in Lifetime	1559/5287 (29%)	757/5287 (14%)	2971/5287 (56%)
Treated for a Sexually Transmitted Disease in Lifetime	502/5073 (10%)	1304/5073 (26%)	3267/5073 (64%)
Contact of Person with Hepatitis C	799/5295 (15%)	742/5295 (14%)	3754/5295 (71%)
Employed in Medical Field	171/5218 (3%)	2012/5218 (39%)	3035/5218 (58%)

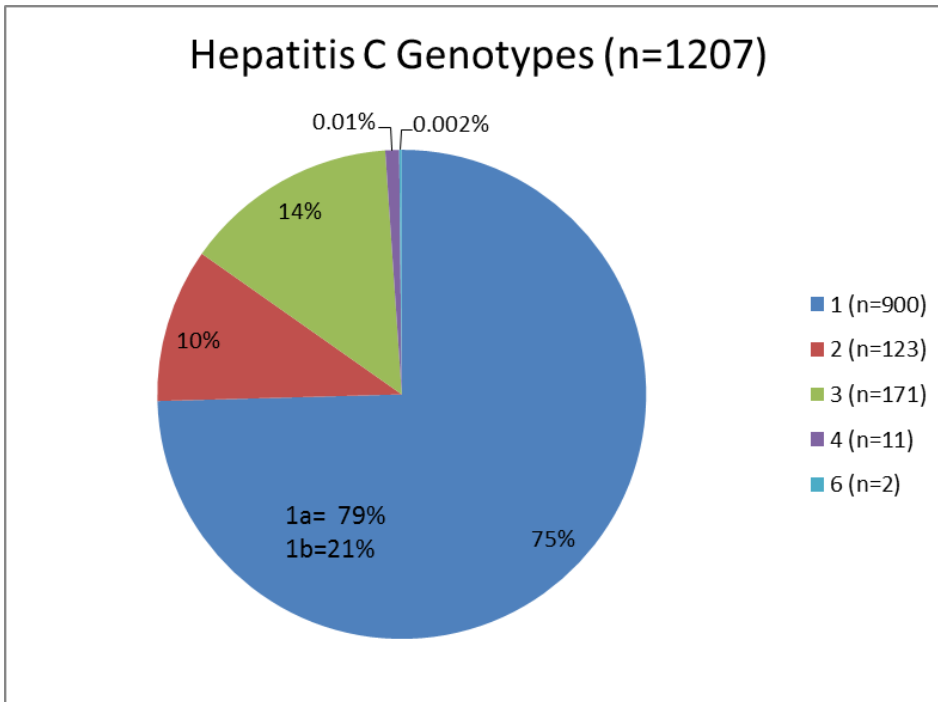
* Percentages calculated based upon those who completed the field; excludes missing data

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 62% of case reports. This is up from 28% in 2012 and 38% in 2013. There is no national comparison for completion of chronic hepatitis C case report forms.

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.

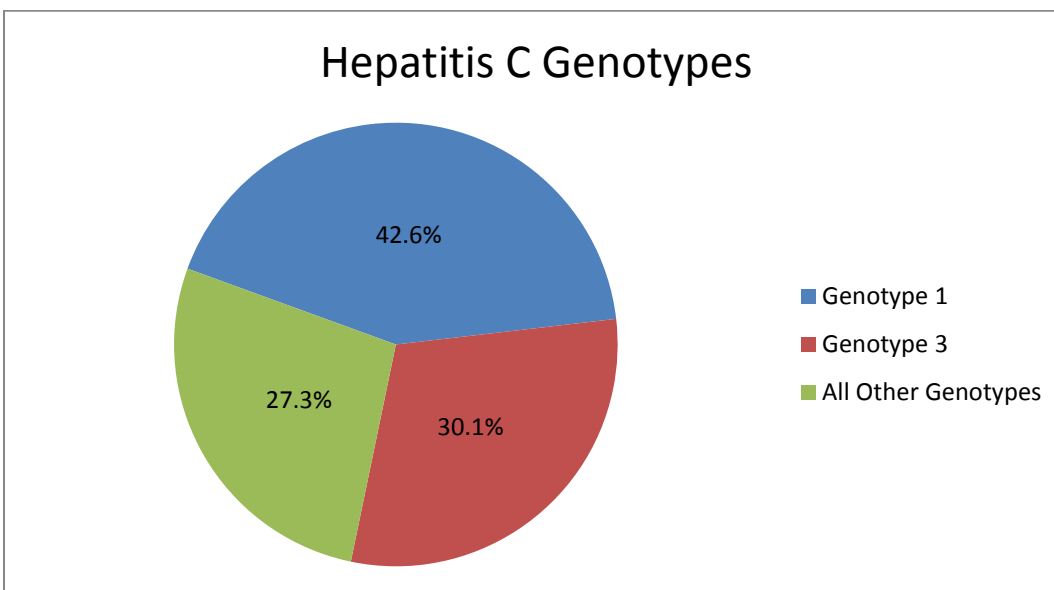
Chronic Hepatitis C

Figure 5.5 Prevalence of Genotypes of Chronic Hepatitis C Cases Reported, Michigan, 2014



A total of 1,207 chronic HCV patients had a genotype reported to MDHHS in 2014. 75% of these were reported with genotype 1 infection (79% subtype 1a and 21% 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 2014. Chart 5.6 below shows the national Hepatitis C genotype breakdown.

Figure 5.6 Prevalence of Genotypes of Chronic Hepatitis C Cases, United States, 2014



Chronic Hepatitis C

Figure 5.7a Number of Chronic Hepatitis C Cases Reported to MDHHS by Year of Birth, 2014

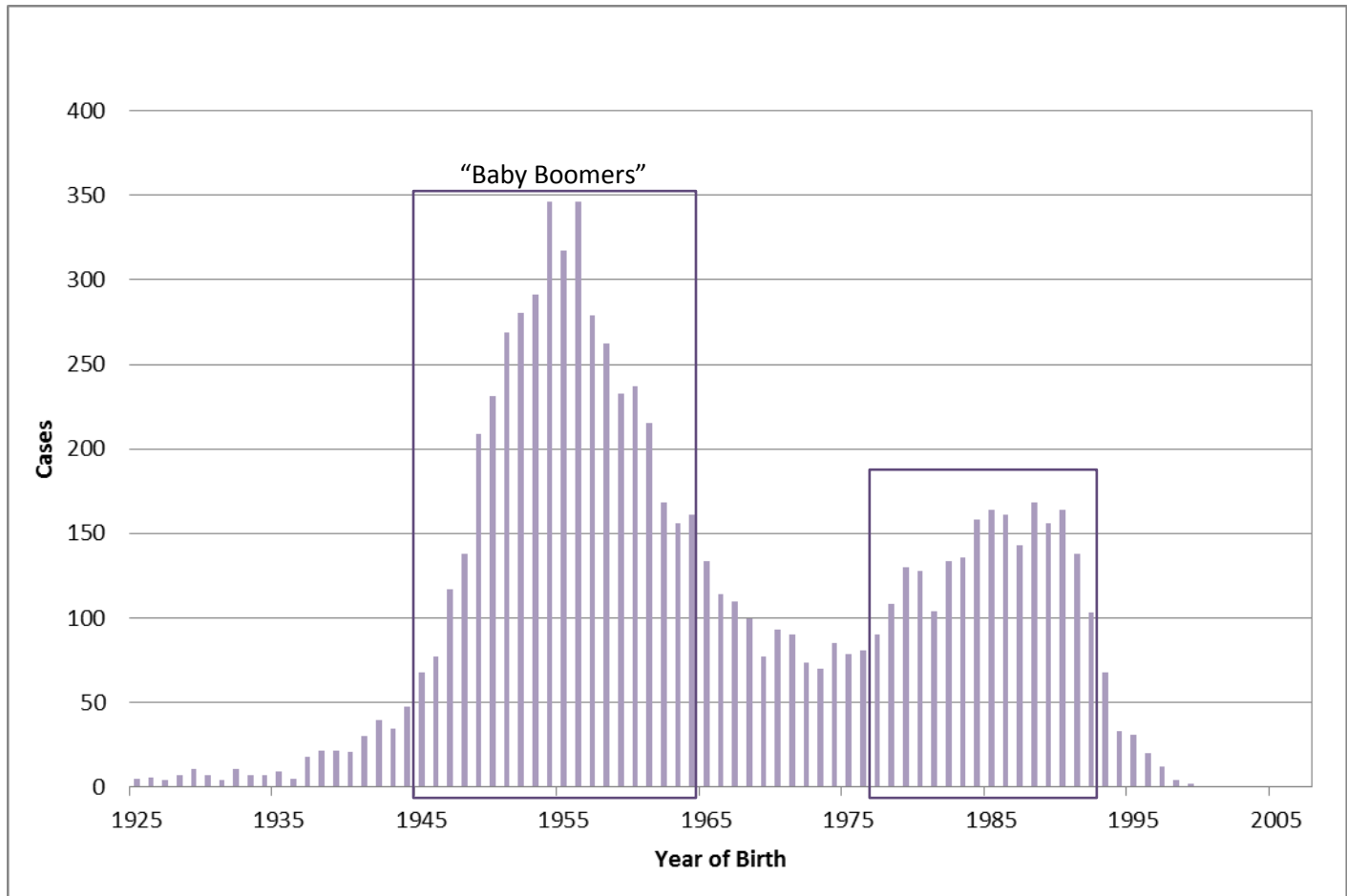


Figure 5.7a depicts the number of chronic hepatitis C cases reported to MDHHS by birth year in 2014. “Baby Boomers,” those born between 1945 and 1965, are five times more likely than other adults to be infected with hepatitis C according to national statistics. CDC now recommends one-time hepatitis C 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 18-28. 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 starting on page 39.

Table 5.7b Number and Percentage of Chronic Hepatitis C cases reported to MDHHS aged 18-29, 2000-2014

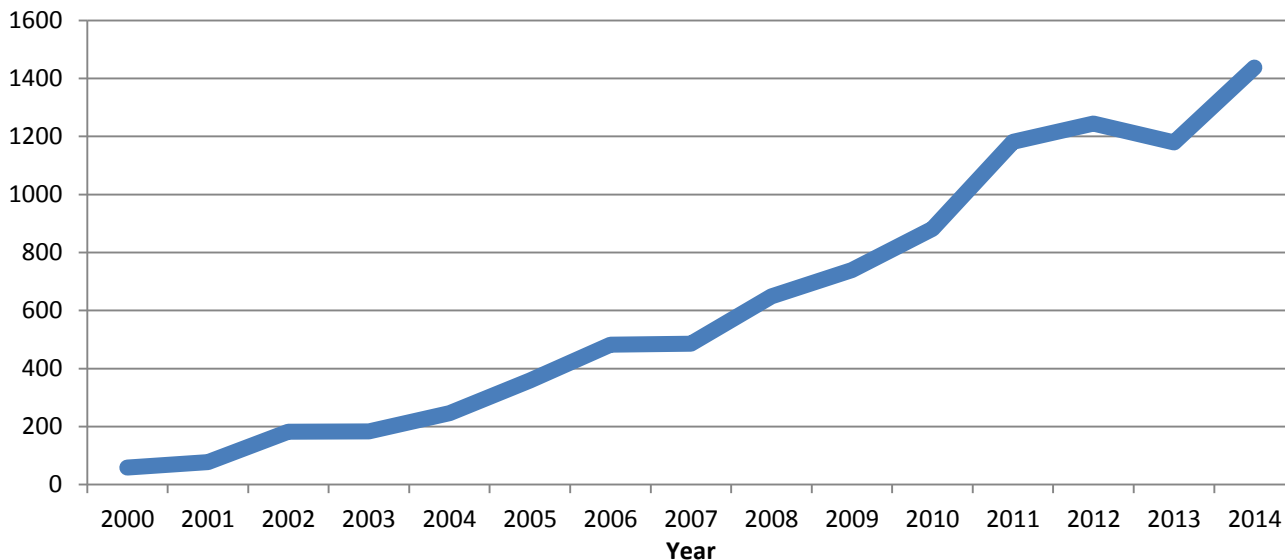
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of cases 18-29	59	78	182	184	246	359	482	486	649	739	882	1182	1244	1180	1437
Total Cases	1498	2486	4296	4638	5169	7347	8117	6898	8464	7732	7214	8006	7967	6703	8233
Percentage of Total	4%	3%	4%	4%	5%	5%	6%	7%	8%	10%	12%	15%	16%	18%	17%

Special Populations



Hepatitis C in Young Adults

Figure 6.1 Number of Chronic Hepatitis C cases reported to MDHHS aged 18-29, 2000-2014



The number of chronic hepatitis C diagnoses among persons 18 to 29 years of age have increased nearly year-over-year since 2000 (Figure 6.1). Between 2004 and 2014, the number of cases has increased 484%, from 246 cases in 2004 to 1437 cases in 2014.

Table 6.2 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 15,419 in 2013 (a 71% increase) while the number of heroin overdose deaths increased from 85 in 2000 to 321 in 2013 (a 280% increase).

Table 6.2 Number Heroin Substance Abuse Treatments Admissions and Deaths, Michigan, 2000-2013

Year	Heroin Overdose Deaths	Heroin Treatment Admissions	Chronic HCV Cases 18-29 Year Olds
2000	85	9023	59
2001	72	9367	78
2002	64	7921	182
2003	66	9558	184
2004	87	10331	246
2005	133	11182	359
2006	123	11642	482
2007	103	11481	486
2008	188	11843	649
2009	230	13548	739
2010	182	12836	882
2011	214	14413	1182
2012	205	14596	1244
2013	321	15419	1180
2014	---	---	1437

Hepatitis C in Young Adults

Figure 6.2 Number Heroin Substance Abuse Treatments Admissions and Deaths, Michigan, 2000-2013

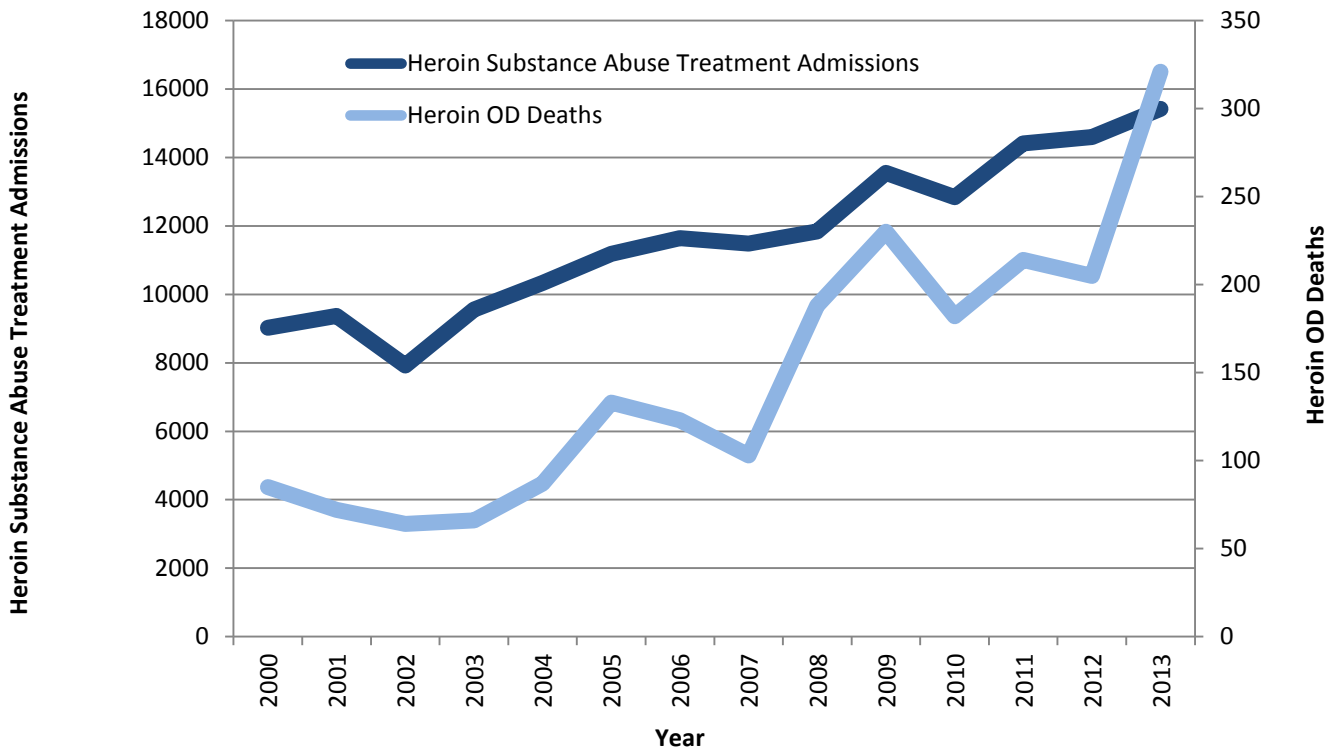


Table 6.3 Epi Summary of 2014 Chronic HCV Cases Aged 18-29

Age (n=1437)		
Median	25 years	
Mean	24.83	
Range	18-29	
Sex (n=1433)		Rate per 100,000
Female	629 (43.9%)	81.25
Male	804 (56.1%)	101.86
Race (n=1136)		Rate per 100,000
White	1060 (93.3%)	91.78
Black	48 (4.2%)	19.08
American Indian	23 (2.0%)	225.22
Asian	5 (0.4%)	10.28
Hispanic Ethnicity (n=763)		Rate per 100,000
Hispanic or Latino	27 (3.5%)	6.19
Not Hispanic or Latino	736 (96.5%)	7.79
Arab Ethnicity (n=514)		Rate per 100,000
Arab	5 (1.0%)	Not Available
Non-Arab	509 (99.0%)	Not Available
History of IVDU (n=695)		
Yes	606 (87.2%)	
No	89 (12.8%)	

Previous studies conducted by MDHHS have shown injection drug use as the primary risk factor for HCV acquisition among those aged 18-29. 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 2014 (Table 6.3) showed 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, 87% reported a history of IVDU.

Hepatitis C in Young Adults



Maps of the rates of 2014 chronic HCV cases among 18-29 year olds, 2013 heroin treatment admissions, and 2013 heroin overdose deaths by county can be found in Appendix D on page 70. 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](#)

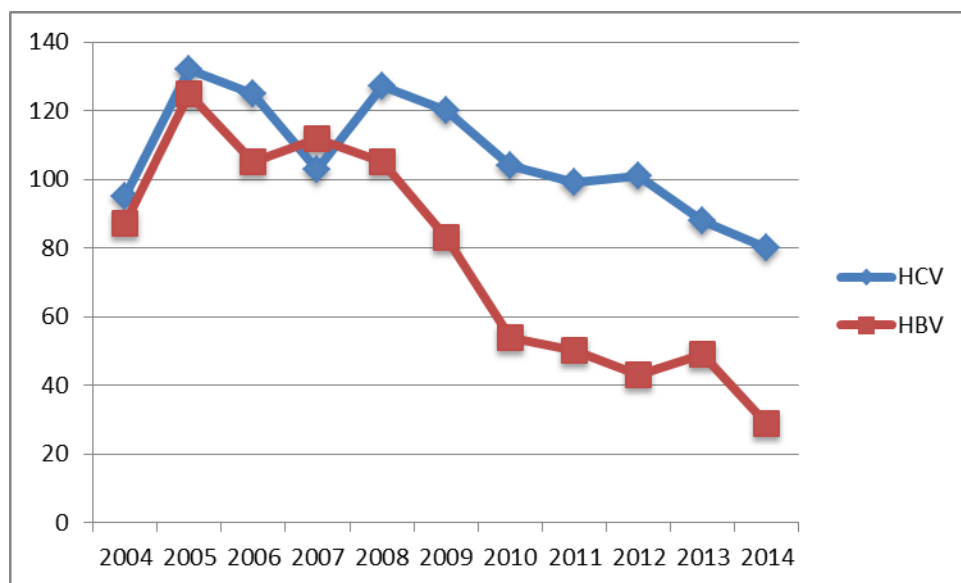
[Young Adults with Hepatitis C Study Fact Sheet](#)

[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

Viral Hepatitis and HIV Co-infection

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, 2004-2014



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 (largely because of improvements in HIV linkage to care and viral suppression) prevalence of both co-infections has increased. The charts below 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.

Viral Hepatitis and HIV Co-infection

HIV and Hepatitis B Co-infection

Between 2004 and 2014, 816 people were reported in Michigan with HBV/HIV co-infection. Table 8.2a shows a breakdown of the HBV/HIV co-infected population in 2014 compared to 2004-2014. The 2014 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 8.2a Hepatitis B and HIV Co-Infection Data, Michigan, 2014

	2014 HBV/HIV Co-infected (n=28)	2004-2014 HBV/HIV Co-infected (n=816)
Sex		
<i>Male</i>	25 (89.3%)	717 (87.9%)
<i>Female</i>	3 (10.7%)	99 (12.1%)
<i>Unknown</i>	0 (0.0%)	0 (0.0%)
Race		
<i>White</i>	7 (25.0%)	207 (25.4%)
<i>Black</i>	18 (64.3%)	546 (66.9%)
<i>Hispanic</i>	1 (3.6%)	24 (2.9%)
<i>American Indian</i>	0 (0.0%)	0 (0.0%)
<i>Asian</i>	2 (7.1%)	13 (1.6%)
<i>Other / Unknown</i>	0 (0.0%)	26 (3.2%)
Risk Factor		
<i>MSM</i>	13 (46.4%)	473 (58.0%)
<i>IDU</i>	4 (14.3%)	88 (10.8%)
<i>MSM/IDU</i>	3 (10.7%)	36 (4.4%)
<i>Blood Recipient</i>	1 (3.6%)	8 (1.0%)
<i>Heterosexual Male</i>	1 (3.3%)	37 (4.5%)
<i>Heterosexual Female</i>	2 (7.1%)	47 (5.8%)
<i>Perinatal</i>	0 (0.0%)	1 (0.1%)
<i>Unknown/Other</i>	4 (14.3%)	126 (15.4%)
Age		
<i>0-19</i>	0 (0.0%)	7 (0.9%)
<i>20-29</i>	2 (7.1%)	101 (12.4%)
<i>30-39</i>	3 (10.7%)	223 (27.3%)
<i>40-49</i>	7 (25.0%)	287 (35.2%)
<i>50-59</i>	10 (35.7%)	151 (18.5%)
<i>60+</i>	6 (21.4%)	44 (5.4%)

Viral Hepatitis and HIV Co-infection

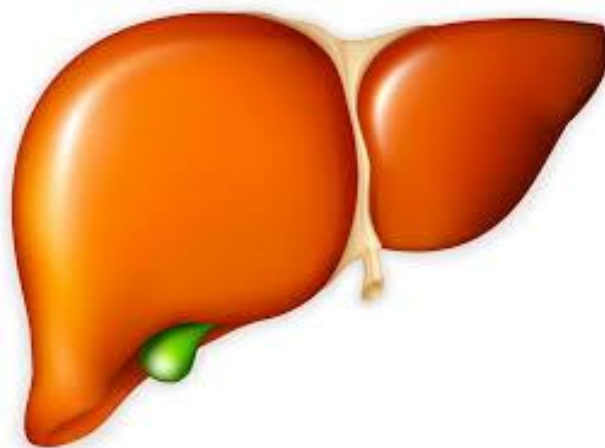
HIV and Hepatitis C Co-infection

Between 2004 and 2014, 1142 people were reported in Michigan with HIV/HCV co-infection. Table 8.1a shows a breakdown of the HCV/HIC co-infected population in 2014 compared to 2004-2014. The 2014 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 8.2b Hepatitis C and HIV Co-Infection Data, Michigan, 2014

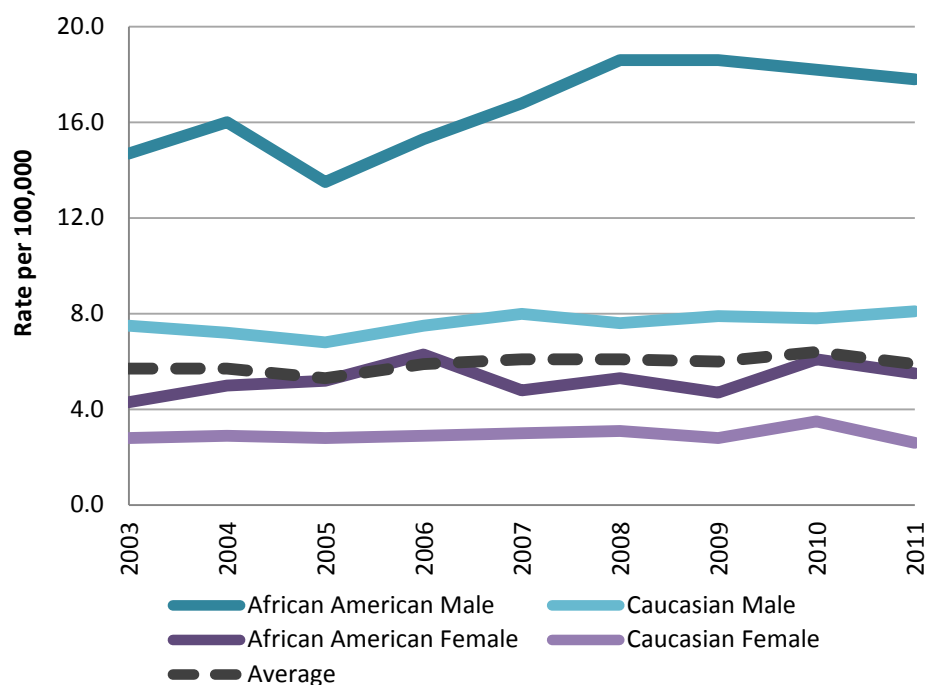
	2014 HCV/HIV Co-infected (n=72)	2004-2014 HCV/HIV Co-infected (n=1142)
Sex		
<i>Male</i>	54 (75.0%)	811 (71.0%)
<i>Female</i>	18 (25.0%)	323 (28.3%)
<i>Unknown</i>	0 (0.0%)	8 (0.7%)
Race		
<i>White</i>	21 (29.2%)	317 (27.8%)
<i>Black</i>	43 (59.7%)	708 (62.0%)
<i>Hispanic</i>	5 (6.9%)	42 (3.7%)
<i>American Indian</i>	0 (0.0%)	2 (0.2%)
<i>Asian</i>	1 (1.4%)	15 (1.3%)
<i>Other / Unknown</i>	2 (2.8%)	58 (5.1%)
Risk Factor		
<i>MSM</i>	23 (31.9%)	208 (18.2%)
<i>IDU</i>	27 (37.5%)	497 (43.5%)
<i>MSM/IDU</i>	3 (4.2%)	136 (11.9%)
<i>Blood Recipient</i>	4 (5.6%)	39 (3.4%)
<i>Heterosexual Male</i>	1 (1.4%)	39 (3.4%)
<i>Heterosexual Female</i>	9 (12.5%)	99 (8.7%)
<i>Perinatal</i>	0 (0.0%)	2 (0.2%)
<i>Unknown/Other</i>	5 (6.9%)	122 (10.7%)
Age		
<i>0-19</i>	0 (0.0%)	7 (0.6%)
<i>20-29</i>	2 (2.8%)	52 (4.6%)
<i>30-39</i>	14 (19.4%)	142 (12.4%)
<i>40-49</i>	14 (19.4%)	365 (32.0%)
<i>50-59</i>	23 (31.9%)	452 (39.6%)
<i>60+</i>	19 (26.4%)	124 (10.9%)

Viral Hepatitis Outcomes



Viral Hepatitis and Liver Cancer

Figure 9.1 Age-adjusted incidence rates of invasive cancers of the liver and intrahepatic bile ducts by race and sex, Michigan, 2003-2011



Note: Rates for African American females were unavailable for all years except 2006 due to a small number of cases. Data shown in Figures 9.1 -9.3 were provided by the MDCH Division for Vital Records and Health Statistics using the Michigan Resident Cancer Incidence File.

Figure 9.2 shows the rate of new cases of liver and intrahepatic bile duct cancer per year from 2003 to 2011 in Michigan per 100,000 people. The overall rate of liver and intrahepatic bile duct cancer in Michigan was 5.9 per 100,000 in 2011. African American males have an incidence rate of 17.8 per 100,000, which is 119% higher than that of Caucasian males (8.1 per 100,000).

Figure 9.2 Age-adjusted death rates due to invasive cancer of the liver and intrahepatic bile ducts by race and sex, Michigan, 2003-2012

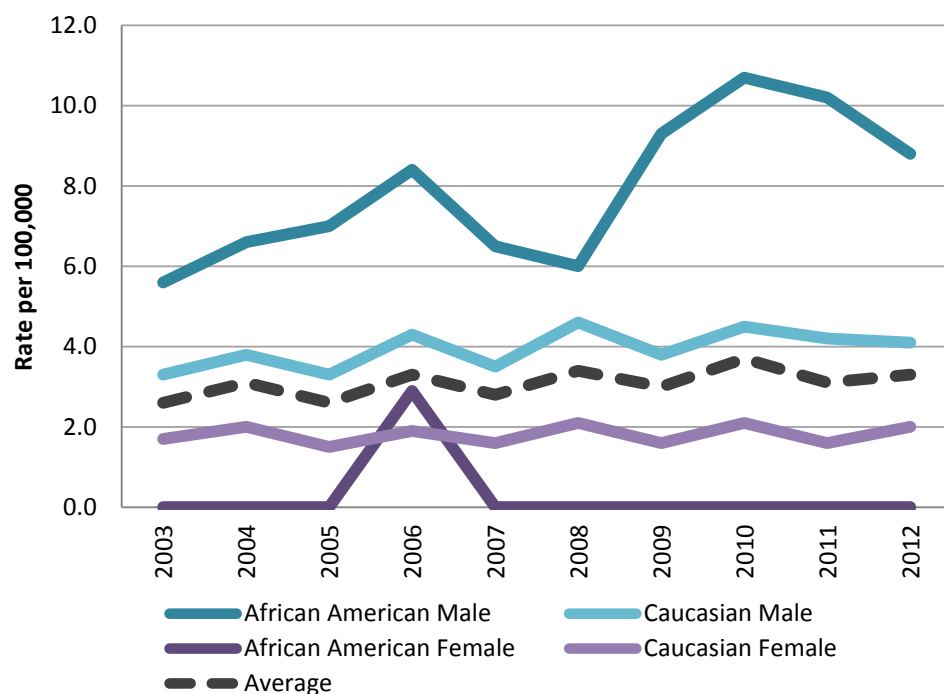


Figure 9.3 shows the death rate per 100,000 Michigan population due to invasive cancer of the liver and intrahepatic bile ducts between 2003 and 2012. The liver and intrahepatic bile duct mortality rate in Michigan in 2012 was 3.3 per 100,000. This mortality rate has risen 27% from 2003 to 2012.

African American males show the highest death rates due to these cancers and rates have increased between 2003 and 2012. The death rate for African American males has

increased 57% over this time period. The death rate in African American males (8.8 per 100,000) is 114% higher than the rate in Caucasian males (4.1 per 100,000). The death rate in Caucasian males has increased by 24% during between 2003 and 2012 while the death rate in Caucasian females has increased by 18%.

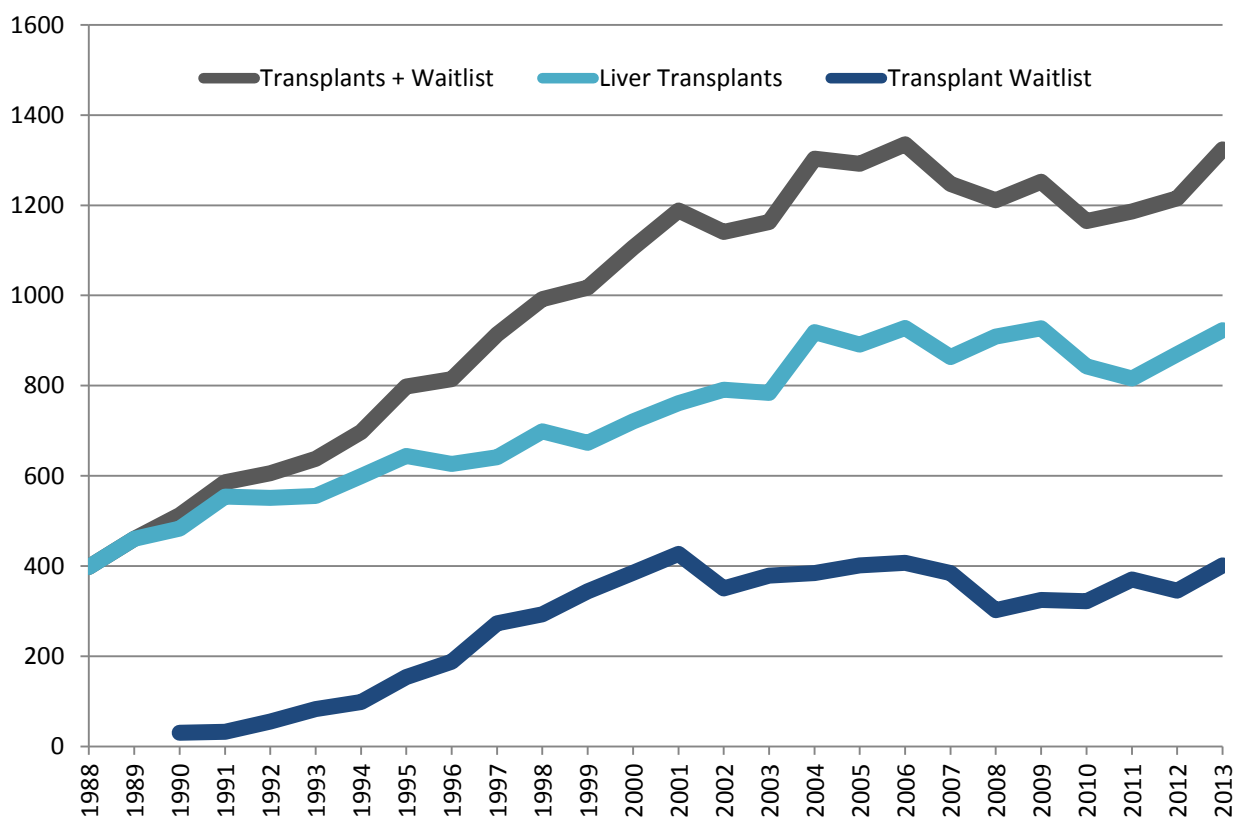
There are clearly noticeable racial/ethnic disparities when it comes to viral hepatitis infections and infection outcomes. It should come as little surprise that the population with highest viral hepatitis prevalence (African-Americans and males) have the highest rates of liver and intrahepatic bile duct cancer and mortality. Further, in last year's Annual Report, we showed that African Americans are diagnosed with HCV, on average, 11.9 years later than Caucasians. This delay in HCV diagnosis in African Americans likely results in delays in liver evaluation, preventative counseling, and treatment, during which the individual's liver may become increasingly damaged. Ultimately, this may result in a higher proportion of infected African-Americans progressing to liver disease, liver cancer, and suffering from liver cancer-related mortality.

Liver Transplants

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 carriage. 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 2013 were requested through the United Network of Organ Sharing (UNOS, <https://www.unos.org/>). The table and chart below examines annual trends in these metrics.

Figure 10.1 Incidence of liver transplants and transplant waitlist patients, Michigan, 1988- 2013



The number of liver transplants conducted in Michigan per year has more than doubled, from 398 in 1988 to 923 in 2013. Despite the increase in the number of liver transplantations conducted annually, the number on the liver transplant waitlist continues to grow. Between 1990 and 2013 the number on the liver transplant waitlist has grown from 30 to over 400 (an over 13-fold increase).

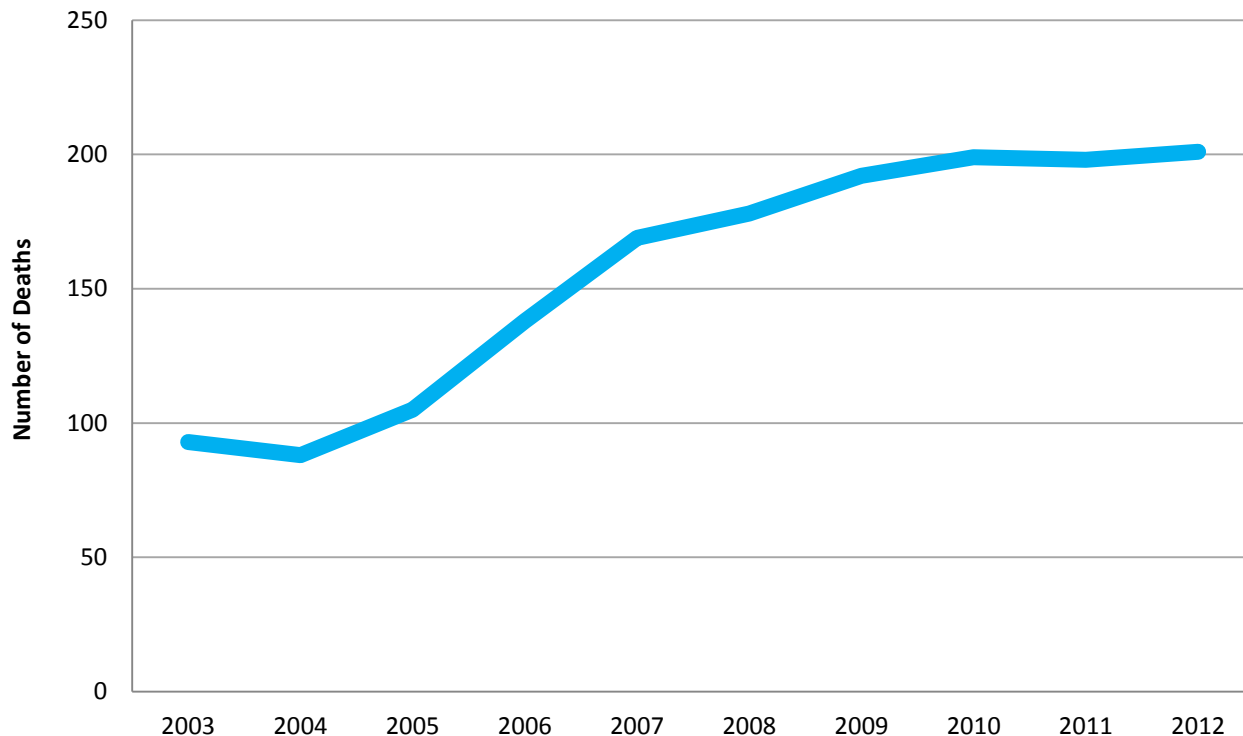
Liver Transplants

Figure 10.1 Incidence of liver transplants and transplant waitlist patients, Michigan, 1988- 2013

Year	Liver Transplants	Liver Transplant Waitlist	Liver Transplants + Transplant Waitlist
1988	398	--	398
1989	460	--	460
1990	483	30	513
1991	554	32	586
1992	551	55	606
1993	555	83	638
1994	599	98	697
1995	644	154	798
1996	626	188	814
1997	641	273	914
1998	699	293	992
1999	673	344	1017
2000	721	385	1106
2001	761	427	1188
2002	791	350	1141
2003	784	379	1163
2004	919	384	1303
2005	891	401	1292
2006	928	407	1335
2007	863	384	1247
2008	909	302	1211
2009	927	325	1252
2010	843	322	1165
2011	816	370	1186
2012	870	345	1215
2013	923	401	1324

Viral Hepatitis-Related Mortality

Figure 11.1 Deaths Due to Acute and Chronic Hepatitis C, Michigan, 2003-2012



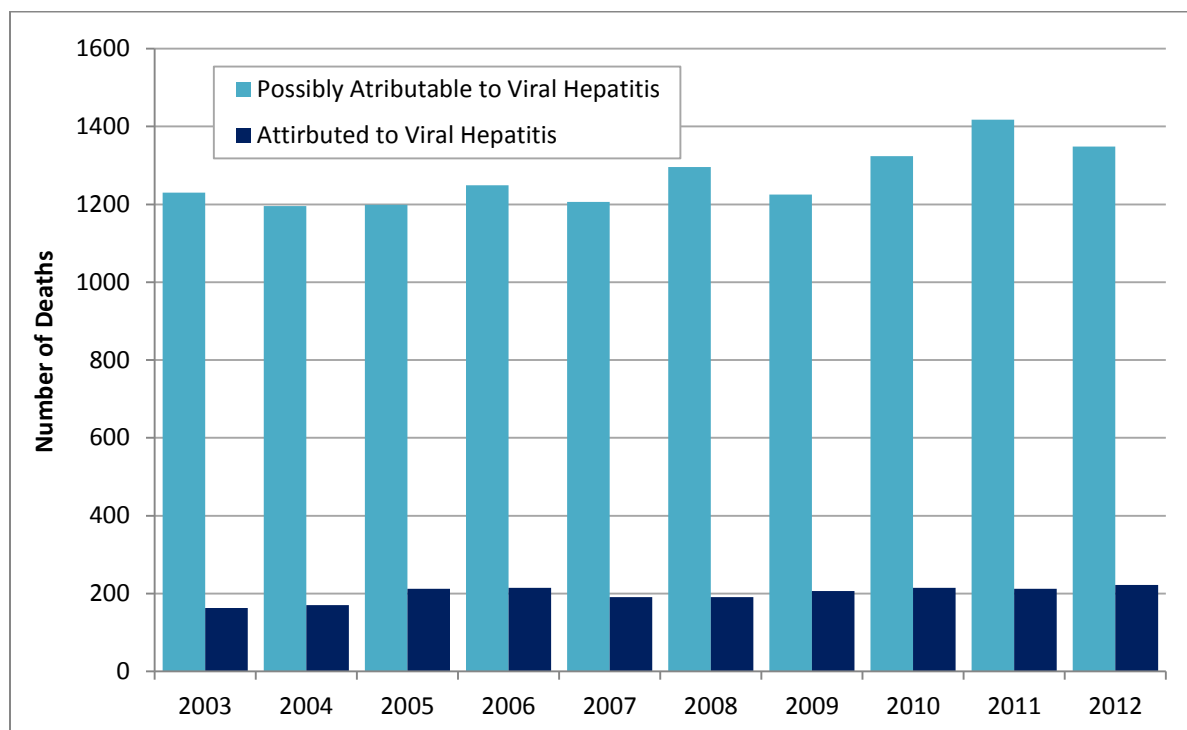
Source: Vital Records and Health Statistics Section, Michigan Department of Community Health

Hepatitis B and C are well-recognized causes of liver-related disease and death. The Vital Records and Health Statistics Section provided the above data on underlying causes of death in Michigan residents between 2003 and 2012, as listed on death certificates. Data on underlying causes of death is classified using the Tenth Revision of the International Classification of Diseases (ICD-10). Figure 11.1 shows deaths with an underlying cause of acute or chronic hepatitis C.

In 2012 there were 201 deaths directly attributed to Hepatitis C in Michigan. Between 2003 and 2012, deaths due to acute and chronic hepatitis C increased by 116%.

Viral Hepatitis-Related Mortality

Figure 11.2 Mortality directly and indirectly attributed to viral hepatitis, Michigan, 2003-2012



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

Deaths shown in Figure 11.2 are either directly attributed to viral hepatitis infection or are due to conditions that can be associated with viral hepatitis. The notes section below indicates which ICD-10 codes we attributed as a cause of death directly related to viral hepatitis and which were conditions associated with, though not necessarily directly a result of, viral hepatitis. Deaths due to conditions that are associated with viral hepatitis may be the result of a non-viral hepatitis related condition (e.g. cirrhosis as a result of alcohol consumption).

Mortality directly due to viral hepatitis has increased by 36% between 2003 (163 deaths) and 2012 (222 deaths).

Mortality due to conditions that may be associated with viral hepatitis has increased by 10% over the same time period (1,230 in 2003 and 1,349 in 2012).

Note:

Deaths that are directly attributed to viral hepatitis include the following ICD-10 diagnoses:

- B16.2 - Acute hepatitis B without delta-agent with hepatic coma
- B16.9 - Acute hepatitis B without delta-agent and without hepatic coma
- B17.1 - Acute hepatitis C
- B17.9 - Acute viral hepatitis, unspecified
- B18.1 - Chronic viral hepatitis B without delta-agent
- B18.2 - Chronic viral hepatitis C
- B18.9 - Chronic viral hepatitis, unspecified
- B19.9 - Unspecified viral hepatitis without hepatic coma
- B94.2 – Sequelae of viral hepatitis

Viral Hepatitis-Related Mortality

Deaths due to conditions that are known to be associated with viral hepatitis include the following ICD-10 diagnoses:

- C22.0 - Liver cell carcinoma
- C22.9 - Malignant neoplasm of liver, not specified as primary or secondary
- K71.7 - Toxic liver disease with fibrosis and cirrhosis of liver
- K72.1 - Chronic hepatitis failure
- K72.9 - Hepatic failure, unspecified
- K73.2 - Chronic active hepatitis, not elsewhere classified
- K73.9 - Chronic hepatitis, not specified
- K74.0 - Hepatic fibrosis
- K74.1 - Hepatic sclerosis
- K74.3 - Primary biliary cirrhosis
- K74.4 - Secondary biliary cirrhosis
- K74.5 - Biliary cirrhosis, unspecified
- K74.6 - Other and unspecified cirrhosis of liver
- K75.9 - Inflammatory liver disease, not specified
- K76.6 - Portal hypertension
- K76.9 - Liver disease unspecified

Appendices

Appendix A1: County Hepatitis Data

County	Population	2014 Chronic HCV Cases	2014 Acute HCV Cases	2014 Chronic HBV Cases	2014 Acute HBV Cases	2014 Chronic HCV Rate*	2014 Acute HCV Rate*	2014 Chronic HBV Rate*	2014 Acute HBV Rate*
Alcona	10942	5	0	1	0	45.70	0.00	9.14	0.00
Alger	9601	4	0	0	0	41.66	0.00	0.00	0.00
Allegan	111408	35	0	2	0	31.42	0.00	1.80	0.00
Alpena	29598	20	0	0	0	67.57	0.00	0.00	0.00
Antrim	23580	23	2	0	0	97.54	8.48	0.00	0.00
Arenac	15899	15	0	0	0	94.35	0.00	0.00	0.00
Baraga	8860	10	0	0	0	112.87	0.00	0.00	0.00
Barry	59173	31	1	0	0	52.39	1.69	0.00	0.00
Bay	107771	71	0	12	2	65.88	0.00	11.13	1.86
Benzie	17525	7	0	1	0	39.94	0.00	5.71	0.00
Berrien	156813	64	3	8	0	40.81	1.91	5.10	0.00
Branch	45248	30	0	3	1	66.30	0.00	6.63	2.21
Calhoun	136146	162	1	26	0	118.99	0.73	19.10	0.00
Cass	52293	17	0	0	0	32.51	0.00	0.00	0.00
Charlevoix	25949	14	0	0	0	53.95	0.00	0.00	0.00
Cheboygan	26152	34	0	1	0	130.01	0.00	3.82	0.00
Chippewa	38520	36	1	3	0	93.46	2.60	7.79	0.00
Clare	30926	24	0	2	0	77.60	0.00	6.47	0.00
Clinton	75382	27	0	11	0	35.82	0.00	14.59	0.00
Crawford	14074	22	0	2	0	156.32	0.00	14.21	0.00
Delta	37069	39	1	4	1	105.21	2.70	10.79	2.70
Detroit City	713777	1138	3	152	14	159.43	0.42	21.30	1.96
Dickinson	26168	19	0	0	0	72.61	0.00	0.00	0.00
Eaton	107759	52	1	11	0	48.26	0.93	10.21	0.00
Emmet	32694	22	0	0	0	67.29	0.00	0.00	0.00
Genesee	425790	381	2	37	3	89.48	0.47	8.69	0.70
Gladwin	25692	24	0	1	0	93.41	0.00	3.89	0.00
Gogebic	16427	15	0	0	0	91.31	0.00	0.00	0.00
Grand Traverse	86986	81	1	4	0	93.12	1.15	4.60	0.00
Gratiot	42476	17	1	1	0	40.02	2.35	2.35	0.00
Hillsdale	46688	25	0	1	0	53.55	0.00	2.14	0.00
Houghton	36628	13	0	0	0	35.49	0.00	0.00	0.00
Huron	33118	9	0	3	0	27.18	0.00	9.06	0.00
Ingham	280895	141	5	46	0	50.20	1.78	16.38	0.00
Ionia	63905	20	1	4	0	31.30	1.56	6.26	0.00
Iosco	25887	21	1	1	0	81.12	3.86	3.86	0.00
Iron	11817	16	0	0	0	135.40	0.00	0.00	0.00
Isabella	70311	22	0	5	0	31.29	0.00	7.11	0.00
Jackson	160248	130	2	4	2	81.12	1.25	2.50	1.25
Kalamazoo	250331	111	1	17	0	44.34	0.40	6.79	0.00

Appendix A1: County Hepatitis Data

Kalkaska	17153	18	0	1	0	104.94	0.00	5.83	0.00
Kent	602622	397	2	62	4	65.88	0.33	10.29	0.66
Keweenaw	2156	2	0	1	0	92.76	0.00	46.38	0.00
Lake	11539	21	0	0	0	181.99	0.00	0.00	0.00
Lapeer	88319	41	1	0	0	46.42	1.13	0.00	0.00
Leelanau	21708	8	1	1	0	36.85	4.61	4.61	0.00
Lenawee	99892	63	1	6	0	63.07	1.00	6.01	0.00
Livingston	180967	124	0	13	1	68.52	0.00	7.18	0.55
Luce	6631	1	0	0	0	15.08	0.00	0.00	0.00
Mackinac	11113	11	0	0	0	98.98	0.00	0.00	0.00
Macomb	840978	707	14	145	7	84.07	1.66	17.24	0.83
Manistee	24733	14	1	0	0	56.60	4.04	0.00	0.00
Marquette	67077	50	1	1	0	74.54	1.49	1.49	0.00
Mason	28705	16	0	2	0	55.74	0.00	6.97	0.00
Mecosta	42798	14	0	3	0	32.71	0.00	7.01	0.00
Menominee	24029	14	0	0	1	58.26	0.00	0.00	4.16
Midland	83629	63	2	3	0	75.33	2.39	3.59	0.00
Missaukee	14849	13	0	1	0	87.55	0.00	6.73	0.00
Monroe	152021	104	0	11	0	68.41	0.00	7.24	0.00
Montcalm	63342	41	0	1	0	64.73	0.00	1.58	0.00
Montmorency	9765	11	0	0	0	112.65	0.00	0.00	0.00
Muskegon	172188	171	4	2	0	99.31	2.32	1.16	0.00
Newaygo	48460	46	1	1	0	94.92	2.06	2.06	0.00
Oakland	1202362	646	4	146	3	53.73	0.33	12.14	0.25
Oceana	26570	11	0	1	0	41.40	0.00	3.76	0.00
Ogemaw	21699	20	0	5	0	92.17	0.00	23.04	0.00
Ontonagon	6780	0	0	0	0	0.00	0.00	0.00	0.00
Osceola	23528	9	0	2	0	38.25	0.00	8.50	0.00
Oscoda	8640	9	0	0	0	104.17	0.00	0.00	0.00
Otsego	24164	21	0	2	0	86.91	0.00	8.28	0.00
Ottawa	263801	56	1	10	0	21.23	0.38	3.79	0.00
Presque Isle	13376	13	0	0	0	97.19	0.00	0.00	0.00
Roscommon	24449	32	0	1	2	130.88	0.00	4.09	8.18
Saginaw	200169	206	0	20	0	102.91	0.00	9.99	0.00
St Clair	43114	156	3	9	0	95.68	1.84	5.52	0.00
St Joseph	8485	47	1	3	0	76.68	1.63	4.89	0.00
Sanilac	70648	11	1	1	0	25.51	2.32	2.32	0.00
Schoolcraft	163040	12	0	0	0	141.43	0.00	0.00	0.00
Shiawassee	61295	40	0	3	0	56.62	0.00	4.25	0.00
Tuscola	55729	11	0	1	1	19.74	0.00	1.79	1.79
Van Buren	76258	40	0	4	0	52.45	0.00	5.25	0.00
Washtenaw	344791	190	0	68	1	55.11	0.00	19.72	0.29
Wayne	1106807	876	3	221	7	79.15	0.27	19.97	0.63
Wexford	32735	34	2	3	0	103.86	6.11	9.16	0.00

Appendix A1: County Hepatitis Data



Michigan Department of Corrections	44113	893	6	24	0	2024.35	13.60	54.41	0
Statewide†	9883640	8230	76	1141	50	83.27	0.77	11.54	0.51

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

†Statewide rates do not include the MDOC population in the denominator

Appendix A2: County Heroin Data

County	Population	2013 Heroin Treatment Admissions	2013 Heroin Overdose Deaths (by Residence)	2013 Heroin Overdose Deaths (by Occurrence)	2013 Heroin Treatment Admission Rate*	2013 Heroin Overdose Death Rate (by Residence)*	2013 Heroin Overdose Death Rate (by Occurrence)*
Alcona	10942	5	0	0	45.70	0.00	0.00
Alger	9601	1	1	0	10.42	10.42	0.00
Allegan	111408	34	0	0	30.52	0.00	0.00
Alpena	29598	29	0	0	97.98	0.00	0.00
Antrim	23580	15	0	0	63.61	0.00	0.00
Arenac	15899	10	0	0	62.90	0.00	0.00
Baraga	8860	4	0	0	45.15	0.00	0.00
Barry	59173	33	0	0	55.77	0.00	0.00
Bay	107771	130	0	0	120.63	0.00	0.00
Benzie	17525	14	1	1	79.89	5.71	5.71
Berrien	156813	151	2	2	96.29	1.28	1.28
Branch	45248	15	0	0	33.15	0.00	0.00
Calhoun	136146	96	2	2	70.51	1.47	1.47
Cass	52293	14	0	0	26.77	0.00	0.00
Charlevoix	25949	38	0	0	146.44	0.00	0.00
Cheboygan	26152	21	0	0	80.30	0.00	0.00
Chippewa	38520	4	0	0	10.38	0.00	0.00
Clare	30926	2	0	0	6.47	0.00	0.00
Clinton	75382	37	1	0	49.08	1.33	0.00
Crawford	14074	13	0	0	92.37	0.00	0.00
Delta	37069	5	0	0	13.49	0.00	0.00
Detroit City	713777	2528	-	-	354.17	-	-
Dickinson	26168	7	0	0	26.75	0.00	0.00
Eaton	107759	100	0	0	92.80	0.00	0.00
Emmet	32694	27	0	0	82.58	0.00	0.00
Genesee	425790	1865	8	9	438.01	1.88	2.11
Gladwin	25692	11	0	0	42.81	0.00	0.00
Gogebic	16427	1	0	0	6.09	0.00	0.00
Grand Traverse	86986	87	2	2	100.02	2.30	2.30
Gratiot	42476	30	0	0	70.63	0.00	0.00
Hillsdale	46688	44	0	0	94.24	0.00	0.00
Houghton	36628	12	0	0	32.76	0.00	0.00
Huron	33118	31	0	0	93.60	0.00	0.00
Ingham	280895	476	5	6	169.46	1.78	2.14
Ionia	63905	29	2	2	45.38	3.13	3.13
Iosco	25887	30	0	0	115.89	0.00	0.00

Appendix A2: County Heroin Data

Iron	11817	3	0	0	25.39	0.00	0.00
Isabella	70311	20	2	2	28.45	2.84	2.84
Jackson	160248	282	0	0	175.98	0.00	0.00
Kalamazoo	250331	260	6	5	103.86	2.40	2.00
Kalkaska	17153	33	0	0	192.39	0.00	0.00
Kent	602622	438	14	16	72.68	2.32	2.66
Keweenaw	2156	2	0	0	92.76	0.00	0.00
Lake	11539	4	0	0	34.67	0.00	0.00
Lapeer	88319	123	2	1	139.27	2.26	1.13
Leelanau	21708	10	0	0	46.07	0.00	0.00
Lenawee	99892	41	0	0	41.04	0.00	0.00
Livingston	180967	95	3	1	52.50	1.66	0.55
Luce	6631	0	0	0	0.00	0.00	0.00
Mackinac	11113	2	0	0	18.00	0.00	0.00
Macomb	840978	1881	71	64	223.67	8.44	7.61
Manistee	24733	11	0	0	44.47	0.00	0.00
Marquette	67077	18	0	0	26.83	0.00	0.00
Mason	28705	6	0	0	20.90	0.00	0.00
Mecosta	42798	9	1	0	21.03	2.34	0.00
Menominee	24029	21	1	1	87.39	4.16	4.16
Midland	83629	91	0	0	108.81	0.00	0.00
Missaukee	14849	7	0	0	47.14	0.00	0.00
Monroe	152021	326	12	10	214.44	7.89	6.58
Montcalm	63342	56	1	1	88.41	1.58	1.58
Montmorency	9765	1	0	0	10.24	0.00	0.00
Muskegon	172188	302	5	6	175.39	2.90	3.48
Newaygo	48460	12	0	0	24.76	0.00	0.00
Oakland	1202362	1550	13	1	128.91	1.08	0.08
Oceana	26570	6	0	1	22.58	0.00	3.76
Ogemaw	21699	17	0	0	78.34	0.00	0.00
Ontonagon	6780	2	0	0	29.50	0.00	0.00
Osceola	23528	7	1	0	29.75	4.25	0.00
Oscoda	8640	14	0	0	162.04	0.00	0.00
Otsego	24164	30	0	1	124.15	0.00	4.14
Ottawa	263801	101	6	7	38.29	2.27	2.65
Presque Isle	13376	0	0	0	0.00	0.00	0.00
Roscommon	24449	27	1	0	110.43	4.09	0.00
Saginaw	200169	216	0	0	107.91	0.00	0.00
St Clair	43114	457	7	9	1059.98	16.24	20.87
St Joseph	8485	24	0	0	282.85	0.00	0.00

Appendix A2: County Heroin Data



Sanilac	70648	39	3	0	55.20	4.25	0.00
Schoolcraft	163040	2	0	0	1.23	0.00	0.00
Shiawassee	61295	113	1	1	184.35	1.63	1.63
Tuscola	55729	26	0	0	46.65	0.00	0.00
Van Buren	76258	33	0	0	43.27	0.00	0.00
Washtenaw	344791	371	19	23	107.60	5.51	6.67
Wayne	1106807	2289	128†	148†	206.81	11.56†	13.37†
Wexford	32735	39	0	0	119.14	0.00	0.00
Michigan Department of Corrections	44113	-	-	-	-	-	-
State-wide‡	9883640	15366	322	174	155.47	3.26	3.26

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

† Counts and rate calculations include the population of Detroit plus Wayne County

‡ Statewide rates do not include the MDOC population in the denominator

Appendix B1: Local Health Department Hepatitis Data

Local Health Jurisdiction	Population	2014 Chronic HCV Cases	2014 Acute HCV Cases	2014 Chronic HBV Cases	2014 Acute HBV Cases	2014 Chronic HCV Rate*	2014 Acute HCV Rate*	2014 Chronic HBV Rate*	2014 Acute HBV Rate*
Allegan	111408	35	0	2	0	31.42	0.00	1.80	0.00
Barry-Eaton	166932	83	2	11	0	49.72	1.20	6.59	0.00
Bay	107771	71	0	12	2	65.88	0.00	11.13	1.86
Benzie-Leelanau	39233	15	1	2	0	38.23	2.55	5.10	0.00
Berrien	156813	64	3	8	0	40.81	1.91	5.10	0.00
Branch-Hillsdale-St. Joseph	100421	102	1	7	1	101.57	1.00	6.97	1.00
Calhoun	136146	162	1	26	0	118.99	0.73	19.10	0.00
Central Michigan	190805	126	0	11	2	66.04	0.00	5.77	1.05
Chippewa	38520	36	1	3	0	93.46	2.60	7.79	0.00
Delta-Menominee	61098	53	1	4	2	86.75	1.64	6.55	3.27
Detroit City	713777	1138	3	152	14	159.43	0.42	21.30	1.96
Dickinson-Iron	37985	35	0	0	0	92.14	0.00	0.00	0.00
District Health Department #10	261616	209	4	14	0	79.89	1.53	5.35	0.00
District Health Department #2	67168	55	1	7	0	81.88	1.49	10.42	0.00
District Health Department #4	78891	78	0	1	0	98.87	0.00	1.27	0.00
Genesee	425790	381	2	37	3	89.48	0.47	8.69	0.70
Grand Traverse	86986	81	1	4	0	93.12	1.15	4.60	0.00
Huron	33118	9	0	3	0	27.18	0.00	9.06	0.00
Ingham	280895	141	5	46	0	50.20	1.78	16.38	0.00
Ionia	63905	20	1	4	0	31.30	1.56	6.26	0.00
Jackson	160248	130	2	4	2	81.12	1.25	2.50	1.25
Kalamazoo	250331	111	1	17	0	44.34	0.40	6.79	0.00
Kent	602622	397	2	62	4	65.88	0.33	10.29	0.66
Lapeer	88319	41	1	0	0	46.42	1.13	0.00	0.00
Lenawee	99892	63	1	6	0	63.07	1.00	6.01	0.00

Appendix B1: Local Health Department Hepatitis Data



Livingston	180967	124	0	13	1	68.52	0.00	7.18	0.55
Luce-Mackinac-Alger-Schoolcraft	190385	28	0	0	0	14.71	0.00	0.00	0.00
Macomb	840978	707	14	145	7	84.07	1.66	17.24	0.83
Marquette	67077	50	1	1	0	74.54	1.49	1.49	0.00
Midland	83629	63	2	3	0	75.33	2.39	3.59	0.00
Mid-Michigan	181200	85	1	13	0	46.91	0.55	7.17	0.00
Monroe	152021	104	0	11	0	68.41	0.00	7.24	0.00
Muskegon	172188	171	4	2	0	99.31	2.32	1.16	0.00
Northwest Michigan	106387	80	2	2	0	75.20	1.88	1.88	0.00
Oakland	1202362	646	4	146	3	53.73	0.33	12.14	0.25
Ottawa	263801	56	1	10	0	21.23	0.38	3.79	0.00
Saginaw	200169	206	0	20	0	102.91	0.00	9.99	0.00
Sanilac	70648	11	1	1	0	15.57	1.42	1.42	0.00
Shiawassee	61295	40	0	3	0	65.26	0.00	4.89	0.00
St Clair	43114	156	3	9	0	361.83	6.96	20.87	0.00
Tuscola	55729	11	0	1	1	19.74	0.00	1.79	1.79
Van Buren-Cass	128551	57	0	4	0	44.34	0.00	3.11	0.00
Washtenaw	344791	190	0	68	1	55.11	0.00	19.72	0.29
Wayne	1106807	876	3	221	7	79.15	0.27	19.97	0.63
Western Upper Peninsula	70851	40	0	1	0	56.46	0.00	1.41	0.00
Michigan Department of Corrections	44113	893	6	24	0	2024.35	13.60	54.41	0
Statewide†	9883640	8230	76	1141	50	83.27	0.77	11.54	0.51

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

†Statewide rates do not include the MDOC population in the denominator

Appendix B2: Local Health Department Heroin Data

Local Health Jurisdiction	Population	2013 Heroin Treatment Admissions	2013 Heroin Overdose Deaths (Residence)	2013 Heroin Overdose Deaths (Occurrence)	2013 Heroin Treatment Admission Rate*	2013 Heroin Overdose Death Rate (Residence)*	2013 Heroin Overdose Death Rate (Occurrence)*
Allegan	111408	34	0	0	30.52	0.00	0.00
Barry-Eaton	166932	133	0	0	79.67	0.00	0.00
Bay	107771	130	0	0	120.63	0.00	0.00
Benzie-Leelanau	39233	24	1	1	61.17	2.55	2.55
Berrien	156813	151	2	2	96.29	1.28	1.28
Branch-Hillsdale-St. Joseph	100421	83	0	0	82.65	0.00	0.00
Calhoun	136146	96	2	2	70.51	1.47	1.47
Central Michigan	190805	77	4	2	40.36	2.10	1.05
Chippewa	38520	4	0	0	10.38	0.00	0.00
Delta-Menominee	61098	26	1	1	42.55	1.64	1.64
Detroit City	713777	2528	-	-	354.17	-	-
Dickinson-Iron	37985	10	0	0	26.33	0.00	0.00
District Health Department #10	261616	140	1	1	53.51	0.38	0.38
District Health Department #2	67168	66	0	0	98.26	0.00	0.00
District Health Department #4	78891	51	0	0	64.65	0.00	0.00
Genesee	425790	1865	8	9	438.01	1.88	2.11
Grand Traverse	86986	87	2	2	100.02	2.30	2.30
Huron	33118	31	0	0	93.60	0.00	0.00
Ingham	280895	476	5	6	169.46	1.78	2.14
Ionia	63905	29	2	2	45.38	3.13	3.13
Jackson	160248	282	0	0	175.98	0.00	0.00
Kalamazoo	250331	260	6	5	103.86	2.40	2.00
Kent	602622	438	14	16	72.68	2.32	2.66
Lapeer	88319	123	2	1	139.27	2.26	1.13

Appendix B2: Local Health Department Heroin Data

Lenawee	99892	41	0	0	41.04	0.00	0.00
Livingston	180967	95	3	1	52.50	1.66	0.55
Luce-Mackinac-Alger-Schoolcraft	190385	5	1	0	2.63	0.53	0.00
Macomb	840978	1881	71	64	223.67	8.44	7.61
Marquette	67077	18	0	0	26.83	0.00	0.00
Midland	83629	91	0	0	108.81	0.00	0.00
Mid-Michigan	181200	123	2	1	67.88	1.10	0.55
Monroe	152021	326	12	10	214.44	7.89	6.58
Muskegon	172188	302	5	6	175.39	2.90	3.48
Northwest Michigan	106387	110	0	1	103.40	0.00	0.94
Oakland	1202362	1550	13	1	128.91	1.08	0.08
Ottawa	263801	101	6	7	38.29	2.27	2.65
Saginaw	200169	216	0	0	107.91	0.00	0.00
Sanilac	70648	39	3	0	55.20	4.25	0.00
Shiawassee	61295	113	1	1	184.35	1.63	1.63
St Clair	43114	457	7	9	1059.98	16.24	20.87
Tuscola	55729	26	0	0	46.65	0.00	0.00
Van Buren-Cass	128551	47	0	0	36.56	0.00	0.00
Washtenaw	344791	371	19	23	107.60	5.51	6.67
Wayne	1106807	2289	128†	148†	206.81	11.56†	13.37†
Western Upper Peninsula	70851	21	0	0	29.64	0.00	0.00
Michigan Department of Corrections	44113	-	-	-	-	-	-
Statewide‡	9883640	15366	322	322	155.47	3.26	3.26

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

† Counts and rate calculations include the population of Detroit plus Wayne County

‡ Statewide rates do not include the MDOC population in the denominator

Appendix C1: Region Hepatitis Data

Region	Population	2014 Chronic HCV Cases	2014 Acute HCV Cases	2014 Chronic HBV Cases	2014 Acute HBV Cases	2014 Chronic HCV Rate*	2014 Acute HCV Rate*	2014 Chronic HBV Rate*	2014 Acute HBV Rate*
1	1055602	619	10	96	3	58.64	0.95	9.09	0.28
3	1173932	887	7	85	6	75.56	0.60	7.24	0.51
5	896155	537	7	63	1	59.92	0.78	7.03	0.11
6	1448695	848	9	95	4	58.54	0.62	6.56	0.28
7	439490	387	7	17	2	88.06	1.59	3.87	0.46
8	465916	242	3	9	2	51.94	0.64	1.93	0.43
2N	2086454	1509	21	300	10	72.32	1.01	14.38	0.48
2S	2317396	2308	6	452	22	99.59	0.26	19.50	0.95
Michigan Department of Corrections	44113	893	6	24	0	2024.35	13.60	54.41	0
Statewide†	9883640	8230	76	1141	50	83.27	0.77	11.54	0.51

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

†Statewide rates do not include the MDOC population in the denominator

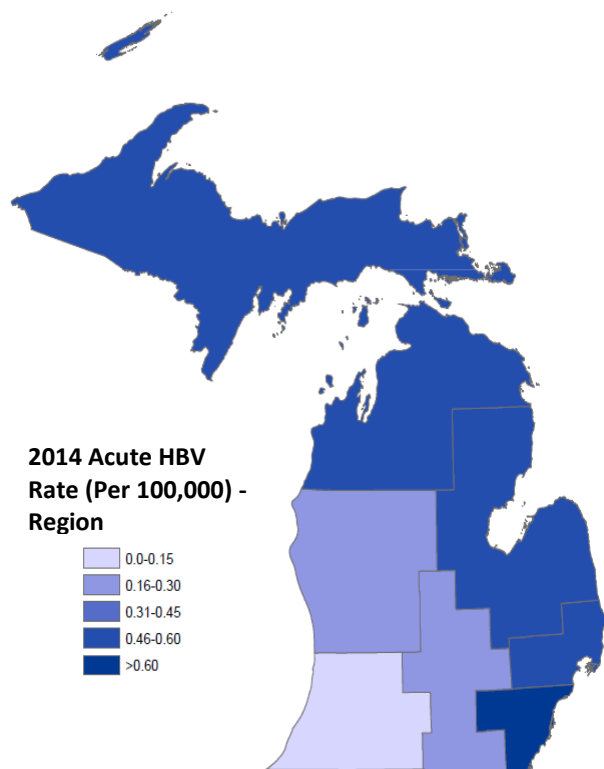
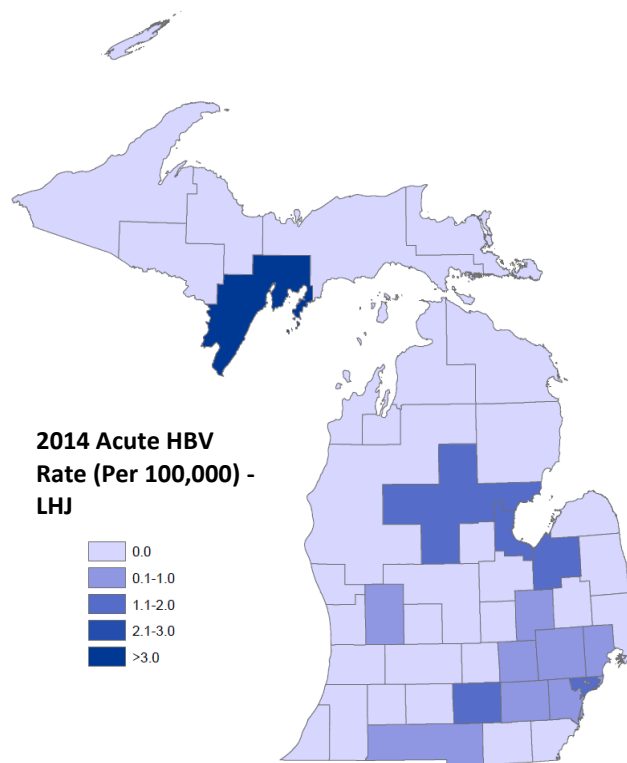
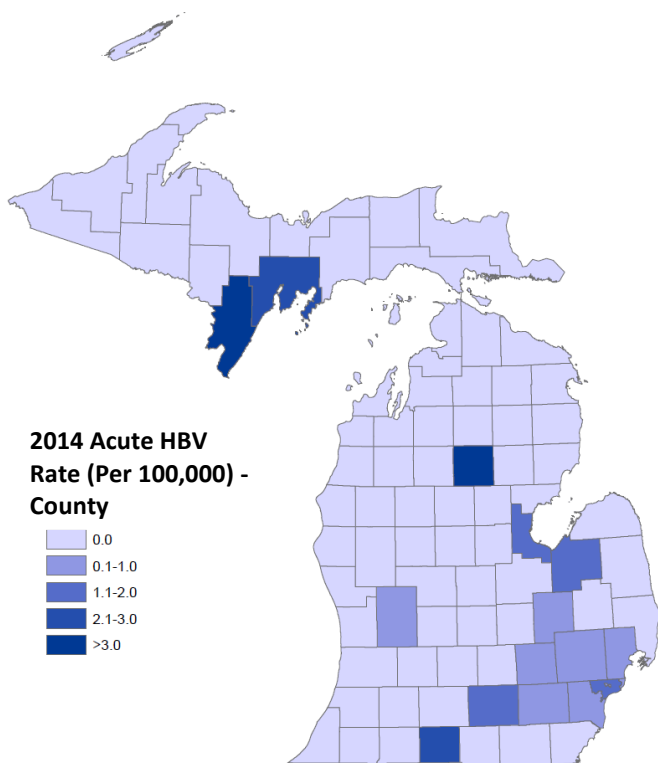
Appendix C2: Region Heroin Data

Region	Population	2013 Heroin Treatment Admissions	2013 Heroin Overdose Deaths (Residence)	2013 Heroin Overdose Deaths (Occurrence)	2013 Heroin Treatment Admission Rate*	2013 Heroin Overdose Death Rate (Residence)*	2013 Heroin Overdose Death Rate (Occurrence)*
1	1055602	1218	10	8	115.38	0.95	0.76
3	1173932	2608	13	10	222.16	1.11	0.85
5	896155	660	10	9	73.65	1.12	1.00
6	1448695	992	32	35	68.48	2.21	2.42
7	439490	402	4	4	91.47	0.91	0.91
8	465916	84	2	1	18.03	0.43	0.21
2N	2086454	3888	91	74	186.34	4.36	3.55
2S	2317396	5514	287	329	237.94	12.38	14.20
Michigan Department of Corrections	44113	-	-	-	-	-	-
Statewide†	9883640	15366	322	322	155.47	3.26	3.26

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

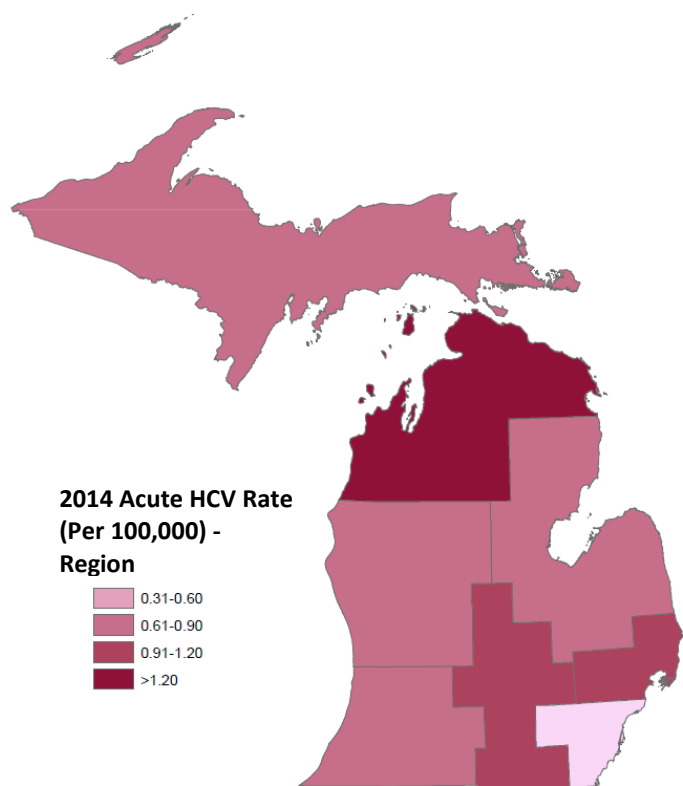
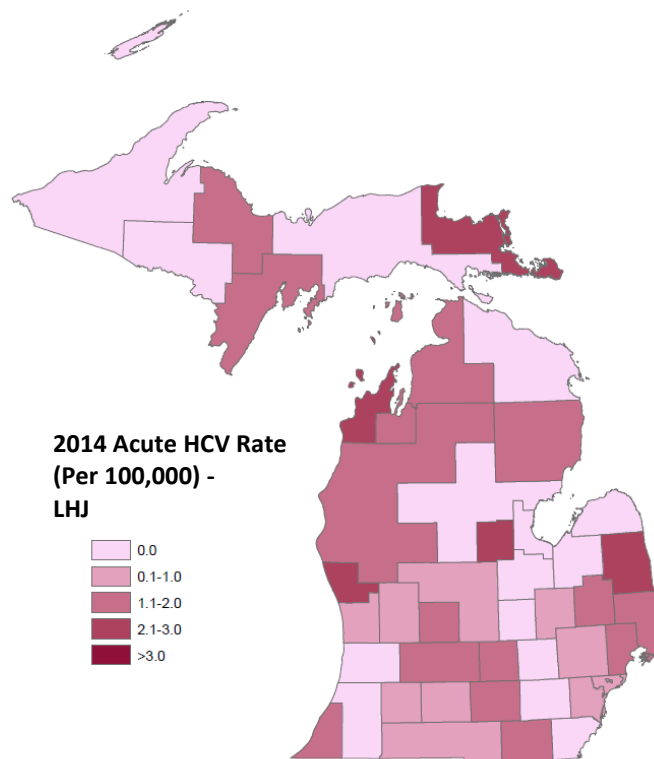
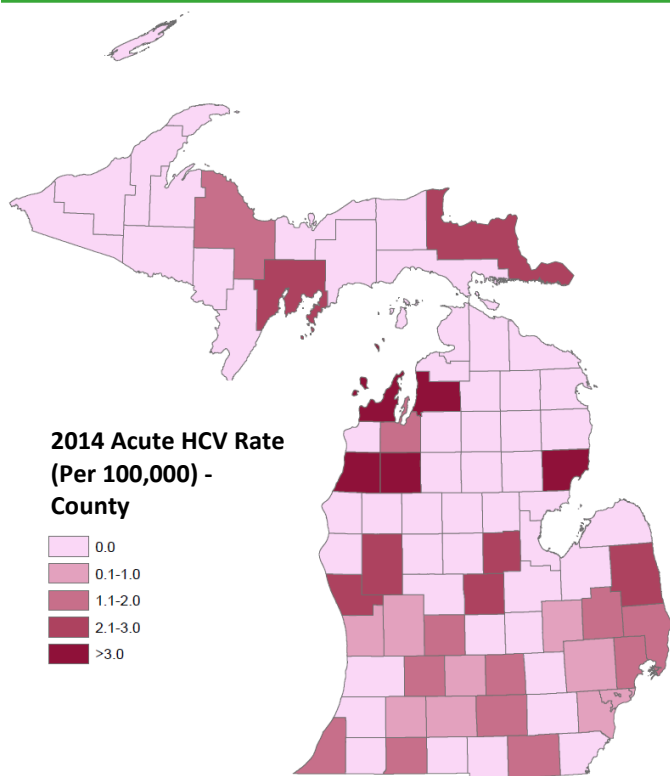
†Statewide rates do not include the MDOC population in the denominator

Appendix D: Rate Maps



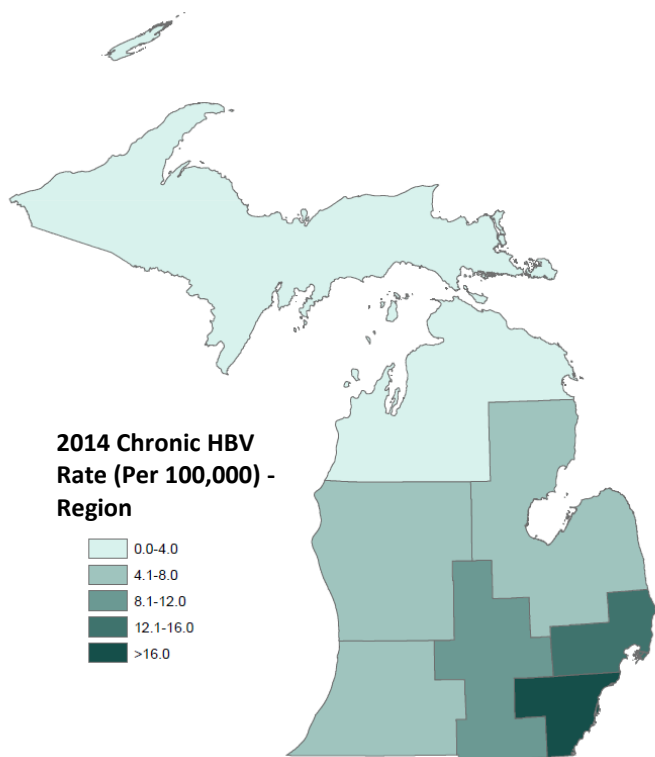
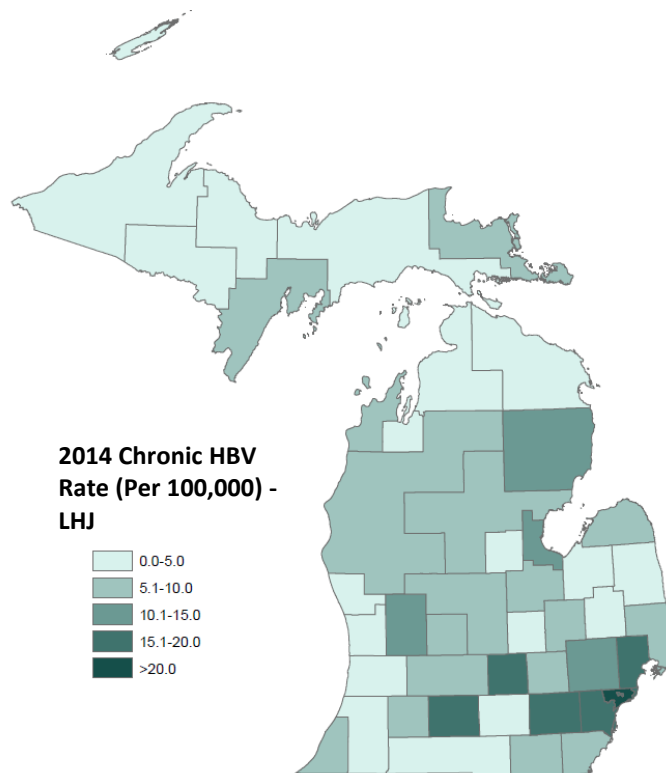
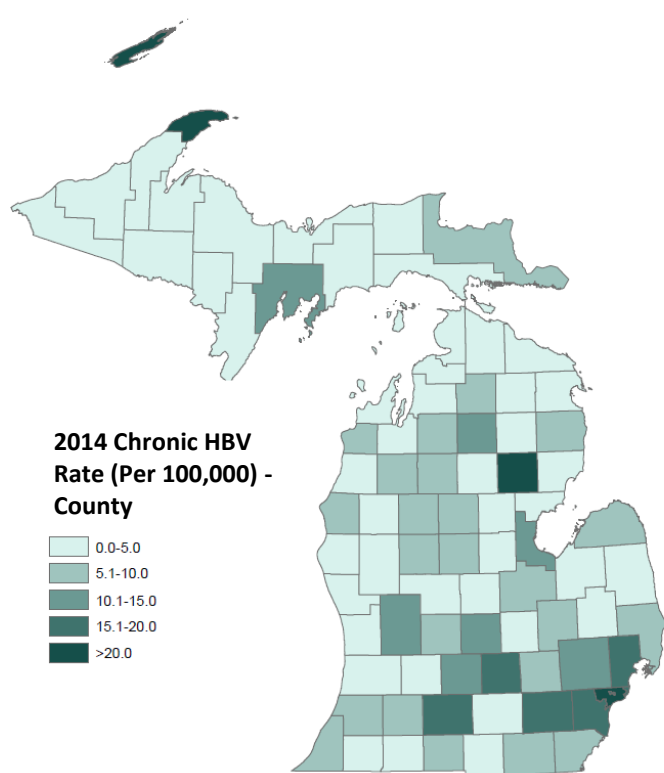
Acute HBV

Appendix D: Rate Maps



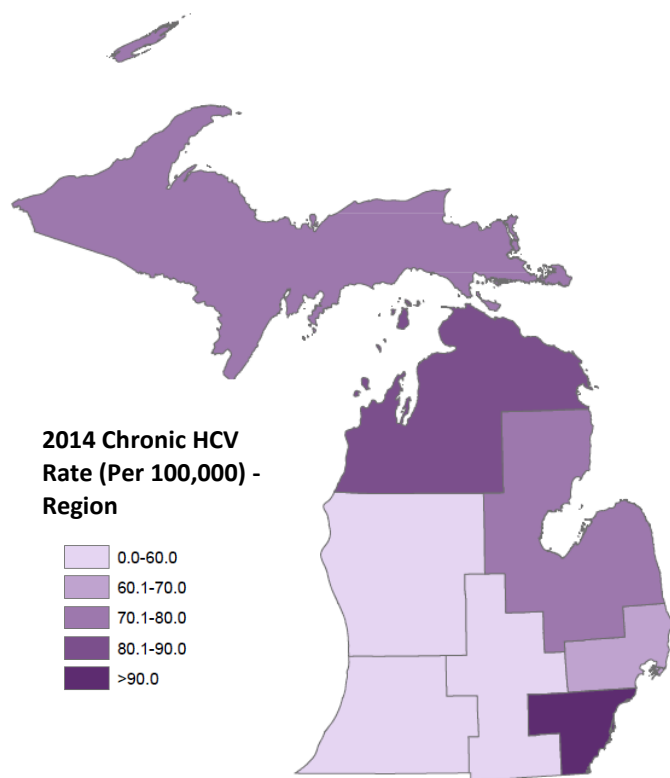
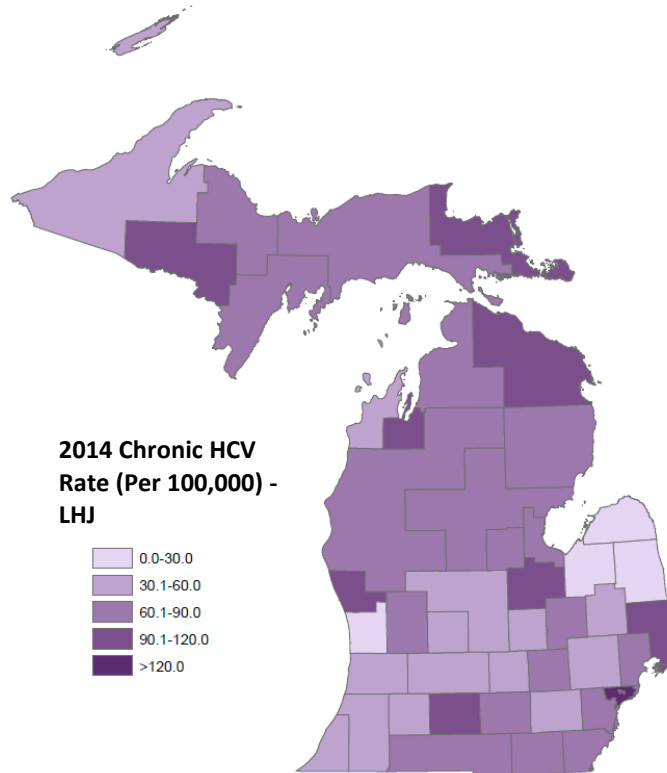
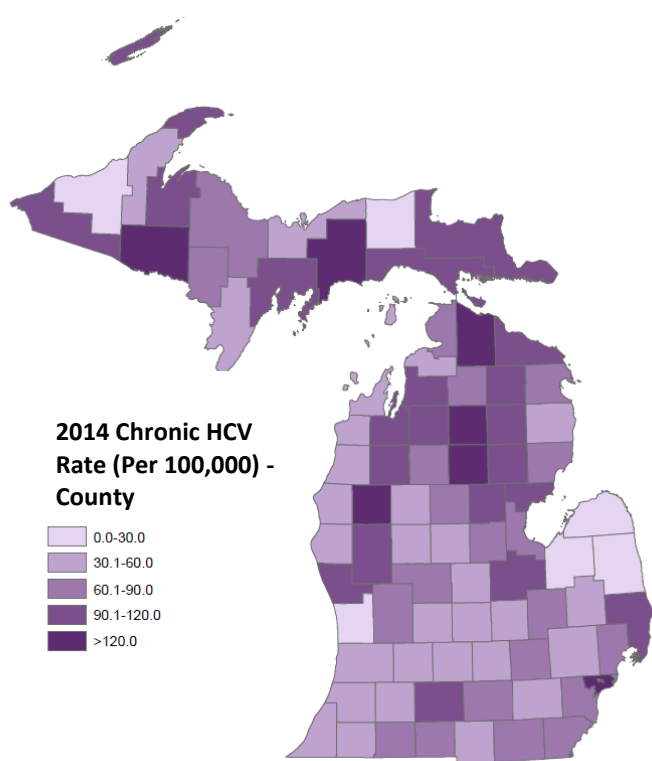
Acute HCV

Appendix D: Rate Maps



Chronic HBV

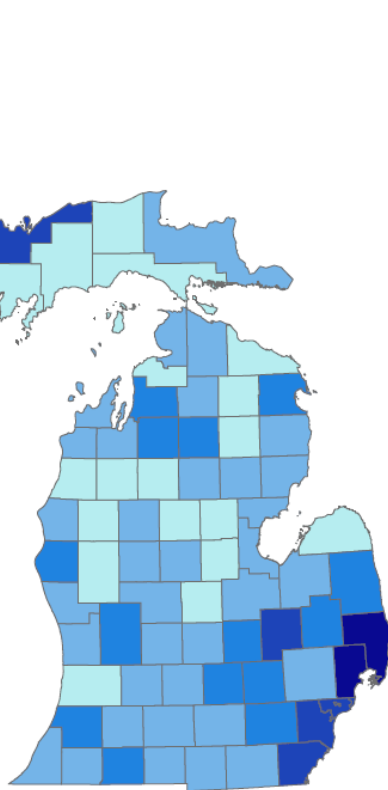
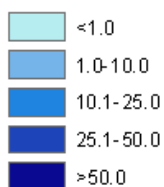
Appendix D: Rate Maps



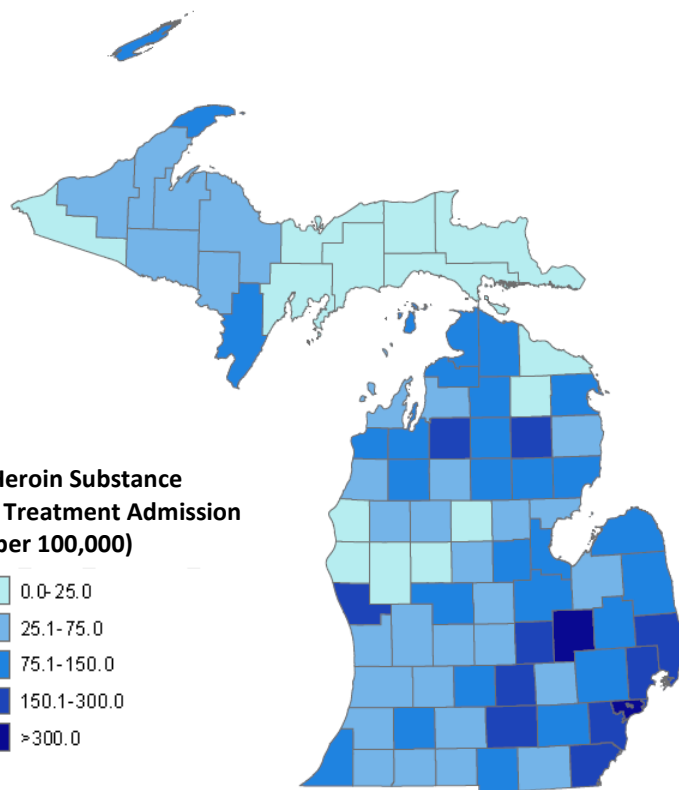
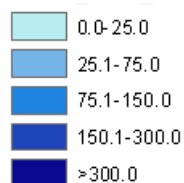
Chronic HCV

Appendix D: Rate Maps

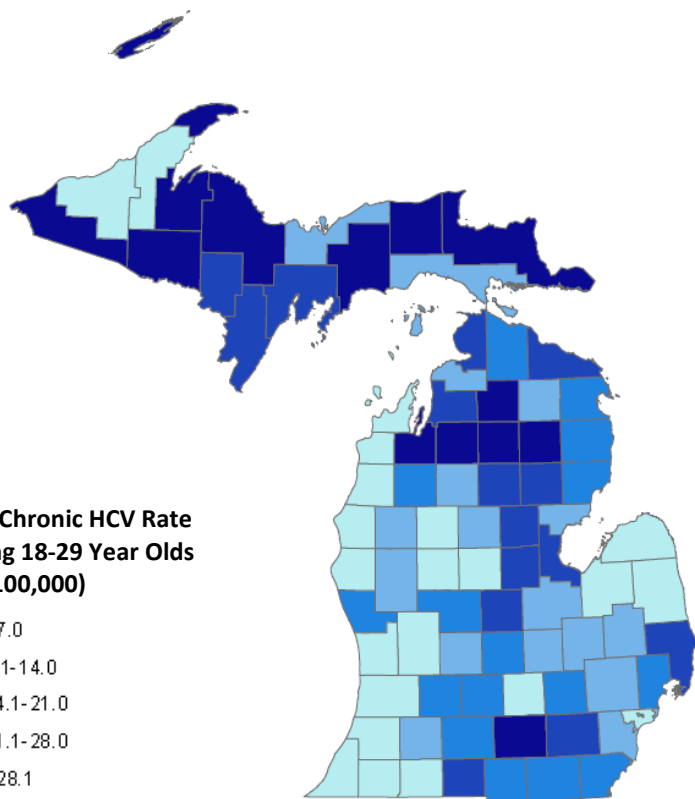
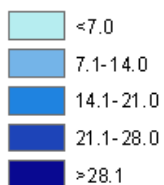
**2000-2013 Heroin
Overdose Death Rate
(per 100,000)**



**2013 Heroin Substance
Abuse Treatment Admission
Rate (per 100,000)**



**2014 Chronic HCV Rate
among 18-29 Year Olds
(per 100,000)**



Heroin and Young Adults with HCV