

Epidemiologic Profile of Hepatitis C Virus (HCV) in Wisconsin 2014



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Executive Summary

The Wisconsin Division of Public Health (DPH) receives approximately 2,500 new reports of hepatitis C virus (HCV) infection each year through a system of electronic reporting by laboratories, public health providers, and physicians. Information gathered through this system is used to analyze trends and estimate the burden of HCV disease in the state.

This Epidemiologic Profile of HCV in Wisconsin provides information about the trends and distribution of HCV to assist DPH staff, local jurisdictions, community health partners and others with prioritizing and planning HCV prevention and treatment efforts. Additional information about HCV and annual data updates can be found on the [DPH website](https://www.dhs.wisconsin.gov/viral-hepatitis/hcv-program.htm) (<https://www.dhs.wisconsin.gov/viral-hepatitis/hcv-program.htm>).

A summary of the epidemiology of HCV in Wisconsin:

- As of December 2013, DPH has received 38,358 reports of HCV infection. The true number is unknown as many people who are infected are not diagnosed. Recent estimates indicate 1.3% of the United States population (or 74,000 people in Wisconsin) has an HCV infection.
- There are disparities in HCV prevalence by age. Baby boomers (born 1945-1965) account for 1 in 4 Wisconsin residents but 2 in 4 people reported and living with HCV in Wisconsin. Baby boomers account for 3 in 4 HCV-related hospitalizations, but only 1 in 4 non-HCV-related Wisconsin hospitalizations.
- There are disparities in rates of HCV detection by race. In 2013, non-Hispanic blacks (84 per 100,000) were two times and American Indians (140 per 100,000) more than three times more likely to be reported with HCV than non-Hispanic whites (37 per 100,000).
- The rise in heroin use in young people under age 30 appears to mirror the increase in reported HCV. HCV reports in people under age 30 (primarily persons who inject drugs) increased from 5% of all HCV reports in 2003 to 27% of all HCV reports in 2013. Heroin overdoses leading to emergency room visits, hospitalizations, and deaths in Wisconsin increased dramatically between 2008 and 2012. The rate of new HCV reports and the rate of heroin overdose have both increased in rural counties in the past five years.
- The age of persons with HCV infection detected at admission in Wisconsin prisons is changing. The median age of people with HCV infection reported from the Department of Corrections in 2013 is 14 years younger (median age, 30) than it was in 2009 (median age, 44).
- The number of deaths from HCV more than doubled since 2000 (73 in 2000 to 162 in 2011). Those with an HCV-associated death during 2009-2011 were 22 years younger (median age 57) than those who died of other causes (median age 79). In 2011, the rate of HCV as a cause of death in males (3.5 per 100,000) was three times the rate in females (1.1 per 100,000).
- Data from the HIV and HCV surveillance systems identified 2.3% of HCV were co-infected with HIV.

Abbreviations

AIDS	Acquired Immune Deficiency Syndrome	TEDS	Treatment Episode Data Set
ASTHO	Association of State and Territorial Health Officials	UNOS	United Network for Organ Sharing
CDC	Centers for Disease Control and Prevention	WEDSS	Wisconsin Electronic Disease Surveillance System
DHS	Department of Health Services	WISH	Wisconsin Interactive Statistics on Health
DPH	Division of Public Health	WI	Wisconsin
ED	Emergency Department	WDPH	Wisconsin Division of Public Health
eHARS	Enhanced HIV and AIDS Reporting System		
HAV	Hepatitis A Virus		
HBV	Hepatitis B Virus		
HCV	Hepatitis C Virus		
HCV RNA	Hepatitis C virus genetic material (ribonucleic acid)		
HIV	Human Immunodeficiency Virus		
IDU	Injection Drug Use		
NH	Non-Hispanic		
OPTN	Organ Procurement and Transplantation Network		
PWID	Persons Who Inject Drugs		
SAMSHA	Substance Abuse and Mental Health Services Administration		

Definitions

Hepatitis C Case Definitions

Acute, Confirmed – An acute, confirmed case, as defined by the Council of State and Territorial Epidemiologists (CSTE) and used for the Wisconsin Electronic Disease Surveillance System (WEDSS), is a case in which there is: a) Clinical criteria defined as “a discrete onset of any sign or symptom” (headache, nausea, vomiting, diarrhea) AND jaundice OR elevated serum alanine aminotransferase (ALT) levels greater than 400 IU/L; b) An anti-HCV positive test with a high signal-to-cut-off ratio OR HCV RNA (PCR) positive (qualitative, quantitative, or genotype) OR HCV RIBA positive AND IgM anti-HAV negative (if done) AND IgM anti-HBc negative (if done); or c) A documented negative anti-HCV followed within six months by a positive HCV, HCV RNA, or HCV RIBA.

Confirmed, Past or Present – A past or present confirmed case, as defined by the Wisconsin Viral Hepatitis Program and used to categorize cases in WEDSS, is one in which “an anti-HCV positive with a high signal-to-cut-off ratio OR HCV RNA (PCR) positive (qualitative, quantitative, or genotype) OR HCV RIBA positive AND does not meet the case definition for acute hepatitis C.”

Probable - A probable case as defined by the Wisconsin Viral Hepatitis Program and used to categorize cases in WEDSS, is one in which an anti-HCV positive with an unknown or low signal-to-cut-off ratio and no other test result reported, or a negative HCV RNA (PCR) (qualitative or quantitative).

Incidence is the number of new cases of a disease that occur during a specified period of time in a population at risk for developing the disease. Data are not available to determine when an HCV infection was acquired. Results reported to WEDSS indicate when HCV infection was detected. Therefore, the term HCV incidence is not used in this profile.

Prevalence is the number of people living with either a confirmed or probable HCV infection at a given time. In this profile, reported prevalence only includes HCV infections reported in WEDSS. It does not account for migration outside or into Wisconsin, resolved infection (15-30% of cases), or individuals who underwent treatment and established a sustained virological response.

New HCV Cases are new HCV diagnoses that were reported in WEDSS with either a confirmed or probable case definition. A new diagnosis is based on when a blood specimen was collected and may not reflect the actual date or year the infection was acquired (incidence).

Rates per 100,000 are given to compare the impact of a disease across two or more groups. Rates are calculated to show the impact of HCV on groups if the size of the populations were identical (i.e., each population consisted of 100,000 people).

Age-adjusted rates per 100,000 allow comparison of rates between populations, even when populations may have different age distributions. Age-adjusted rates are commonly seen for mortality and morbidity. Age-adjusted rates may also be used to control for age effects when comparing across several years of data, as the age distribution of the population changes over time. Age-adjusted rates in this report were calculated using the direct method based on the year 2000 United States standard population.

X-fold difference means something is X-times higher or lower in one group or population than another. Ex: In 2003, the percent of young adults infected with HCV was 5% and in 2013 it was 27%. This is a five-fold increase of young adults infected with HCV since 2003 ($27/5 = 5.4$).

Percent Change is an increase or decrease over time described as a percent change. Ex: Percent change of liver transplants from 2009 (138 cases) to 2013 (133 cases): $(133-138)/138 = -3.8\%$ (a 3.8% decline in liver transplants).

Statistical Significance is a mathematical technique to measure whether an observation or estimate is likely to be true. Statistical significance is calculated as the probability that an effect observed is occurring because of chance. In this report a 95% confidence interval (CI) was used to measure the degree of uncertainty around an estimate, such as the rate of HCV in a certain year or demographic group. When CIs do not overlap, there is likely to be a statistically significant difference between the estimates.

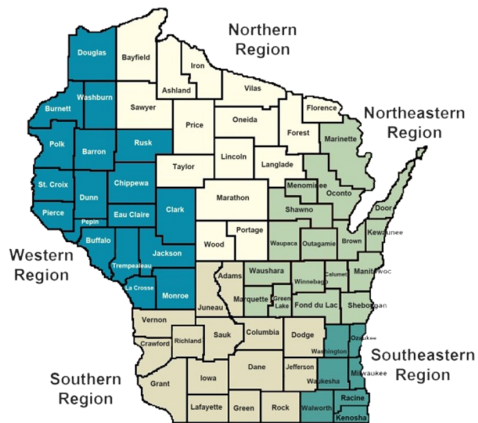
Baby Boomer, as defined by CDC, includes the birth cohort of individuals born between the years of 1945 and 1965. Due to available age categories of Wisconsin population denominators, those aged 45-65 years are used to describe disease in the baby-boomer population, although the actual age of those born between the years of 1945 and 1965 is 47-67 in 2012.

Wisconsin Socio-Demographic Characteristics

Overview

Wisconsin is a medium-sized Midwestern state that is divided into five public health regions (Figure 1). The socio-demographics of Wisconsin are described in this chapter for consideration in prevention, transmission and treatment of HCV.

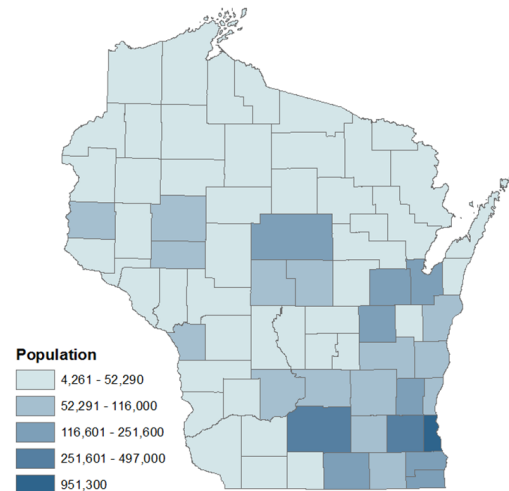
Figure 1: Wisconsin Public Health Regions



Population Size

Wisconsin's overall population in 2012 was estimated to be 5,715,331, making up less than 1.8% of the nation's estimated population of 313,914,040 (WISH, 2012; U.S. Census Bureau, 2012). The 72 counties of Wisconsin are organized into five different public health regions where population differences among counties can be seen. The Northern region, consisting of 15 counties, has a population of only 487,753 (8.5% of the entire population), compared to the county of Milwaukee in the Southeastern region, which is home to 951,315 (16.6% of the population). Difference in population size by county is illustrated in Figure 2.

Figure 2: Wisconsin Population by County, 2012



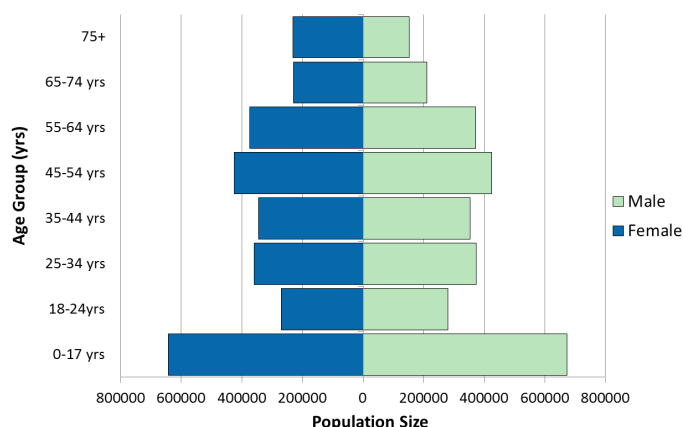
Growth Trends

Between the years of 2002 and 2012, Wisconsin's estimated population increased nearly 5%; with almost a 50% increase in persons aged 55-64 years. The American Indian and Asian populations increased by 13,837 (24.8%) and 42,644 (39.6%), respectively. The Hispanic population increased by 129,379 (57.7%). While the Northern region of Wisconsin had no significant population change, the Southern region grew 7.7%, most notably in the counties of Dane (12.3%) and Sauk (10%). The county of St. Croix also increased by 23.9% over 2002-2012 (Table 1) (Wisconsin Department of Health Services, 2014).

Table 1: Wisconsin Population from 2002 and 2012

Category	2002 Census		2012 Census		2002-2012	
	Number (n)	Percent of total	Number (n)	Percent of total	Change	Percent difference
Race						
White	4,959,078	90.8%	5,094,479	89.1%	135,401	2.7%
African American	339,022	6.2%	400,790	7.0%	61,768	18.2%
American Indian	55,851	1.0%	69,688	1.2%	13,837	24.8%
Asian	107,730	2.0%	150,374	2.6%	42,644	39.6%
Ethnicity						
Non-Hispanic	5,237,487	95.9%	5,361,757	93.8%	124,270	2.4%
Hispanic	224,195	4.1%	353,574	6.2%	129,379	57.7%
Sex						
Female	2,761,819	50.6%	2,877,744	50.4%	115,925	4.2%
Male	2,699,863	49.4%	2,837,587	49.6%	137,724	5.1%
Age Group (years)						
0-17	1,338,681	24.5%	1,317,004	23.0%	-21,677	-1.6%
18-24	563,098	10.3%	551,010	9.6%	-12,088	-2.1%
25-34	694,285	12.7%	733,052	12.8%	38,767	5.6%
35-44	867,231	15.9%	697,738	12.2%	-169,493	-19.5%
45-54	787,807	14.4%	849,251	14.9%	61,444	7.8%
55-64	501,522	9.2%	744,370	13.0%	242,848	48.4%
65-74	349,511	6.4%	439,317	7.7%	89,806	25.7%
75+	359,547	6.6%	383,589	6.7%	24,042	6.7%
Total Population	5,461,682	100%	5,715,331	100%	253,649	4.6%

Figure 3: Age and Sex of the Wisconsin Population, 2012



Age and Sex Distribution

In 2012, Wisconsin’s age and sex distribution closely resembled that of the United States (U.S.) (U.S. Census Bureau 2012). Females slightly outnumber males (50.4% to 49.6%). The median age was 38.9 (compared to 37.3). However, this median age has increased since 2002, indicating an aging Wisconsin population. The baby-boomer population (born between 1945 and 1965) make up 28% of the population, while those under the age of 30 make up 39%.

Males and females have very similar ratios in most age groups (Figure 3). As age increases (65 and over), females increasingly make up the majority (56%) of the population.

There are regional differences in median age throughout the state (Figure 4). The median age in 2012 was 38.9 years.

The northern part of the state has counties that have median ages well above the median age of the state (38.9). Conversely, younger populations that are more representative of the median age reside in the southern part of the state.

Figure 4: Wisconsin Median Age by County, 2012

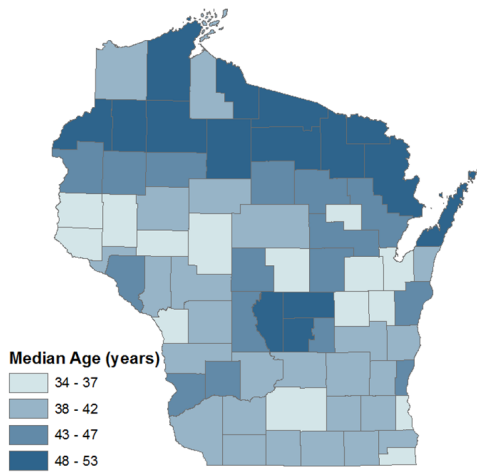
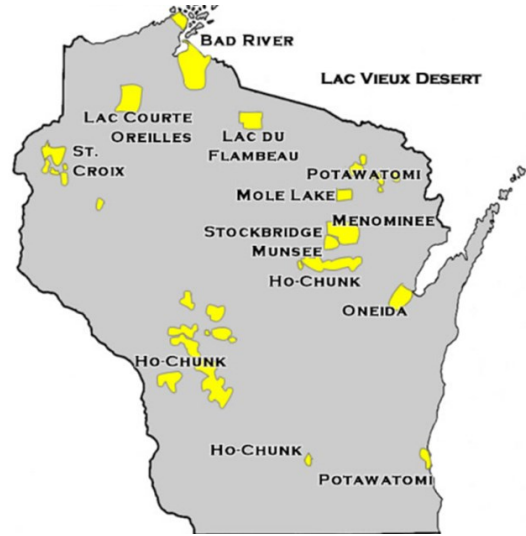


Figure 5: American Indian Tribes in Wisconsin



Source: Great Lakes Inter-Tribal Council, Inc.

Race and Ethnicity

Despite the large overall increase in percentage of American Indians, Asians, and Hispanics seen in Table 1, in 2012, Whites and non-Hispanics still made up the majority of the population (89% and 94%, respectively).

Black Population

The Southeastern region, which includes Milwaukee and Kenosha counties, is home to 79% of the state’s total Black population. Over two-thirds of the population resides in Milwaukee county.

American Indian Population

There are concentrated areas in the state where there are high proportions of American Indians, primarily American Indian tribal lands (Figure 5). For example, in the county of Menominee, which is on tribal land, American Indians made up 85% of the county’s total population. Surrounding counties, including Forest, Shawano, and Vilas, also have large ratios of American Indians. A dense American Indian population can be found near the Lac Courte Oreilles Tribal and Bayfield lands, in the Ashland, Bayfield, and Sawyer counties. However, 15% of American Indians live in Milwaukee County.

Income and Insurance

The median household income in Wisconsin in 2012 was estimated at \$52,627, closely behind the median income of the rest of the nation (\$53,046) (American Community Survey, 2008-2012). Regionally, the higher median household incomes are found in the Southeastern, Southern, and Northeastern regions (Figure 6).

Correspondingly, with the exception of Milwaukee County, the majority of the counties with the highest percent (>15%) of poverty are found in the Western and Northern regions (American Community Survey, 2008-2012).

Figure 6: Wisconsin Median Household Income by County, 2012

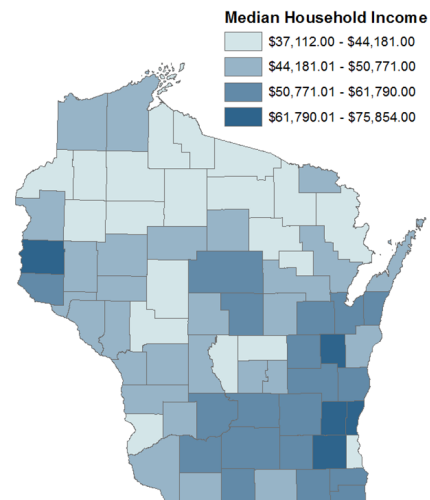
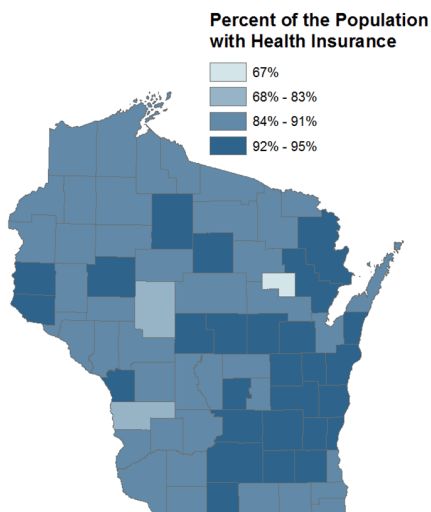


Figure 7: Wisconsin Percent with Health Insurance by County, 2012



An estimated 91% of the Wisconsin population is insured by either private or public insurers (American Community Survey, 2008-2012). The majority of the counties (45) have at least 90% of the population insured and 69 counties have a higher percent population insured than national estimates (85.1%). Menominee, Clark, and Vernon counties fall below the national estimate (Figure 7).

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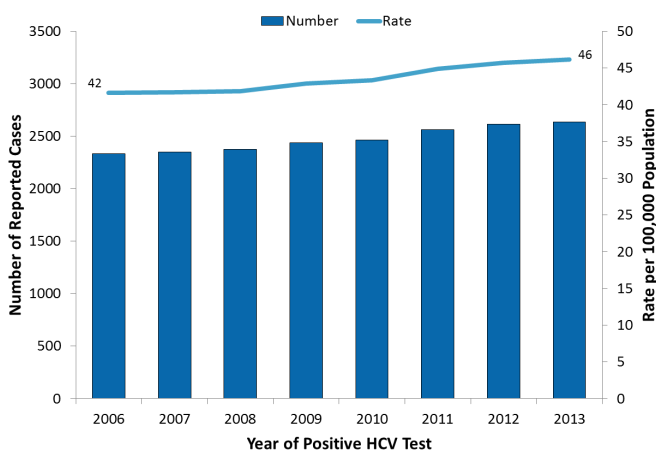
Scope of Disease

An estimated 74,000 Wisconsin residents are living with HCV, fewer than half of whom have been diagnosed with the virus. Two populations characterize the majority of HCV reports in Wisconsin: baby boomers (born 1945-1965), many of whom were infected through contaminated blood products and medical equipment in their twenties and thirties, and recent infections in injection drug users, many of whom are under age 30.

Trend

Since 2006, reports of HCV have slowly increased. On average, 2,500 cases have been detected at a rate of 43.5 per 100,000 population per year (Figure 1).

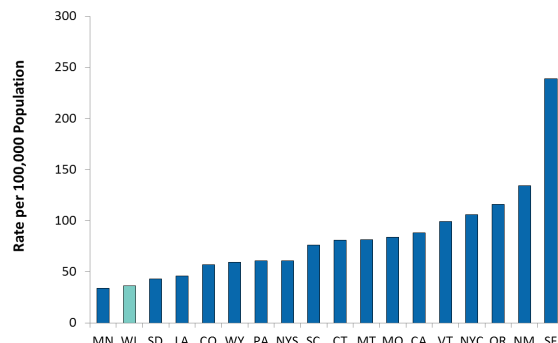
Figure 1: Number and Rate of Reported HCV Cases, Wisconsin, 2006-2013



Wisconsin and the United States

The most recent summary of national HCV infection published by the Centers for Disease Control and Prevention (CDC) describes reports of past or present infection reported from Emerging Infections Program sites and the National Notifiable Diseases Surveillance System in 2011 (CDC, a). The rate of reported, laboratory confirmed HCV infection in Wisconsin is among the lowest of reporting jurisdictions and similar to states with comparable populations (Figure 2).

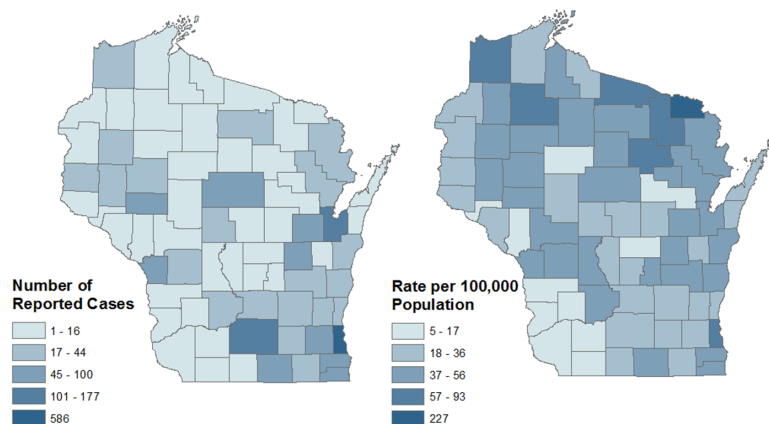
Figure 2: Reported Cases of Laboratory-Confirmed HCV (Past or Present) Infection, Wisconsin in Comparison with other HCV Surveillance Programs*, 2011



Geography

In 2013, 2,638 new HCV cases were reported in Wisconsin. Milwaukee County, with the largest population, accounted for 22% of reports. Cases reported from the correctional system accounted for 10% of reports in 2013. Although the larger population centers are in the southern half of the state, the highest rates of new HCV reports are in Milwaukee and the northern, more rural counties (Figure 3).

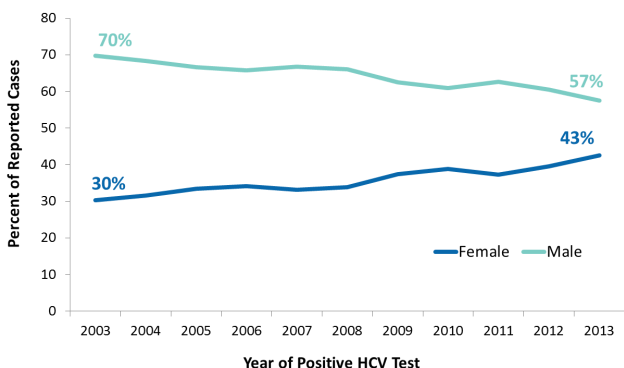
Figure 3: Reported HCV Cases by County, Wisconsin, 2013



Sex and Age

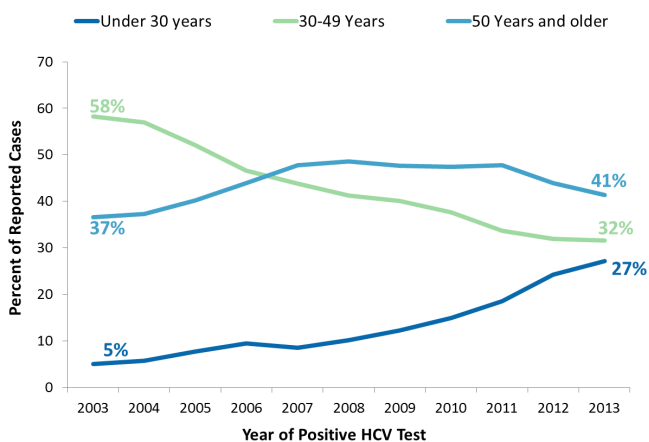
Men accounted for 57% of new HCV reports in 2013 (Figure 4). The rate of report in men has declined from 94.2 per 100,000 in 2003 to 53.4 per 100,000 in 2013. The rate of report in women has not changed significantly (40.0 per 100,000 in 2003 to 39.0 per 100,000 in 2013).

Figure 4: Percent of HCV Reports by Sex, Wisconsin, 2003-2013



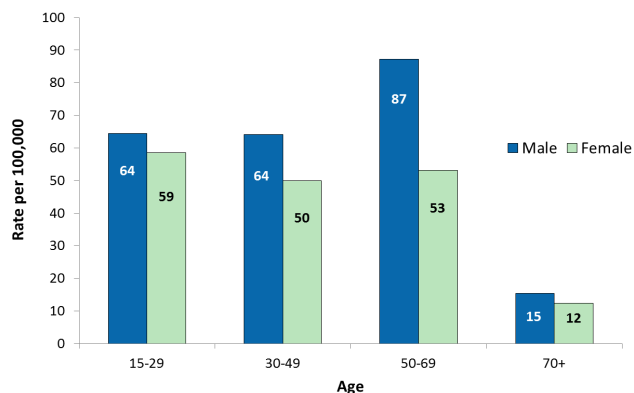
The greatest number of HCV reports in 2013 occurred among those aged 50-69 at the time of HCV positive test (n=1,009). The median age of HCV cases in 2013 was 44 years. The percent of detections in young adults under age 30 increased from 5% in 2003 to 27% in 2013 while the percent of detections in adults age 30-49 declined steadily from 58% in 2003 to 32% in 2013 (Figure 5).

Figure 5: Percent of HCV Reports by Age Group, Wisconsin 2003-2013



In young adults, males and females were reported at a similar rate in 2013. However, men aged 50-69 were reported at a rate 1.6 times higher than that of women in the same age group (Figure 6).

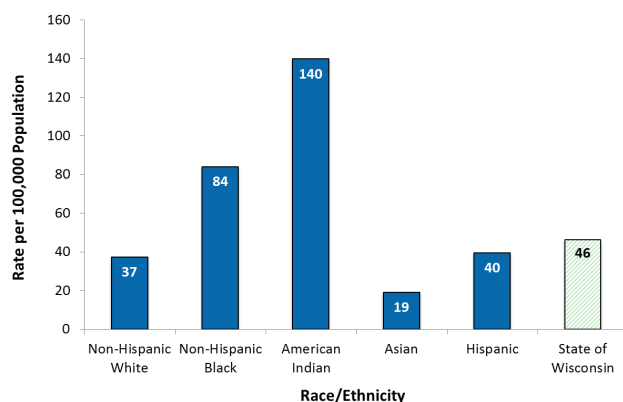
Figure 6: Rate of HCV Reports per 10,000, by Sex and Age, Wisconsin, 2013



Race and Ethnicity

There are disparities in HCV detection in Non-Hispanic Blacks and American Indians compared to Non-Hispanic Whites. In 2013, an estimated 7% of Wisconsin's population was Non-Hispanic Black yet this population accounted for 12% of the HCV cases reported in 2013. When expressed as a rate, Non-Hispanic Blacks were two times and American Indians were more than three times more likely to be reported with HCV than Non-Hispanic Whites in Wisconsin (Figure 7).

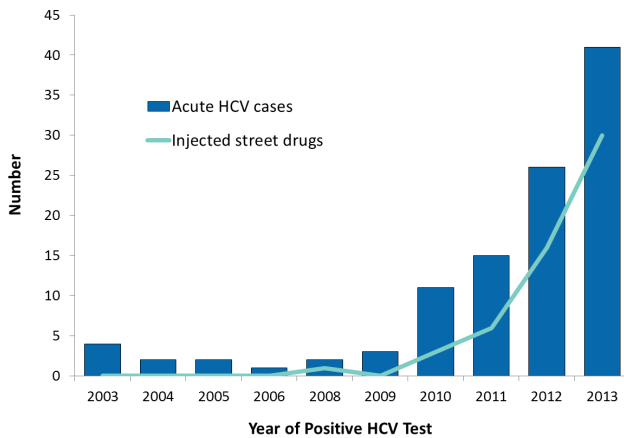
Figure 7: Rate of HCV Reports, by Race and Ethnicity, Wisconsin, 2013



Acute HCV Infection

The number of acute HCV detections has increased substantially in recent years, from 3 in 2009 to 42 in 2013 (Figure 8). In response to a cluster of acute HCV illness in young adults in northern Wisconsin, DPH initiated enhanced surveillance for HCV infection in young adults during 2010-2012.

Figure 8: Reported Acute HCV Cases, Wisconsin, 2003-2013



The availability of a rapid test for HCV antibody in 2012 allowed for increased HCV screening in outreach settings.

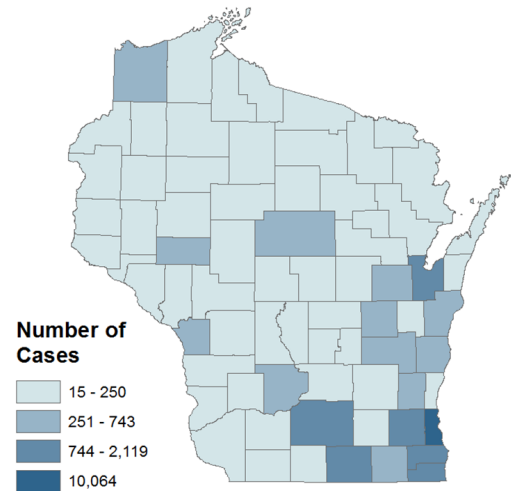
These activities led to reports of more cases in young adults, who are more likely to have acute infection than are older adults. During 2009-2013, the median age of acute HCV cases was 24 years, (significantly younger than the median age of all cases, 44) and 61% were male. The most common reported risk factor of injection drug use in recent acute cases may reflect risks associated with the current heroin epidemic in Wisconsin.

People Living with HCV

DPH has received approximately 35,000 reports of HCV infection in individuals presumed to be alive (Figure 9). The true number of people living with HCV in Wisconsin is unknown because the majority of U.S. adults who are infected are not diagnosed (CDC, b). Recent estimates indicate 2.3 million, or 1.3% of the

United States population, has an HCV infection (Ditah, 2014). Therefore, 74,000 people in Wisconsin are estimated to have HCV infection.

Figure 9: Map of Prevalent HCV Cases in Wisconsin, 2013



For every 10 people in Wisconsin who have been reported with an HCV infection:

- Approximately six are male.
- Approximately five are non-Hispanic white.
- Approximately five are aged 45-64 years.

Deaths

A death certificate was matched to approximately 4,000 individuals with HCV infection reported to DPH between 2000 and 2013. The number of deceased has increased by 54% during 2006-2011 (Figure 10). The median age at death was 54 years. The primary cause was viral hepatitis, liver disease or liver cancer in 27%, followed by heart disease (11%) and accidental poisoning (8%). As the population living with HCV infection ages, future morbidity and mortality from HCV are likely to increase substantially in the absence of public health intervention or access to treatment (Rein, 2011).

Figure 10: Prevalent HCV Cases (reported) and All Cause Mortality, Wisconsin, 2000-2011

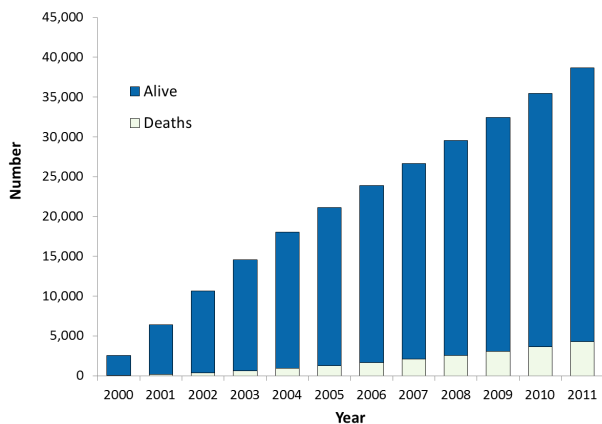
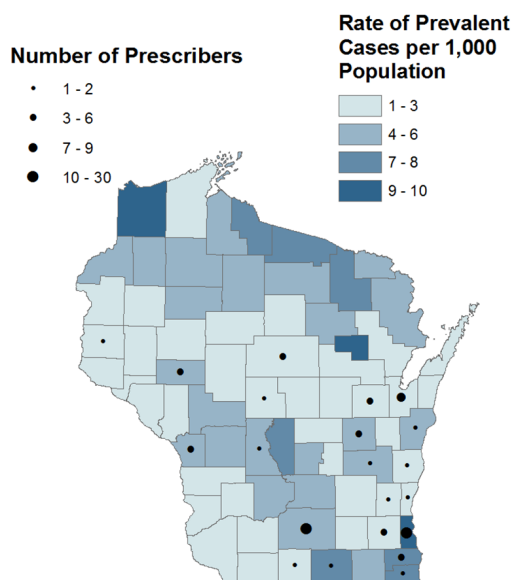


Figure 11: Distribution of HCV Treatment Prescribers and Rate of Prevalent HCV Cases, Wisconsin, 2012



HCV Treatment Providers

The distribution of providers who prescribed at least one direct-acting antiviral drug for HCV treatment in 2012 was used as an indicator of treatment in Wisconsin. The ratio of providers who prescribed HCV treatment to all reported persons living with HCV was highest in the southeastern region of the state. There were no HCV treatment prescribers in the majority of counties in the northern region of the state where the rate of prevalent cases is high (Figure 11). This analysis does not include individuals in border counties who may HCV receive treatment in another state.

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Hospitalizations

Patients in the United States with chronic HCV are estimated to have a hospitalization rate three times that of persons without HCV infection (Davis, 2011). As the HCV-infected population ages, those who progress to cirrhosis and liver disease are expected to present a substantial healthcare burden in Wisconsin.

In 2012, there were 626,629 total hospitalizations for all causes in acute care, non-federal Wisconsin hospitals. Figure 1 shows the number of hospitalizations for HAV, HBV, HCV and HIV listed as any discharge diagnosis for the hospitalization for the most recent three years. The numbers refer to hospitalization events and individual patients can have multiple discharges during the year.

During 2010-2012, the majority of hospitalizations for viral hepatitis in Wisconsin were related to hepatitis C virus (HCV). There were 3,865 hospitalizations with an HCV diagnosis in 2012 (Figure 1). Hospitalizations for which HCV was coded as the primary or secondary cause of hospitalization are referred to as “HCV hospitalizations” for this report.

Figure 1: Hospitalizations with Viral Hepatitis or HIV, Wisconsin, 2010-2012

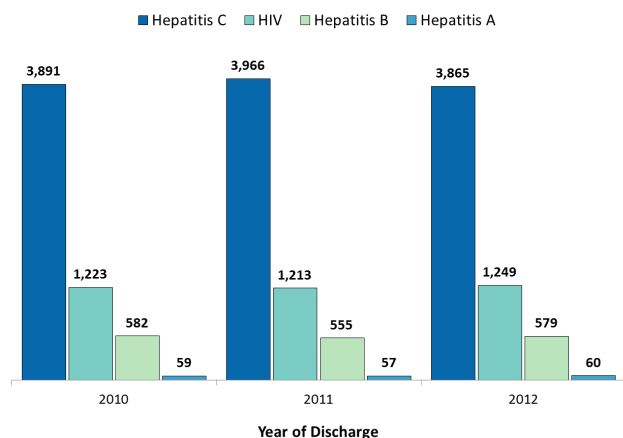
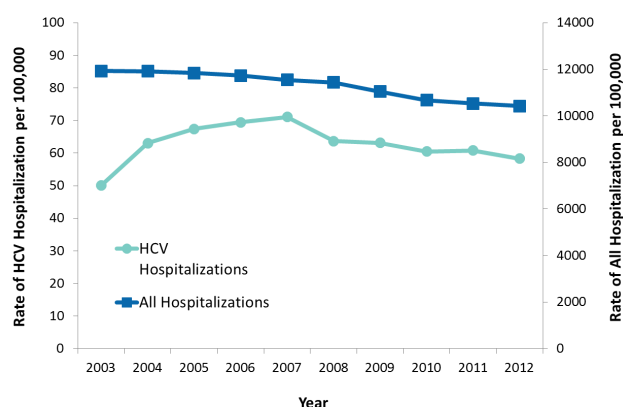


Figure 2 shows the rate of HCV hospitalizations. In 2007 there were 4,356 hospitalizations (71.1 per 100,000 population) and in 2012 there were 3,865 hospitalizations (58.3 per 100,000). The statistically significant decline in the rate of HCV hospitalizations since 2007 is consistent with a decline in the rate of hospitalizations for all causes in the state.

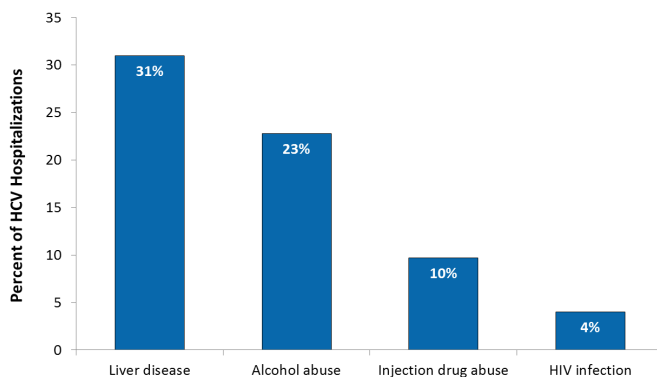
Figure 2: Age-adjusted Rate of Hospitalizations, Wisconsin, 2003-2012



Underlying Conditions

Of all HCV hospitalizations in 2012, 31% had co-diagnoses of liver disease, 23% alcohol abuse, 10% injection drug abuse and 4% HIV infection (Figure 3).

Figure 3: Underlying Conditions in Hospitalizations with HCV, Wisconsin, 2012*



* Conditions are not mutually exclusive

Table 1: Diagnostic Categories of Hospitalizations with or without HCV, Wisconsin, 2012

Hospitalizations with Hepatitis C Virus, Wisconsin, 2012 (N=3,865)		
Rank	Major Diagnostic Category	% of Hospitalizations
1.	Diseases and Disorders of the Hepatobiliary System and Pancreas	18.8
2.	Diseases and Disorders of the Digestive System	10.7
3.	Alcohol/Drug Use and Alcohol/Drug Induced Mental Disorders	9.9
4.	Mental Diseases and Disorders	8.8
5.	Diseases and Disorders of the Respiratory System	7.5
Hospitalizations without Hepatitis C Virus, Wisconsin, 2012 (N=622,764)		
Rank	Major Diagnostic Category	% of Hospitalizations
1.	Diseases and Disorders of the Circulatory System	12.4
2.	Pregnancy, Childbirth and the Puerperium	11.1
3.	Diseases and Disorders of the Musculoskeletal System and Connective Tissue	10.9
4.	Newborns and other Neonates with Condition Originating in Perinatal Period	10.9
5.	Diseases and Disorders of the Respiratory System	8.9

Diagnostic Categories

The most common diagnoses associated with HCV hospitalizations were diseases and disorders of the hepatobiliary system, pancreas, and digestive system, which together accounted for 30% of all HCV hospitalizations (Table 1). In comparison, the largest category of hospitalizations without HCV was disease of the circulatory system or pregnancy and childbirth.

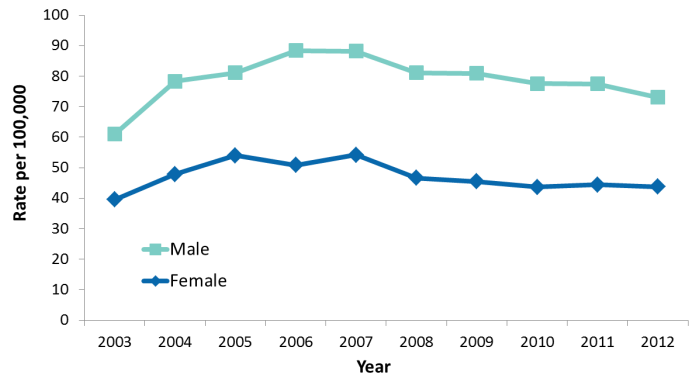
Sex

Males in Wisconsin are hospitalized with HCV at a higher rate than females (Figure 4). The ratio of males and females hospitalized with HCV has remained consistent during the last 10 years.

The predominance of hospitalization in males reflects common routes of HCV transmission in the 1970s (i.e., blood transfusions and injection drug use) and a higher prevalence among older men in the United States (Ditah, 2014). Wisconsin surveillance data from recent years show young adult males and females to be reported with HCV at more equal rates.

Over the next decade, the trend of hospitalizations may change to reflect the change in the epidemiology of new HCV infections in young injection drug users.

Figure 4: Age-adjusted Rate of HCV Hospitalizations, by Sex, Wisconsin 2003-2012

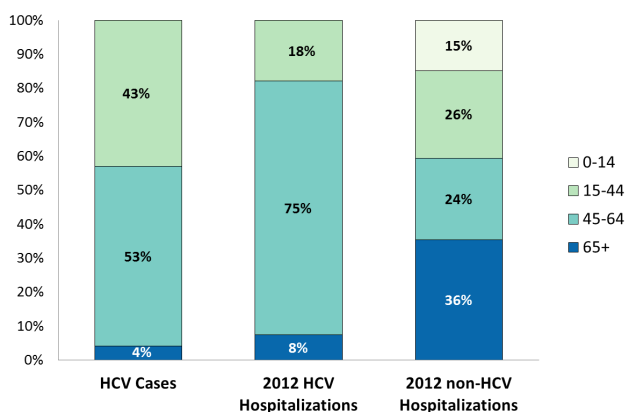


Age

Most acute HCV infections are asymptomatic or mild until more severe disease develops decades after infection, typically cirrhosis, liver cancer and liver disease (Seeff, 2009).

In 2012, persons aged 45-64 years were 28% of the population in Wisconsin but accounted for 53% of the reported HCV cases and 75% of HCV hospitalizations. The percent of HCV hospitalizations in this age group is three times that of hospitalizations for other causes in this age group. In 2012, the percent of persons over 65 years old hospitalized with HCV was twice as high as the HCV cases in this age group (Figure 5).

Figure 5: Ages of Reported HCV Cases and HCV Hospitalizations in Wisconsin, 2012



Race

Reflecting the disparity of a higher rate of HCV infection, Blacks in Wisconsin were hospitalized with HCV at a rate six times higher than Whites living in Wisconsin in 2012. While representing only 7% of the state population in 2012, Blacks accounted for 23% (4,927) of reported HCV

Figure 6: Race of Reported HCV Cases and HCV Hospitalizations, Wisconsin, 2012

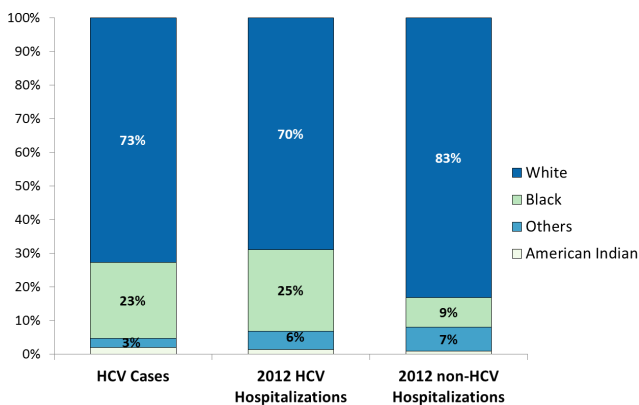
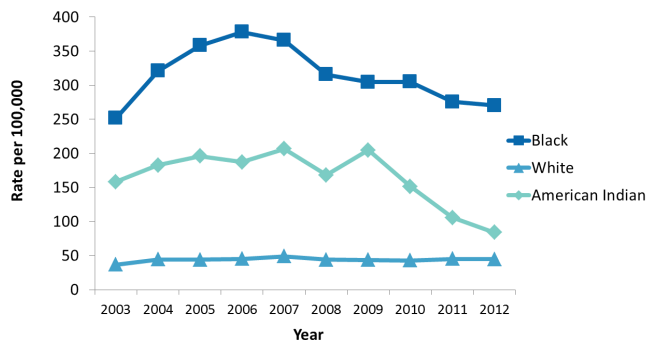


Figure 7: Age-adjusted Rate of HCV Hospitalizations, Wisconsin, 2003-2012



cases and 25% (941) of the HCV hospitalizations in Wisconsin (Figure 6).

Figure 7 shows the trend in hospitalization rate for HCV from 2003-2012. In 2012, the age-adjusted hospitalization rate of HCV for Blacks in Wisconsin was 270.4 per 100,000 compared with 44.6 for Whites in Wisconsin. Since 2007, there has been a significant decline in the HCV hospitalization rate among the American Indian population. Importantly, these numbers reflect hospitalizations among the population of each race or ethnicity, not among the population infected with HCV.

The increased rate of HCV hospitalization among those aged 45-64 is reflected across race and ethnicity. Table 2 shows the hospitalization rate of Blacks aged 45-64 (1,031 per 100,000) is higher than among Whites (127 per 100,000), American Indians (337 per 100,000), or Hispanics (442 per 100,000) in Wisconsin.

Figure 8: Primary Payer for HCV Hospitalizations, Wisconsin, 2012

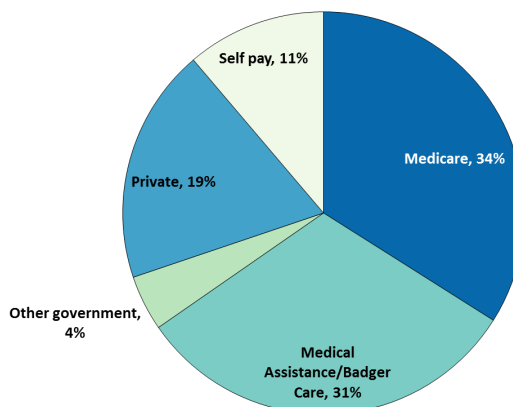


Table 2: Hospitalizations by Age group, Race and Ethnicity, Wisconsin, 2010-2012

Age (years)	American Indian		Black		White		Hispanic		Non-Hispanic	
	N ¹	Rate ²	N	Rate	N	Rate	N	Rate	N	Rate
15-24	--	--	--	--	255	12.7	--	--	--	--
25-44	63	109.0	223	70.0	1413	37.2	248	75.9	1601	40.1
45-64	148	337.0	2428	1031.0	5625	127.4	605	441.8	7944	171.8
65+	--	--	199	279.0	545	23.8	64	198.1	756	32.0

Hispanic and Non-Hispanic ethnicity are reported separate from race (i.e., hospitalizations can be included in each category).

¹ Numbers of discharges represent events, not unique persons hospitalized. HCV discharge based on HCV in any diagnostic position. Numbers less than 10 and rates based on less than 10 hospitalizations are not shown.

² Rates are expressed as number of discharges per 100,000 population in Wisconsin.

Charges

Charges for hospital stay for HCV hospitalizations in non-federal Wisconsin hospitals were most often billed to government sources (Figure 8). Charges are used to estimate hospital facility cost of HCV.

Importantly, they do not reflect the actual reimbursement paid by any payer and do not include outpatient care or course of HCV treatment.

Of hospitalizations for which HCV was the primary diagnosis, the average charge in 2012 was \$63,770 per hospitalization (+/- \$13,385 standard error). In the past ten years, the average charge per hospitalization increased by 283% from \$16,640 in 2003 to \$63,770 in 2012. For comparison, the average charge per hospitalization for all other causes increased by 69% during the same time period.

The total annual charge of HCV hospitalizations in Wisconsin is estimated to range from \$15 million for hospitalizations in which HCV was the primary diagnosis, to \$118 million in which HCV was listed as a contributing cause of hospitalization.

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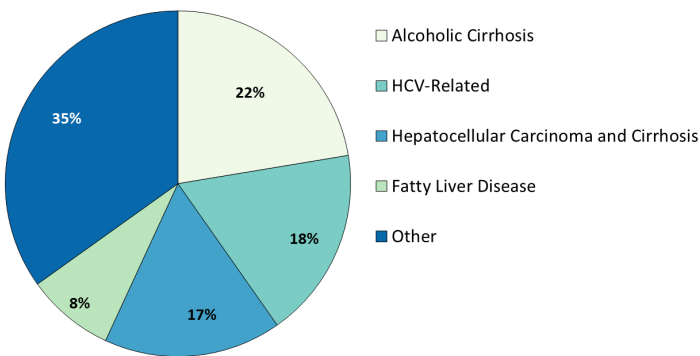
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Liver Transplants

Infection with HCV is known to increase the risk of hepatocellular carcinoma (HCC) and cirrhosis an estimated 14 to 25-fold (El-Serag, 2004). Liver transplants are a substantial burden to health care costs as the estimated U.S. average in 2011 of billed charges per liver transplant was \$577,100 (Bentley, 2011).

According to the United Network for Organ Sharing (UNOS), there were 641 liver transplants in Wisconsin from 2009-2013. Of these, 115 (18%) or an average of 23 per year, were related to evidence of HCV infection. Other diagnoses in the liver recipient included alcoholic cirrhosis (23%) and hepatocellular carcinoma with cirrhosis (17%) (Figure 1). The relatively small number of HCV-specific diagnoses reported in liver transplant recipients may reflect under-diagnosis of HCV.

Figure 1: Diagnoses of Patients Receiving Liver Transplants in Wisconsin, 2009-2013

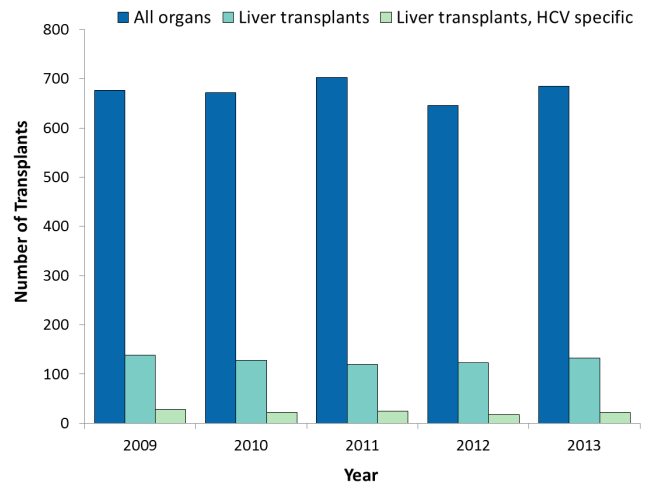


Trend

In the past five years, liver transplants specific to HCV infection reported by UNOS decreased slightly from 28 in 2009 to 22 in 2013. During this same time, transplants of any organ remained stable (Figure 2). Historically in Wisconsin, HCV-specific liver transplants increased steadily from 19 in 1993 to 162 in 2002 (Gasiorowicz, 2006). The decline in recent

years may reflect limited availability of organs for transplant. In 2013, there were 283 patients waiting for a liver transplant and 21% of these had an HCV specific diagnosis.

Figure 2: All Organ and Liver Transplants, Wisconsin, 2009-2013



Demographics

Recipients of HCV-specific transplants were primarily male (80%) and 81% were aged 50-64 years. Seventy-nine percent were White, 12% Hispanic, 8% Black and 1% American Indian.

References

El-Serag, Hashem B. Hepatocellular carcinoma: recent trends in the United States. *Gastroenterology* 127.5 (2004): S27-S34.

Bentley S, et al. 2011 U.S Organ and tissue transplant cost estimates and discussion. Milliman Research Report. 2011.

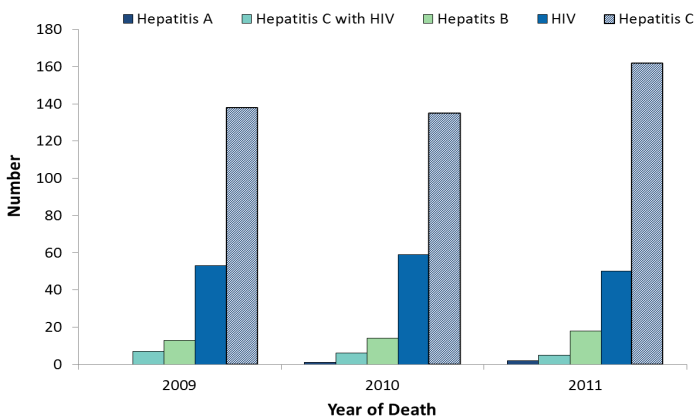
Gasiorowicz M, et al. Epidemiologic trends in infection, mortality, and transplants related to hepatitis C in Wisconsin. *Wisconsin Medical Journal*. 2006; 105(1):34-39.

Mortality

The rate of mortality among HCV-infected patients in U.S. healthcare networks has been estimated to be three times higher than patients without HCV infection (Moorman, 2013). In a national study, on average, those with HCV die 22 years earlier and are more likely to have liver cancer, fibrosis, cirrhosis, renal failure and septicemia than those without HCV infection (Ly, 2014).

For the purposes of this report, an “HCV-associated death” is a death in which HCV was indicated as the underlying or a contributing cause of death designated by clinician, medical examiner or coroner on the death certificate. During 2009–2011 there were 435 HCV-associated deaths in Wisconsin, an average of 145 per year. HCV associated deaths outnumbered deaths from other viral hepatitis infections and HIV combined, by 2:1 (Figure 1).

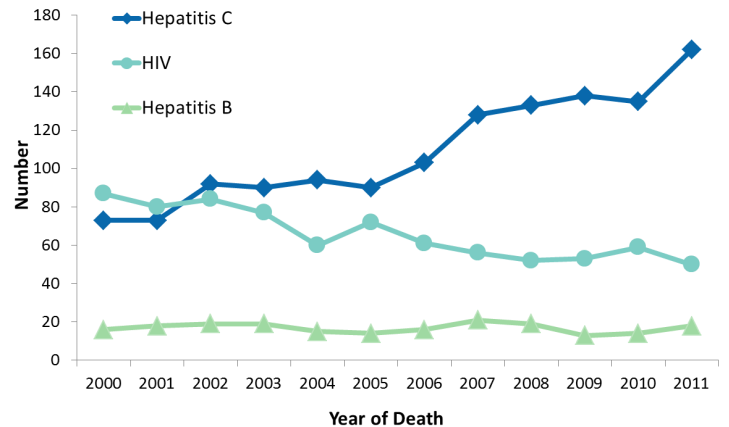
Figure 1: Deaths Associated with Viral Hepatitis or HIV, Wisconsin, 2009-2011



The number of deaths associated with HCV more than doubled between 2000 and 2011. In contrast, the number of deaths from HIV during this time decreased by 43%. The increase in HCV deaths and decrease in HIV deaths matches the national trend (Ly, 2012). Because of the slow progression of chronic HCV infection, the large number of people

infected as young adults in the 1970s are now dying from HCV-related illnesses. Deaths from HBV have remained stable and have averaged 17 per year (Figure 2).

Figure 2: Deaths Associated with Hepatitis C Virus, Hepatitis B Virus, and HIV, Wisconsin, 2000-2011



Rate

The age-adjusted rate of death associated with HCV in Wisconsin has increased from 1.3 per 100,000 in 2000 to 2.3 per 100,000 in 2011. For comparison, in 2010, the age-adjusted rate of death associated with HCV in the United States was 4.6 per 100,000 (Ly, 2014).

Cause of Death

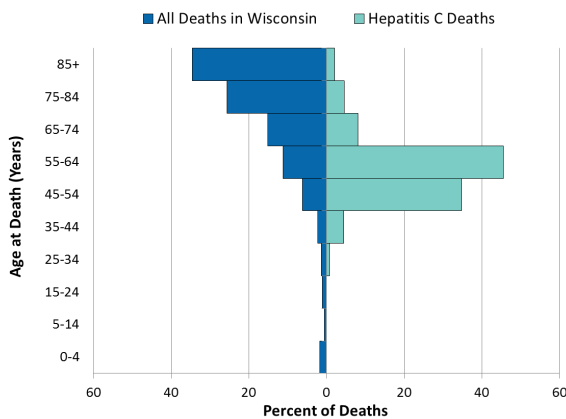
Contributing causes of death for HCV-associated deaths were viral hepatitis (38%) and cancer of the liver and intrahepatic bile duct (19%), established outcomes of chronic hepatitis infection. In contrast, persons without HCV infection, as indicated on the death certificate, were most likely to die of ischemic or other heart disease (25%), cerebrovascular diseases (6%) and cancer of the trachea, bronchus or lung (6%).

Age

Those with an HCV-associated death during 2009-2011 were 22 years younger than those who died of other causes.

Most (80%) of HCV deaths occurred in persons aged 45-64 years (Figure 3) and the median age of death was 57 years. The highest mortality rates were observed among persons aged 45-64 (7.4 per 100,000). These age patterns of HCV-related deaths and the highest burden among those aged 45-64 are consistent with other findings in the United States (CDC Viral hepatitis surveillance, 2011; Pinchoff, 2014; Ly, 2014; Mahajan, 2014).

Figure 3: Age Distribution of Deaths in Wisconsin, 2009-2011



Sex

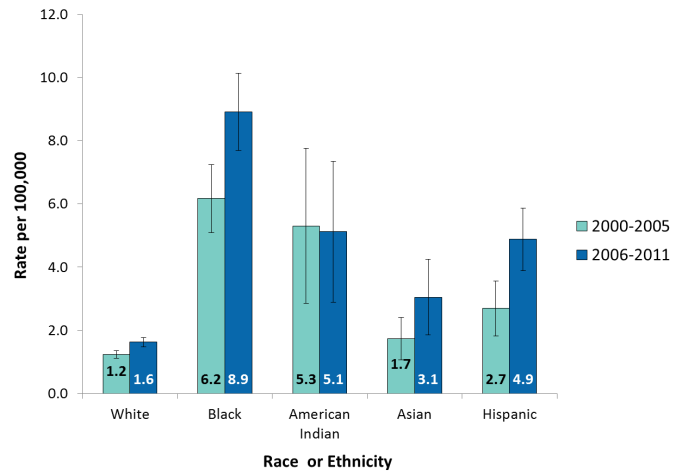
In 2011, the rate of HCV as a cause of death in males was three times higher than the rate in females, (3.5 compared to 1.1 per 100,000 population). Men comprised 65% of HCV cases and accounted for 76% of the HCV-related deaths. The higher rate of HCV death among men in Wisconsin is consistent with national findings (Ly, 2014; Mahajan, 2014).

Race

The HCV mortality rate in Wisconsin differs by race and ethnicity. The rate of HCV as a cause of death in Blacks increased from 6 per 100,000 during 2000-2005 to 9 per 100,000 during 2006-2011. In Hispanics, the rate of HCV as a cause of death

increased from 3 to 5 per 100,000 during these same time periods. These disparities have been reported for earlier years in Wisconsin (Gasirowicz, 2006), and in the United States, population rates of American Indian/Alaskan Native, Hispanics and Blacks are higher than Whites (Ly, 2014). The higher mortality rate from HCV in these racial and ethnic minorities mirrors the higher rates of reported HCV infection in these groups in Wisconsin.

Figure 4: Increase in Mortality Rates of HCV in Wisconsin, 2000-2005 vs. 2006-2011



*Rates are age-adjusted and allow for comparison between two time periods. Error bars show 95% confidence intervals for the rate.

Evidence of Under-Reporting

Hepatitis C virus surveillance data and Wisconsin vital records data were cross-matched to identify persons with HCV in the surveillance system that are no longer living. Of HCV infections reported to the Division of Public Health (DPH) since 2000, 4,266 had died of any cause, 1,113 died of viral hepatitis, liver disease or liver cancer of which 470 (42%) had HCV indicated on the vital record death certificate as a cause of death. The remaining deaths from liver disease and liver cancer among persons with an HCV infection reported to DPH (58%), did not receive a code for HCV on their death certificate. This indicates that HCV is under-reported on death certificates. Numbers and rates shown here are expected to be a conservative estimate of HCV mortality. Chronic HCV infection likely plays a larger role in premature death in Wisconsin than is recognized.

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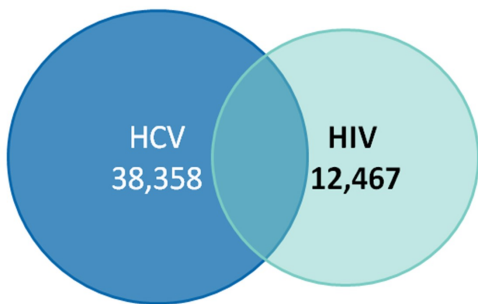
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HCV and HIV Co-Infection

In the United States, about 25% of HIV-infected persons are also infected with HCV (CDC, 2013) and co-infection is common among HIV-infected injection drug users. Those with HIV-HCV co-infection have three times the risk for liver disease and liver failure (CDC, 2013) and die at a younger age than those infected with HCV alone (Pinchoff, 2014).

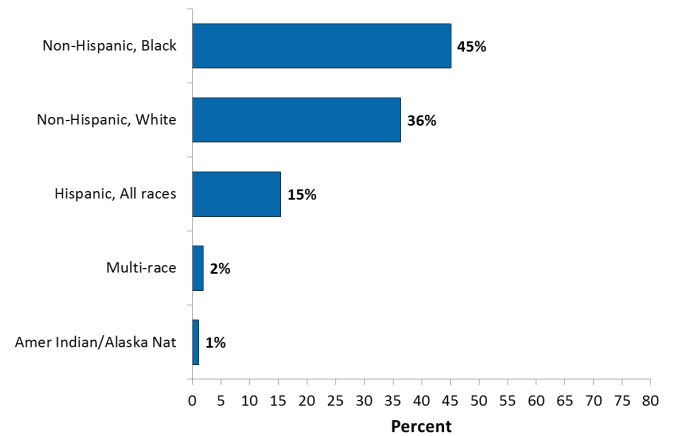
HCV cases reported in Wisconsin during 2000-2013 were matched with HIV cases identified in the Wisconsin HIV registry (eHARS) through 2013. A total of 891 people were identified in both registries, indicating that 2.3% of individuals reported with HCV had HIV infection and 7.1% of individuals reported with HIV had HCV infection. Of 891 individuals, 754 had a current residence in Wisconsin.

Figure 1: Overlap of Reported HCV and HIV Infection



Of 754 identified to be HIV/HCV co-infected and with a current residence in Wisconsin, 579 (77%) were male and 175 (23%) were female. Race was most often Non-Hispanic, Black (340, 45%), Figure 2. The majority of HCV/HIV co-infected persons resided in Milwaukee County (56%), followed by Dane County (8%) and Kenosha County, (4%). All other counties accounted for fewer than 4% of co-infected cases.

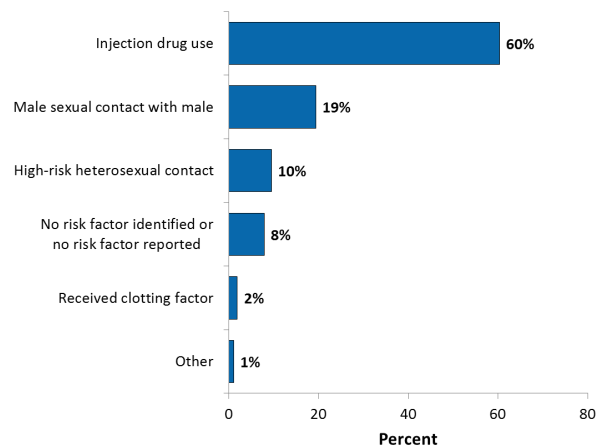
Figure 2: Race and Ethnicity of Individuals with HIV and HCV Co-Infection



Risk

Because risk behavior data for HCV reports is incomplete, the transmission category in the HIV report was used to describe risk associated with co-infection. Cases were assigned to only one risk category. Sixty percent of individuals with co-infection had a history of injection drug use. Other, non-IDU reported risk were men who have sex with men (MSM), high-risk heterosexual contact and receipt of blood clotting factor (Figure 3).

Figure 3: Transmission Category of Individuals with HIV and HCV Co-Infection



Note: The category male sexual contact with male (MSM) includes men who report having sex with men with no history of injection drug use. Any MSM who also have a history of IDU are included in the IDU category.

Deaths Among Co-Infected

Among the 754 persons with co-infection, 26% were identified as deceased in the HIV registry. The median age at death for those with HCV-HIV co-infection was 50 years, 54 years for those with HCV mono-infection, and 40 years with HIV mono-infection.

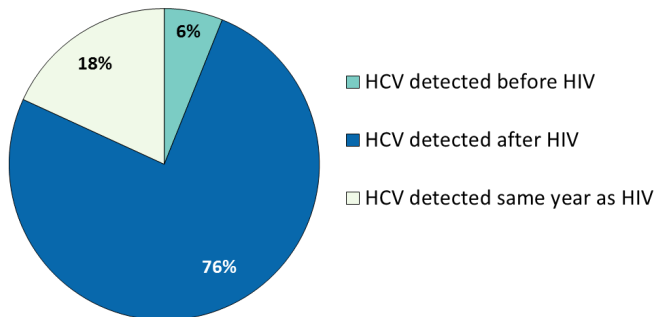
Timing of Detection

The United States Public Health Service and Infectious Diseases Society of America guidelines recommend persons with HIV infection be screened for HCV infection (CDC, 1999). HCV infection was detected more than one year after HIV diagnosis in 76% of those co-infected and 18% were detected the same year as HIV detection (Figure 4). With the rapid HCV antibody test available, there may be opportunities to further expand HCV testing within HIV testing programs in Wisconsin.

Wisconsin Department of Health Services HIV/AIDS Surveillance Annual Review. 2012. Accessed on March 26, 2014: <https://www.dhs.wisconsin.gov/publications/p00484-12.pdf>

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Figure 4: Timing of HCV Detection Relative to HIV Diagnosis



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Pinchoff J, et al. Deaths among people with hepatitis C in New York City, 2000-2011. Clin Infect Dis. 2014; Mar 8 [Epub ahead of print].

Most new HCV transmissions in the United States occur among persons who inject drugs (PWID) (Daniels, 2009). HCV is highly transmissible via syringes and other injection materials and new HCV infection is often acquired during the first few years of injection drug practice (Garfein, 1996). A new cohort of young injection drug users acquiring HCV infection has been recognized nationwide, notably in suburban and rural areas (Page, 2013). Although not common, HCV can be transmitted through sexual activity, from a needlestick injury in a healthcare setting, from receiving blood transfusions or organ transplants before 1992, or being born to a mother who has HCV.

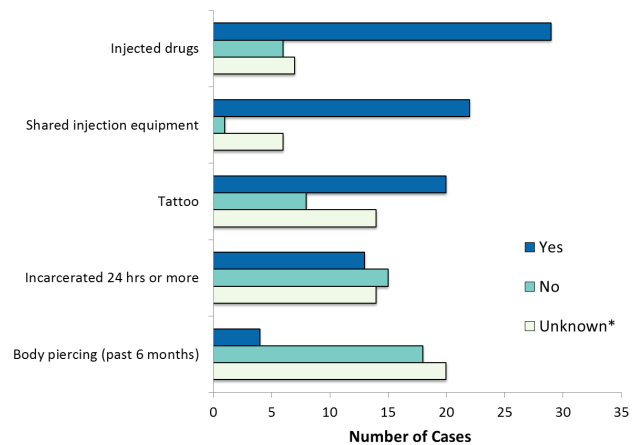
Cluster Investigation: Rural Wisconsin

The growing burden of HCV in rural areas has been noted in Wisconsin since 2010. During November 2010, the number of HCV infections among young adults in 6 neighboring rural counties in Wisconsin increased from an average of 8 per year during 2004-2008 to an average of 24 per year during 2009-2010 (CDC, 2012). This cluster was associated with sharing syringes, drug preparation equipment and illicit drugs. Use of prescription opioids before switching to injecting heroin or methamphetamine after a median of three years was reported. This transition from prescription opioids to injection drug use has been recognized nationally as contributing to the burden of HCV in rural areas.

Information from Acute Hepatitis C Infections

Among 42 acute HCV infections detected in Wisconsin in 2013, 29 (69%) were associated with injection drug use (Figure 1). Most with a reported acute HCV infection reported multiple risk factors.

Figure 1: Acute HCV Reports, by Risk Behavior, Wisconsin 2013



Note: A total of 42 case reports of acute hepatitis C were received in 2013. More than one risk behavior may be indicated on each case report. *Risk data not reported.

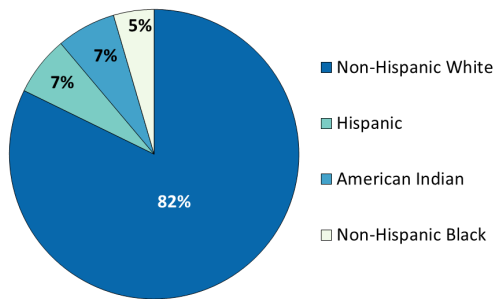
Rapid Testing Pilot

Beginning in October 2012, the Wisconsin Division of Public Health (WDPH), in partnership with community organizations, used rapid HCV tests to test persons at increased risk for HCV infection (Stockman, 2014).

Of PWID with HCV infection, 88% reported injection drug use within six months prior to testing. Eighty-five percent reported sharing injection equipment and the average number of persons in their injection networks was six people.

Persons who inject drugs and have HCV infection were more often male (54%) than female (45%) and most were Non-Hispanic white (82%), Figure 2. While American Indians comprised less than 1% of Wisconsin population in 2012, 7% of PWID infected with HCV were American Indian.

Figure 2: Race and Ethnicity of HCV Positive Persons with Injection Drug Use, Wisconsin Rapid Testing Data, 2012-2013

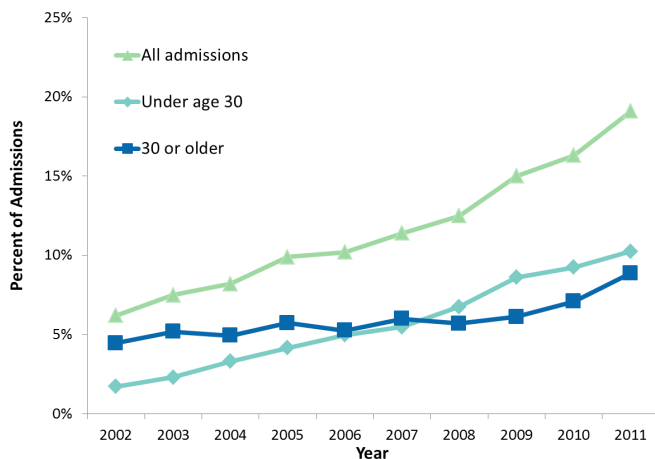


While it is possible that the location of outreach sites that offered the rapid HCV test may account for differences in detection in American Indians, a greater incidence of HCV infection has been observed in American Indians on a national scale (Rempel 2012; Byrd 2011).

Wisconsin Behavioral Data

In a statewide survey of those treated for substance abuse in Wisconsin, one quarter of people who used heroin in Wisconsin were younger than 25 years old when they began using (Source: Treatment Episodes Data Set). Publicly funded substance abuse treatment episodes for heroin continually increased between 2001 and 2011.

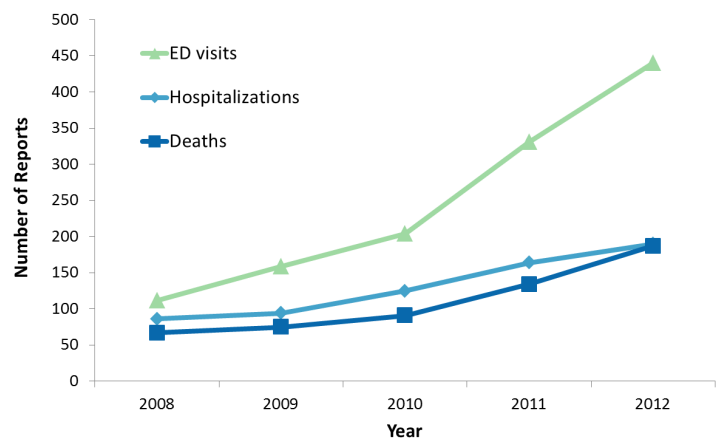
Figure 3: Percent of Admissions who Reported Heroin or Opiates as Substances of Abuse at Time of Admission, by Age, Wisconsin, 2002-2011



Since 2007, more substance abuse treatment episodes were provided for those younger than age 30 than those older than age 30.

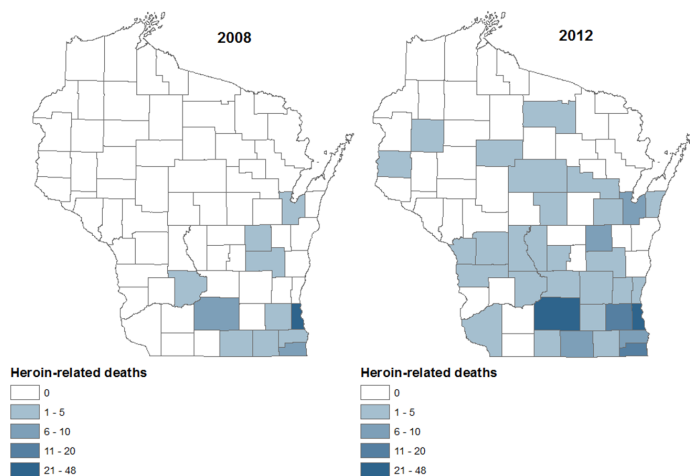
In Wisconsin, deaths and medical visits associated with heroin use increased substantially in recent years. The number of deaths from heroin overdose has more than doubled between 2008 (n=67) and 2012 (n=187) (Figure 4). In 2012, heroin overdoses resulted in 190 hospitalizations (3.5 per 100,000) and 440 emergency department visits (8.1 per 100,000). The rate of heroin overdose in 2012 was highest among those aged 15-24 years.

Figure 4: Number of Heroin Overdoses and Deaths in Wisconsin, 2008-2012



In the past five years, the number of heroin-related deaths have increased across Wisconsin. Heroin-deaths in rural areas now account for a significant proportion of all heroin-related deaths in the state (Figure 5).

Figure 5: Heroin-related Deaths in Wisconsin, 2008-2012



Source: Wisconsin resident death certificates; Department of Health Services, Division of Public Health, Office of Health Informatics. For details, see Technical Notes, page 32.

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Corrections

Two adult (Dodge Correctional, Taycheedah Correctional) and one male juvenile (Lincoln Hills) state correctional systems exist in Wisconsin, all of which offer HCV screening to those who admit to past risk or have met other medical criteria.

In Wisconsin, the amount of risk-based testing for HCV in correctional facilities has increased (Table 1). The percentage positive in Taycheedah, a facility admitting only women, is higher than the percentage positive in Dodge, a facility admitting only men (25% vs. 16%), and has increased in 2013 compared to the previous five-year average.

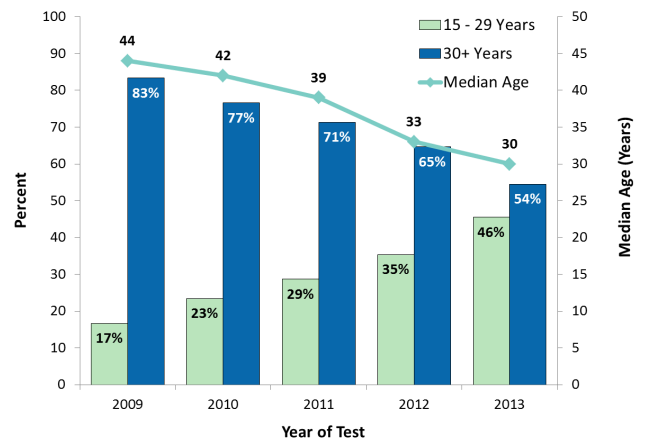
Table 1: HCV Risk-Based Admissions Screening at Correctional Facilities, Wisconsin 2008-2013

	2008-2012	2013
Facility	Average EIA Tests (% Positive)	Total EIA Tests (% Positive)
Dodge Correctional	1,289 (17%)	1,671 (16%)
Taycheedah Correctional	358 (20%)	434 (25%)
Lincoln Hills School	5 (4%)	20 (5%)

Lincoln Hills, the juvenile correctional system, saw a four-fold increase in the amount of risk-based testing for inmates under the age of 18 in 2013.

The composition of HCV infections reported from the incarcerated population is changing (Figure 1). The median age of people with HCV infection reported from the Department of Corrections in 2013 was 14 years younger (median age, 30) than it was in 2009 (median age, 44).

Figure 1: HCV Infections Reported by the Department of Corrections, by Age, 2009-2013



American Community Survey (ACS) are data relating to median income, poverty, and insurance from the 2008-2012 5-Year American Community Survey that is administered by the U.S Census Bureau. Median income is the household median income in the past 12 months (in 2012 inflation adjusted dollars). Percent poverty refers to all people in the county whose income in the past 12 months was below the federal poverty level. Insurance status refers to all non-institutionalized citizens.

Wisconsin Electronic Disease Surveillance System (WEDSS) is a secure, web-based system established in 2007, designed to facilitate reporting, investigation, and surveillance of communicable diseases in Wisconsin. HCV infection is a reportable communicable disease by Wisconsin administrative rule (DHS 145). WEDSS includes reports from all jurisdictions and the Department of Corrections in Wisconsin. Reports of HCV infection are submitted by local public health staff, infection control practitioners, clinical laboratories, clinics, and other disease reporters. HCV case numbers in WEDSS may vary depending on the date the data were accessed, as WEDSS is not a static database and cases can be updated daily. This profile includes reports of probable and confirmed past, present or acute HCV infection ([See Case Definitions](#)) reported as of 3/31/2014. Cases are counted by year of first positive HCV test.

Organ Procurement and Transplantation Network (OPTN) is administered by the United Network for Organ Sharing (UNOS) under contract with the U.S. Department of Health and Human Services (HHS). The OPTN database contains pre-transplant information that pertains to transplant candidates. Much of the data are collected via electronic data collection forms. Liver data used in this profile was collected at the time of recipient registration and includes transplant date, patient description (at time

of transplant), and recipient's primary liver disease. Data are not static and are subject to change on data submission and corrections. Data presented is based on data accessed on 4/7/2014.

HCV-Specific Liver Transplants are HCV-related liver transplants via the United Network for Organ Sharing (UNOS) based on a previous definition (Gasiorowicz M, et al. Epidemiologic trends in infection, mortality, and transplants related to hepatitis C in Wisconsin. Wisconsin Medical Journal. 2006; 105(1):34-39) and included the diagnoses of acute hepatitis necrosis: type C, cirrhosis type C, cirrhosis type B and C, cirrhosis: chronic active hepatitis: etiology unknown, and alcoholic cirrhosis with hepatitis C.

Hepatitis C Virus Protease Inhibitor Prescriber Data were provided to collaborators by the Insurance Management Services Institute for Healthcare Informatics. Data represent prescribers in Wisconsin who wrote one or more prescriptions for a direct-acting antiviral for HCV, Incivek (telaprevir) or Victrelis (boceprevir), to a retail store or for mail-order in 2012. The data exclude prescriptions written at the Veterans Health Administration hospitals, as well as prescriptions for other HCV-related drugs, including interferon or nucleoside analogs (i.e., ribavirin). Data are provided for the prescriber's primary business address only, and may not reflect true location of HCV treatment.

Substance Abuse and Mental Health Services Administration (SAMHSA) and Treatment Episode Data Set (TEDS) is maintained by the Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration (SAMHSA). The TEDS system includes records for some 1.5 million substance abuse treatment admissions annually. In this profile, data include the percent of admissions in those over the age of 12, who reported heroin or other opiates as a primary,

secondary, or tertiary substance of abuse at time of admission. TEDS is an admission-based system, and TEDS admissions do not represent individuals. Treatment facilities include those in Wisconsin that are required to report to the state because they receive public funds or are licensed and certified by the state substance abuse agency. "Opiate abuse" refers to all opiates and synthetics other than heroin, including buprenorphine, codeine, hydrocodone, hydromorphone, meperidine, morphine, opium, oxycodone, pentazocine, propoxyphene, tramadol, and any other drug with morphine-like effects.

Wisconsin Interactive Statistics on Health (WISH)

provides information about health indicators (measures of health) in Wisconsin. Data are prepared by the Department of Health Services, Division of Public Health, Office of Health Informatics and accessible at <http://www.dhs.wisconsin.gov/wish/>. WISH uses protected databases containing Wisconsin data from a variety of sources. In this profile, WISH data and estimates available through 2012 were used to describe the demographic characteristics of Wisconsin and for population denominators to calculate rates.

Wisconsin hospital inpatient discharge data are reported quarterly by Wisconsin hospitals as required by Wisconsin statute and administrative code. Reportable hospital inpatients are all of those discharged from any of Wisconsin's acute care, non-federal hospitals. Each submitted record contains patient demographic data, admission and discharge data, charge and payer data, and ICD-9 CM-coded diagnostic and procedure information.

In this profile, hospitalizations considered related to conditions of interest include an ICD-9 code in any of nine discharge diagnosis positions (principal or contributing cause of hospitalization). Data are dependent on ICD-9 codes to indicate an HCV-related hospitalization. There may be systematic variations from hospital to hospital in the thoroughness and quality of medical records coding, depending on the resources of each hospital devoted to that area. Data

exclude emergency department visits or records from any of the three Veterans Health Administration hospitals in Wisconsin. Some areas of Wisconsin are routinely served by hospitals located in neighboring states, particularly along the western border. Hospitalizations of those patients do not appear in this data system.

Definition of hospitalizations related to disease

The following ICD-9 codes were used to define hospitalizations in Wisconsin during 1/1/2003 – 12/31/2012: Hepatitis B: 070.2, 070.3. Hepatitis C: 070.41, 070.44, 070.51, 070.54, 070.70, 070.71. HIV: 042, V08, 079.53. Heroin overdose: 965.01, E-code of E850.0.

Hospital charges

For a more specific estimate of hospital charges related to a disease, only inpatient discharges with a disease-related code in the principal diagnostic position were included in this profile. Hospital charges represent the total facility charges for the entire length of stay and not the actual reimbursement paid by any particular payer. Charges are the hospital's facility-based charges and do not include professional fees, outpatient care, medical equipment, etc.

Underlying conditions with Hepatitis C Virus infection

Liver disease (ICD-9 codes: 571, 155), alcohol abuse (ICD-9 codes: 303, 305.0), injection drug abuse (ICD-9 codes: 304.0, 304.7, 305.5) and HIV infection (ICD-9 codes: 042, V08, 079.53) were defined as an underlying condition when an ICD-9 code for the condition was present in any position of the same discharge record as an HCV-specific code.

Diagnostic categories

The Major Diagnostic Category is assigned by dividing all ICD-9 codes listed in the primary diagnosis field into 25 mutually exclusive diagnosis areas. These codes are typically used for medical care reimbursement systems in the United States.

Wisconsin Vital Records - The Office of Health

Informatics, State Vital Records Office, provided analysis files containing identifying elements from the 2000-2011 Wisconsin death record files. The disease of interest was identified by ICD-10 code as either the underlying cause of death (first listed code) or a contributing cause of death (up to 20 codes may be listed). This profile used the following ICD-10 codes to identify disease-related deaths: Hepatitis A: B15, Hepatitis B: B16, B17.0, B18.0, B18.1 Hepatitis C: B17.1, B18.2 Viral hepatitis: B15 – B19 HIV: B20 – B24. Heroin-related deaths were identified by an underlying cause of death of: X40-44, X60-64, X85, Y10-Y14 (drug poisoning) with T40.1 (heroin overdose) as a contributing cause.

reported as mutually exclusive in HCV and HIV surveillance data.

Maps were created with GIS ArcMap 10.1. HCV cases or rates of HCV cases are displayed by county of residence. Reports from the Department of Corrections and the Federal Correctional Institution are not shown as these reports would inflate the number of cases residing in the county of the correctional facility.

HIV and HCV Co-Infected individuals were determined by a match of the Wisconsin HCV surveillance database (WEDSS) to the Wisconsin electronic HIV and AIDS reporting system (eHARS). All reports of HCV infection as of 3/10/2014 were matched to all HIV reports in eHARS as of 3/10/2014. Matches were based on a unique variable created by date of birth, last name and soundex of first name. Persons with at least one infection reported in both surveillance systems were determined to be HIV/HCV co-infected. Persons with co-infection are described using the information (demographics and transmission risk) reported in eHARS.

Heroin overdose - Hospitalizations and emergency department visits with a diagnosis code of 965.01 in any diagnostic position or E-code of E850.0 were included. Deaths of Wisconsin residents were identified by an underlying cause of death of: X40-44, X60-64, X85, Y10-Y14 (drug poisoning) with T40.1 (heroin overdose) as a contributing cause.

Race and Ethnicity - Hispanic ethnicity and race are

Additional Resources

Wisconsin HCV and HIV Programs

- Wisconsin Hepatitis C Program:
<http://www.dhs.wisconsin.gov/communicable/ViralHepatitis/HepC/HepCProgram.htm>
- Wisconsin HCV Statistical Reports:
<http://www.dhs.wisconsin.gov/communicable/ViralHepatitis/HepC/HepCStatistics.htm>
- Wisconsin AIDS/HIV Program:
<http://www.dhs.wisconsin.gov/aids-hiv/>
- Wisconsin AIDS/HIV Statistics & Reports:
<http://www.dhs.wisconsin.gov/aids-hiv/Stats/index.htm>
- Notes from the Field: HCV Infections Among Young Adults – Rural Wisconsin, 2010:
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6119a7.htm>
- Rapid Hepatitis C Testing Among Persons at Increased Risk for Infection—Wisconsin, 2012-2013
http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6314a3.htm?s_cid=mm6314a3_e
- Healthiest Wisconsin 202 Baseline and Health Disparities Report:
<http://www.dhs.wisconsin.gov/hw2020/hw2020baselinereport.htm>

General HCV Epidemiology, Diagnosis, and Treatment

- CDC General Viral Hepatitis Information:
<http://www.cdc.gov/HEPATITIS/>
- CDC Hepatitis C information for the Public:
<http://www.cdc.gov/hepatitis/C/index.htm>
- CDC Hepatitis C Information for Health Professionals:
<http://www.cdc.gov/hepatitis/HCV/index.htm>
- CDC Recommendations for the Identification of Chronic HCV Infection Among Persons Born During 1945-1965:
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6104a1.htm?s_cid=rr6104a1_w
- Combating the Silent Epidemic of Viral Hepatitis: HCV Infection in Young PWID:
<http://aids.gov/pdf/hcv-and-young-pwid-consultation-report.pdf>

- Viral Hepatitis for Veterans and the Public:
<http://www.hepatitis.va.gov/patient/index.asp>
- NASTAD Viral Hepatitis Resources:
http://www.nastad.org/viral_hepatitis/default.aspx

HCV and Heroin Outreach, Treatment and Harm Reduction Sources

- Wisconsin's Heroin Epidemic: Strategies and Solutions:
<http://uat.scaoda.state.wi.us/docs/main/SCAODAHeroinReportFinal063014.pdf>
- Wisconsin Department of Justice Fly Effect Heroin Prevention Campaign:
<http://www.doj.state.wi.us/dci/heroin-awareness/a-dangerous-epidemic>
<http://www.theflyeffect.com/>
- Wisconsin HIV/STD/Hepatitis C Information and Referral Center:
<http://www.irc-wisconsin.org/>
- 911 Good Samaritan Recommendations: Analysis and Recommendations for Reducing Drug-Related Overdoses in Wisconsin:
<http://www.scaoda.state.wi.us/docs/911GSL/GoodSamFINAL081213.pdf>
- Reducing Wisconsin's Prescription Drug Abuse: A Call to Action:
<http://scaoda.state.wi.us/docs/prevandspfsig/FINAL01032012CSWReport.pdf>
- Substance Abuse & Mental Health Behavioral Health Treatment Facility Locator:
<http://findtreatment.samhsa.gov/>
- Harm Reduction International:
<http://www.ihra.net/>

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