Indiana
Hepatitis C Epidemiologic Profile
2015

Indiana State Department of Health

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Executive Summary

The Indiana State Department of Health (ISDH) receives reports of hepatitis C (HCV) cases through the Indiana National Electronic Disease Surveillance System (I-NEDSS). These reports are submitted as electronic reports, communicable disease reports from healthcare providers, and case investigations from local health departments. Data collected through I-NEDSS, the Enhanced HIV/AIDS Reporting System (eHARS), U.S. Census Bureau, and the Substance Abuse and Mental Health Services Administration (SAMHSA), among a variety of other data sources were used to develop the 2015 Hepatitis C Epidemiologic Profile. The goals of this profile are to provide a description of HCV in the Indiana general population and those who are living with or at high risk for HCV. The primary users of this profile are able to utilize this information to increase general community awareness of HCV, disseminate HCV data, frame research and evaluation questions, apply for and receive HCV funding, project future needs for prevention and care, and guide policy.

As detailed in the Communicable Disease Reporting Rule, Title 410, Article 1, Rule 2.5 of the Indiana Administrative Code, the ISDH requires hospitals, healthcare providers and laboratories to provide prompt reporting of all positive hepatitis B Virus (HBV) and HCV serologic results to the local health department or the ISDH for both acute and chronic cases. Hospitals, healthcare providers and laboratories must report their findings within 5 days. Laboratory reporting enables identification of asymptomatic persons infected with the virus, as well as those displaying symptoms. The ISDH uses the Council for State and Territorial Epidemiologists (CSTE) case definitions to standardize the classification of an individual as a case based on clinical features and laboratory findings.

Summary of the Indiana Hepatitis C Epidemiologic Profile 2015:

- The number of acute HCV cases in Indiana increased by 400% from 28 in 2010 to 140 in 2015.
- While nationwide blacks are disproportionately affected by HCV, in Indiana rates for blacks are 91% lower (64.7 per 100,000) compared to whites (756.9 per 100,000). No acute HCV cases were reported among blacks in 2015.
- People 18-29 and 30-39 years old exhibit the largest change in HCV cases from 2010-2015, both increasing from 17% in 2010 to 33% and 24%, respectively, in 2015. Increases in these age groups mirror national trends with the increase in the opioid and heroin epidemic among people of these ages.
- People who inject drugs (PWID), particularly those who share syringes and injection equipment, are the leading risk factor among both acute and chronic HCV cases in Indiana and increased since 2010. In 2015, among cases of HCV who provided risk factor information during the case investigation, 30% acknowledged injection drug use, an increase of 18% from 2010.
- Indiana saw an 80% increase in the number of non-fatal emergency department visits due opioids and a 17% increase in the number deaths involving any opioid from 2010-2015.
- A total of 1,308 Indiana residents died from HCV as the underlying cause of death from 1999-2014, with an average of 82 deaths per year. While the overall number of deaths due to HCV are generally lower than human immunodeficiency virus (HIV), 2010 marked the first year that HCV deaths outnumbered those from HIV.
- In Indiana, 8.6% of people testing positive for HIV are co-infected with HCV. Among those co-infected in Indiana, 34% report injection drug use, compared with the national average of 75%. In contrast, in the Scott County outbreak, 97.1% of cases reported injection drug use.

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Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ACS	American Community Survey
ANTI-HCV	Hepatitis C Virus Antibody
CDC	Centers for Disease Control and Prevention
CSTE	Council for State and Territorial Epidemiologists
DAA	Direct Acting Antivirals
DOC	Department of Corrections
eHARS	Enhanced HIV/AIDS Reporting System
HCC	Hepatocellular Carcinoma
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
I-NEDSS	Indiana National Electronic Disease Surveillance System
ISDH	Indiana State Department of Health
NVHR	National Viral Hepatitis Roundtable
PWID	People Who Inject Drugs
SAHIE	Small Area Health Insurance Estimates
SAIPE	Small Area Income and Poverty Estimates
SEA	Senate Enrolled Act
SNAP	Supplemental Nutrition Assistance Program
SPSP	Special Populations Support Program
SSP	Syringe Services Program
SVR	Sustained Viral Response

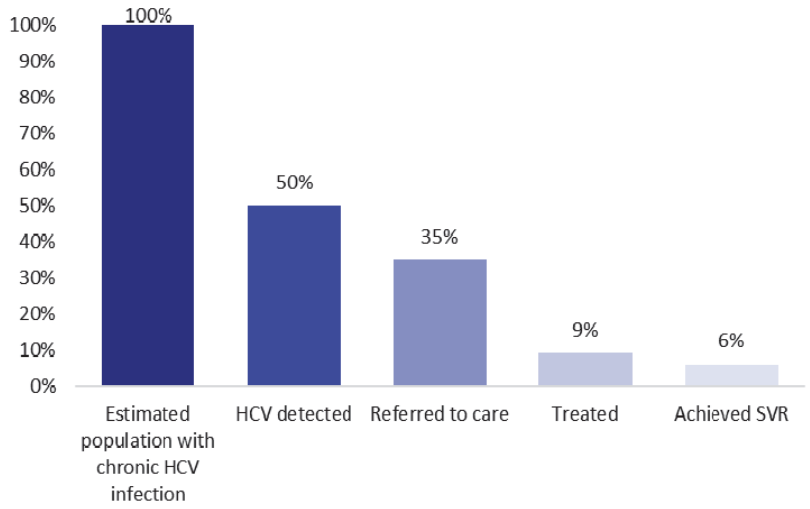
Introduction

Prevalence of HCV in the general United States population is approximately 1%, with an estimated 3.2 million Americans chronically infected (Armstrong et al., 2006; Beckman et al., 2016). In 2013, more people died of HCV in the United States than 60 other nationally notifiable diseases combined, including HIV, pneumococcal disease, and tuberculosis (Ly, Hughes, Jiles, & Holmberg, 2016). At the time of infection, the majority of people will experience no symptoms, with 75%-85% developing chronic infections. About half of those infected with HCV are not diagnosed or even aware of their infections (Denniston et al., 2014). Over a period of 20-30 years, approximately 5%-20% will develop cirrhosis. Ultimately 1%-5% will die from liver cancer or cirrhosis as a consequence of the infection (CDC, 2016a). On average, those patients with HCV infection die 22-23 years prematurely compared to those without HCV (Ly, Xing, Klevens, Jiles, & Holmberg, 2014). It is not clearly understood why 15%-25% of those infected spontaneously clear the virus (CDC, 2016a, 2016e). Symptoms, if present, can be mild to severe and include fever, fatigue, abdominal pain, dark urine, clay-colored bowel movements, nausea, vomiting and jaundice (Figure 1). Infection with HCV is the most common reason for needing a liver transplant (Seeff, 2002).

Figure 1. Signs and symptoms of hepatitis C.

Prior to the implementation of universal antibody screening of blood donors in 1992, most HCV infections were acquired through medical procedures – including blood, tissue, and organ donations. These sources of infection account for an estimated 3 million baby boomers with chronic HCV. Today the predominant route of exposure is the sharing of injection drug use equipment, mainly syringes. Other high-risk groups include healthcare workers, infants born to infected mothers (via perinatal exposure), people who get tattoos and body piercings, and, in rarer instances, those who have sexual contact with someone who is already infected (CDC, 2016b). While treatment for HCV is considered highly effective with direct acting antiviral (DAA) medications, it is estimated that only 7%-11% of cases nationwide are treated (Figure 2) (Holmberg, Spradling, Moorman, & Denniston, 2013). These low treatment rates mean that long-term mortality and morbidity from HCV will continue to rise. In addition to the long-term health effects from HCV, the economic costs associated with HCV are staggering. It is estimated that the average lifetime cost for HCV (without liver transplant) exceeds $205,000 per patient and the annual healthcare cost will be as high as $9 billion annually by the year 2024 (Razavi et al., 2013).

Figure 2. Cascade of care for those infected with hepatitis C (HCV). Adapted from Holmberg, et al., 2013.



Indiana Sociodemographic Characteristics

Population, Age, and Sex Distribution

In 2015, the U.S. Census Bureau estimated that Indiana ranked 16th nationally in population. Its capital and largest city is Indianapolis. According to the U.S Census, the estimated population in Indiana in 2015 was 6,619,680, up 2.1% from 2010. The most populated counties are located in the northern and central parts of the state (Figure 1). Whites comprise the majority of the population at 85.8%, followed by blacks at 9.6%. Hispanics make up 6.7% of the population. The most populated county in Indiana is Marion, with a population of 939,020, and the least populated is Ohio County, with 5,938 people. Thirty-eight counties in Indiana have fewer than 30,000 people, while 17 counties contain over 100,000 people. In 2015, females outnumbered males (50.7% vs. 49.3%) (Table 1). There is a 20-year difference in county median age (ranging from 28.1 to 48.1) (Figure 2). As the population ages, the female-to-male ratio increases, where it is the highest in ages 85 and older (ratio of 1:2.03 compared to the average 1:1.03) (Figure 3).

Figure 1. Population of Indiana by county, 2015.

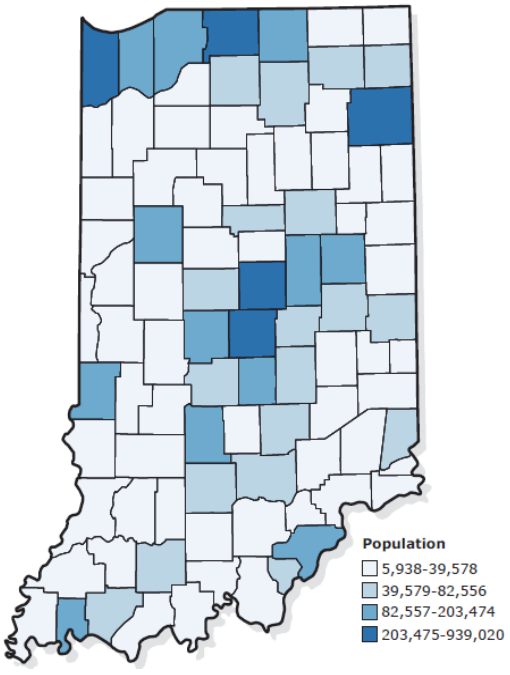


Table 1. Population in Indiana and United States by gender, ethnicity, race, and age, 2015.

	Indiana		United States	
	Number (n)	Percent (%)	Number (n)	Percent (%)
Gender				
Female	3,357,815	50.7	163,189,523	50.8
Male	3,261,865	49.3	158,229,297	49.2
Ethnicity				
Non-Hispanic	6,177,771	93.3	264,826,027	82.4
Hispanic	441,909	6.7	56,592,793	17.6
Race*				
White	5,681,607	85.8	247,784,609	77.1
Black	636,646	9.6	42,632,530	13.3
Asian	141,740	2.1	17,982,195	5.6
Other**	159,687	2.4	13,019,486	4.1
Age (years)				
0-14	1,304,430	19.7	61,016,787	19.0
15-29	1,369,587	20.7	66,309,770	20.6
30-49	1,663,530	25.1	83,119,275	25.9
50-79	2,037,181	30.8	98,886,486	30.8
≥80	244,952	3.7	12,086,502	3.8
Median Age	37.5		37.8	
Total	6,619,680		321,418,820	

* Race is defined by Census (see Technical Notes for more information).
**Includes two more races.

Figure 2. Median age of Indiana residents by county, 2015.

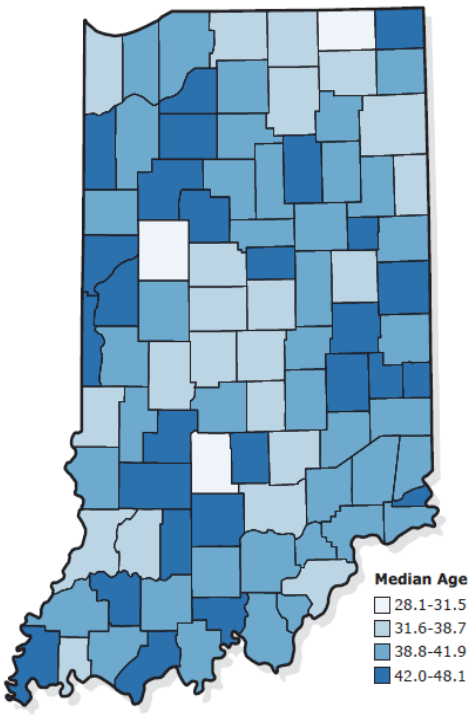
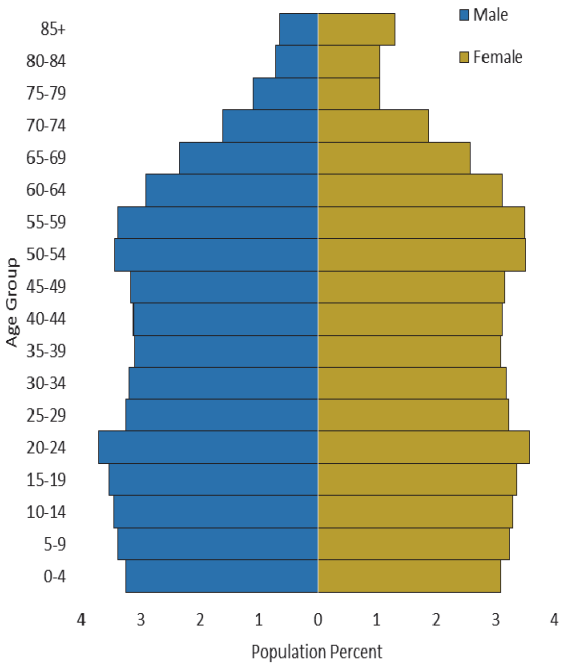


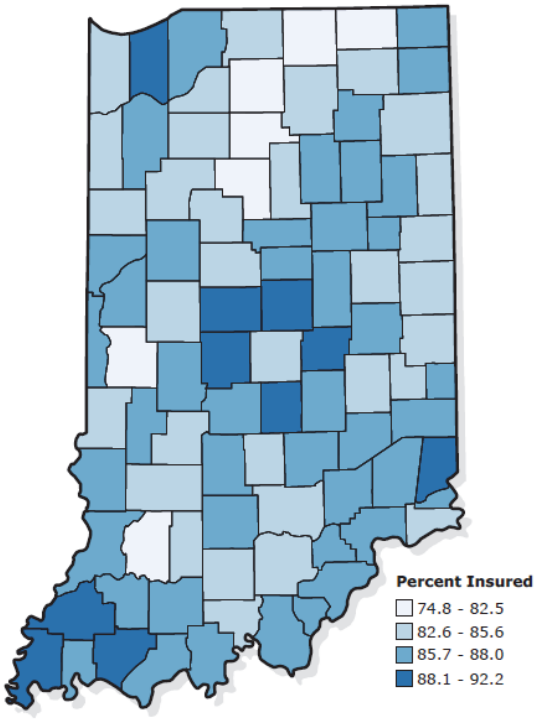
Figure 3. Age and gender of Indiana Residents, 2015.



Income and Insurance

The median household income in Indiana in 2015 was an estimated $50,532, somewhat lower than the national average of $55,775. The population percentage with health insurance ranges from 74.8%-92.2% (Figure 4). The highest rates of health insurance coverage are in central and southwest Indiana. Approximately 14.5% of all Indiana residents live below the poverty level, with county levels ranging from a low of 4.9% to a high of 24% (Figure 5).

Figure 4. Percent of Indiana residents (age under 65) with health insurance by county, 2014.



Urban and Rural

Of the 92 counties in Indiana, 68 are considered rural and 24 urban (Figure 6) (see Technical Notes for classification methodology). The majority of the urban counties are located in central Indiana, surrounding the capital, Indianapolis, and in the northwest near the border of Illinois and Michigan. Rural populations typically have less access to mental and physical healthcare compared to urban populations. Those living in rural areas often have to travel longer distances for healthcare visits, as there is a chronic shortage of rural healthcare providers. Additionally, rural youth are more likely to engage in risky behaviors such as smoking (NRHA, 2016). Populations in urban Indiana counties are on average 10 years younger and more racially diverse than rural counties (Table 3).

Figure 5. Poverty rate of Indiana residents by county, 2014.

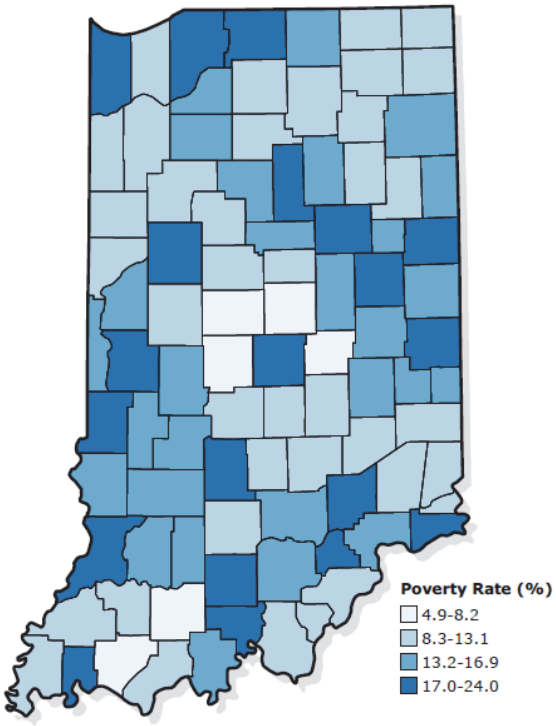


Figure 6. Indiana urban and rural county designations.

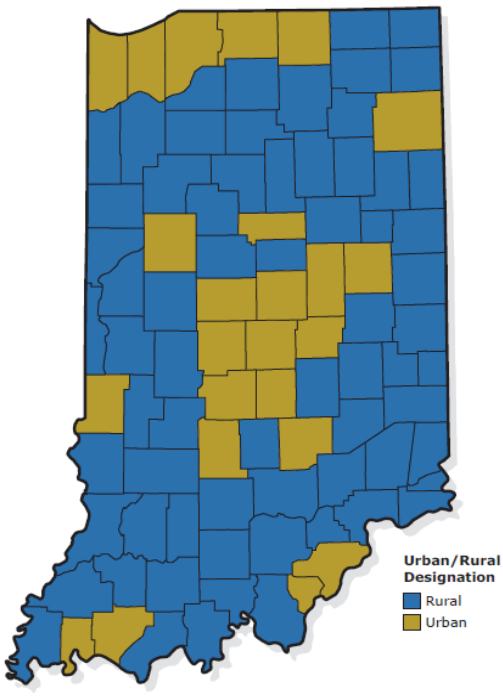


Table 3. Select demographic and economic indicators for urban and rural Indiana counties, 2014 (U.S. Census Bureau Small Area Income and Poverty Estimate (SAIPE)).

	Rural (n=68)		Urban (n=24)	
	Min	Max	Min	Max
Median Income	$38,663	$59,975	$39,449	$89,861
Percent Poverty	8.0	20.0	4.9	24.0
Median Age	31.5	48.1	28.1	41.6
Percent White	89.0	98.0	65.8	97.5
Percent Insured	74.8	90.9	80.7	92.2

Hepatitis C in Indiana

Indiana has an estimated 81,538 antibody HCV (anti-HCV) positive persons (National Viral Hepatitis Roundtable, 2016). Surveillance data indicate approximately 54,479 anti-HCV positive individuals have been identified, signifying that 33% of those infected are unaware of their infection. Incidence of acute and chronic cases has increased 21.2% from 5,890 in 2010 to 7,144 in 2015, with an average of 6,050 new cases per year (Figure 1). The number of acute HCV cases in Indiana increased by 400% from 28 in 2010 to 140 cases in 2015. It is estimated that for every one acute case diagnosed, approximately 12.3 cases go unidentified (Klevens, Liu, Roberts, Jiles, & Holmberg, 2014). Extrapolating Indiana acute cases (n=140, Table 1), an estimated 1,722 acute cases could occur in 2015 (Klevens et al., 2014).

Removing Department of Corrections (DOC) and federal penitentiary cases from counts and rates (discussed separately under Special Populations), the southeastern and east central portion of the state display the highest rates (the highest being Scott County, center of the 2015 HIV/HCV outbreak). Appendices A and B provide county-specific rates and counts for 2015. Rural counties had a higher rate compared to urban counties (109.1 per 100,000 versus 78.2 per 100,000).

Figure 1. Combined reported count and rate of reported acute and chronic hepatitis C cases, Indiana, 2010-2015.

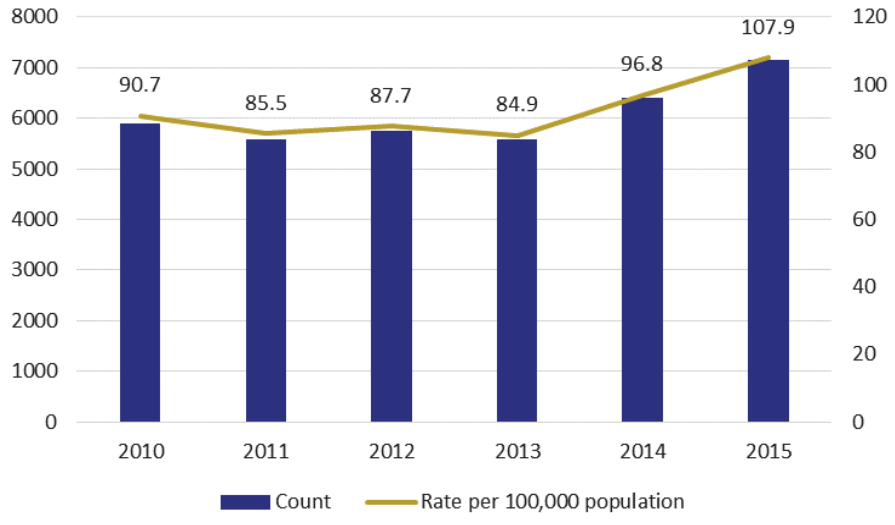


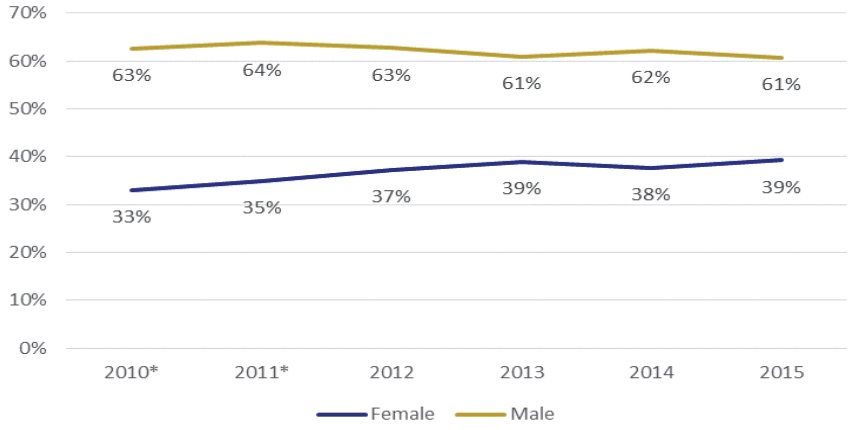
Table 1. Hepatitis C acute and chronic cases* by age, gender, ethnicity and race, Indiana, 2015.

	Acute		Chronic	
	Number (n)	Percent (%)	Number (n)	Percent (%)
Gender				
Female	66	47.1	2737	39.1
Male	74	52.9	4267	60.9
Ethnicity				
Non-Hispanic	87	62.1	4013	57.3
Hispanic	0	-	115	1.6
Unknown	53	37.9	2876	41.1
Race				
White	110	78.6	4300	61.4
Black	<5	-	412	5.9
Asian	<5	-	31	0.4
Other	<5	-	119	1.7
Unknown	26	18.6	2142	30.6
Age (years)*				
<18	<5	-	57	.81
18-29	54	38.6	2324	33.2
30-39	47	33.6	1638	23.4
40-49	20	14.3	988	14.1
50-59	17	12.1	1233	17.6
60-69	<5	-	666	9.5
70+	<5	-	94	1.3
Unknown	<5	-	4	0.1
Median Age at diagnosis	33.6		41.39	
Total	140		7004	

***Including Indiana Department of Corrections (DOC) and the Federal Penitentiary Facility located in Vigo County.**

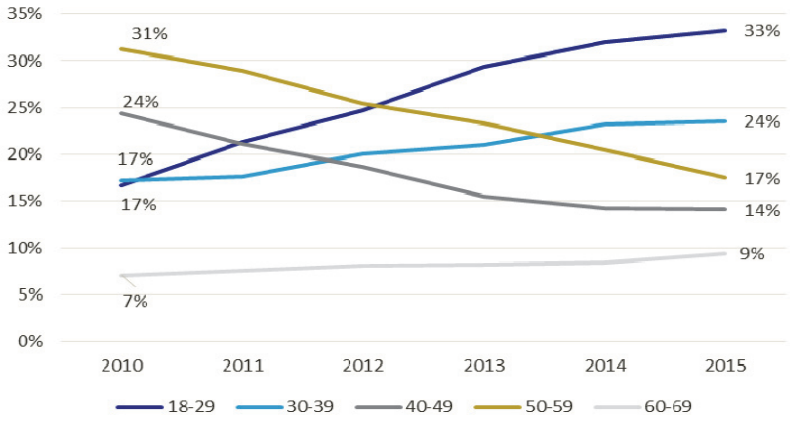
Of people newly reported to have chronic HCV cases in 2015, 61% were males and 39% were females (Table 1). Combined acute and chronic cases of males decreased slightly from 63% to 61% from 2010 to 2015 while female HCV cases increased from 33% to 39%. While nationwide blacks are disproportionately affected by HCV, in Indiana rates for blacks are 91% lower (64.7 per 100,000) compared to whites (756.9 per 100,000).

Figure 2. Combined acute and chronic cases of hepatitis C in Indiana, percent by gender, 2010-2015. *Including Indiana Department of Corrections (DOC) and the Federal Penitentiary Facility located in Vigo County.



By far, the majority of incident cases (78.6% of acute and 61.6% of chronic cases) are white. No acute cases were reported among blacks in 2015. People ages 18-29 and 30-39 exhibit the largest change in HCV cases from 2010-2015, both increasing from 17% in 2010 to 33% and 24%, respectively, in 2015 (Figure 3). Increases in these age groups mirror national trends with the increase in the opioid and heroin epidemic among people of these ages.

Figure 3. Reported acute and chronic cases of hepatitis C in Indiana, percent by age, 2010-2015.



Treatment

Treatment regimens for HCV are simpler, shorter and more effective than previous treatment. Prior to 2013, HCV infection was treated with a combination of pegylated interferon and ribavirin for a duration of up to 48 weeks. The introduction of direct-acting antivirals improved HCV treatment dramatically with higher treatment success rates. Treatment success is measured by a sustained virologic response (SVR), which is a lower than detectable viral load six months after finishing treatment.

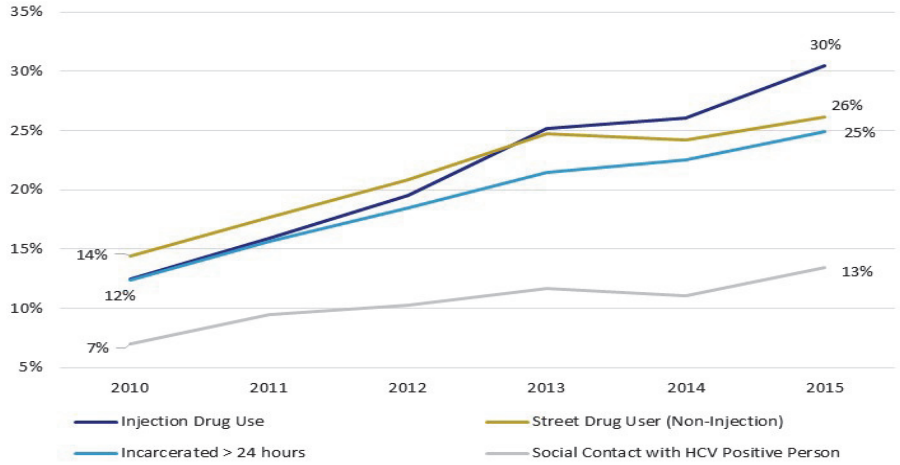
In 2014, a new treatment, Harvoni, was introduced as the first once-daily pill that does not require pegylated interferon or ribavirin. The treatment was approved for HCV treatment in those with genotype 1 infection. In clinical trials SVR was achieved for 94-100% of patients receiving treatment. In 2015, two new treatments, Daklinza and Technive, were approved to treat patients with HCV genotypes 3 and 4. Several new drugs are being developed and will be released in the near future.

Patients who have been diagnosed with HCV should be evaluated to determine the best treatment option. Specialists who work with patients with HCV include hepatologists, gastroenterologists, and infectious disease physicians. Most often, specialists care for and treat HCV, but new treatment options allow for primary care providers to care for and treat patients with HCV in consultation with a specialist.

Risk Factors

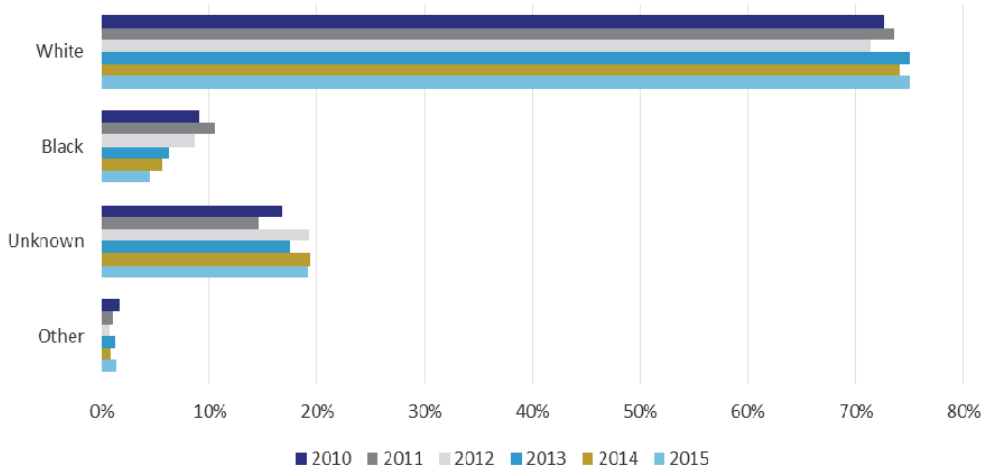
Risk factor information is collected during HCV case investigations after positive HCV test results are received through the ISDH surveillance system. Disease reports and positive lab reports are sent to the local health departments for follow-up and completion of case investigations. Due to case volume, collecting risk factor information during HCV case investigations can be challenging for local health departments. Data collected on new cases indicate an increasing rate of injection drug use among new HCV cases (both acute and chronic). This increase in HCV parallels the increase in heroin and opioid drug abuse.

Figure 1. Percent of those newly identified acute and chronic hepatitis C (HCV) cases reporting one (or more) of the top four risk factors for hepatitis C in Indiana, 2010-2015. Note: Some patients may have more than one risk factor.



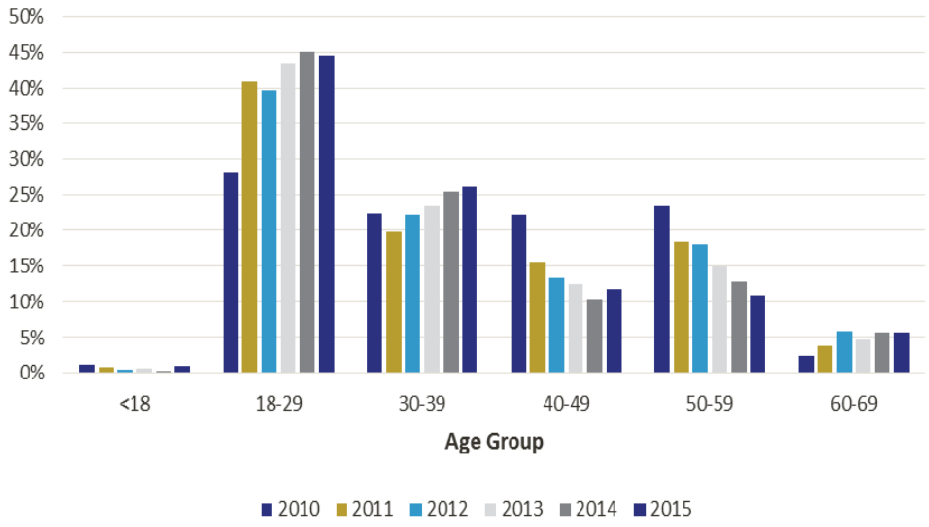
PWID, particularly those who share syringes and injection equipment, are the leading risk factor reported among both acute and chronic HCV cases in Indiana; the rate among this population has increased since 2010. In 2015, among the cases of HCV who provided risk factor information during the case investigation, 30% acknowledged injection drug use, an increase of 18% from 2010 (Figure 1). The other top reported risk factors among Indiana cases include non-injection street drug use, social contact with someone with HCV, or having been incarcerated for more than 24 hours.

Figure 2. Percent of those newly identified acute and chronic cases of hepatitis C who reported injection drug use by race, Indiana 2010-2015.



Among PWID reported on case investigations, whites account for 74% on average of cases from 2010-2015, compared with 7% for blacks (Figure 2). Consistent with the national trend of increase in heroin and opioid drug use among young adults, those aged 18-29 years had a 40% increase in reported injection drug use (Figure 3).

Figure 3. Percent of newly identified acute and chronic cases of hepatitis C who reported injection drug use by age group, Indiana 2010-2015.



Heroin and Opioids

Heroin and opioids are among the most commonly used addictive drugs, and addiction increases the risk of overdose and death. It has been reported that for every one drug overdose, there are 130 people who abuse or are dependent on drugs (Cruze, Chris, & Crystal, 2015). The National Institute on Drug Abuse states that almost 5.9% of people aged 18-25 years have reported nonmedical use of prescription pain relievers (National instutite on Drug Abuse, 2016). Injection of heroin and opioids is a public health crisis that is associated with increasing rates of HIV and HCV, as demonstrated by the 2015 Scott County, Indiana, outbreak. The development of tolerance to non-injection prescription opioids (e.g. oxycodone) leads individuals to seek drugs that are cheaper and have a greater bioavailability, such as heroin injection (National instutite on Drug Abuse, 2016). Indiana saw an 80% increase in the number of non-fatal emergency department visits due to opioids and a 17% increase in the number deaths involving any opioid (Figure 1) from 2010-2015.

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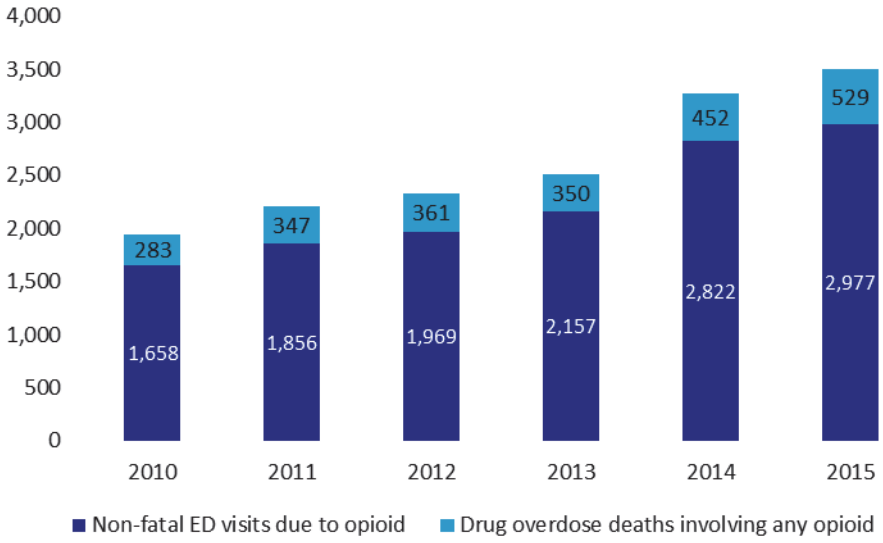
Figure 1. Drug overdose deaths involving any opioid and non-fatal emergency department visits due to opioid overdose, Indiana 2010-2015.



Mortality, Hospitalizations, and Transplant

According to the Centers for Disease Control and Prevention (CDC), the number of HCV deaths reached an all-time high in 2014 with 19,659 reported deaths nationwide (CDC, 2016b). Additionally, more people died from HCV than 60 other nationally notifiable infectious diseases, including HIV, pneumococcal disease, and tuberculosis (Ly et al., 2016). On average, patients with HCV infection die 22-23 years earlier than those without HCV (Ly et al., 2014). A total of 1,308 Indiana residents died from HCV as the underlying cause of death from 1999-2014, with an average of 82 deaths per year. While the overall number of deaths due to HCV is generally lower than HIV, 2010 marked the first year that HCV deaths outnumbered those from HIV (Figure 1). As the population with HCV continues to age, deaths from HCV are expected to rise in the coming decades. Residents who had HCV or HIV listed as a contributing cause of death were likely to have co-morbidities that include cancer, heart disease, chronic lower respiratory disease, and diabetes (Figure 2).

Figure 1. Deaths with hepatitis C (HCV), human immunodeficiency virus (HIV), or hepatitis B (HBV) as underlying cause of death, Indiana residents, 1999-2015.

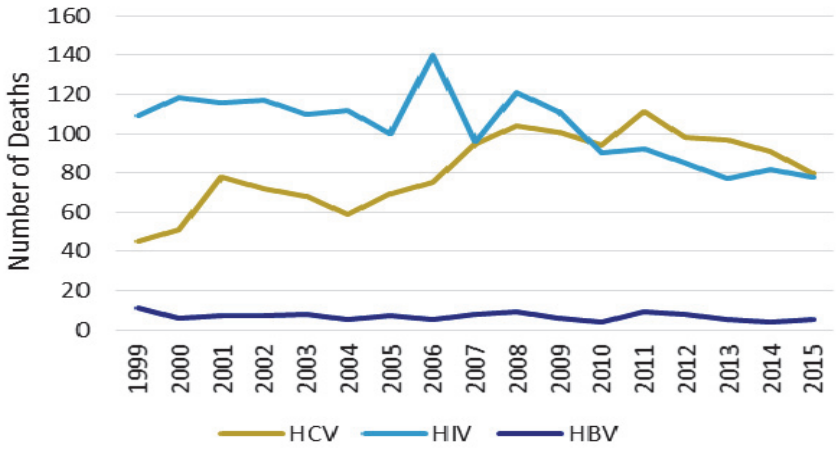
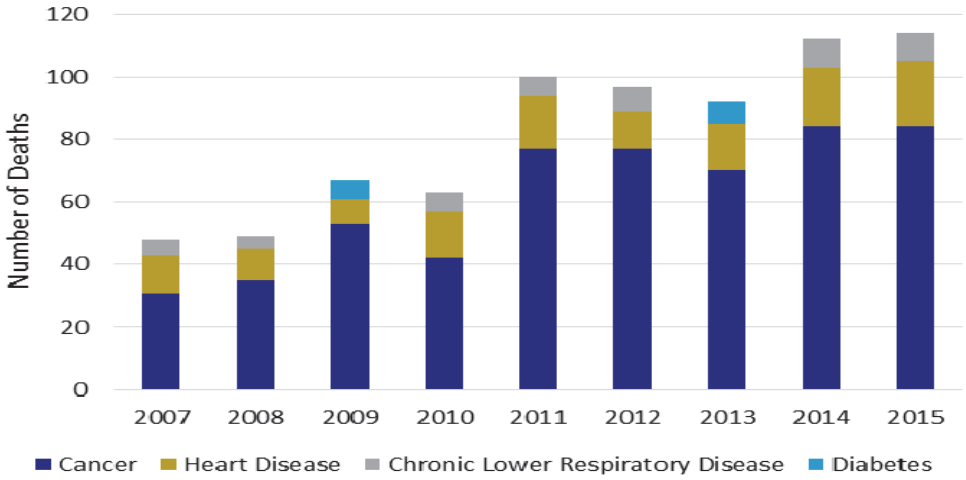
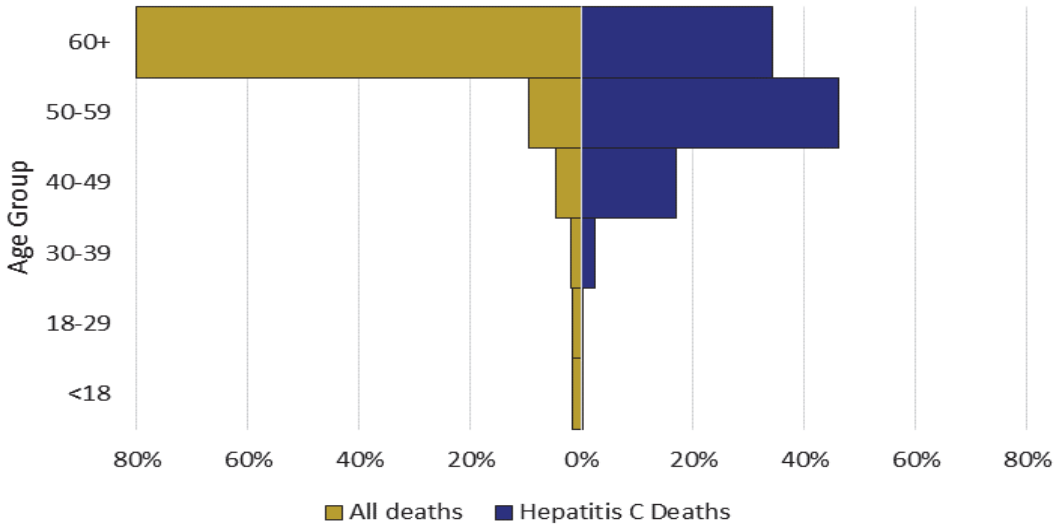


Figure 2. Top four causes of death with hepatitis C as contributing or underlying cause of death, Indiana residents, 2007-2015.



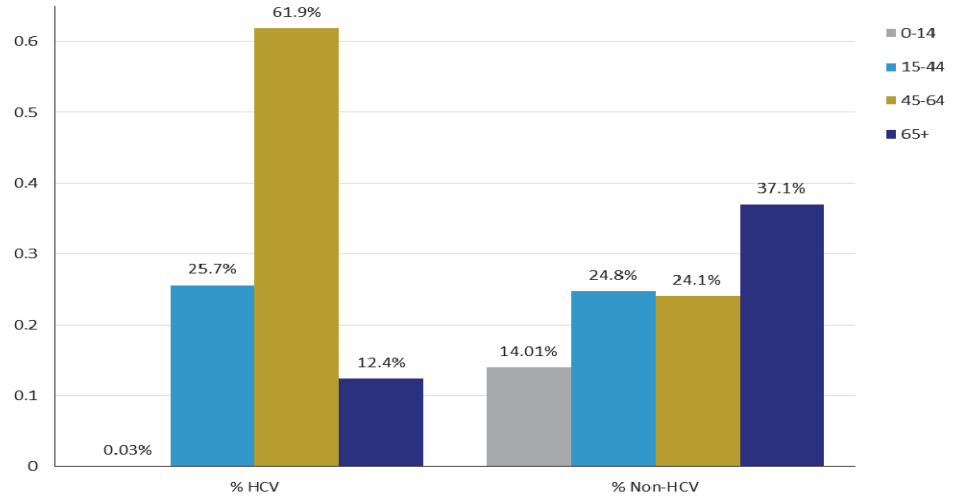
The majority of all deaths occurred in those greater than 60 years of age (80%). In contrast, most deaths with HCV as contributing or underlying cause were in the 50-59 age group (46%) (Figure 3).

Figure 3. Age distribution for all deaths and hepatitis C (underlying or contributing) deaths, Indiana residents, 1999-2015.



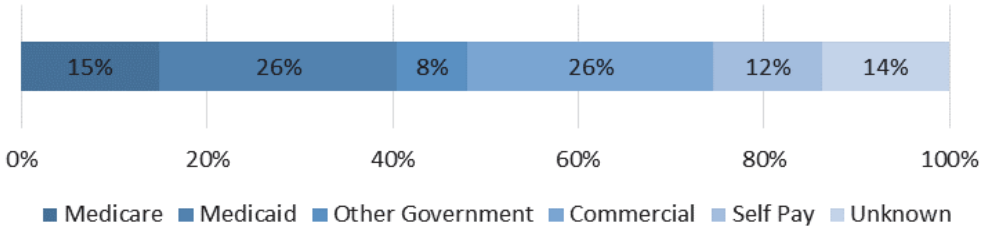
In 2015, 704,654 hospitalizations were reported among residents in Indiana, with inpatient data showing 1.3% (9,429) discharges due to HCV. Of those, 61.9% were aged 45-64 years compared with 24.1% of those hospitalized for non-HCV related causes. Those ages 65 and over accounted for 12.4% of those hospitalized with HCV (Figure 4).

Figure 4. Ages of reported hepatitis C (HCV) and non-hepatitis C (non-HCV) hospitalizations, Indiana, 2015.



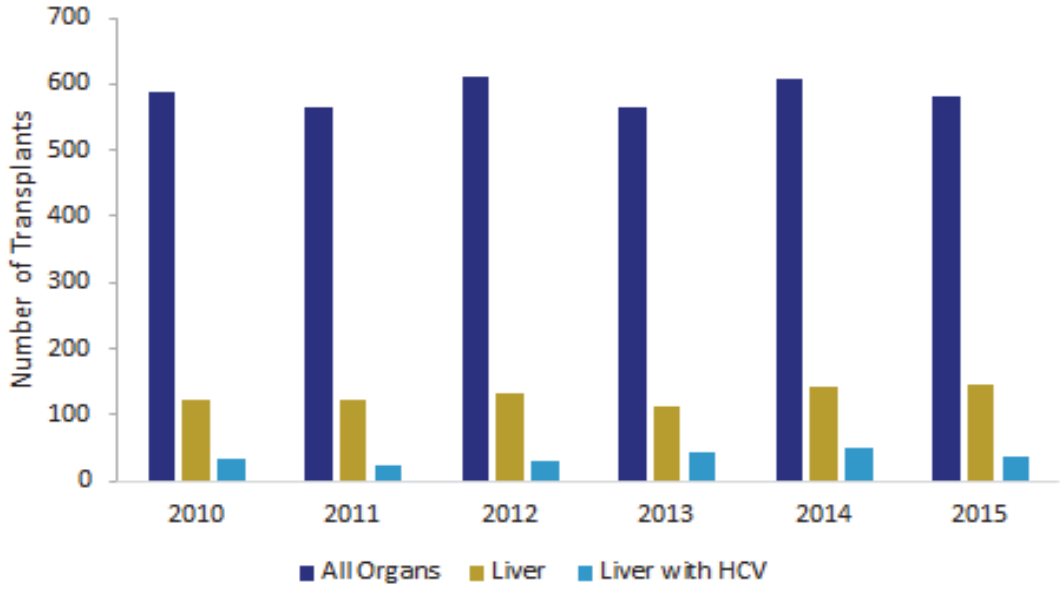
The primary payers for HCV discharges in Indiana are Medicaid and commercial insurers (each 26%) followed by Medicare (15%). Medicaid and Medicare paid for 41% of all HCV hospitalizations in Indiana in 2015 (Figure 5). With the HCV infected population aging, Medicare costs associated with HCV hospitalizations will most likely increase.

Figure 5. Primary payer for hepatitis C hospitalizations, Indiana, 2015.



HCV is known to cause an increase in adverse liver outcomes, including hepatocellular carcinoma (HCC) and cirrhosis. As a result, the potential need for liver transplant is high for patients with HCV. There are three active liver transplant centers in Indiana (Indiana University Health, Lutheran Hospital of Fort Wayne, and St. Vincent Hospital and Health) and one organ procurement organization (Indiana Donor Network). Out of an average of 130 liver transplants in Indiana per year between the years 2010-2015, 36 are for people infected with HCV (Figure 6). It is expected that as baby boomers continue to age, the need for liver transplant will continue to grow.

Figure 6. All organ, liver, and liver with hepatitis C (HCV) transplants, Indiana, 2010-2015.



HIV/HCV Co-Infections

According to CDC estimates, 25% of persons living with HIV are co-infected with HCV, and 75% of those co-infected are PWID (CDC, 2016c). HCV infection also impacts the course and management of HIV infection. As of 2015, an estimated 11,698 persons were living with HIV in Indiana (eHARS). To ascertain co-infection of HIV and HCV in Indiana, living Indiana HIV cases were matched with persons who were HCV-antibody positive in the I-NEDSS database. Indiana has a lower number of co-infections than the national average, with 8.6% of those infected with HIV being co-infected with HCV (n=1,006). Indiana cases are predominately males (79.3%), compared with Scott County cases that are nearly equally distributed among both males and females (43.5% and 56.5%, respectively) (Table 1). Thirty-four percent of HIV/HCV co-infections in Indiana report injection drug use; however, among Scott County outbreak cases, 97.1 % of cases report injection drug use.

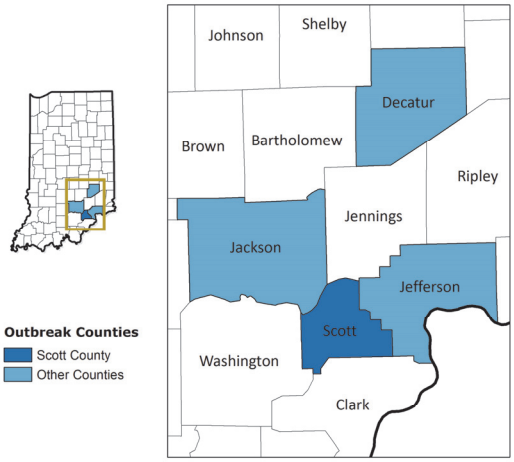
Table 1. Gender, race for HIV/HCV co-infected individuals in Indiana as of 12/31/2015.

	Indiana		Scott County Outbreak*	
	Number (n)	Percent (%)	Number (n)	Percent (%)
Gender				
Male	663	79.3	96	43.5
Female	173	20.7	74	56.5
Race				
White	429	51.3	166	97.7
Black	286	34.2	0	0.0
Asian	24	2.9	0	0.0
Hispanic (All Races)	57	6.8	<5	--
Other	40	4.8	<5	--

*Scott County outbreak counts includes Scott, Jackson, Jefferson and Decatur counties (Figure 1).

Scott County HIV/HCV Outbreak

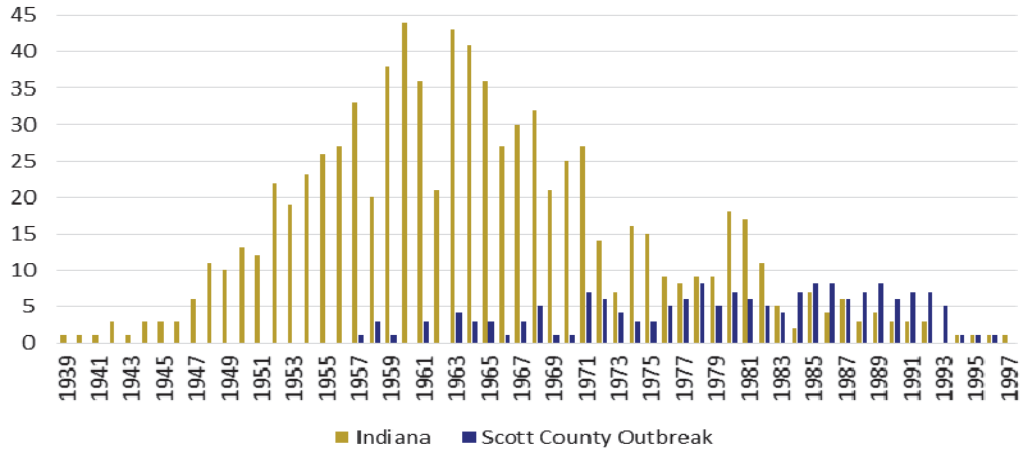
Figure 1. Indiana counties involved in the Scott County human immunodeficiency virus (HIV) outbreak.



In late 2014, the first cases of the largest outbreak of HIV in Indiana history were identified in Scott County (Figure 1). By December 31, 2015, 189 individuals had tested positive for HIV, and of those, 170 (89.9%) were co-infected with HCV. The primary risk factor identified with transmission was injection drug use. In response to the outbreak on March 26, 2015, Governor Mike Pence issued Executive Order 15-05, declaring a public health emergency in Scott County and allowing the Scott County Health Department to create a syringe services program (SSP) as part of a comprehensive disease control and prevention plan for a period of 30 days. Scott County officials opened the first legal SSP in Indiana on April 4, 2015. The Executive Order was renewed in mid-April, and Senate Enrolled Act (SEA) 461, allowing SSPs to be created in response to a public health emergency due to HIV or HCV, passed in both houses of the Indiana legislature later that month. SSPs became legal in Indiana when Governor Pence signed SEA 461 into law on May 5, 2015. In 2015, four counties in Indiana received approval to operate SSPs based on a county-wide HCV epidemic declaration (Scott, Madison, Fayette, and Monroe).

Of the total 1,006 individuals identified with HIV/HCV co-infection, 759 (75%) were male and 247 (25%) were female. Of the HIV/HCV co-infections, 59% were white and 28% were black. The county with the largest amount of HIV/HCV co-infections was Marion County (37%), followed by Scott County (12%). When examining Indiana, not including the Scott County outbreak, 51% percent of co-infections were white, compared to 97.7% in the Scott County outbreak (Table 1). For Scott County, most (83%) of the co-infected cases were younger than 44 years of age compared to non-Scott County cases, where 79% were older than 44 years of age (Figure 2).

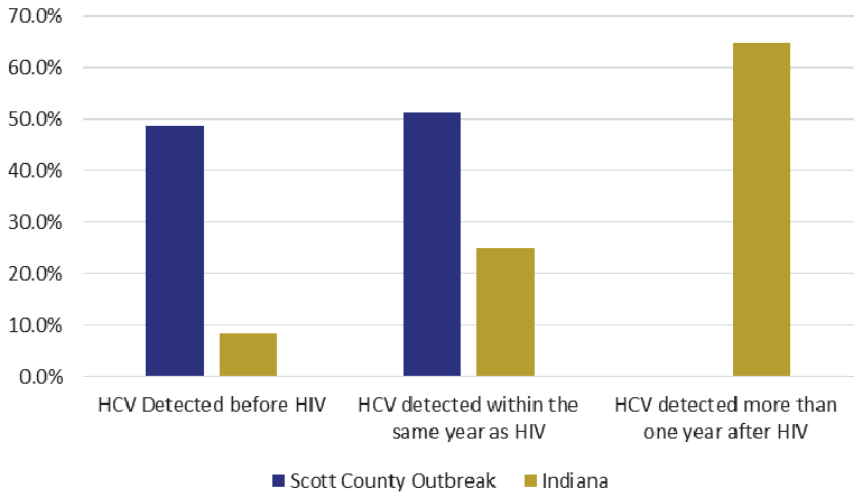
Figure 2. Year of birth of HIV/HCV co-infected individuals in Indiana, as of 12/31/2015.



Timing of Detection

CDC guidelines recommend that all HIV-infected persons be screened for HCV infection (CDC, 2016e). Determining the timing of infection is important for identifying outbreaks. In non-Scott County outbreak cases, 65% were identified as having been diagnosed with HIV more than one year before being diagnosed with HCV. In contrast, for Scott County outbreak cases, no cases were identified as having HIV diagnosed more than one year before the HCV diagnosis (Figure 3).

Figure 3. Timing of hepatitis C (HCV) detection relative to human immunodeficiency virus (HIV) diagnosis, Indiana and Scott County Outbreak. (Note: Timing of HIV infection available for 1.9% of cases).

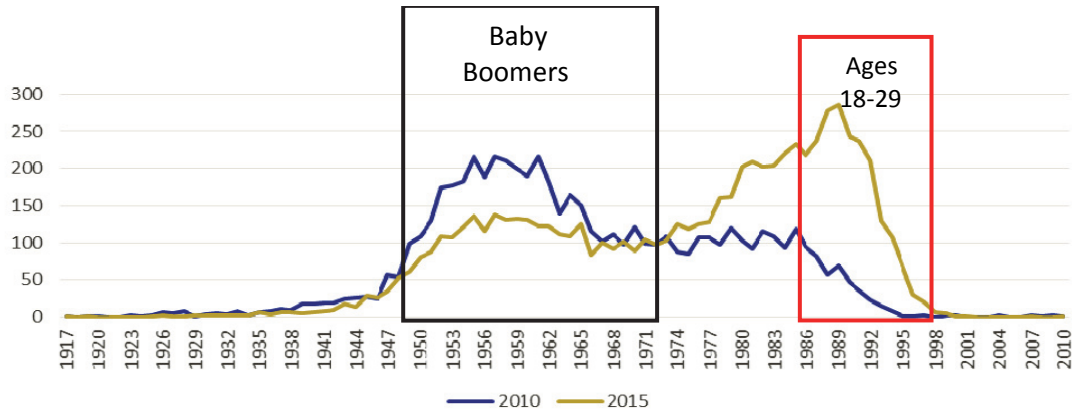


Special Populations

Baby Boomers and Those Aged 18-29 Years

Historically, the greatest burden of HCV has been among baby boomers (those born between 1945 and 1965), and CDC recommends these baby boomers be screened once in their lifetime. Three out of every four persons with HCV are baby boomers, and baby boomers are five times more likely to have HCV than other adults (CDC, 2016d). A hepatitis risk assessment for this cohort can be found at: https://www.cdc.gov/knowmorehepatitis/hra.htm. It is believed that most baby boomers were infected in the 1970s and 1980s when rates of HCV were highest and before screening of blood products for HCV.

Figure 1. Combined acute and chronic hepatitis C cases by year of birth, diagnosed in 2010 and 2015, Indiana.



Recently, however, the incidence of HCV has risen in younger populations due to the heroin and opioid epidemic. Figure 1 shows acute and chronic HCV cases by year of birth comparing those diagnosed in 2010 and 2015 in Indiana. In contrast to the decrease in the baby boomer population, there has been a steady increase in the 18- to 29-year-old population that is associated with PWID (Figure 1). This age-cohort shift highlights the changing discussions surrounding intervention strategies for Indiana counties. Examining the 18- to 29-year-old cohort more closely, Indiana has not only seen an increase in the number of cases of newly identified HCV infection, but also a corresponding increase in the percentage of those 18- to 29-year-olds who report injection drug use as a risk factor in the case investigation (Figure 2). In contrast, 55.7% of this group either did not answer or selected unknown for injection drug use status.

Figure 2. Number of newly identified acute and chronic cases of hepatitis C with reported injection drug use, adults ages 18-29 years, Indiana 2010-2015.

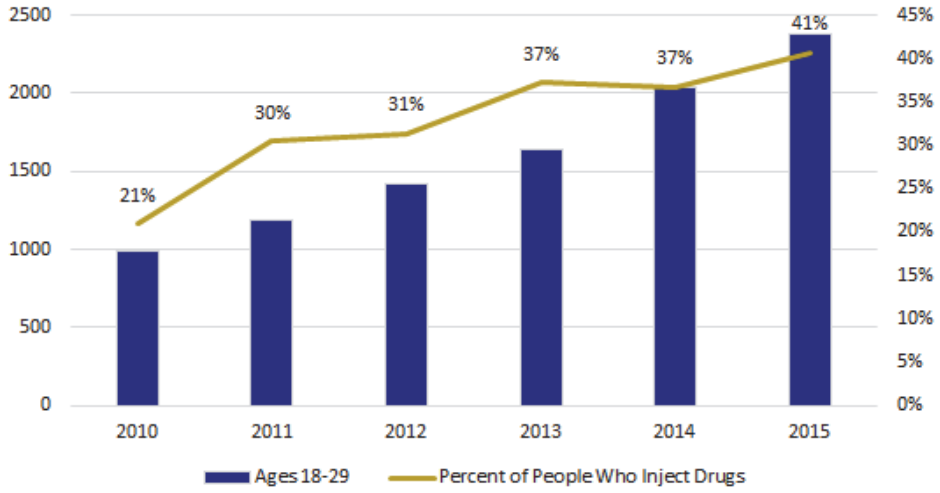
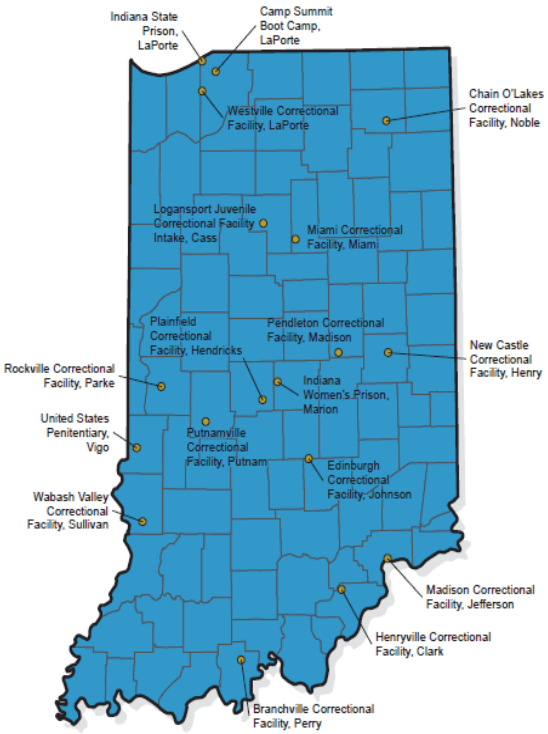


Figure 3. Location of Department of Correctional Facilities and U.S. Penitentiary (Vigo County) in Indiana.



Incarcerated

More than 2.2 million Americans are incarcerated in U.S. federal and state prisons. HCV infection is one of the many chronic illnesses that disproportionally impact the correctional population (Tan, Joseph, & Saab, 2008). Compared to 1%-2% of the general population, HCV prevalence in correctional facilities is estimated between 10%-40% (Beckman et al., 2016). Indiana is home to six minimum (Level 1), nine medium (Levels 2 & 3) and four maximum (Level 4) security facilities, and two newly-committed adult offenders intake facilities (Figure 3). Indiana is also home to an all-male high security U.S. Penitentiary in Vigo County. All DOC offenders are tested for HCV through ISDH upon intake. Positive cases are enrolled in chronic HCV care and have liver function monitoring every six months.

In 2015, 18% of all newly reported HCV cases in Indiana were identified as inmates in the state federal correctional system (Figure 4). The average age for all inmates testing positive for HCV upon DOC intake has dropped from 34.8 years to 33.5 years. In 2015 for the DOC population, whites accounted for 69.2% of newly identified cases of HCV, compared with only 3.4% in blacks (Table 1). Ninety percent of the female HCV cases were white. Incident HCV cases for ages 18-39 years increased while those ages 50-59 years decreased. Newly acquired HCV infections for the years 2013-2015 at the all-male U.S. Penitentiary in Vigo County, Indiana are found in table 2.

Figure 4. Percent of total newly acquired acute and chronic hepatitis C cases for inmates in Department of Corrections facilities and the all-male U.S. Penitentiary in Vigo County, 2013-2015.

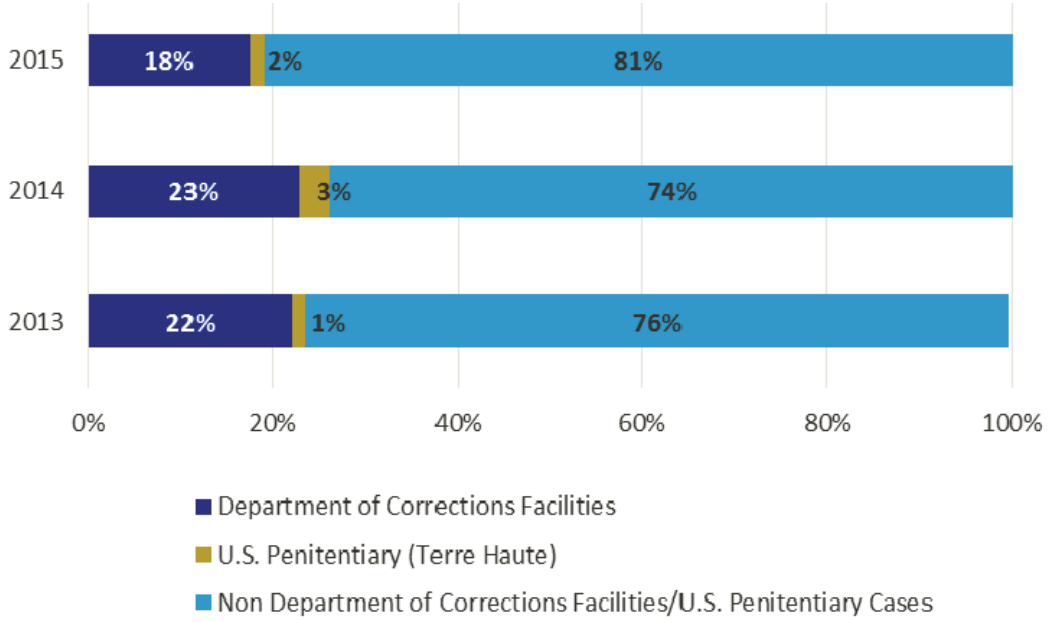


Table 1. Newly acquired hepatitis C infections for the years 2013-2015 at Indiana Department of Corrections.

Year		2013		2014		2015		Total	
Gender	**Female**	303	24.5%	390	26.7%	271	21.7%	964	24.5%
	Male	933	75.5%	1069	73.3%	980	78.3%	2982	75.5%
Ethnicity	**Non-Hispanic**	877	71.0%	666	45.6%	816	65.2%	2359	59.8%
	Hispanic	17	1.4%	9	0.6%	19	1.5%	45	1.1%
	Unknown	342	27.7%	784	53.7%	416	33.3%	1542	31.1%
Race	**White**	1026	83.0%	926	63.5%	866	69.2%	2818	71.4%
	Black	77	6.2%	43	2.9%	43	3.4%	162	4.1%
	Asian	<5	(-)	--	--	<5	(-)	<5	(-)
	Other	21	1.7%	9	0.6%	15	1.2%	45	1.1%
	Unknown	110	8.9%	481	33.0%	325	26.0%	916	23.2%
Age (years)*	**<18**	10	0.8%	5	0.3%	5	0.4%	20	0.5%
	18-29	473	38.3%	593	40.6%	522	41.7%	1588	32.8%
	30-39	376	30.4%	490	33.6%	430	34.4%	1296	32.8%
	40-49	205	16.6%	228	15.6%	176	14.1%	609	15.4%
	50-59	151	12.2%	121	8.3%	97	7.8%	369	9.4%
	60+	21	1.7%	22	1.5%	21	1.7%	64	1.6%
Median Age		34.8		33.9		33.5		34	
Total		1236		1459		1251		3946	

Table 2. Newly acquired HCV infections for the years 2013-2015 at the all-male U.S. Penitentiary in Vigo County, Indiana.

Year		2013		2014		2015		Total	
Ethnicity	**Non-Hispanic**	31	39.2%	19	8.9%	59	53.2%	109	27.0%
	Unknown	48	60.8%	195	91.1%	52	46.8%	295	73.0%
Age (years)	**18-29**	<5	2.5%	13	6.1%	12	10.8%	27	6.7%
	30-39	21	26.6%	54	25.2%	30	27.0%	105	26.0%
	40-49	20	25.3%	70	32.7%	34	30.6%	124	30.7%
	50-59	26	32.9%	54	25.2%	29	26.1%	109	27.0%
	60+	22	1.5%	21	1.7%	64	1.6%	39	9.7%
Median Age		47.3		45		43.2		45	
Total		79		214		111		404	

*Race data missing for >99% of cases.
Note: Due to rounding, percentages may not add up to 100%.

Special Projects

Aspire Indiana, Inc. HCV Screening Partnership Project

The ISDH is dedicated to preventing the spread of HCV in the state of Indiana by identifying and testing high-risk populations. Recently, the ISDH has worked with partners to implement HCV rapid testing at sites that service high-risk populations. During 2015, the ISDH partnered with Aspire Indiana, Inc., a Special Populations Support Program (SPSP), to implement a pilot HCV rapid testing project to test linkage-to-care in a region of rural Indiana. Using federal viral hepatitis prevention funds, 1,300 rapid HCV test kits and 1,500 educational materials were purchased and dispersed among four testing sites servicing 45 counties. Aspire provides a variety of health services including behavioral, counseling, primary care, and social health services to individuals in need (Aspire Indiana, 2016). Due to its experience with PWID and the resources they provide, Aspire was an ideal community partner for the rapid HCV testing and data collection. Collection forms were utilized to capture the demographics, risk factors, and testing status of individuals. Educational materials were given to those who received rapid HCV testing, as well as referrals for linkage-to-care. Data were collected to capture additional demographics and risk factors that are prevalent in these high-risk HCV-positive individuals. With over 1,000 individuals tested, these data may be useful in future ISDH outreach models to address the population with the highest hepatitis C risk. A full report will be released in 2017.

Rapid HCV Testing Project

In late 2015, the ISDH received funds from CDC in response to the HIV and HCV outbreak in Scott County. These funds were used to address the immediate need of testing individuals for HCV in southeastern Indiana and linking those testing positive to care. The project was split into three phases: planning, implementation, and evaluation. Phase one began in November 2015. The ISDH developed state-specific protocols that included identifying and collaborating with local partners, participation marketing, rapid and confirmatory testing, and linkage to care. Implementation (Phase two) began in early 2016.

2016 Viral Hepatitis Epidemiologic Profile

The 2016 Viral Hepatitis Epidemiologic Profile will be funded through a grant from the Association of State and Territorial Health Officials (ASTHO) and will be released in 2017. Features of the 2016 Indiana Viral Hepatitis Epidemiologic Profile will include:

- HBV statistics, including rates, counts, and risk factor information
- Information on premature death due to HCV
- Analysis of perinatal HCV cases including mothers who self-identified as having HCV on infants' birth records and infants identified as having records of hepatitis A (HAV) and HBV vaccination
- Results from the rapid HCV testing projects
- Updates on HCV, Scott County outbreak, HCV/HIV co-infection, and Syringe Services Programs
- Rates of HCV/HBV/HIV co-infections
- Spatial analysis of vulnerability to HCV among PWID
- Tableau-based dashboards for data visualization using maps, charts, graphs, and tables

Additional Resources

American Liver Foundation Patient Financial Assistance
http://he123.liverfoundation.org/patient-support/financial-assistance/

CDC Division of Viral Hepatitis
https://www.cdc.gov/hepatitis/

Evaluation and Management of Chronic Hepatitis C Virus (HCV) Infection: Federal Bureau of Prisons Clinical Guidance, October 2016
https://www.bop.gov/resources/pdfs/hepatitis_c.pdf

Harm Reduction Coalition
http://harmreduction.org/

Health and Human Services Administration: Opioids: The Prescription Drug & Heroin Overdose Epidemic
https://www.hhs.gov/opioids/

Health and Human Services Administration Viral Hepatitis
https://www.hhs.gov/hepatitis/#

Hepatitis C Support Project, HCV Advocate
http://hcvadvocate.org/

Hepatitis Resource Directory for Medical Caregivers (in Indiana), 2015
https://www.in.gov/isdh/files/HepResDirectoryProvider-2015-OPA(2).pdf

HIV and HCV

https://www.aids.gov/hiv-aids-basics/staying-healthy-with-hiv-aids/potential-related-health-problems/hepatitis-c/
ISDH Stats Explorer
https://gis.in.gov/apps/isdh/meta/stats_layers.htm

ISDH Syringe Service Program Information
https://www.in.gov/isdh/files/ISDH%20SEP%20Guidance%20Version%202%200%20FINAL%20-%2010-04-2016-EC.pdf

ISDH Viral Hepatitis
http://www.in.gov/isdh/17433.htm

National Alliance of State and Territorial Aids Directors (NASTAD)
https://www.nastad.org/domestic/viral-hepatitis

Substance Abuse and Mental Health Services Administration (SAMHSA)
https://www.samhsa.gov/

Technical Notes

Acute and Chronic HCV Cases
The number of reported cases is determined by the initial number of positive HCV tests reported during a given year. Cases are defined as either acute or chronic and are classified using case definitions published by the CDC. Acute cases were reportable in 2015, but data were also collected and reported on chronic cases to assess risk factors when feasible. Investigation of chronic (also known as Hepatitis C, past or present) HCV cases contributes to the reduction in the spread of disease by increasing the percentage of persons aware they have HCV infection and educating infected individuals. Case definitions for both acute and chronic HCV are available on the CDC website at the National Notifiable Diseases Surveillance System (NNDSS) page: http://wwwn.cdc.gov/nndss/.

American Community Survey (ACS)
The American Community Survey is a survey conducted by the U.S. Census Bureau. It uses monthly surveys to create 1-year, 3-year, and 5-year estimates of a wide variety of sociodemographic variables. These estimates fill in data between the decadal Census. This profile uses 1-year state-level data from the ACS.

Census Bureau Race Identification
The U.S Census Bureau must adhere to the 1997 Office of management and Budget (OMB) standards on race and ethnicity. Race definitions can be found at
http://www.census.gov/topics/population/race/about.html

County Population and Median Age
2015 Vintage County Population Estimates – U.S. Census Bureau https://www.census.gov/popest/

Heroin and Opioid Deaths and Hospitalizations
Heroin deaths are deaths with drug poisoning (ICD-10 codes X40-X44, X60-X64, X85 or Y10-Y14) as the underlying cause with contributing cause of T40.0-T40.4 and T40.6. Non-fatal heroin drug poisoning emergency department visits due to heroin or opioid overdose are defined as emergency department

discharges that included a diagnostic code of 96501 (heroin) or 965.00-965.09 (opioid) in the first 20 diagnoses fields. For fourth quarter 2015, the diagnostic codes were T40.1 (heroin) and T40.0, T40.1, T40.2, T40.3, T40.4, T40.6 (opioid). For 2002-2011, there were 15 diagnoses fields and all 15 were checked. For 2007-2009, there were 18 diagnoses fields and all 18 were checked.

Indiana National Electronic Disease Surveillance System (I-NEDSS) is a web-based application that promotes the collection, integration and sharing of data at federal, state and local levels. The purpose of I-NEDSS is to electronically report infectious diseases to the state and local health departments. Benefits of I-NEDSS include an increase of speed, accuracy, and accountability in our disease surveillance. This will be accomplished by having all reporting and investigation forms accessed, completed, and submitted electronically through I-NEDSS. I-NEDSS is part of a national electronic disease reporting system that not only links healthcare providers and state and local public health agencies within Indiana, but also provides data to the U.S. Centers for Disease Control and Prevention. This system is currently in use by 99 percent of the local health agencies in the state and nearly 134 hospitals to report infectious diseases.

Small Area Income and Poverty Estimates (SAIPE)
U.S. Census Bureau Small Area Income and Poverty Estimate (SAIPE) 2014. The SAIPE is a modeled estimate based on data from the American Community Survey (ACS), federal income tax return summary reports, SNAP benefits, decennial census, post-censal population estimates, Supplemental Security Income recipients, and economic data from the Bureau of Economic Analysis (BEA). http://www.census.gov/did/www/saipe/

Percentage of Population with Health Insurance (Age Less than 65 Years)
U.S. Census Bureau Small Area Health Insurance Estimates (SAHIE) 2014. This is a model-based estimate consistent with the ACS. http://www.census.gov/did/www/sahie/

Prevalence Estimates
Crude state estimates of persons with reactive anti-HCV antibody calculated using U.S. Census Bureau 2015 age and sex compositions; (Ditah et al., 2014)- NHANES HCV survey found 1.3% prevalence anti-HCV in US population age >18; (Chak, Talal, Sherman, Schiff, & Saab, 2011) – 25% adjustment for groups excluded from NHANES including homeless, incarcerated, active military and nursing home residents. For details visit: http://nvhr.org/content/nvhr-hepatitis-c-state-specific-resources-pages

Stats Explorer
Stats Explorer provides quick access to publicly available health and health-related statistics through a single easy-to-use resource for both public health professionals and the general public. The Stats Explorer is developed and maintained by the Public Health Geographics (PHG) program within the ISDH Epidemiology Resource Center (ERC) division. PHG gathers information, adds geographic context and redistributes data in various formats as a *stat resource*. PHG is not an authoritative steward of these stats nor do PHG stats provide authoritative information. Please contact the program or organization listed as the source for each *stat* to obtain authoritative information. Built with Fusioncharts (lic) and GIS web services. https://gis.in.gov/apps/isdh/meta/stats_layers.htm.

Underlying and Contributing Cause of Death
The underlying cause of death is defined as the disease or injury that initiated the chain of events leading directly to death. The contributing cause of death is defined as diseases or injuries that contributed to the death.

Urban/Rural County Designation

Counties were classified as urban if they met two criteria: 1. Located within a Metropolitan Statistical Area, as defined by the Office of Management and Budget (2013); 2. At least 50% of the population lives within an urban area, as defined by the U.S. Census Bureau (2010).

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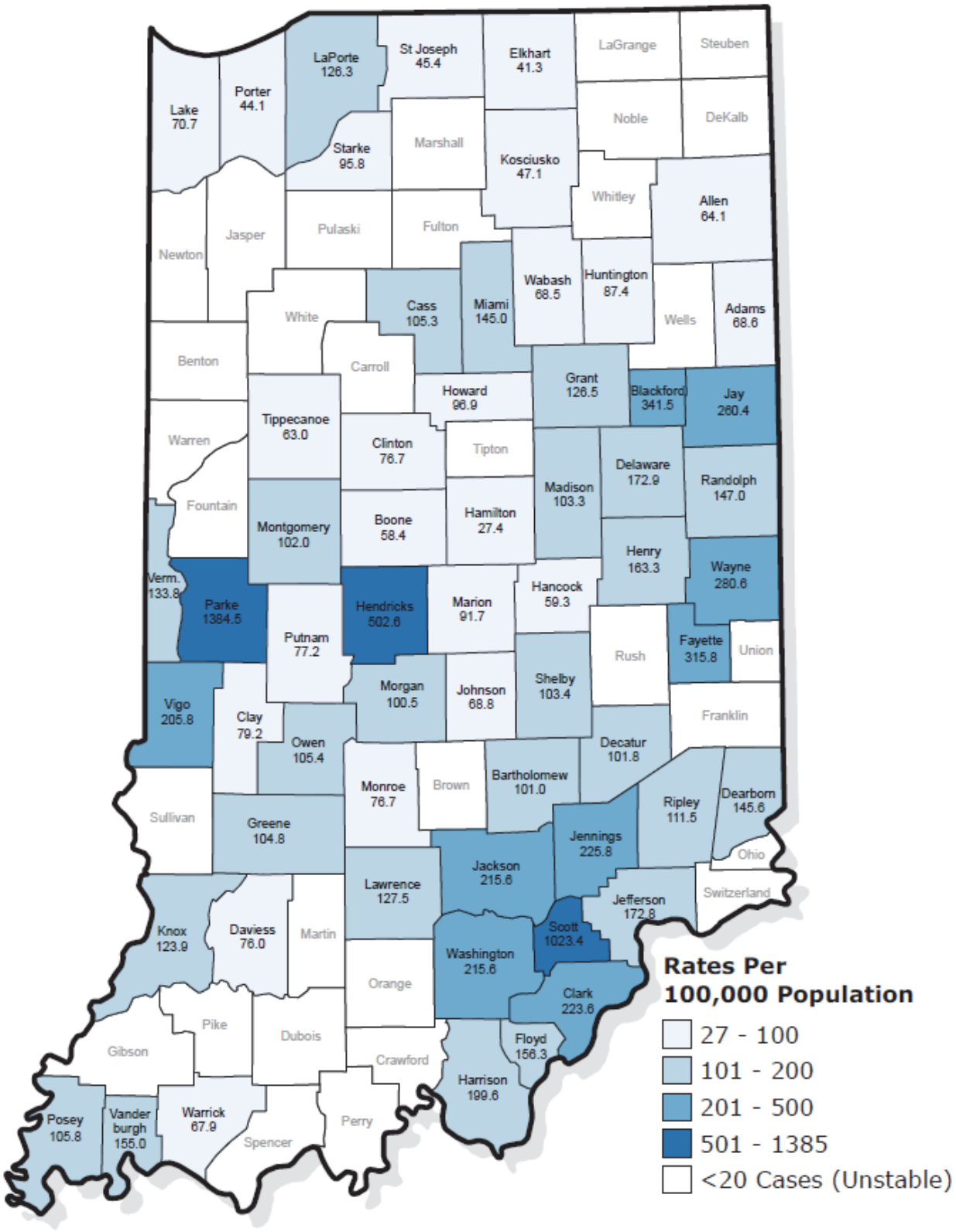
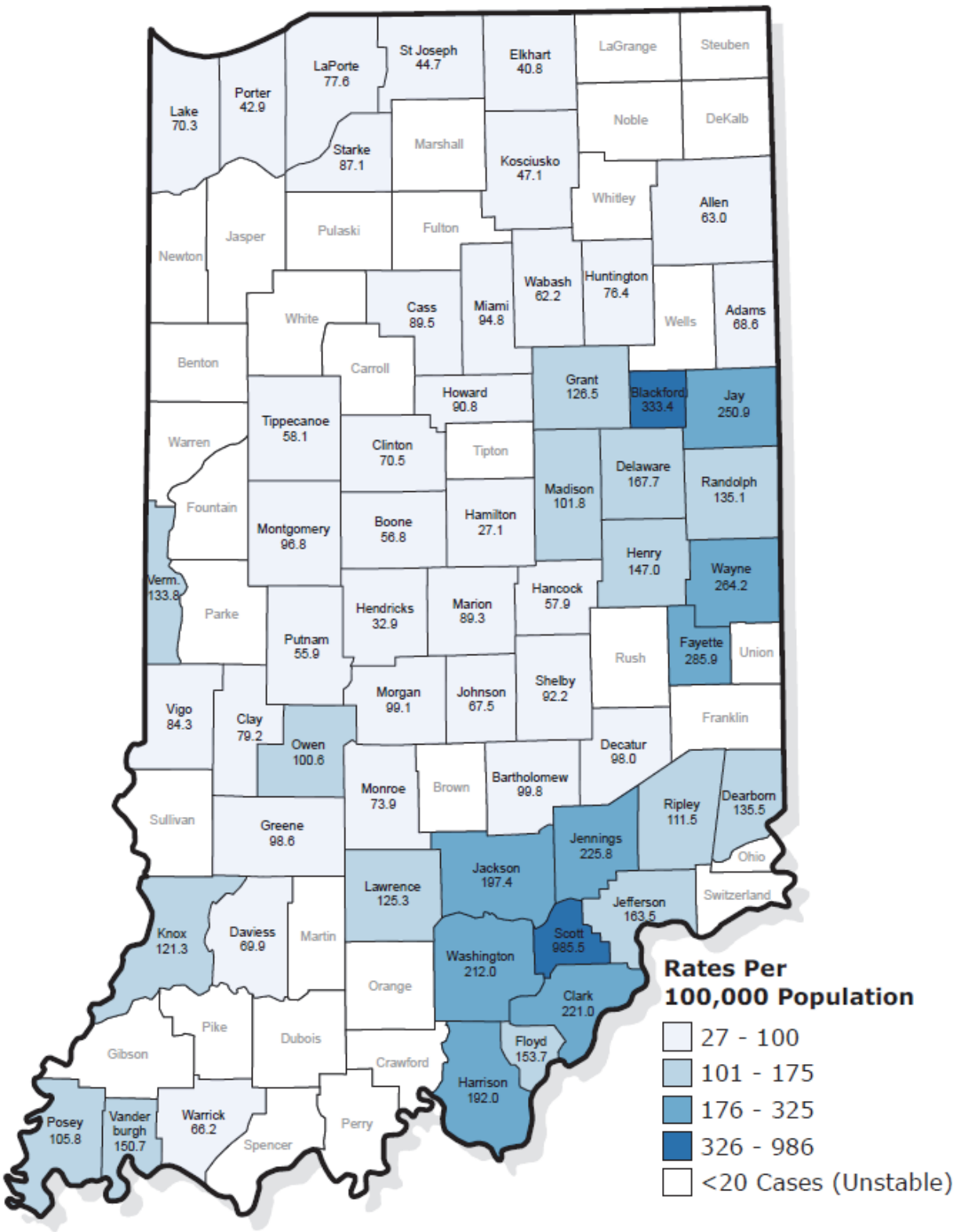
Appendix A. Acute and chronic hepatitis C county counts and rates, Indiana, 2015 (including incarcerated individuals at time of hepatitis C detection).

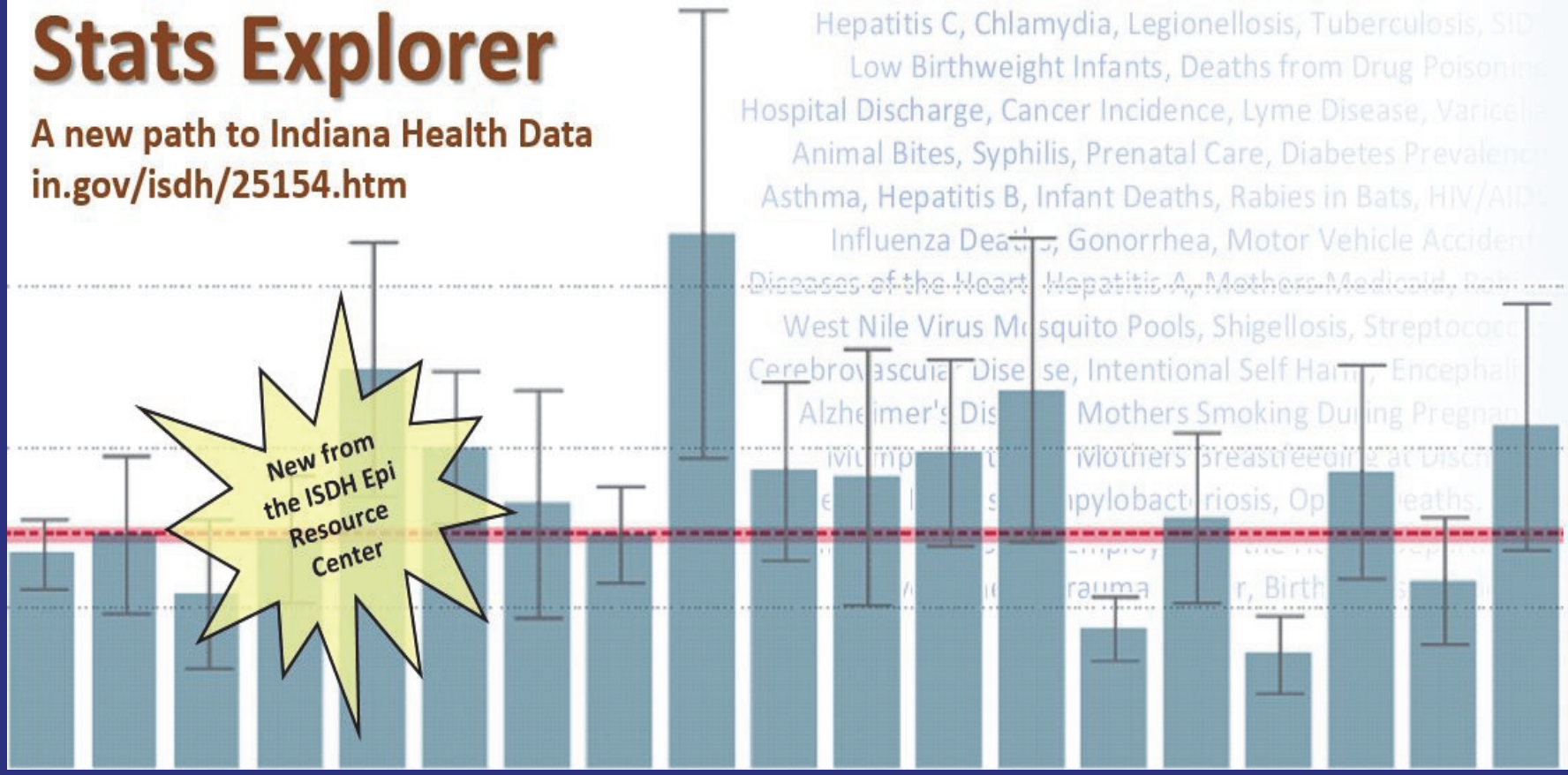


Appendix B. Acute and chronic hepatitis C county counts and rates, Indiana, 2015 (not including incarcerated individuals at time of hepatitis C detection).



Stats Explorer

A new path to Indiana Health Data
in.gov/isdh/25154.htm



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