Indiana State Department of Health | Epidemiology Resource Center

Hepatitis C Surveillance Report, Indiana, 2008

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Background

The Centers for Disease Control and Prevention (CDC) estimates that 4.1 million people, or 1.6% of the United States population, has been infected with hepatitis C virus (HCV) of which 3.2 million are chronically infected (CDC, 2010; Institute of Medicine, IOM, 2010). Approximately 75% of individuals infected with HCV do not even know that they are infected with the virus (IOM, 2010; Milliman, 2009). There are 2.5–3.5 times more people living with chronic viral hepatitis in the United States than are living with human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) (IOM, 2010). Individuals can be acutely or chronically infected with HCV. A case of acute HCV infection was defined as acute illness with a discrete onset of any sign or symptom consistent with acute viral hepatitis and either jaundice or an alanine aminotransferase (ALT) over 400 IU/mL, a positive confirmatory HCV test, and negative results for IgM antibody to HAV and IgM antibody to HBV core antigen. A chronic HCV infection was defined as having a positive HCV antibody test that is repeat reactive, a positive confirmatory HCV test, or a case that does not meet the acute case definition. Only 15–25% of individuals clear the virus without treatment and 75–85% of individuals become chronically infected. Of those chronically infected, 60–70% will develop chronic liver disease, 5–20% will develop cirrhosis over a 20–30 year period, and 1–5% will die from the consequences of the infection (CDC, 2010; Heymann, 2008; IOM, 2010). There are approximately 12,000 deaths a year attributed to HCV infection. During the next

decade, it is estimated that 120,000 individuals will die as a result of HCV infection (CDC, 2010; IOM, 2010).

HCV infection is currently the #1 indication for liver transplantation in the United States. Depending on the type of insurance (i.e., Medicare, private insurance), medical care costs range from $148,000–$233,400 during the first six months of liver transplantation, $45,600–$67,200 for the 6–18 months following transplantation, and then $2,200–$3,900 monthly for the individual's lifetime (Milliman, 2009). The medical costs associated with HCV infected individuals is expected to more than double over the next 20 years, and Medicare will be affected the most, currently from $5 billion spent per year to nearly $30 billion spent per year (Milliman, 2009). These figures do not take into account indirect costs associated with HCV infection (e.g., lost wages, lost productivity, decreased quality of life).

The following are risk factors for HCV infection: sharing contaminated needles, syringes, and other drug injection equipment, blood transfusion or solid organ transplantation prior to July 1992, receiving clotting factor concentrates manufactured before 1987, a needle stick injury in a health care setting, sex with an infected individual, an invasive medical procedure where proper infection control measures were not used, perinatal exposure at birth, sharing personal items with an infected individual, history of incarceration, and/or having HIV/AIDS (CDC, 2010; Heymann, 2008; IOM, 2010). Injection drug use (IDU) is a reported risk factor in up to 90% of HCV case patients (CDC, 2010; IOM, 2010). Males have a higher prevalence of HCV infection than females. It is also known that HCV infections are more prevalent among African Americans than Caucasians, while Caucasians of Hispanic/Latino descent a have

higher prevalence rate than non-Hispanic/Latino Caucasians (IOM, 2010; Milliman, 2009). There are at least six HCV genotypes and more than 50 subtypes; HCV genotype 1 is the most commonly reported genotype in the United States. Genotype 1 is harder to treat than other genotypes such as genotypes 2 and 3 (CDC, 2010; Milliman, 2009).

Results

In 2008, there were 5,447 reported cases of HCV infection in Indiana, of which 13 were acute and 5,434 were chronic. All reported acute cases in 2008 were males, with an incidence rate of 0.41 per 100,000 males. The prevalence rate for chronic HCV infection in Indiana among males was 107.4 per 100,000 males and 61.2 per 100,000 females. Race and ethnicity was provided for 42% and 22%, respectively, of all HCV case patients. Among both acute and chronic HCV case patients, the most commonly reported race was Caucasian. For both acute and chronic HCV case patients, not being of Hispanic/Latino descent was the most common ethnicity reported. See Table 1.

Table 1. Hepatitis C Case Patients by Ethnicity, Race, and Gender, Indiana, 2008 (n=5,447)

	Acute			**Chronic**		
	Cases	**Percent (%)**	**Rate***	**Cases**	**Percent (%)**	**Rate***
Indiana	13	-	0.20	5,434	-	85.22
Ethnicity						
Hispanic/Latino	0	0	**	53	1	**
Not Hispanic/Latino	6	46	**	1,149	21	**
Unknown	7	54	-	4,232	78	-
Race						
Asian	0	0	**	23	<1	**
African American	0	0	**	456	8	**

American Indiana/ Alaskan Native	0	0	**	4	<1	**
Native Hawaiian/Other Pacific Islander	0	0	**	6	<1	**
Caucasian	9	69	**	1,763	32	**
Other/Multiracial	1	8	**	48	1	**
Unknown	3	23	-	3,134	58	-
Gender						
Female	0	0	0.00	1,977	36	61.15***
Male	13	100	0.41	3,363	62	107.39****
Unknown	0	0	-	94	2	-

*Rate per 100,000 population based on the U.S. Census Bureau's population data as of July 1, 2008.
** Race not reported on 58% of all case patients and ethnicity not reported on 78% of all case patients; rates not calculated.
***Rate per 100,000 females based on the U.S. Census Bureau's population data as of July 1, 2008.
**** Rate per 100,000 males based on the U.S. Census Bureau's population data as of July 1, 2008.

The most common age groups for reported acute HCV case patients were the 30–39 year-old age group with an incidence rate of 0.60 per 100,000 population and the 40–49 year-old age group with an incidence rate of 0.54 per 100,000 population. For chronic HCV case patients, the most common reported age groups were the 40–49 year-old age group and the 50–59 year-old age group. The age or date of birth (DOB) was not reported for 19% of chronic case patients so prevalence rates were not calculated. See Table 2. Case patients with HCV infection were reported in all counties in 2008, but no further analysis was performed because 20% of case patients were reported without a county of residence.

Table 2. Hepatitis C Case Patients by Age Group, Indiana, 2008 (n=5,447)

	Acute			**Chronic**		
	Cases	**Percent (%)**	**Rate***	**Cases**	**Percent (%)**	**Rate***
Indiana	13	-	0.20	5,434	-	85.22
Age Group						
<5	0	0	0.00	7	<1	**

5-9	0	0	0.00	2	<1	**
10-19	0	0	0.00	18	<1	**
20-29	0	0	0.00	363	7	**
30-39	5	38	0.60	546	10	**
40-49	5	38	0.54	1,051	19	**
50-59	2	16	0.23	1,803	33	**
60-69	0	0	0.00	439	8	**
70-79	0	0	0.00	121	2	**
80+	0	0	0.00	48	1	**
Unknown	1	8	-	1,036	19	-

*Rate per 100,000 population based on the U.S. Census Bureau's population data as of July 1, 2008.
**19% of case patients reported without an age or DOB, rates not calculated.

In Indiana during 2008, the most commonly reported risk factors for acute HCV case patients were the following: history of incarceration for ≥24 hours (38%), IDU (46%), non-injection street drug use (54%), and sexual contact in the two weeks to six months prior to the onset of symptoms (54%). Of the cases that reported a history of incarceration, 60% reported the place of incarceration as a jail. Of the acute HCV case patients that reported non-injection street drug use, 29% reported using only non-injection drugs while 71% reported using both injection and non-injection street drugs. Cocaine use (including crack) was reported in 86% of the non-injection street drug users. Of the acute HCV case patients reporting sexual contact in the two weeks to six months prior to the onset of symptoms, all reported having had heterosexual sex with the number of partners ranging from 1–20. Other risk factors reported include the following: contact with someone known to have HCV infection, non-occupational exposure to someone else's blood, history of outpatient injection, infusion, or transfusion, oral surgery, overnight hospitalization, piercing (other than ear), ear piercing, and tattoo placement. No acute HCV case patients reported a history of

hemodialysis, being a healthcare worker (HCW), being a public safety worker (PSW), surgery (other than oral), history of long-term care (LTC), or an accidental stick in the two weeks to six months prior to the onset of symptoms. See Table 3.

Table 3. Reported Risk Factors, Acute Case Patients, Indiana, 2008 (n=13)

	Cases			Percent (%)		
	Yes	**No**	**Unknown/ Unanswered**	**Yes**	**No**	**Unknown/ Unanswered**
Acute						
Contact with HCV Infected Individual	2	2	9	15	15	70
History of Hemodialysis	0	9	4	0	69	31
History of Incarceration	5	4	4	38	31	31
Healthcare Worker	0	7	6	0	54	46
Public Safety Worker	0	6	7	0	46	54
Non-Occupational Exposure to Blood	1	4	8	8	31	61
IDU	6	4	3	46	31	23
Non-Injection Street Drug Use	7	3	3	54	23	23
Outpatient Transfusion/Infusion/Injection	3	4	6	23	31	46
Oral Surgery	1	3	9	8	23	69
Surgery (other than oral)	0	7	6	0	54	46
Overnight Hospitalization	1	5	7	8	38	54
Long-Term Care	0	6	7	0	46	54
Sex Partners	7	0	6	54	0	46
Piercing (other than ear)	1	6	6	8	46	46
Ear Piercing	1	5	7	8	38	54
Tattoo	2	5	6	16	38	46
Accidental Stick	0	7	6	0	54	46

The most commonly reported risk factors among chronic HCV case patients were the following: history of incarceration (8%), IDU (12%), and non-injection street drug use (14%). Of those chronic case patients reporting non-injection street drug use, cocaine (including crack) (50%) and heroin (11%) were most commonly used. Other risk factors reported included: having been in contact with someone known to be HCV

infected, history of hemodialysis, treatment for a STD, blood transfusion prior to 1992, organ transplantation prior to 1992, and having received clotting factor concentrates manufactured prior to 1987. Of chronic HCV case patients, 6% reported having been in contact with someone known to be HCV infected, of which 89% reported having contact other than what was included in the case investigation. For the risk factor history of hemodialysis, 1% reported having had dialysis during their lifetime, 4% reported being treated for a STD, 3% reported a blood transfusion prior to 1992, <1% reported organ transplantation prior to 1992, and <1% reported having received clotting factor concentrates manufactured prior to 1987. See Table 4.

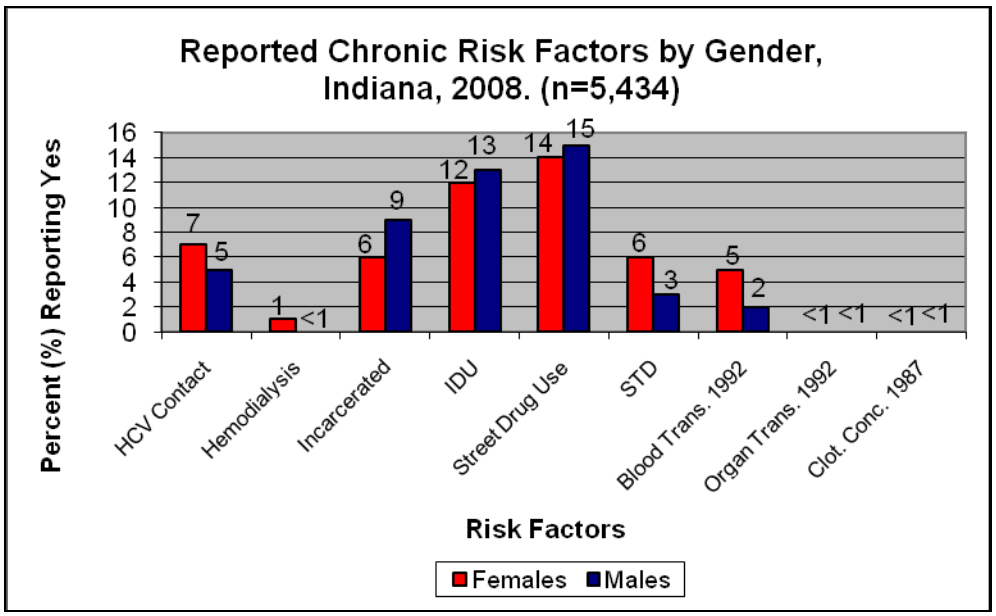
Table 4. Reported Risk Factors, Chronic Case Patients, Indiana, 2008 (n=5434)

	Cases			Percent (%)		
	Yes	**No**	**Unknown/ Unanswered**	**Yes**	**No**	**Unknown/ Unanswered**
Chronic						
Contact with HCV Infected Individual	317	58	5,059	6	1	93
History of Hemodialysis	33	1,203	4,198	1	22	77
History of Incarceration	421	698	4,315	8	13	79
IDU	662	580	4,192	12	11	77
Non-Injection Street Drug Use	772	434	4,228	14	8	78
STD	216	657	4,561	4	12	84
Transfusion Before 1992	178	894	4,362	3	16	81
Organ Transplant Before 1992	6	1,178	4,250	<1	22	-
Clotting Factor Concentrates Before 1987	12	1,082	4,340	<1	20	-

The most commonly reported risk factors for female chronic case patients were non-injection street drug use, IDU, and contact with someone known to have HCV infection. The most commonly reported risk factors for males were non-injection street drug use, IDU, and history of incarceration. Among chronic HCV case patients, more

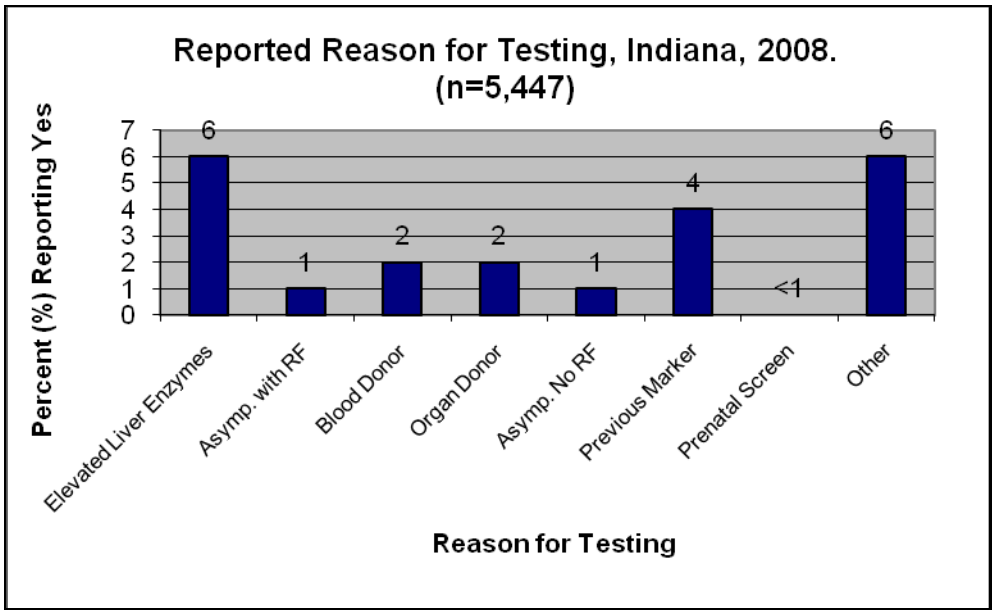
females reported the following risk factors: contact with someone known to have HCV infection, history of hemodialysis, treatment for a STD, blood transfusion prior to 1992, and organ transplantation prior to 1992. More males reported history of incarceration, IDU, non-injection street drug use, and having received clotting factor concentrates manufactured prior to 1987. See Figure 1.

Figure 1. Reported Chronic Risk Factors by Gender, Indiana, 2008 (n=5,434)



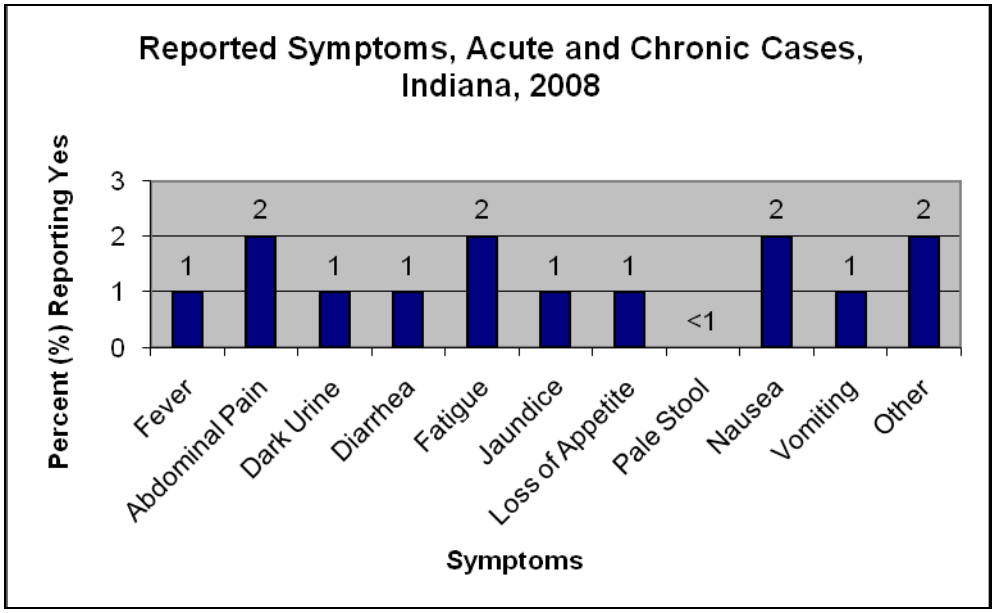
The most commonly reported reason for HCV testing was having elevated liver enzyme (6%) or a previous positive marker for HCV (4%). The reason for testing was reported as “other” for 6% of case patients. Being a blood donor and an organ donor both were reported as the reason for testing in 2% of all HCV case patients. One percent of case patients reported the reason for testing as an asymptomatic individual with reported risk factors and an asymptomatic individual with no reported risk factors; <1% reported a prenatal screen as the reason for testing. See Figure 2.

Figure 2. Reported Reason for Testing, Indiana, 2008 (n=5,447)



The most commonly reported symptoms were abdominal pain, fatigue, and nausea; 2% of all case patients reported having these symptoms. Another 2% of case patients reported having other symptoms that were not listed on the case investigation. Approximately 1% of case patients reported fever, dark urine, diarrhea, jaundice, loss of appetite, and vomiting. Less than 1% of HCV case patients reported having pale stool. See Figure 3.

Figure 3. Reported Symptoms in HCV Case Patients, Indiana, 2008 (n=5,447)



One percent of HCV case patients reported being hospitalized due to their infection and <1% were reported as having died from their infection. ALT levels were reported for 19% of all case patients, of which 7% had levels greater than 400 IU/mL and 93% were lower than or equal to 400 IU/L. Among acute HCV case patients, 38% reported having been vaccinated for HAV and 31% reported having been vaccinated for HBV, while 24% were reported as “unknown” or not answered for HAV vaccination and 31% were reported as “unknown” or not answered for HBV vaccination. Among chronic HCV case patients, 3% reported having been vaccinated for HAV, 5% reported having been vaccinated for HBV, and 83% were reported as “unknown” or not answered for HAV vaccination and 82% as “unknown” or not answered for HBV vaccination. See Table 5.

Table 5. Reported HAV and HBV Vaccination History, Indiana, 2008 (n=5,447)

	Cases			Percent (%)		
	Yes	**No**	**Unknown/ Unanswered**	**Yes**	**No**	**Unknown/ Unanswered**
Acute						
History of HAV Vaccination	5	5	3	38	38	24
History of HBV Vaccination	4	5	4	31	38	31
Chronic						
History of HAV Vaccination	149	786	4,499	3	14	83
History of HBV Vaccination	260	695	4,479	5	13	82

Acute HCV case patients received case education from health care providers (HCPs) (61%), local health departments (LHDs) (31%), and 8% did not answer. For chronic HCV case patients, 19% were educated by HCPs, 7% were educated by LHDs, and 1% was educated by both HCPs and LHDs, while the education status for the other 73% of case patients was not reported. See Figures 4 and 5.

Figure 4. Reported Education Status, Acute Case Patients, Indiana, 2008 (n=13)

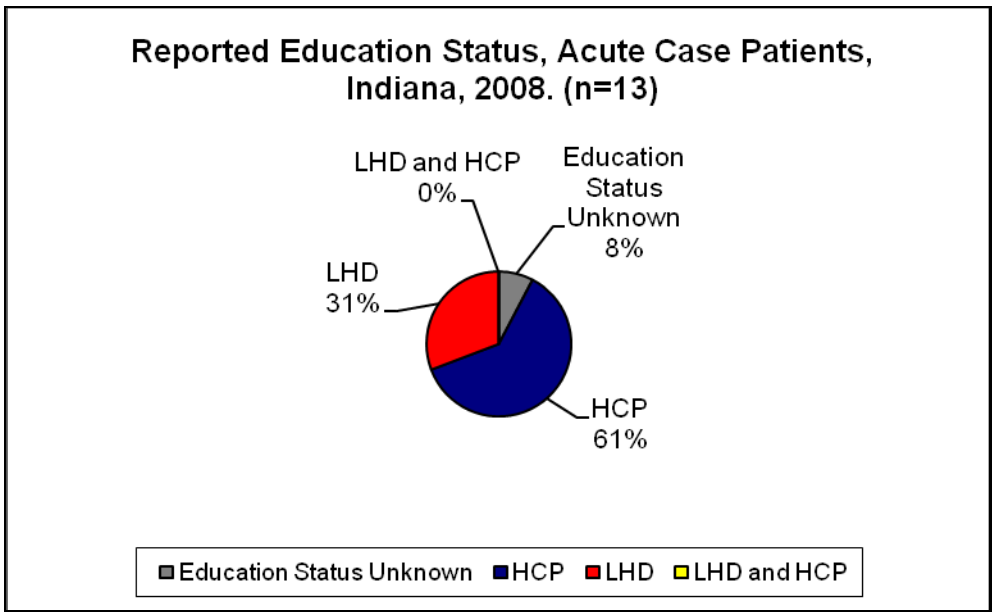
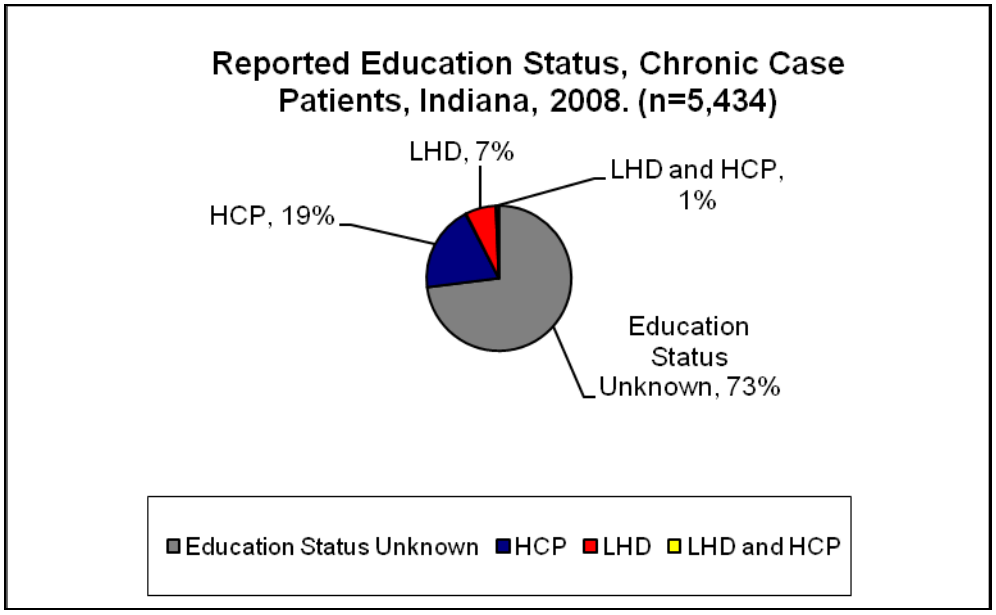


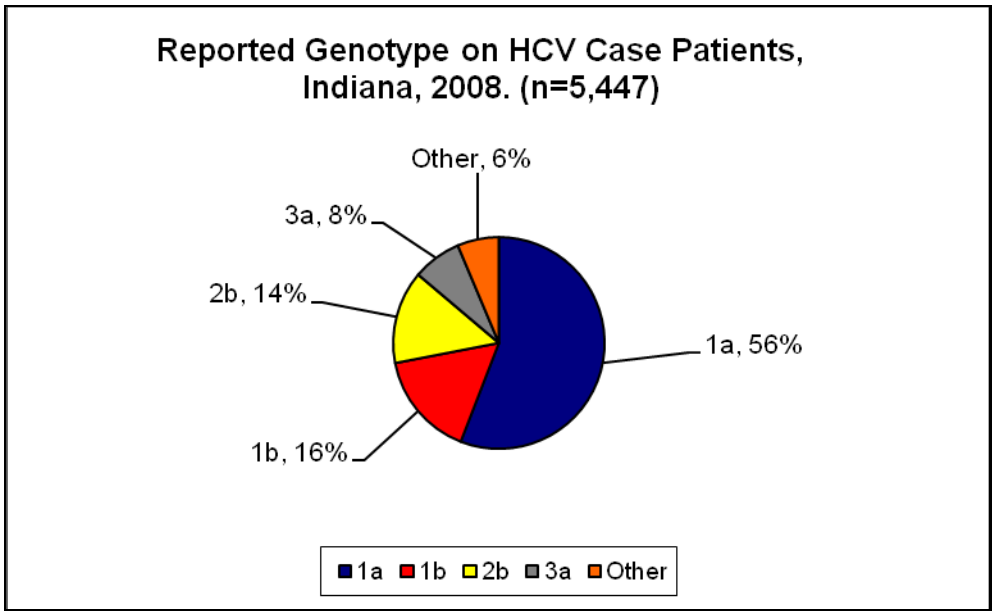
Figure 5. Reported Education Status, Chronic Case Patients, Indiana, 2008 (n=5,434)



Ten percent of all HCV case patients had a reported genotype in 2008. Of those case patients, the most commonly reported genotypes were 1a (56%) and 1b (16%). Other genotypes reported were 2b and 3a and other genotypes not included in the case

investigation. See Figure 6. Twenty-one percent of HCV case patients were able to be confirmed based on the data received in 2008 while 79% of HCV case patients were not confirmed because not enough data was received.

Figure 6. Reported Genotype on HCV Case Patients, Indiana, 2008 (n=5,447)



Discussion

The Communicable Disease Reporting Rule for Physicians, Hospitals, and Laboratories (410 IAC 1-2.3) requires that all positive testing indicating HCV infection (e.g., HCV antibodies, HCV RIBA, HCV RNA, HCV genotype) be reported to the ISDH. LHDs are required to investigate potential acute HCV case patients in order to educate the case patients about their infection and collect risk factor data. Thirteen case patients met the CDC case definition for an acute case of HCV infection in 2008 and 5,434 case patients were classified as chronic HCV infection. The acute case patients accounted for less than 1% of reported cases. The number of acute case patients was likely underestimated due to several factors including: individuals being asymptomatic upon infection, reporting issues, and understaffing at LHDs limiting the completion of case investigations on potential cases. In 2008 all acute cases were males, but typically cases are reported in females as well. The prevalence of chronic HCV infection among males was higher than the rate for females (Table 1). Surveillance in the United States has shown that males have a higher prevalence of HCV infection than females (IOM, 2010; Milliman, 2009). Race and ethnicity was reported for less than half of case patients (Table 1) making it inappropriate to calculate incidence and prevalence rates based on these variables. Therefore this report is unable to comment on the role of race and ethnicity in the burden of HCV infection. Acute HCV case patients were most commonly identified in persons aged 30–39 and 40–49 years and chronic HCV case patients were most commonly identified in persons aged 40–49 and 50–59 years (Table 1). It would be expected that acute cases of HCV infection are younger than chronic cases of HCV infection (Milliman, 2009). This is due to HCV not being discovered until 1989 at which time several new prevention measures (e.g., blood donor screening,

plasma donor screening, organ donor screening, more advanced methods of manufacturing clotting factor concentrates used, improved infection control measures) were implemented. This finding is in agreement with what is seen at the national level. Frequency of case patients by age group was not affected when stratified by gender so it does not appear that one gender is more at risk than the other in any given age group. Cases were reported in every Indiana county, but an error in INEDSS allowed 20% of cases to be reported without a county of residence. Typically, if the case's address is not provided, the county of residence defaults to the provider's county or the laboratory's county. Since this error occurred, it was not possible to calculate incidence rates based on county resulting in the inability to determine were the true burden of disease lies based on county.

The most common risk factors for acute HCV case patients in Indiana were history of incarceration, IDU, non- injection street drug use, and sexual contact. This was expected. IDU is the most common risk factor associated with HCV infection (CDC, 2010; IOM, 2010). It is commonly accepted that non-injection street drug use does pose some risk for HCV infection, but it is difficult to separate out its risk from risk associated with IDU and sex with HCV–infected partners (CDC, 2010). In 2008, 71% of acute HCV case patients reported using both non-injection street drugs and IDU during the two weeks to six months prior to the onset of symptoms. The most commonly reported non-injection street drug used was cocaine (including crack) which may be associated with HCV transmission via bleeding and cracked skin, broken mucous membranes, and shared drug equipment. The most commonly injected drug is not known since the type of drug used was not requested in the case investigation in 2008. Other risk factors

reported are among the commonly accepted risk factors such as contact with someone known to have HCV infection, outpatient injections, infusions, and transfusions, oral surgery, overnight hospitalization, number of sex partners, and piercing and tattoo placement. None of these were the only risk factor reported so they could not be directly linked to acquiring infection. Other potential risk factors that were not reported among the acute HCV case patients in 2008 were a history of hemodialysis, being a HCW, being a PSW, surgery (other than oral), being in LTC, and any accidental stick. Many of the risk factors included in the case investigation for acute HCV case patients were reported as “unknown” or not answered, so their association with acute HCV infection cannot be analyzed.

The most commonly reported risk factors for chronic HCV infection were history of incarceration, IDU, and non-injection street drug use. IDU among chronic HCV case patients was expected since it is the most common risk factor associated with HCV infection (CDC, 2010; IOM, 2010). The type of injection drug used was not asked in the 2008 case investigation form. The most commonly reported non-injection street drugs used were cocaine (including crack) and heroin. Other risk factors reported among chronic case patients include the following: contact with someone with a known HCV infection, history of hemodialysis, treatment for a STD, a blood transfusion or organ transplant prior to 1992, and having received clotting factor concentrates manufactured prior to 1987. Among those reporting contact with someone known to have a HCV infection, 89% reported the contact type as other than sexual or household. The number of case patients reporting a blood transfusion or organ transplant prior to 1992 and having received clotting factor concentrates manufactured prior to 1987 is lower than

what was expected since these are common risk factors for chronic HCV case patients, but that is not what was seen with the chronic HCV case patients in Indiana during 2008. Similar to acute case patients, most of the risk factor data for chronic HCV case patients were reported as “unknown” or not answered, making any further analysis difficult. The most common risk factors reported among females and males varied, but reported IDU and non-injection street drug use were in the top three reported risk factors for both genders. This was expected since IDU is the most common reported risk factor for HCV infection (CDC, 2010; IOM, 2010).

The most commonly reported reasons for testing were elevated liver enzymes (above the normal range set by each testing facility), previous positive HCV infection marker, and reasons other than what was included in the case investigation. This illustrates that some case patients were being managed by a HCP. Other common reasons for testing that were not explicitly asked in the case investigation were the following: symptomatic case, state required inmate testing, admission to a hospital, and pre-surgical screen. For more than 94% of all case patients, there was no reason for testing reported, making it difficult to determine why individuals were being tested and if individuals were receiving the appropriate follow-up testing. The most commonly reported symptoms by case patients were abdominal pain, fatigue, and nausea. For more than 97% of HCV case patients, there were no symptoms reported. This could be because symptoms are not being reported or that people are not experiencing symptoms. There is no way to clarify the role that each of these issues was playing among HCV case patients in 2008. Approximately 1% of case patients reported having been hospitalized for their HCV infection, but 67% responded as “unknown” or did not

answer, so the exact number of hospitalizations due to HCV infection is unknown. Less than 1% of case patients were reported as dying due to HCV infection, but 69% of case patients were reported as “unknown” or not answered making it difficult to determine the number of deaths attributed to HCV infection from this data set. ALT levels were reported on 19% of case patients with 7% of those case patients potentially being acute and needing further investigation. If these case patients were not investigated appropriately by the LHDs, they became classified as chronic by default because not enough data was received to meet the CDC’s acute case definition. Not all case patients with ALTs above 400 IU/mL are acute case patients, underscoring why thorough investigation is needed. Likewise, case patients that do not have a reported ALT level need to be investigated because they could be acute HCV cases. In 2008, 81% of case patients did not have a reported ALT level so they would have need to be investigated further to determine if they were acute HCV cases.

Among 2008 acute HCV cases, only 38% of case patients reported being vaccinated for HAV, while only 31% of case patients reported being vaccinated for HBV (Table 5). These are missed opportunities to protect HCV infected individuals against further liver damage from HAV and/or HBV infection. In chronic HCV cases, 3% of case patients reported being vaccinated for HAV, while 5% of case patients reported being vaccinated for HBV (Table 5). Again, these are missed opportunities to protect HCV–positive individuals against further liver damage from HAV and/or HBV infection. All but 8% of acute case patients were known to be educated about their disease by either a HCP or LHD. Both acute and chronic case patients were most commonly educated by their HCP (Figure 4 and Figure 5). From this data, it is impossible to determine how

many of the 73% of case patients with an unknown education status have been educated about their disease and how many have not. Genotypes were reported on 10% of the 2008 HCV case patients with genotype 1 being the most commonly reported (Figure 6). This was expected since genotype 1 is the most common genotype in the United States (CDC, 2010; Milliman, 2009). Finally, based on the data submitted in 2008, 79% of case patients were not able to be confirmed because of missing test results (e.g., positive HCV antibody test with high signal-to-cut-off ratio, positive HCV RIBA, positive HCV RNA, reported genotype). This demonstrates that data received on potential cases is incomplete at the time of case determination due to several items such as cases not being investigated appropriately, follow-up testing not being reported, and/or follow-up testing not being performed.

Conclusions

There is considerable opportunity for improvement in surveillance for HCV infection in Indiana. Data is often incomplete, variable, inaccurate, and biased leaving a misleading impression of the burden of HCV infection. These issues are not specific to Indiana. They are seen across the nation and are a result of poor funding of programs, lack of standardized surveillance programs, lack of staffing to complete the data entry and case investigations that accompany proper surveillance, and lack of HCV infection knowledge and awareness among HCPs, LHDs, and the public. As a result of these known issues, there is an inability to track and gather data on cases, prevention measures are not being implemented, and people are not being moved into case management or care.

There are many ways Indiana can improve upon the surveillance that was conducted in 2008. There needs to be better compliance with 410 IAC 12.3 regarding reporting of demographics such as DOB or age, gender, race, ethnicity, and county of residence. If there was improved reporting of these variables, a more accurate picture of the burden of disease in Indiana could be attained. Nationally, prevalence rates of HCV infection suggest that African Americans and Hispanic/Latino Caucasians experience higher rates of infection than non-Hispanic/Latino Caucasians (IOM, 2010: Milliman, 2009). That is not demonstrated by Indiana's data because of the sparse reporting of race and ethnicity. The error in INEDSS that allowed case patients to be reported without a county of residence has been corrected so this problem should not exist in future years. Additionally, better reporting of case patients' addresses would reduce the need to use providers' or laboratories' addresses as a proxy for county of residence, thus increasing the accuracy of county-level prevalence rates.

There are several issues to address regarding the collection of data on risk factors for both acute and chronic HCV infections. One problem is that LHDs were informed at the inception of collecting data on chronic HCV case patients to mark all data fields as "unknown" if they were unable to locate the case patient or the case patient did not respond making it impossible to differentiate true "unknown" responses from unasked questions marked as "unknown." This issue is currently being resolved through enhanced education efforts. Additionally, a check box has been added in the diagnosis section of the case investigation for case patients that LHDs are unable to locate or that did not respond so that these cases can be differentiated from case patients that are investigated. These changes will be in effect for the 2010 reporting

year. Other risk factor issues addressed include the following: more choices for HCV contact type, added type of injection drugs used, more choices for type of injection and non-injection drugs used, and type of outpatient procedure performed. Having a more efficient and useful database, like INEDSS, is important. Continued efforts need to be made to encourage all LHDs to use INEDSS and ongoing education for LHDs regarding the hepatitis C processes is needed. There appears to be some duplication of efforts and case investigating that does not need to take place. Strategic trainings are being planned for later in 2010 to address some of these issues. These training sessions will include the following: an overview of the IOM report on hepatitis and liver cancer, understanding and interpreting HCV lab results, determining if positive HCV labs need follow-up, making case determinations using CDC HCV case definitions, and completing the HCV case investigation form. Another issue with surveillance that existed in 2008 and will exist in 2009 data as well is that two different case investigations existed; one for INEDSS participating counties and one for non-INEDSS participating counties. In 2008, there were six pilot LHDs during the spring and summer with an additional 12 LHDs participating in INEDSS by the fall leaving, 78 LHDs using the case investigation form for non-INEDSS participating LHDs. Most data fields in the non-INEDSS participating case investigation are included in the INEDSS case investigation, but the INEDSS case investigation was enhanced to report the most beneficial data. This resulted in counties reporting data using different surveillance assessment tools. Data fields that were common to both case investigations were included in this report. For example, IDU is the most common risk factor associated with HCV infection (CDC, 2010; IOM, 2010) yet the case investigation form used by non-

INEDSS participating counties did not collect the type of injection drug used. In contrast, the INEDSS case investigation does collect this useful data. In 2010, both participating and non-participating INEDSS counties will be asked for this data so results can be reported.

One last way to improve the quality of reported risk factors is to differentiate the Department of Corrections (DOC) case patients from the rest of the case patients. A very small number of DOC case patients are investigated so it is expected that there would be no risk factors data on these case patients. Another reason why DOC case patients should be differentiated is that DOC case patients falsely increase rates in counties that have a DOC facility. This issue was addressed in 2009. Now DOC case patients can be differentiated from other HCV case patients. Efforts should still be made to increase investigation of DOC case patients to determine the burden of disease and risk factors among incarcerated populations in Indiana.

In addition, efforts to improve the reporting of the reasons why HCV testing is ordered and associated signs and symptoms need to be implemented. Data on the presentation of symptoms, or lack of symptoms, is vital when determining case status. For 2010, additional options have been added to the list of reasons for testing to reduce the number of free text entries and to better capture if case patients are symptomatic or asymptomatic. Increasing the number of HCV case patients that have a reported ALT level at the time of testing positive for HCV is important. The presentation of jaundice or an ALT of greater than 400 IU/mL is crucial when determining case status, but is often not reported. Better compliance with 410 IAC 12.3 among hospital administrators and

physicians will make a substantial impact on this problem. The low and unknown rates of vaccination for HAV and HBV among HCV infected individuals is unfortunate and efforts should be made to collect better data and implement better vaccination programs because vaccination is one way to prevent additional damage to the liver.

Another area to improve upon is the reporting of case patient education. The education status is unknown for a majority of chronic HCV case patients. Since investigating chronic case patients is not mandatory, it is unclear if case patients received education by HCPs and/or LHDs or not at all. Better efforts should be made to at least educate HCV positive individuals about their disease even if risk factors are not gathered although it is a good opportunity to gather this data as a relationship is being built through education.

Finally, one last area to improve on is collection of ancillary data that assists in confirming a case or ruling out a case. This includes positive and negative confirmatory tests that are conducted after the initial positive test. Positive confirmatory tests should be received by the ISDH, but negative results are not reportable so that data is often lost unless the LHDs investigate the cases. Other tests that are important are the IgM to HAV and the IgM to HBV core antigen for acute HCV case patients because these tests rule out HAV and HBV infection. Gathering this data usually requires LHDs to investigate case patients and report their findings to the ISDH.

References

1. CDC. (2010) Hepatitis C FAQ. Retrieved March 5, 2010, from http://www.cdc.gov/hepatitis/HCV/HCVfaq.htm.

2. Heymann, D.L. (2008). Control of Communicable Diseases Manual (19th ed.). American Public Health Association.

3. IOM. (2010). *Hepatitis and Liver Cancer: A National Strategy for Prevention and Control of Hepatitis B and C*. National Academies Press.

4. Milliman Inc. (2009, May). *Consequences of Hepatitis C Virus (HCV): Costs of a Baby Boomer Epidemic of Liver Disease*.