ARIZONA DEPARTMENT OF HEALTH SERVICES

2016 Viral Hepatitis Epidemiologic Profile for Arizona

June 2016

Contents

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EXECUTIVE SUMMARY

Introduction

Hepatitis is an inflammation of the liver. There are three main viruses that cause viral hepatitis in the United States: hepatitis A (HAV), hepatitis B (HBV), and hepatitis C (HCV). Hepatitis A has had an important role in public health efforts in Arizona, but the incidence of hepatitis A has decreased dramatically since the implementation of recommendations for childhood vaccinations and county requirement for childcare immunization; furthermore, hepatitis A does not cause chronic infection and thus does not lead to the same long-term health effects and burden that hepatitis B and C can produce. Viral hepatitis caused by HBV or HCV are the leading causes of liver cancer and the most common reason for liver transplantation. Hepatitis B and hepatitis C are two of the most commonly reported infectious diseases in the state of Arizona.

Hepatitis B and C are bloodborne pathogens, meaning that the viruses are spread through exposure to blood or body fluids. Hepatitis B can be transmitted through sexual contact with an infected person or sharing needles or syringes. Hepatitis B can also be spread from mother to baby at birth. Hepatitis C is spread by exposure to blood from an infected person, such as through sharing needles. Up to 75 percent of Americans living with chronic HBV or HCV do not know they are infected. Thus, it is important for at-risk populations to get tested for HBV and HCV. The CDC recommends that those born in Asia or the Pacific Islands or whose parents were born there get tested for HBV. The CDC also recommends that baby boomers (people born from 1945 to 1965) get tested for HCV.

The Viral Hepatitis Epidemiologic Profile was created to illustrate the burden of hepatitis B and hepatitis C amongst Arizonans. The goals of the profile are to:

- Promote awareness about viral hepatitis;
- Promote screening recommendations for HBV and HCV;
- Provide data to local health departments, other state agencies, and health care providers for planning purposes; and
- Inform policies for viral hepatitis prevention and services.

Highlights

- From 2006 – 2015, an average of 979 chronic hepatitis B and 128 acute hepatitis B cases were reported each year, though there has been a decrease in the number of acute hepatitis B cases identified in recent years.
  - The rate of new reports of acute HBV was highest among persons aged 40-44 years. Chronic HBV rates were highest among those 30-34 years.
  - The average annual rate of hepatitis B infection amongst Asians/Pacific Islanders was much higher than among other racial/ethnic groups. However, race/ethnicity was not identified for the majority of cases.
  - Mohave County had the highest overall rate of acute HBV in this time period; Maricopa, Pima and Pinal Counties had the highest rates of chronic HBV.

- From 1998 – 2008, an average of 7,514 cases of hepatitis C cases was reported each year.
  - 68% of HCV cases were males.
  - The average age of HCV diagnosis was 44 years. The baby boomer cohort (born from 1945 to 1965) had the highest number of reported cases.
  - Of the small proportion of cases investigated, mostly in the early 2000's, over 60% had used injection or intranasal drugs.

- Hepatitis C laboratory reports from 2009 – 2015 also suggest the highest rates of HCV in the baby boomer cohort (1945 – 1965). Additionally, these data suggest an increase in HCV cases born after 1978.
    - Data from 2002 – 2008 and 2013 – 2015 suggest the highest rate of newly reported cases of HCV was in Mohave County.

- Inpatient records from Hospital Discharge Data showed:
    - From 2009 – 2014, there were 5,565 hospitalizations associated with HBV.
        - The highest rates were among those between the ages of 50-54.
        - Those with a principal diagnosis of HBV were hospitalized an average of 4.8 days.
    - From 2009 – 2014, there were 80,829 hospitalizations associated with HCV.
        - The highest rates were amongst those between the ages of 55-59 years.
        - Those with a principal diagnosis of HCV were hospitalized an average of 5.0 days.

- Hepatitis B patients reported through communicable disease surveillance, who also had liver cancer as noted in the Cancer Registry, were more likely to be Asians/Pacific Islanders and Black/African-Americans compared to the general Arizona population.
    - Eighty-five percent of the HBV-liver cancer patients were male.

- Hepatitis C patients who also had liver cancer were more likely to be male (81%).

- The Vital Records Death Database showed that:
    - From 2005 – 2014, there was an average of 27 deaths associated with HBV each year.
        - The average age at death associated with HBV was 60 years, compared to 74 years for all deaths in Arizona.
        - From 2011 – 2014, Asians/Pacific Islanders with HBV had the highest age-adjusted mortality rate.
    - The number of deaths documenting HCV infection as a cause or contributing condition to death increased from 261 in 2005 to 560 in 2012. During 2011 – 2014, there was an average of 508 deaths per year.
        - The average age of death associated with HCV was 59 years compared to 74 years for all deaths in Arizona.
        - From 2011 – 2014, Hispanics with HCV infection had the highest age-adjusted mortality rate.

- From 2008 to 2014, the numbers of drug-related hospitalizations with a HCV diagnosis have increased by 59%.
    - Males comprised over 65% of these hospitalizations.
    - The highest percentage of drug-related hospitalizations and HCV infections are among those 45-54 years of age.
    - Whites had the highest rate of drug-related hospitalizations with co-occurring HCV infection.

- Ninety-seven percent of those co-infected with acute HBV and HIV were male and 95% of those co-infected with chronic HBV and HIV were male.
    - A relatively high proportion of co-infections were among Blacks/African-Americans.
    - Approximately two-thirds of co-infections were among men who have sex with men (MSM).

- Eighty-three percent of those co-infected with HCV and HIV were male.
    - Blacks/African-Americans made up 13% of HCV-HIV co-infected cases.
    - Thirty-nine percent of those co-infected with HCV and HIV had a history of injection drug use; 29% were MSM.

- Out of 3,254 clients that were tested using the HCV rapid antibody test in a screening program to facilitate access among high-risk populations, 10% had positive test results.

- Among HCV antibody-positive clients, the proportion reporting a history of intranasal drug use, injection drug use, or incarceration was much higher than the proportions of these risk factors among all tested clients.
- There were challenges in ensuring positive clients were linked to care and received confirmatory testing.

Recommendations

The profile highlights the burden of HBV and HCV amongst Arizonans. Of note, racial and ethnic disparities amongst Asian/Pacific Islanders and Blacks/African-Americans exist for HBV, although there are challenges in accurately collecting and measuring that information. The highest numbers of HCV infections are in baby boomers (those born between 1945 and 1965) and a high percentage of newly detected HCV-positive individuals have a history of drug use and/or incarceration. There is a concerning number of positive HCV tests reported amongst persons born after 1978. This population bears further investigation to identify whether these reports represent true cases, and if so, to characterize this group in order to better understand how to reduce ongoing transmission. HIV patients continue to be at-risk for being co-infected with either HBV or HCV.

It is important to uphold the CDC recommendations in testing at-risk populations for HBV, including those born in countries where the virus is endemic in the population, and testing for HCV among baby boomers and those who have ever injected drugs. Ensuring that those identified with HBV or HCV infection are linked to care is also important in order to reduce the morbidity and mortality of viral hepatitis among Arizonans.

Introduction

Diagnosed cases of viral hepatitis (A, B, C, D, or E) are reported to the local health agencies by healthcare providers, per the Arizona Administrative Code (A.A.C.) R9-6-202. Likewise, laboratory reports indicative of a hepatitis infection must be reported to the Arizona Department of Health Services (ADHS), per A.A.C. 204. Local and state health department officials work together to monitor and track this information. This may include combining information reported from multiple sources or at multiple points in time, or conducting case investigations, as warranted.

Chronic infections, like hepatitis B or C, can be challenging for this type of surveillance. A patient's healthcare provider may change over time, and the provider may not know if a patient has been reported to the health department in the past. Laboratories continue to send positive results on a patient as long as the tests are ordered, without identifying the reasons for testing, or whether the result is the first confirmation of disease. Disease incidence data, or the incidence of first report, rely on health departments being able to identify and exclude reports for persons who were previously reported.

Further details on the methods for this section, as well as additional references and data tables, are included in the Technical Appendix.

Hepatitis B

Since 2006, the Medical Electronic Disease Surveillance Intelligence System (MEDSIS) has been the statewide surveillance system for many of Arizona's reportable infectious disease conditions, including hepatitis B. MEDSIS is a secure web-based, centralized, person-based disease surveillance system for Arizona. MEDSIS is supported by the ADHS for use by local health departments for disease surveillance, and for individuals and institutions responsible for reporting communicable diseases. ADHS and local health departments have methods to help identify whether a patient has been reported for hepatitis B previously; cases are counted only for the first report. Hepatitis B data from 2006 – 2015 were extracted from MEDSIS and analyzed for the profile.

Every year, ADHS receives about 1,000 new case reports of HBV (Figure 1A). Figure 1B shows the incidence rate of reported acute and chronic HBV by year. From 2006 – 2015, there were a total of 1,479 new acute HBV cases and 9,790 new chronic HBV cases reported. For this period, there were only six reports of perinatal hepatitis B infection: four in 2007, one in 2009 and one in 2013. The average number of reported acute HBV cases was 128 per year and the average number of reported chronic HBV cases was 979 per year for this period.

The decrease in acute HBV cases between 2006 and 2015 could be the result of several factors, including a true decrease in acute infections, but also the methods for how cases are counted. The acute HBV case definition changed in 2013, requiring cases to have clinical symptoms in addition to laboratory results in order to be counted. Cases in earlier years may not been counted based only on laboratory results, or symptomatic cases may be excluded after 2012 if there were limited resources conducting an investigation

to determine whether a person had compatible symptoms. The decrease observed between 2006 and 2007 would be unaffected by these changes in case definitions.

Figure 1A. Number of Hepatitis B Cases, by Year Reported

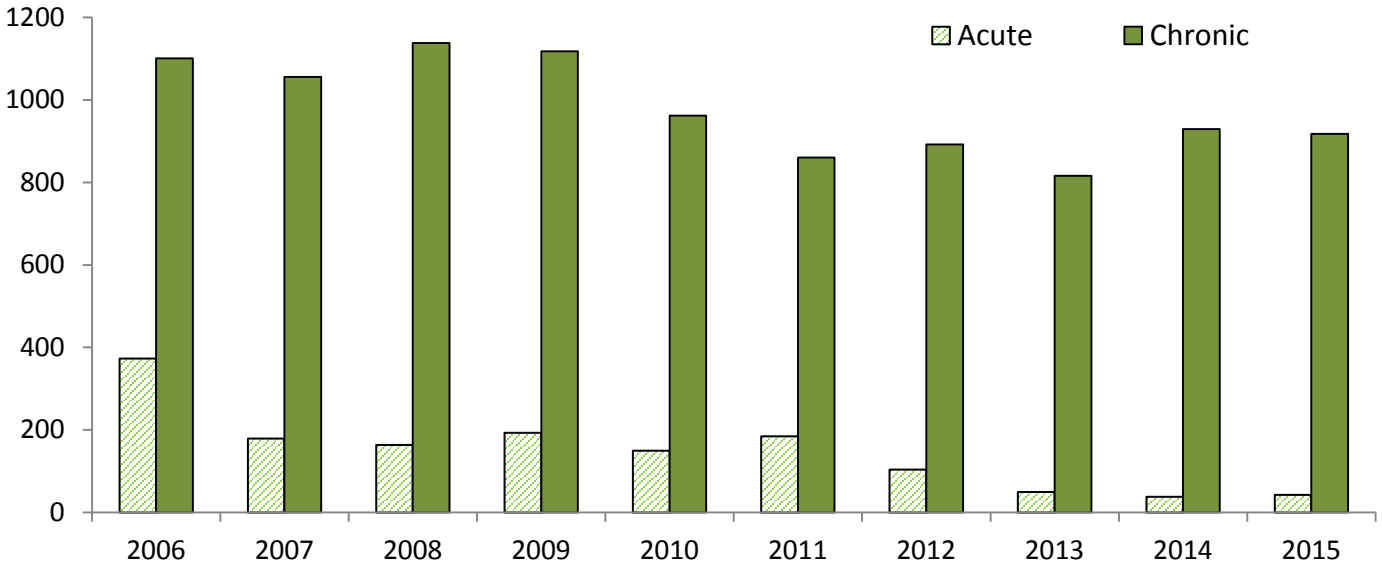
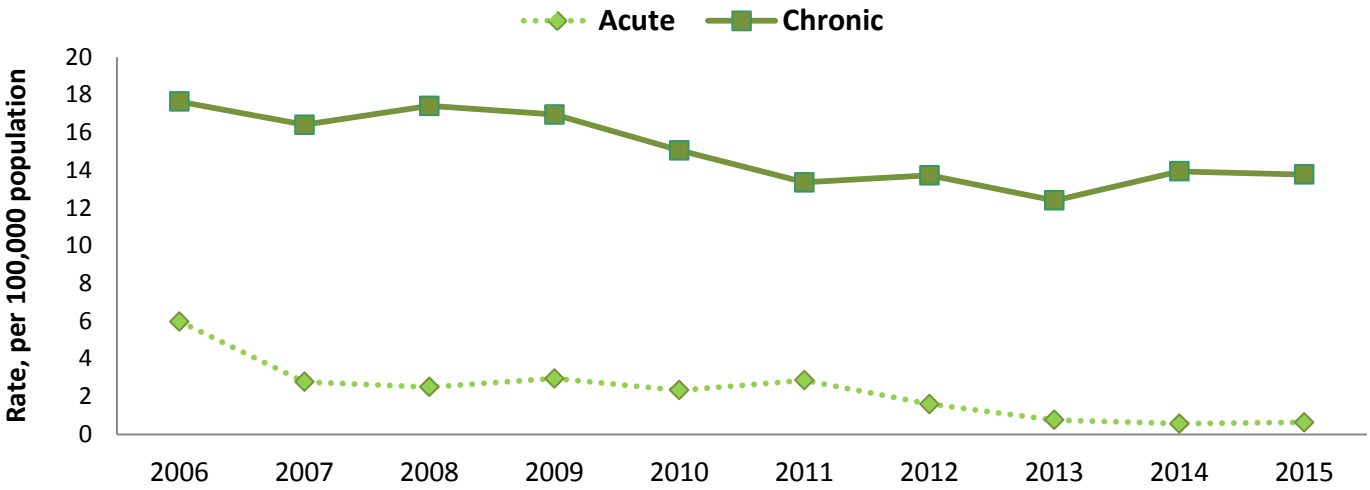


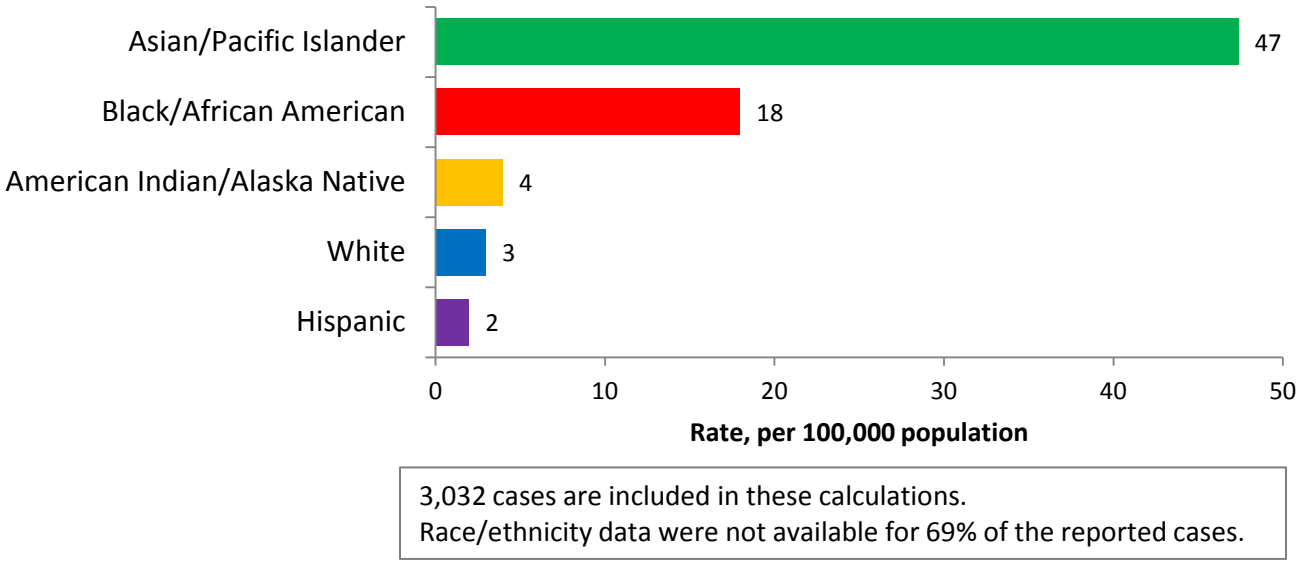
Figure 1B. Rate of Reported Hepatitis B, per 100,000 population, by Year



Of HBV cases reported during this 10-year period, males accounted for 62% of acute cases, and 57% of chronic cases.

Annualized rates of newly reported acute HBV ranged from 0.7 cases per 100,000 persons among Hispanics, to 1.3 cases per 100,000 among American Indian/Alaska Natives during this period, but, significantly, race or ethnicity was available for only 39% of cases. More sizable differences between racial/ethnic groups are observed in the chronic hepatitis B data (Figure 1C), with much higher rates for Asians and Pacific Islanders than other groups. However, like for acute hepatitis B, more than half (69%) of cases were missing racial/ethnic data, so these findings should be interpreted with caution.

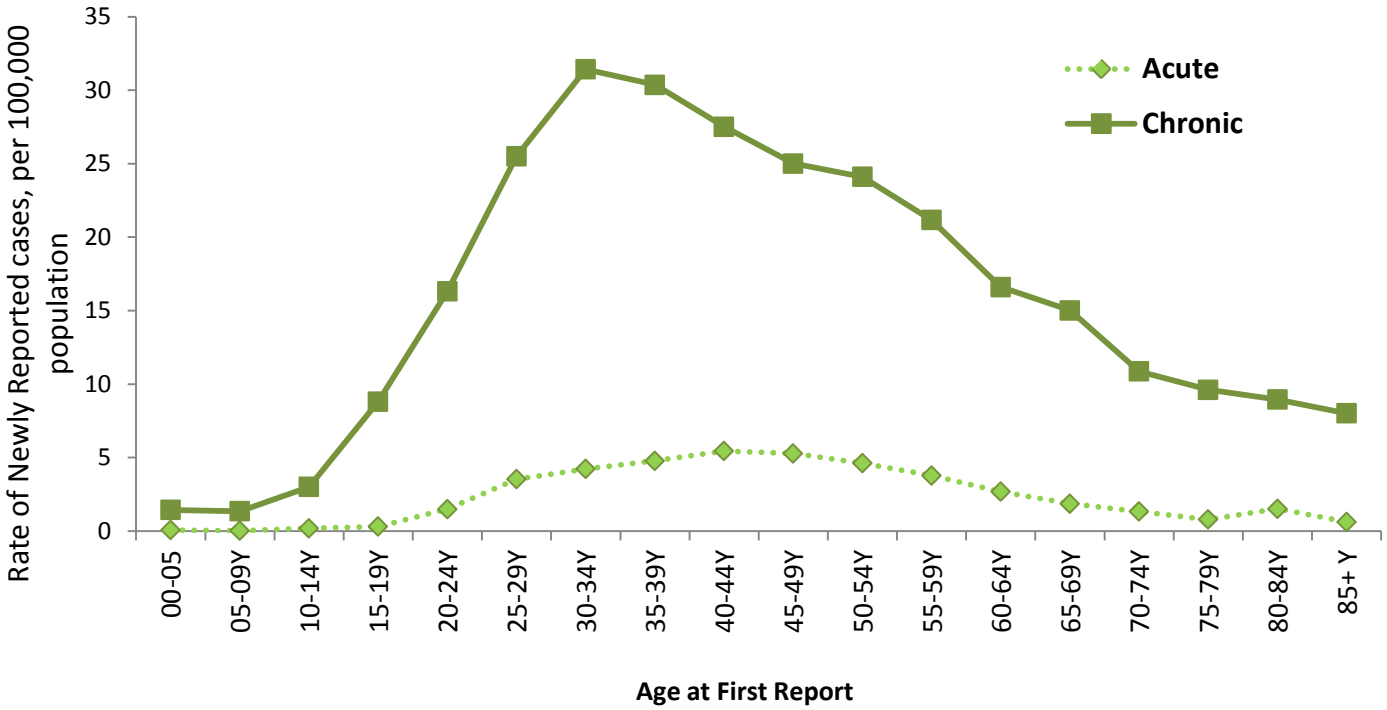
Figure 1C. Average Rate of Chronic Hepatitis B per 100,000 population, by Race/Ethnicity, 2006 – 2015



3,032 cases are included in these calculations.
Race/ethnicity data were not available for 69% of the reported cases.

Figure 1D illustrates the average annual rate of acute and chronic HBV, by age at the time of first report to public health. The highest rates for acute HBV were among those between the ages of 40-44 years old. For chronic HBV, the highest rates were among those between the ages of 30-34 years old.

Figure 1D. Average Annual Rate of Hepatitis B, per 100,000 population by Age Group, 2006 – 2015

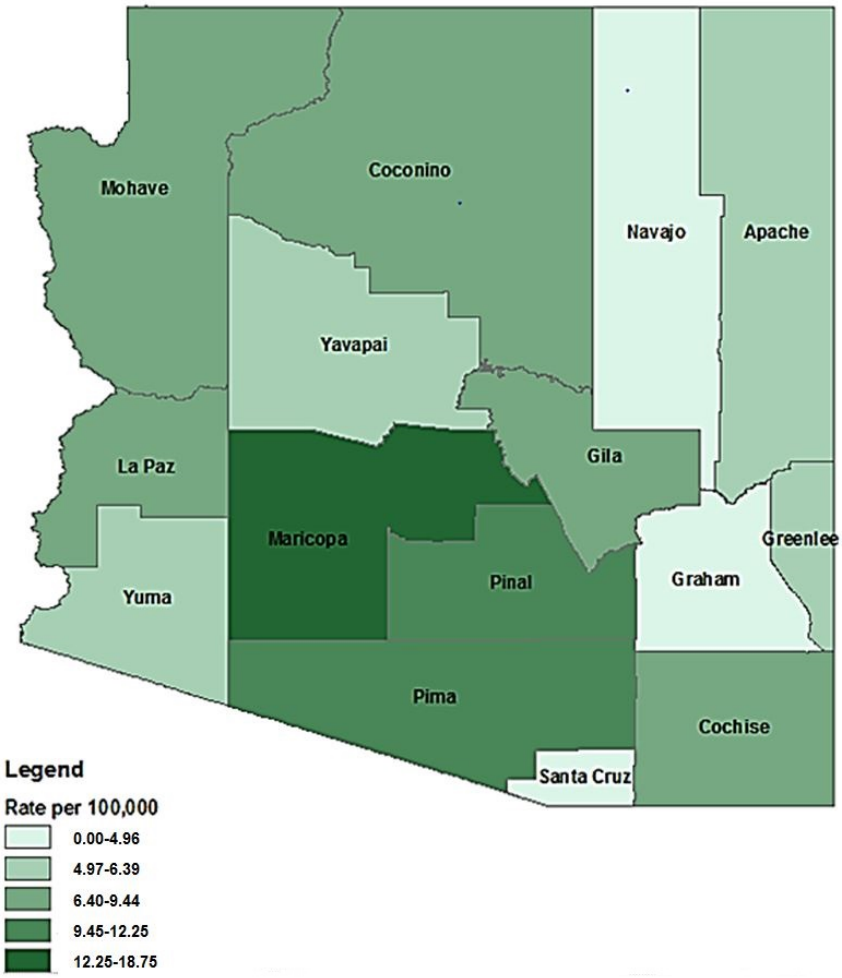


Rates of reported acute and chronic hepatitis B differed across counties. Mohave County had the highest overall rate of reported acute HBV for this time period (Figure 1E). However, there was considerable variability in rates year-to-year for many counties; no county showed consistently higher rates than others.

Figure 1E. Average Annual Rate of Acute Hepatitis B by County, 2006 – 2015

The counties with the highest rates of chronic HBV were the most populated counties of Maricopa, Pima, and Pinal (Figure 1F). Unlike for acute HBV, these counties had consistently higher rates during this time period; rates for many of the smaller counties varied more year-to-year.

Figure 1F. Average Annual Rate of Chronic Hepatitis B by County, 2006 – 2015



Hepatitis C

1998 – 2008 Data

From 1998 – 2008, ADHS had the capacity to conduct comprehensive surveillance for HCV, which included entry of all reported confirmed and probable cases of HCV into a database. Additionally, a small subset (8.3%) of the 1998 – 2008 HCV cases was investigated, including information on risk factors, characteristics, and outcomes.

From 1998 – 2008, there were 83,115 HCV cases newly reported to ADHS. The average number of reported HCV cases was 7,514 per year. Sixty-eight percent of the HCV cases were male (Table 1A). The mean and median age at the time of HCV report was 45 years. Fifty-nine percent were white, 25% were Hispanic, 8% were American Indian/Alaska Native (AI/AN), 7% were Black/African-American, and 0.5% were Asian/Pacific Islander (API). In comparison, the median Arizona population during this timeframe was 64% white, 25% Hispanic, 5% AI/AN, 3% Black/African American, and 2% API. Thus, a higher percentage of AI/ANs and Blacks/African Americans were observed among the HCV cases than the general Arizona population. It is important to note, however, that race/ethnicity is missing for most than half of the HCV cases.

Table 1A also compares the 8% of cases that were investigated to all reported HCV 1998 – 2008 cases. A higher percentage of non-Hispanic Whites and a lower percentage of AI/ANs and Hispanics were investigated compared to the proportion reported. Women were slightly more likely to be investigated. Also, most of the investigations involved cases first reported in 2000 – 2003, while case reports were more evenly distributed across the time period.

Table 1A. Characteristics of Investigated HCV Cases and All HCV Cases, 1998 – 2008

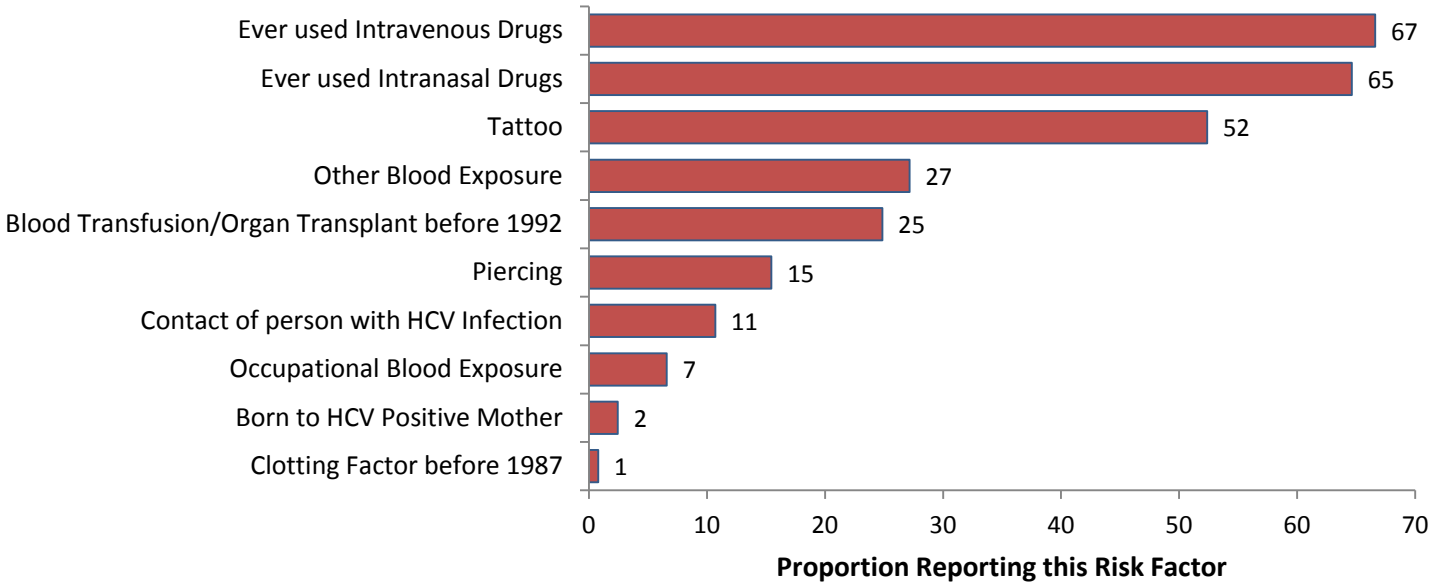
Characteristic	Investigated HCV Cases (n=6,898)	All HCV Cases (n=83,115)
Gender (%) †		
Male	66.5	67.8
Female	33.5	32.1
Race/ethnicity* (%)†		
White, non-Hispanic	68.2	59.4
Black	6.5	6.8
Asian/Pacific Islander	0.6	0.5
American Indian/Native American	4.4	8.0
Hispanic	20.2	25.4
Year reported (%)†		
1998-1999	8	9
2000-2001	26	15
2002-2003	57	23
2004-2005	7	22
2006-2008	3	31
Age		
Mean	46.2	44.7
Median	46	45

*15% of investigated cases and 55% of all cases had unknown race/ethnicity

† Statistically significant difference between investigated and non-investigated cases.

Figure 1G displays common risk factors amongst the investigated HCV cases. A large percentage of HCV cases investigated had a history of injection drug or intranasal drug use. Over 50% of those investigated had received a tattoo. Additionally, the following outcomes were reported at the time of investigation: cirrhosis (20%), needing a liver transplant (8%), and hepatocellular cancer (2.5%).

Figure 1G. Percentage of Investigated HCV Cases with Certain Risk Factors, 1998 – 2008



2009 – 2015 Data

Due to a loss of funding and resources to be able to continue a hepatitis C surveillance program, after 2008 ADHS was unable to sustain entering, counting, and ensuring de-duplication of all reported HCV cases. In 2009, ADHS began on-boarding commercial and hospital laboratories to submit reportable infectious disease testing results electronically, and by mid-2012, more than half of all laboratory reports were being submitted through this method. ADHS has begun to assess the burden of HCV in Arizona by utilizing electronic laboratory reporting (ELR) data and will continue to use ELR as a proxy mechanism for hepatitis C surveillance in Arizona. While we know that reports submitted via ELR are not comprehensive of all positive HCV laboratory reports, this mechanism allows us to sustain some indication of HCV trends in the state.

Hepatitis C laboratory results from ELR from 2009 – 2015 were cleaned to remove negative results and classified according to the CSTE case definition. The laboratory results were de-duplicated so that only the first report was retained for an individual person. The HCV ELR cases from 2009 – 2015 were then cross-matched with the 1998 – 2008 HCV database to identify new (not previously reported) cases; both datasets were then combined for analysis purposes. We anticipate that many reports of newly identified hepatitis C infection may be missed by this method, especially in the earlier years of ELR reporting, as not all laboratories are yet reporting via ELR in 2016. However, we believe the ELR results to be indicative of the trends in newly identified cases, even if they do not represent the total.

Combined Data for 1998 – 2015

There were a total of 117,445 HCV cases identified for 1998 – 2015. Sixty-six percent were male. The number and rates of reported hepatitis C cases increased from 1998 to 2004 with the highest rates of newly reported cases being reported between 2002 and 2004 (Table 1B and Figure 1H).

The baby boomer birth cohort of 1945 – 1965 accounts for the majority of hepatitis C cases for the data reported 1998 – 2008 as well as from the ELR data reported 2009 – 2015 (Figure 1I). Looking at birth year,

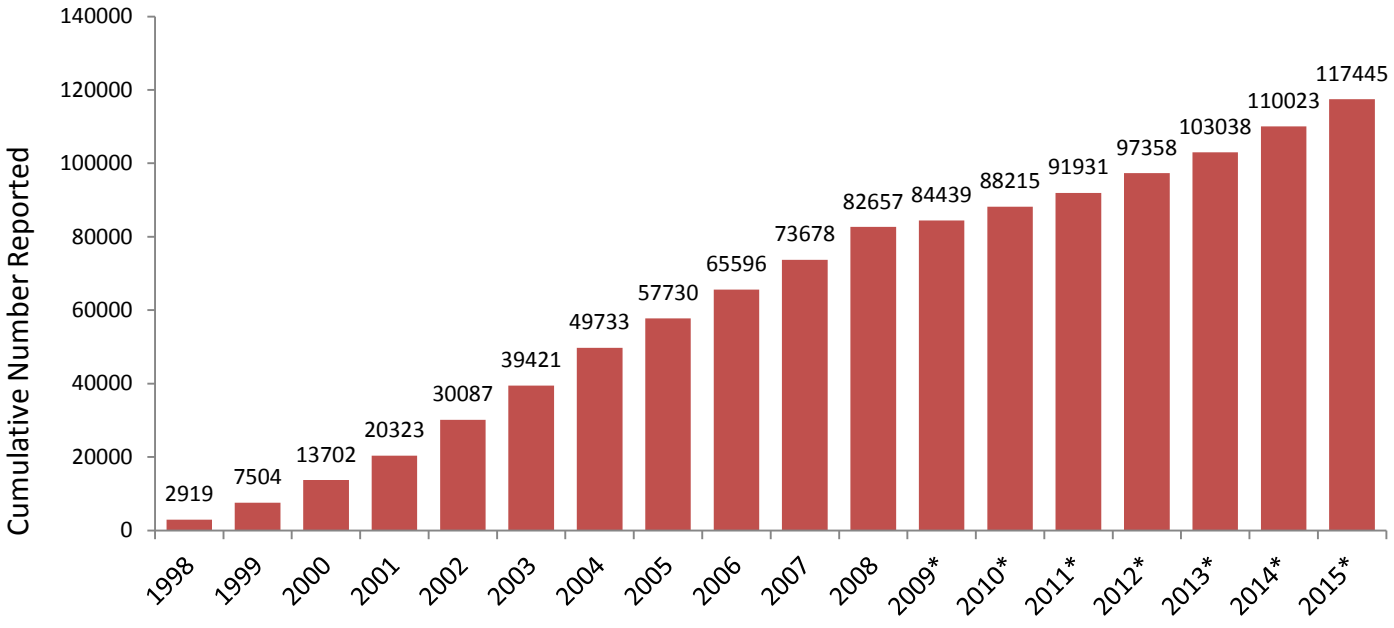
rather than age at diagnosis or report, is useful for hepatitis C because may people affected by HCV were likely infected decades ago, even if the diagnosis is made much more recently. A substantial proportion of the ELR cases were also born after 1978, which may suggest a correlation with increasing injection drug use amongst the younger populations in the United States.

Table 1B. Number and Rates of Hepatitis C Cases by Year, 1998 – 2015

Year	Number	Rate, per 100,000 population
1998	2919	60
1999	4585	91
2000	6198	121
2001	6621	125
2002	9764	178
2003	9334	166
2004	10312	177
2005	7997	132
2006	7866	126
2007	8082	126
2008	8979	137
2009	1782	*
2010	3776	*
2011	3716	*
2012	5427	*
2013	5680	*
2014	6985	*
2015	7422	*

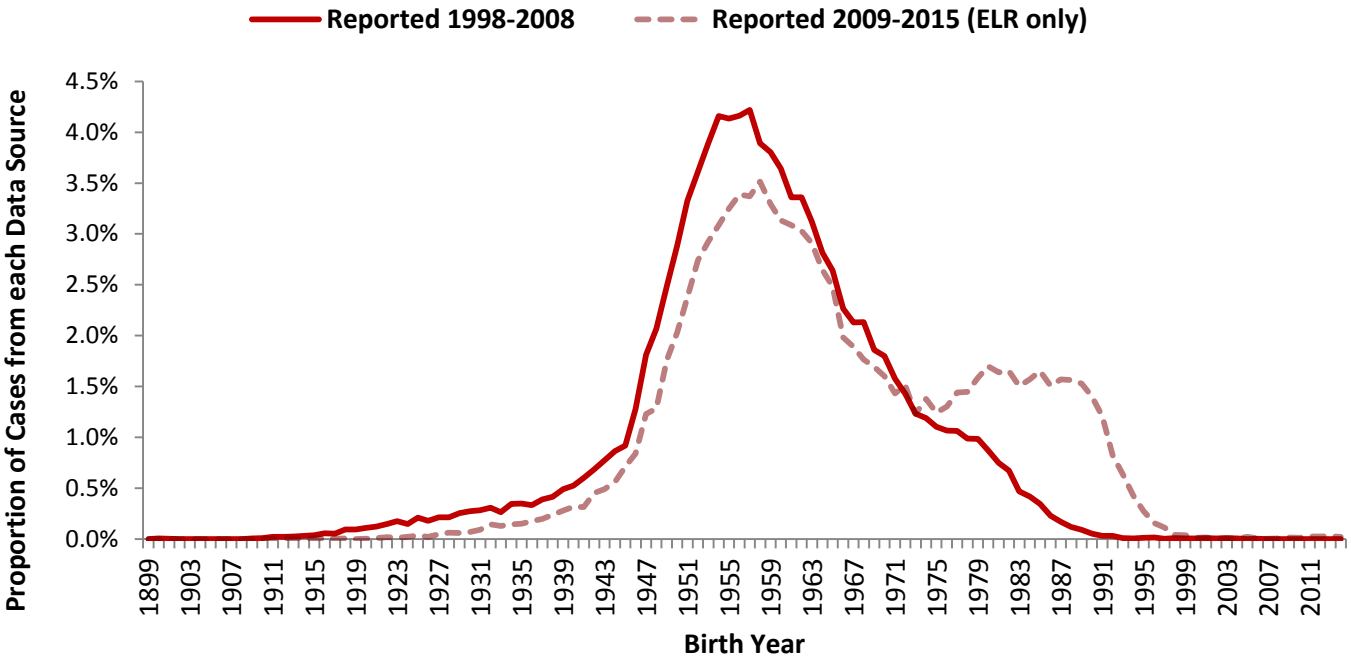
*Rates not calculated; ELR-only surveillance.

Figure 1H. Cumulative Number of New Cases of Hepatitis C Reported, by Year



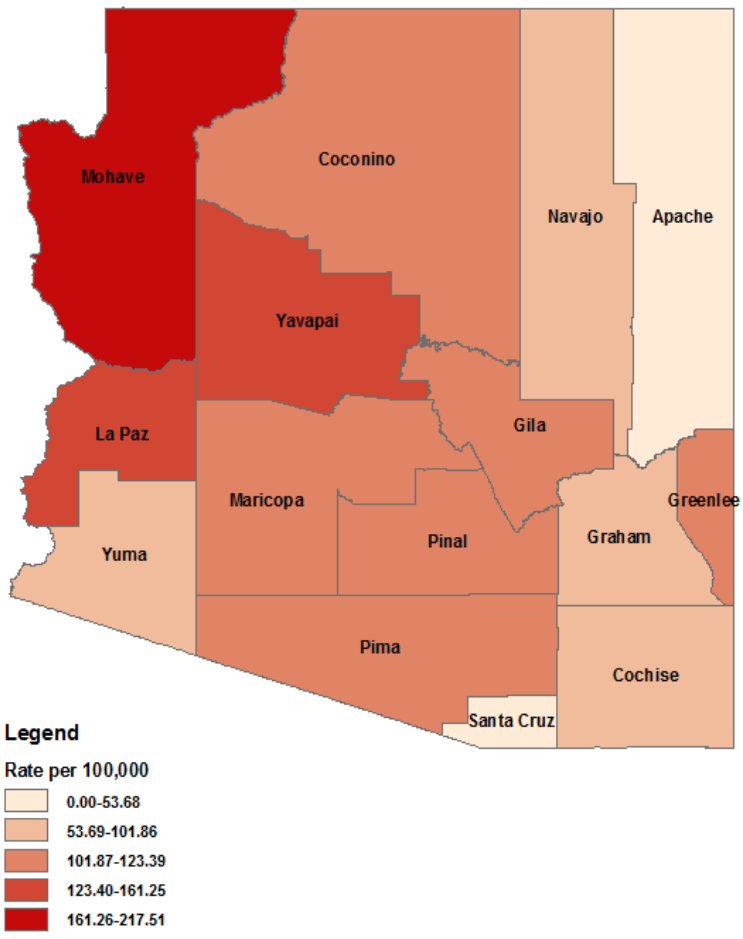
*Surveillance data from ELR only, 2009-2015.

Figure 1I. Hepatitis C Cases Reported 1998 – 2015, by Birth Year



Excludes 735 cases with missing birthdate or ages <1 or >99 (possible data errors)

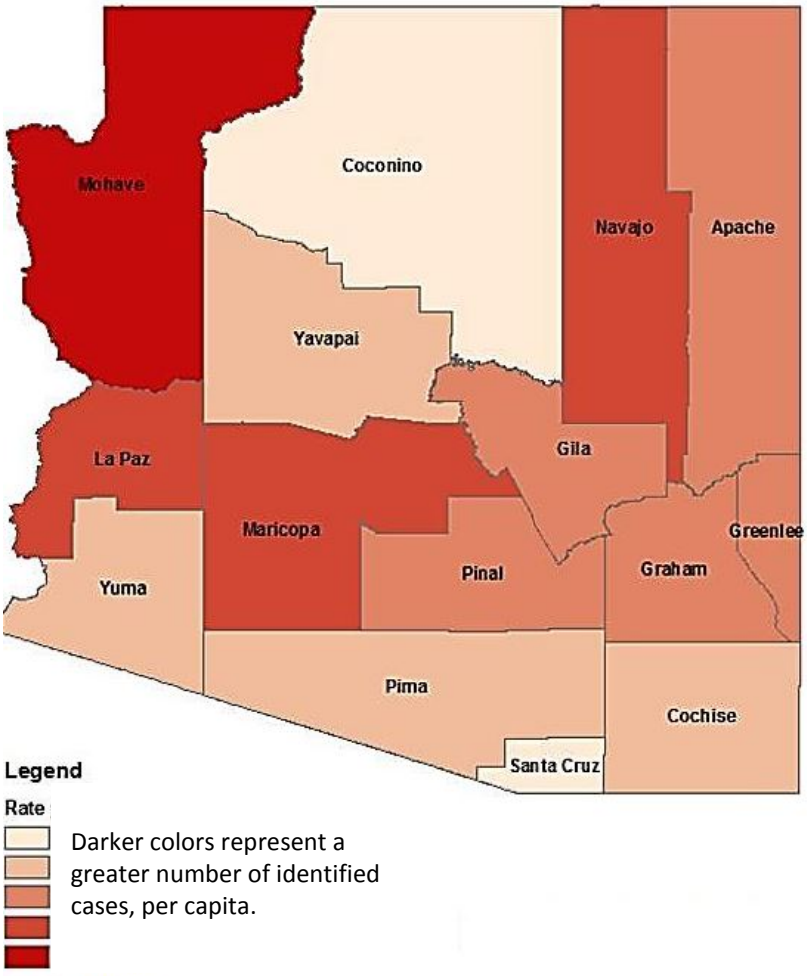
Figure 1J. Average Annual Rate of Hepatitis C by County, 2002 – 2008



From 2002 – 2008, the highest rate of newly reported cases of hepatitis C were in Mohave County. La Paz and Yavapai Counties also had high rates of HCV (Figure 1J).

Using ELR data for more recent years (2013 – 2015), the highest rate of HCV was still found in Mohave County (Figure 1K). Because the numbers for this time period only use ELR data, we know the rates are underestimates and thus we show only the relative rankings of reports per population, as the rates cannot be compared to the earlier time period. However, it is also important to note that different patterns of laboratory utilization between counties, and whether those laboratories report data via ELR, would affect these later data.

Figure 1K. Number of Newly Identified Cases of Hepatitis C reported through ELR, Relative to County Population, 2013 – 2015



HOSPITALIZATIONS

Hospitalizations related to viral hepatitis were examined utilizing the Arizona Hospital Discharge Data (HDD). ADHS collects hospital discharge records for inpatient and emergency department visits at non-federal facilities in Arizona. All Arizona licensed hospitals are required to report, per A.R.S. § 36-125-05, and Arizona Administrative Code Title 9, Chapter 11, Articles 4 and 5. Approximately 3 million discharge records are collected annually. Records contain hospital identifiers, patient demographics, diagnoses, external cause codes, procedures, billing information, and physician information.

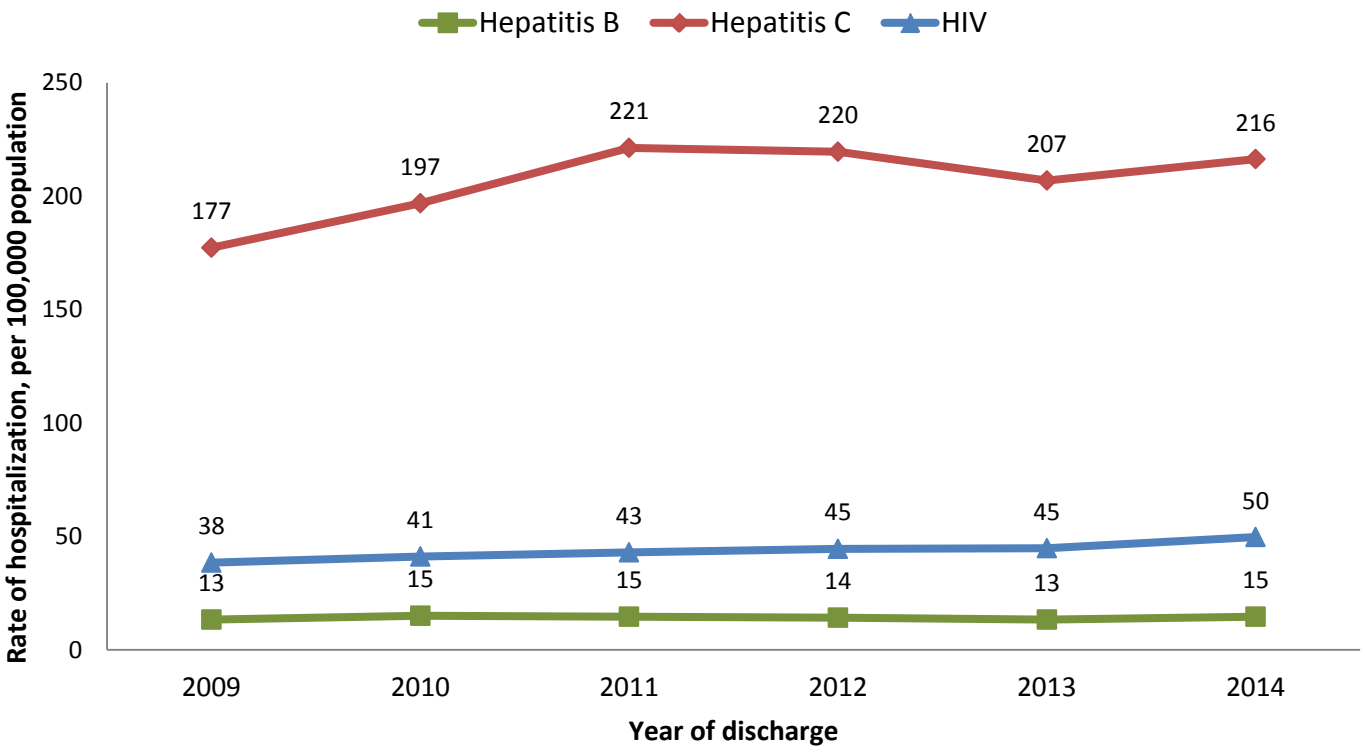
The following diagnosis codes were pulled from Arizona inpatient HDD records from 2009 – 2014, for Arizona residents: hepatitis B (ICD-9 codes: 070.20, 070.21, 070.22, 070.30, 070.31, 070.32, 070.33) and hepatitis C (ICD-9 codes: 070.41, 070.44, 070.51, 070.54, 070.70, and 070.71). All 25 available diagnosis codes in HDD were examined.

Hepatitis B and C HDD data were also compared with HIV HDD data from the same timeframe (ICD-9 codes: 042, V08, 079.53, and 795.71). Figure 2A compares hospitalization rates per 100,000 population for hepatitis B, hepatitis C, and HIV. The hospitalization rates for HCV are more than quadrupled those for HIV and HBV.

It is important to note that the hospitalization data shown here represents visits rather than patients. A patient who was hospitalized for these conditions multiple times during this time period will be counted for each visit.

Further details on the methods for this section are included in the Technical Appendix.

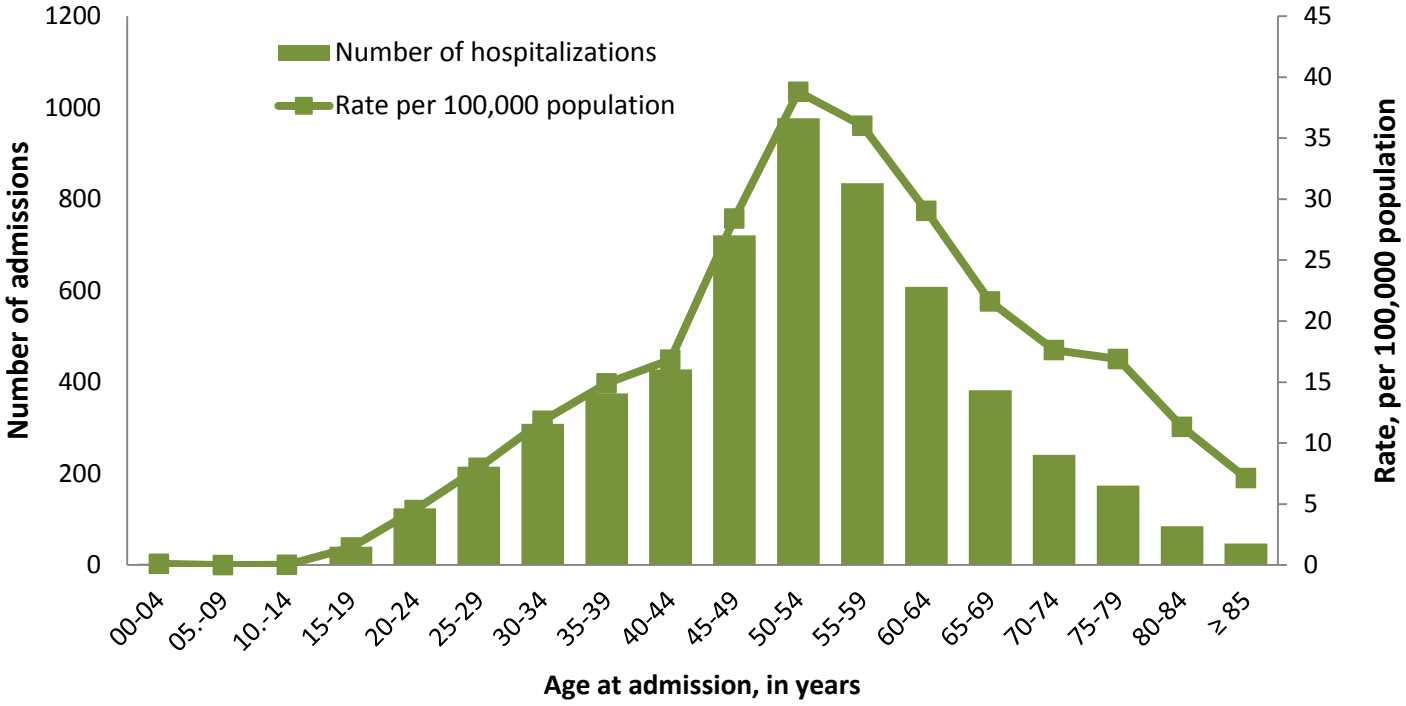
Figure 2A. Hospitalization Rates, per 100,000 populations, for Hepatitis B, Hepatitis C, and HIV, by year



Hepatitis B

From 2009 – 2014, there were 5,565 hospitalizations associated with hepatitis B. Of these, 7.0% (391) listed hepatitis B as the principal diagnosis. Sixty-three percent of hospitalizations were among males. The highest hospitalization rates associated with HBV were amongst persons between the ages of 50-54 years (Figure 2B). The prominent ages for hospitalization are somewhat older than the ages from the laboratory and provider surveillance data. Patients with a principal diagnosis of HBV are somewhat younger (mean age = 49, median 48) than those with HBV-associated visits but a different principal diagnosis (mean age = 52, median 53) (Figure 2C).

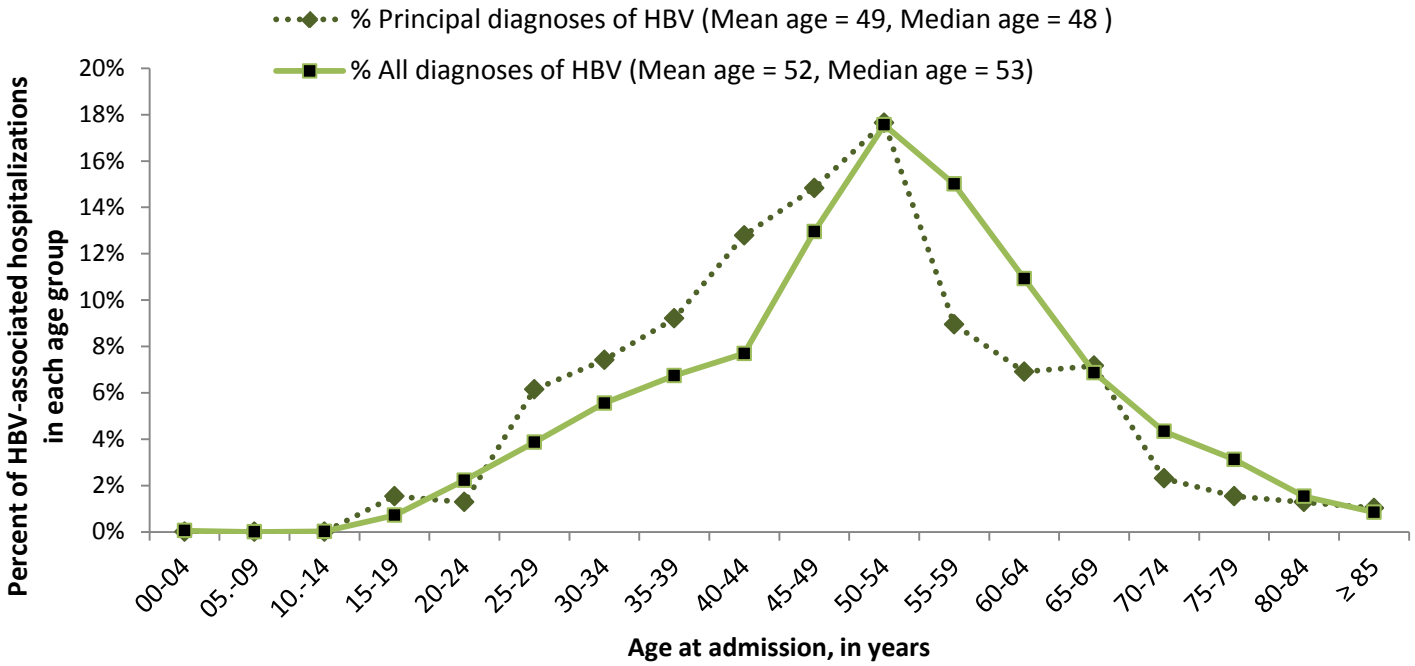
Figure 2B. Number and Rate of All Hospitalizations associated with HBV, per 100,000 population, by Age Group, 2009 – 2014



The majority of hospitalized patients were insured through either AHCCCS Medicaid (33%) or Medicare (28%). For all HDD inpatient visits (any diagnosis), Medicaid and Medicare account for 28% and 26% of visits, respectively.

Looking only at hospitalizations with a principal diagnosis of hepatitis B, the total charges were $16.5 million for 2009 – 2014, with an average charge per hospital visit of $42,104 (median $24,160). The mean length of stay for those with a hepatitis B principal diagnosis was 4.8 days (median four days).

Figure 2C. Proportion of Hospitalizations associated with HBV, by Age Group, 2009 – 2014, for Principal Diagnosis vs. Any Diagnosis of HBV



Hepatitis C

From 2009 – 2014, there were 80,829 hospitalizations associated with hepatitis C. Of these, 6.2% (4,995) listed hepatitis C as the principal diagnosis. Sixty-six percent of hospitalizations were among males. The highest hospitalization rates associated with HCV were amongst those between the ages of 55-59 years (Figure 2D). The ages for hospitalization are similar to those seen among the laboratory surveillance data. While the age distribution of patients with a principal diagnosis of HCV is similar to those with HCV-associated visits but a different principal diagnosis (Figure 2E), those with a principal HCV diagnosis are more likely to be clustered in the range of 50-59 years of age.

The majority of patients were insured through either AHCCCS Medicaid (40%) or Medicare (24%). For all HDD inpatient visits (any diagnosis), Medicaid and Medicare account for 28% and 26% of visits, respectively.

Looking only at hospitalizations with a principal diagnosis of hepatitis C, the total charges were $23.3 million for 2009 – 2014, with an average charge per hospital visit of $46,716 (median $25,094). The mean length of stay for those with a hepatitis C principal diagnosis was five days (median three days).

Figure 2D. Rate of Hospitalizations associated with HCV, per 100,000 population, by Age Group, 2009 – 2014

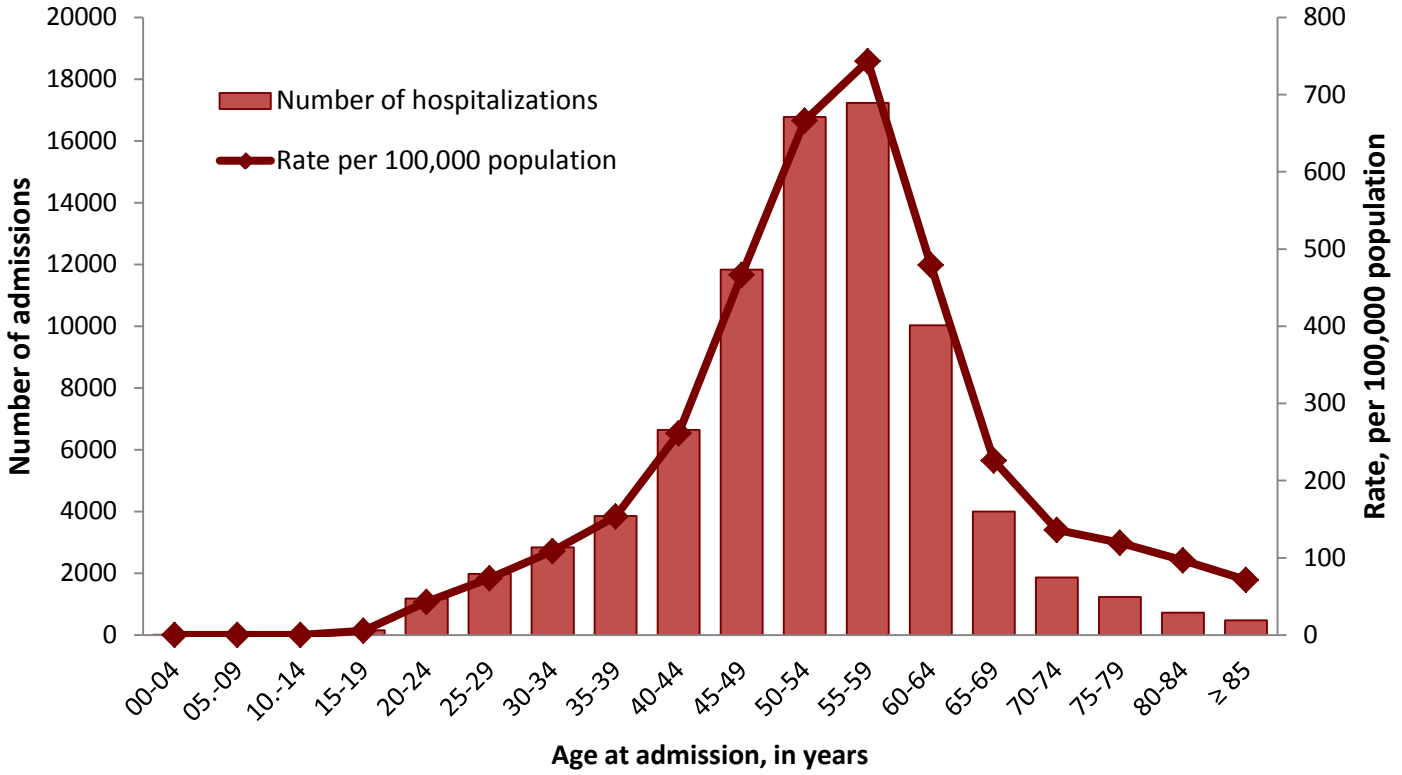
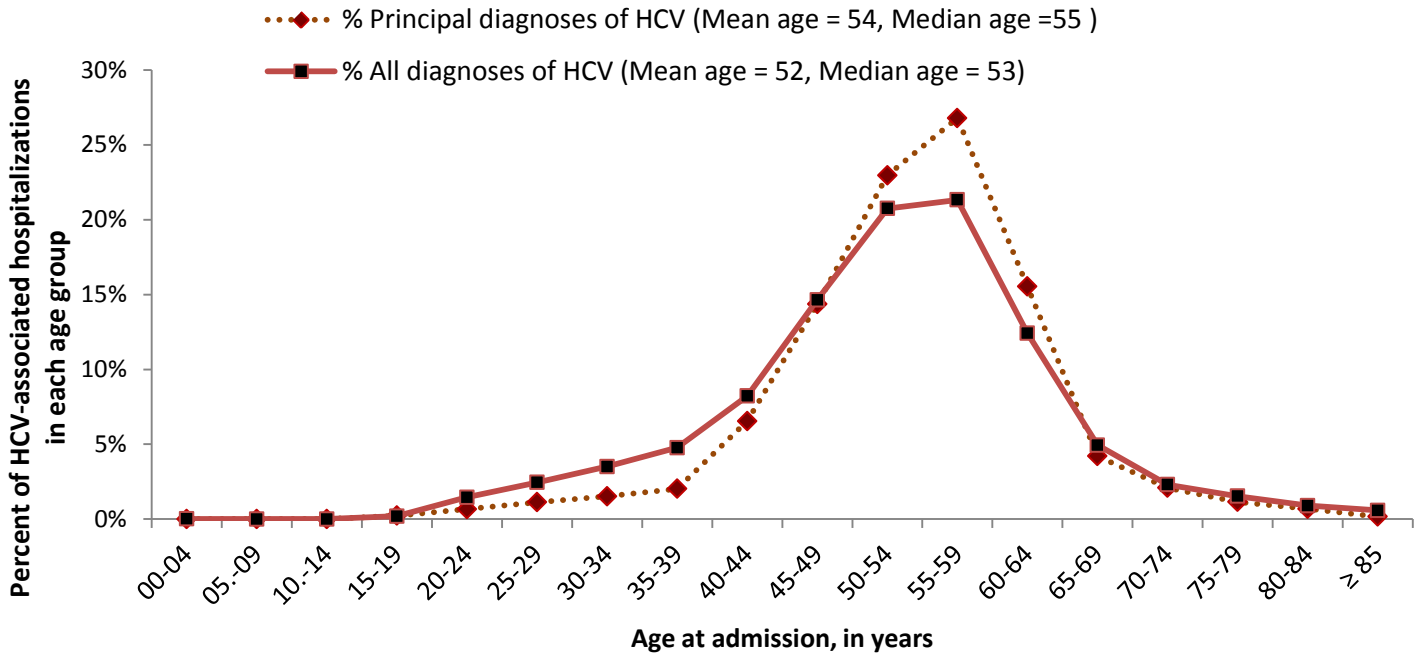


Figure 2E. Proportion of Hospitalizations associated with HCV, by Age Group, 2009 – 2014, for Principal Diagnosis vs. Any Diagnosis of HCV



LIVER CANCER

The Arizona Cancer Registry (ACR) is a population-based surveillance system that collects, manages and analyzes information on the incidence, survival and mortality of persons having been diagnosed with cancer. The ACR began collecting cancer case information in 1981. The ACR has data available describing cancer in Arizona using a variety of descriptors, including site of origin, age, sex, race, ethnicity, geographic area, and year of diagnosis.

Hepatitis B

The ACR was matched with HBV data from 1988 – 2014. A total of 112 liver cancer patients with HBV were identified during this time period. The highest numbers of liver cancer diagnoses amongst HBV patients was in 2010 (Figure 3A). The low numbers of diagnoses in 2015 may be due to a lag in reporting to the ACR.

Figure 3A. Liver Cancer Patients with HBV by Year of Liver Cancer Diagnosis, N=112

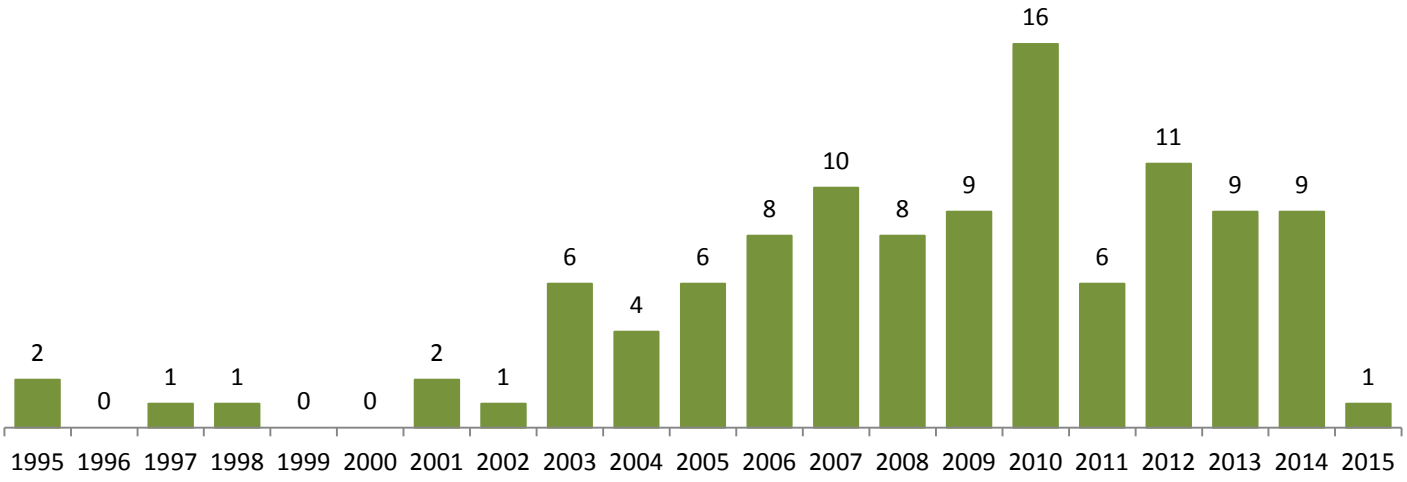


Figure 3B shows the race/ethnicity distribution of liver cancer patients with HBV, which shows higher percentages in Asian/Pacific Islanders (29%) and African Americans/Blacks (11%) compared to the general population. Most liver cancer patients with HBV were male (Figure 3C).

Figure 3B. Liver Cancer Patients with HBV by Race/Ethnicity, N=112

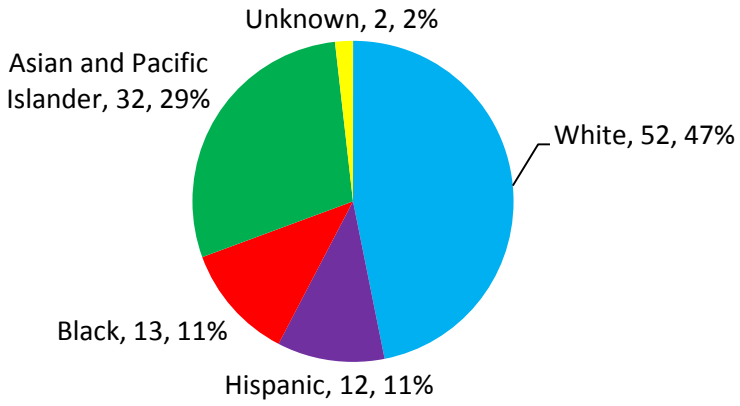


Figure 3C. Liver Cancer Patients with HBV by Gender, N=112

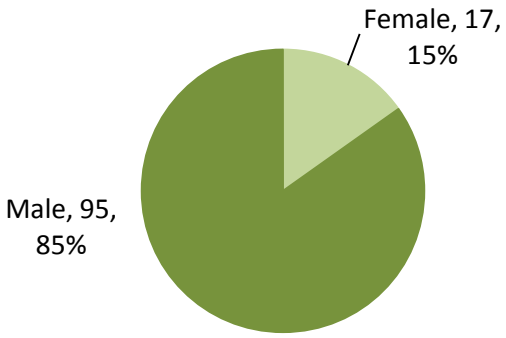


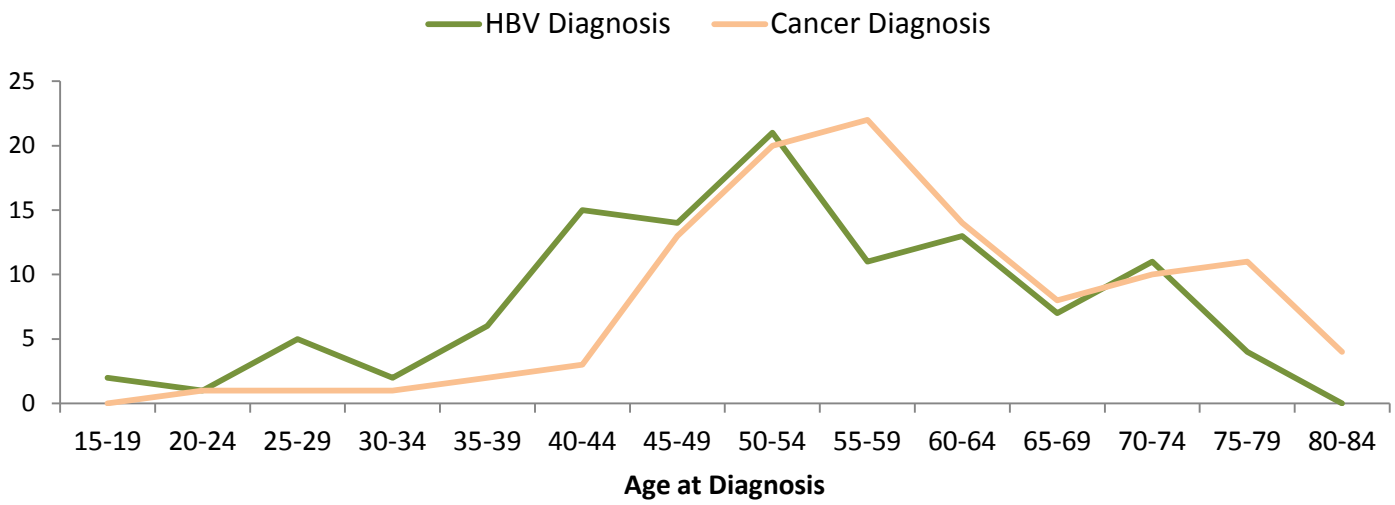
Table 3A depicts the number of liver cancer patients with HBV by county.

The average age of diagnosis of HBV among these persons was 53 years (median 53, range 18-77). The average age of cancer diagnosis was 59 years (median 58, range 20-81). The average length of time from HBV diagnosis to liver cancer diagnosis was 6.0 years (median: 4.8 years, range 0.1 years to 24.2 years). Figure 3D shows the age of diagnosis of HBV as well as cancer amongst liver cancer patients with HBV.

Table 3A. Liver Cancer Patients with HBV by County

County	Number
Apache	0
Cochise	4
Coconino	1
Gila	1
Graham	2
Greenlee	0
La Paz	0
Maricopa	80
Mohave	2
Navajo	0
Pima	15
Pinal	3
Santa Cruz	0
Yavapai	1
Yuma	2
Unknown	1

Figure 3D. Age of Diagnosis amongst Liver Cancer patients with HBV, N=112



Hepatitis C

The ACR was matched with HCV data from 1998 – 2008 and HCV electronic laboratory reporting data (ELR) from 2009 – 2015. Refer to the Surveillance Data section for a description of using ELR data for HCV surveillance.

A total of 948 liver cancer patients with HCV were identified during this time period. The highest numbers of liver cancer diagnoses amongst HCV patients was in 2014 (Figure 3E). The low numbers of diagnoses in 2015 may be due to a lag in reporting to the ACR.

Figure 3E. Liver Cancer Patients with HCV by Year of Liver Cancer Diagnosis, N= 948

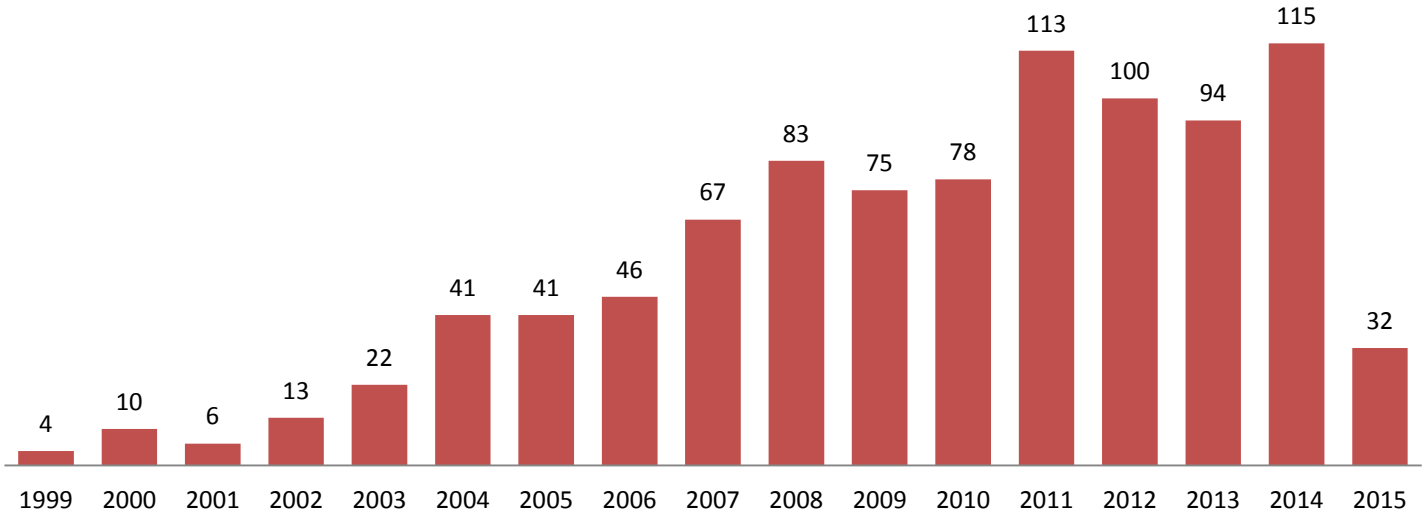


Figure 3F shows the race/ethnicity distribution of liver cancer patients with HCV. The race/ethnicity distribution is comparable to the general population, aside for African Americans/Blacks being slightly

higher at 7%. Refer to the Hepatitis C Testing section to see the distribution of race/ethnicity for the general Arizona population. The majority of liver cancer patients with HCV were amongst males (Figure 3G).

Figure 3F. Liver Cancer Patients with HCV by Race/Ethnicity, N= 948

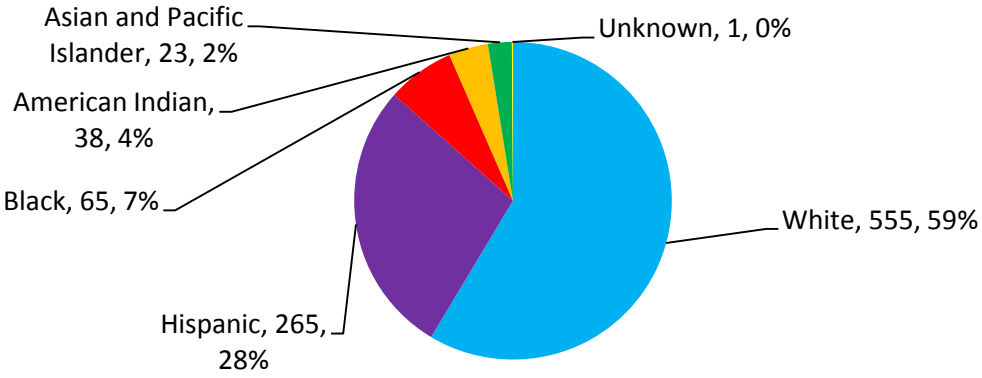


Figure 3G. Liver Cancer Patients with HCV by Gender, N=948

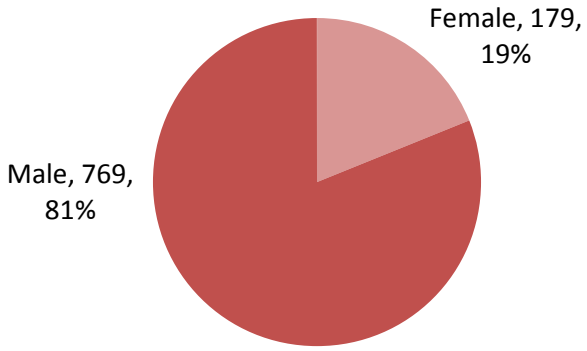


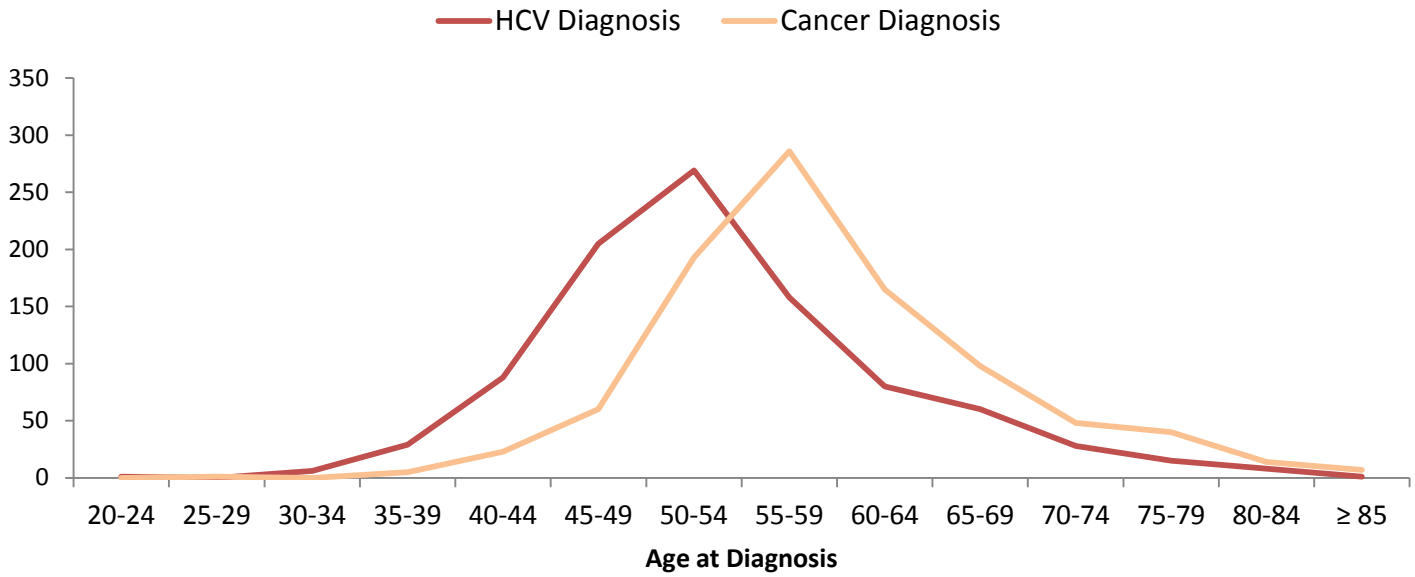
Table 3B depicts the number of liver cancer patients with HCV by county.

The average age of diagnosis of HCV among the identified liver cancer patients with HCV was 53 years (median 52, range 23-85). The average age of cancer diagnosis was 58 years (median 58, range 27-88). The average length of time from HCV diagnosis to liver cancer diagnosis was 5.2 years (median: 4.8 years, range 0.1 years to16.9 years). Figure 3H shows the age of diagnosis of HCV as well as cancer amongst liver cancer patients with HCV.

Table 3B. Liver Cancer Patients with HCV by County

County	Number
Apache	1
Cochise	19
Coconino	20
Gila	11
Graham	3
Greenlee	2
La Paz	4
Maricopa	526
Mohave	30
Navajo	8
Pima	198
Pinal	40
Santa Cruz	6
Yavapai	48
Yuma	25
Unknown	7

Figure 3H. Age of Diagnosis amongst Liver Cancer patients with HCV, N= 948



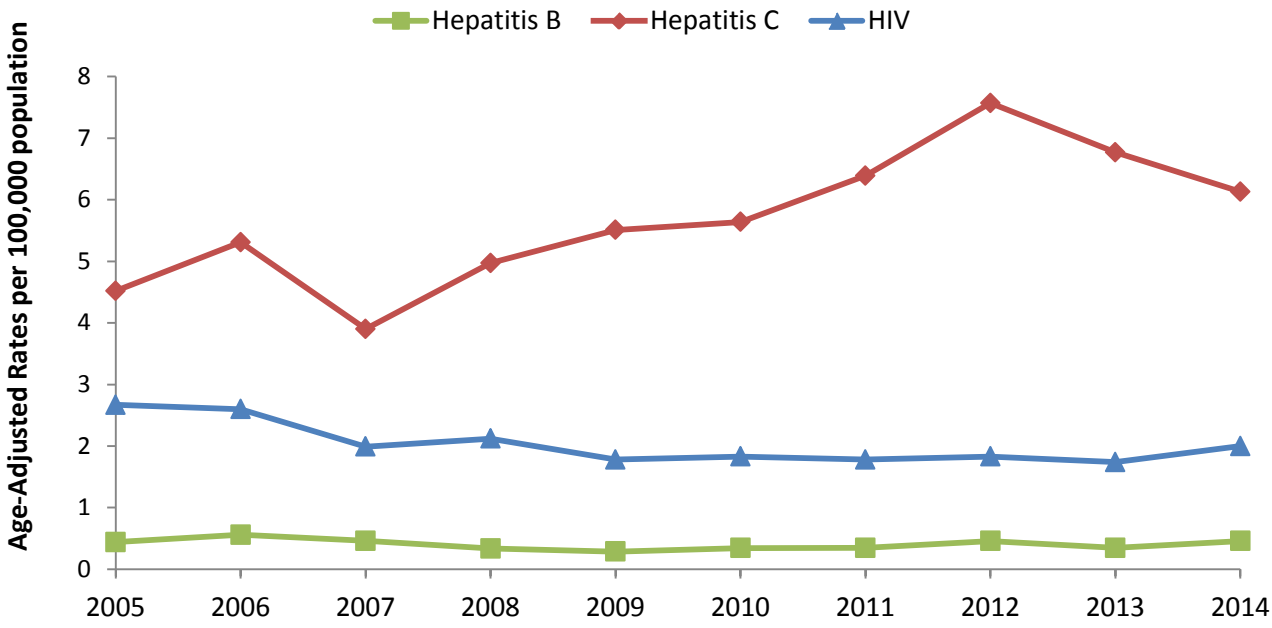
DEATHS

The ADHS Office of Vital Records maintains all information related to an Arizona resident's death including cause and manner of death, death certificate number, personal identifying information, and demographic information. The Vital Records death database was examined to identify deaths with the following classifications by the International Classification of Diseases, 10th Revision (ICD-10): hepatitis B as ICD-10 codes B16, B17.0, B18.0, and B18.1; hepatitis C as B17.1 and B18.2; and HIV as B20 through B24. To calculate mortality rates, the number of deaths associated with a disease was divided by the estimated Arizona population denominator for each year and then adjusted to the age distribution of the U.S. population (2000 census).

Figure 4A depicts the age-adjusted mortality rates per 100,000 population due to hepatitis B, hepatitis C, and HIV as a primary or contributing cause of death from 2005 – 2014 in Arizona. Hepatitis C had the highest mortality rates among the three diseases. Deaths due to hepatitis C increased from 2007 to 2012 before decreasing slightly in 2013 and 2014. Mortality rates of hepatitis B remained approximately the same, while a slight decline was reported in HIV rates during the same time period.

Further details on the methods for this section are included in the Technical Appendix.

Figure 4A. Deaths Documenting Hepatitis B, Hepatitis C, or HIV as a Cause or Contributing Condition to Death, Arizona, 2005 – 2014



Hepatitis B

Table 4A displays the number of reported hepatitis B-associated deaths by year, as well as the crude mortality rate and age-adjusted mortality rate. We analyzed demographic information for deaths occurring in the last four years of this time period, as shown in the following tables and graphs.

Table 4A. Deaths Documenting HBV Infection as a Cause or Contributing Condition to Death in Arizona, 2005 – 2014

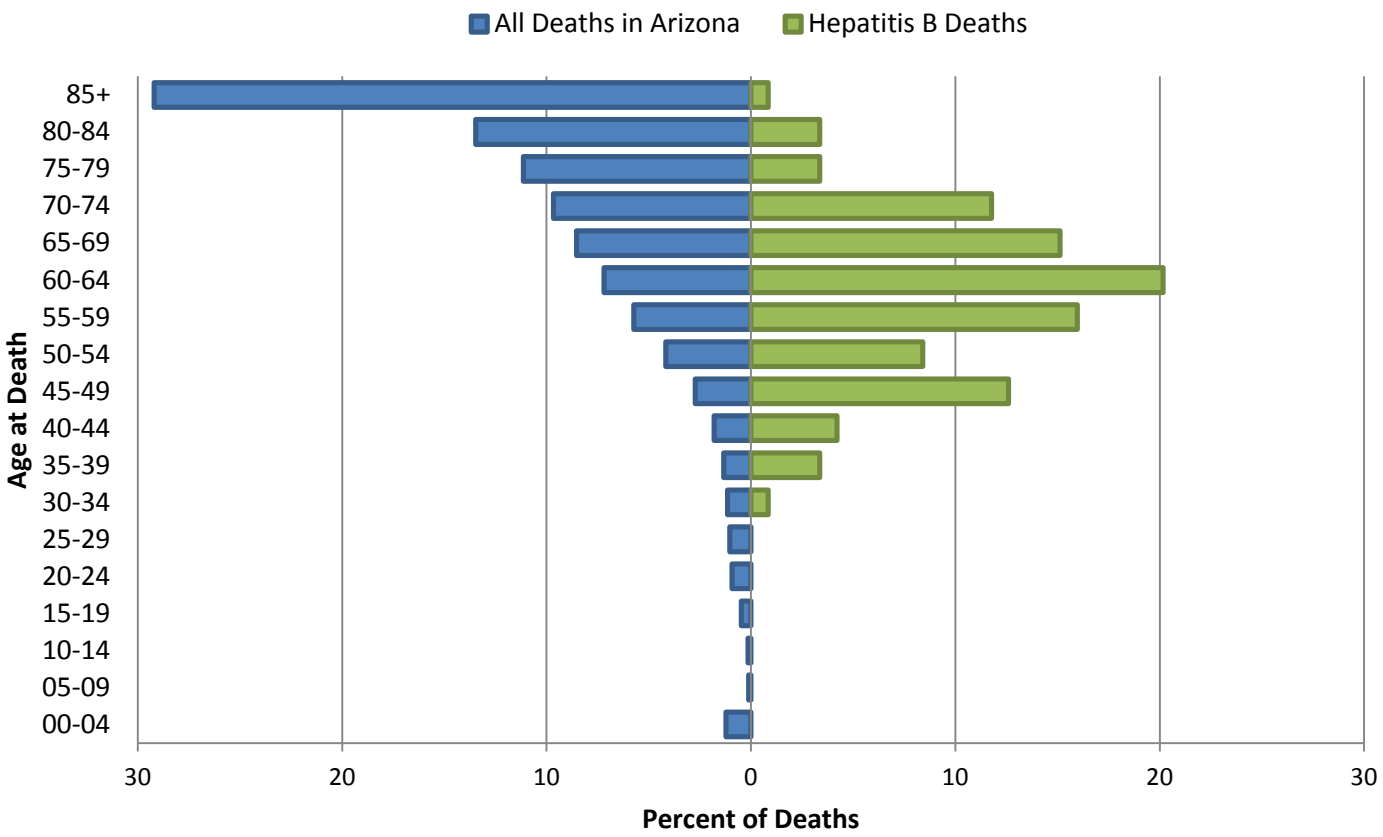
Year	Number of Deaths Documenting HBV	Crude Mortality Rate per 100,000 Arizonans	Age-Adjusted Mortality Rate per 100,000 Arizonans
2005	26	0.43	0.44 (0.27 – 0.61)
2006	34	0.55	0.56 (0.37 – 0.75)
2007	30	0.47	0.46 (0.30 – 0.63)
2008	22	0.34	0.34 (0.20 – 0.48)
2009	19	0.29	0.29 (0.16 – 0.41)
2010	23	0.36	0.34 (0.20 – 0.48)
2011	25	0.39	0.35 (0.21 – 0.48)
2012	33	0.51	0.46 (0.30 – 0.61)
2013	25	0.38	0.35 (0.21 – 0.48)
2014	36	0.54	0.46 (0.31 – 0.61)

Table 4B. Demographics of Decedents with HBV Infection Documented as a Cause or Contributing Condition to Death in Arizona, 2011 – 2014

Characteristic	Number	Percent
Total	119	100
Sex		
Male	84	70.6
Female	35	29.4
Ethnicity		
Hispanic	23	19.3
Non-Hispanic	96	80.7
Race		
American Indian	5	4.2
Asian or Pacific Islander	14	11.8
Black	8	6.7
Multiple	2	1.7
White	90	75.6
Birth Country		
United States	89	74.8
Outside the United States	28	23.5
Unknown	2	1.7

Figure 4B depicts the proportion of hepatitis B-related deaths occurring in each five-year age group compared to all-cause mortality in Arizona. The age group accounting for the highest proportion of HBV deaths was 60-64 years, with a mean and median age at death of 60 years. The most deaths of any cause in Arizona occurs among those age 85 years or older, with a mean and median age at death of 74 and 76 years of age, respectively.

Figure 4B. Age Distribution of Deaths in Arizona, 2011 – 2014



The annualized, age-adjusted mortality rates for hepatitis B (Figure 4C) for this period are highest among Asian/Pacific Islanders (APIs) followed by Blacks, compared to other racial/ethnic groups. However, we must interpret these numbers with some caution given the small number of deaths in several of these groups.

Figure 4C. Age-Adjusted Average Annual Mortality Rates of HBV by Race/Ethnicity, Arizona, 2011 – 2014

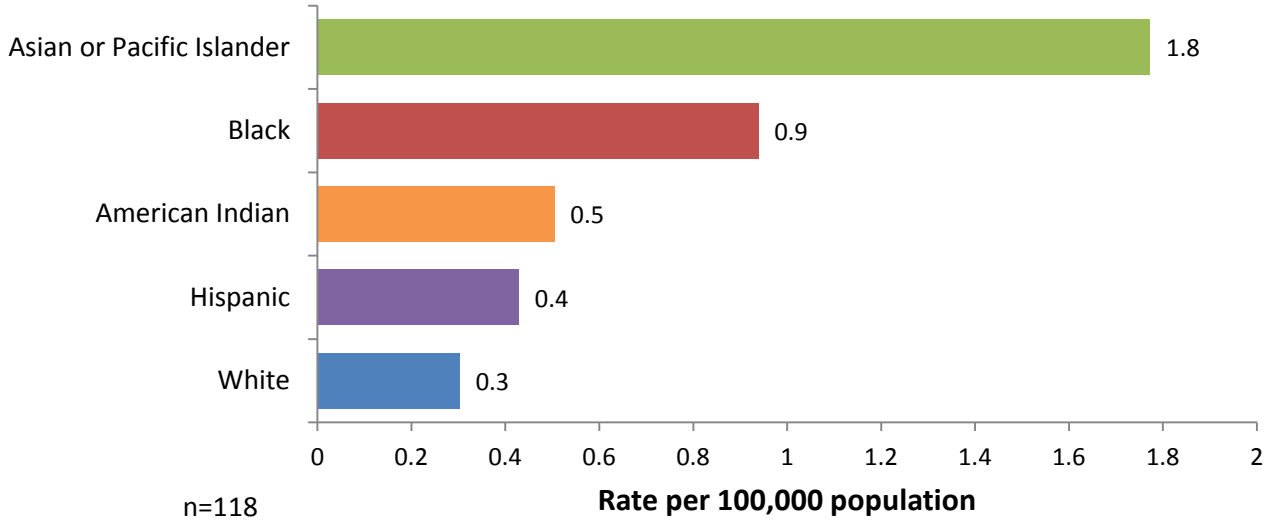


Table 4C shows the distribution of hepatitis B-associated deaths by county of residence.

Table 4C. Deaths Documenting HBV Infection as a Cause or Contributing Condition to Death, by County, Arizona, 2011 – 2014

County	Number of Deaths Documenting HBV	Crude Rate per 100,000
Apache	0	0
Cochise	2	0.38
Coconino	2	0.37
Gila	3	1.39
Graham	1	0.66
Greenlee	0	0
La Paz	0	0
Maricopa	75	0.48
Mohave	4	0.49
Navajo	0	0
Pima	13	0.33
Pinal	8	0.51
Santa Cruz	0	0
Yavapai	8	0.94
Yuma	1	0.12
Unknown/Other	2	N/A

Hepatitis C

Table 4D displays the number of reported hepatitis C-associated deaths by year, as well as the crude mortality rate and age-adjusted mortality rate. From 2011 through 2014, there was an average of 508 HCV-associated deaths per year.

Table 4D. Deaths Documenting HCV Infection as a Cause or Contributing Condition to Death in Arizona, 2005 – 2014

Year	Number of Deaths Documenting HCV	Crude Mortality Rate per 100,000 Arizonans	Age-Adjusted Mortality Rate per 100,000 Arizonans (95% CI)
2005	261	4.3	4.5 (4.0 - 5.1)
2006	331	5.3	5.3 (4.7 – 5.9)
2007	255	4.0	3.9 (3.4 – 4.4)
2008	336	5.1	5.0 (4.4 – 5.5)
2009	337	5.7	5.5 (4.9 – 6.1)
2010	408	6.4	5.6 (5.1 – 6.2)
2011	462	7.2	6.4 (5.8 – 7.0)
2012	560	8.6	7.6 (6.9 – 8.2)
2013	521	7.9	6.8 (6.2 – 7.3)
2014	490	7.3	6.1 (5.6 – 6.7)

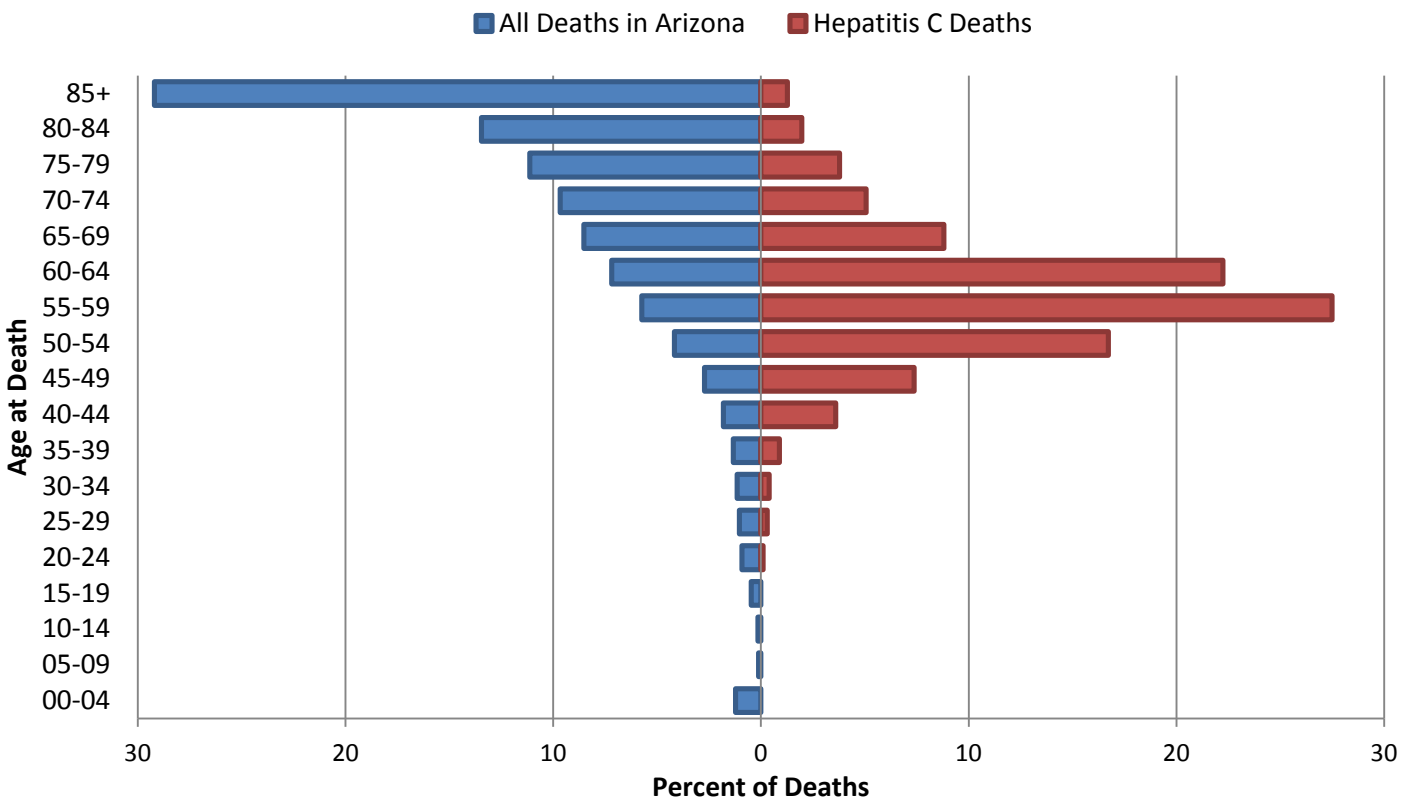
Table 4E displays additional demographic information for deaths occurring during the later four years.

Table 4E. Demographics of Decedents with HCV Infection Documented as a Cause or Contributing Condition to Death in Arizona, 2011 – 2014

Characteristic	Number	Percent
Sex		
Male	1476	72.6
Female	557	27.4
Veteran Status		
Yes	474	23.3
No	1513	74.4
Unknown	46	2.3
Ethnicity		
Hispanic	516	25.4
Non-Hispanic	1517	74.6
Race		
American Indian	98	4.8
Asian or Pacific Islander	29	1.4
Black	89	4.4
Multiple	24	1.2
Other or Unknown	13	0.6
White	1780	87.6

Figure 4D depicts the proportion of hepatitis C-related deaths occurring in each five-year age group compared to all-cause mortality in Arizona. The age group with the highest proportion of HCV deaths was 55-59 years, with a mean and median age at death of 59 and 58 years, respectively. The most deaths of any cause in Arizona occur among those age 85 years or older, with a mean and median age at death of 74 and 76 years of age, respectively.

Figure 4D. Age Distribution of Deaths in Arizona, 2011 – 2014



The annualized, age-adjusted mortality rates associated with hepatitis C (Figure 4E) are highest among Hispanics, followed by Blacks and American Indians.

Figure 4E. Age-Adjusted Average Annual Mortality Rates of HCV by Race/Ethnicity, Arizona, 2011 – 2014

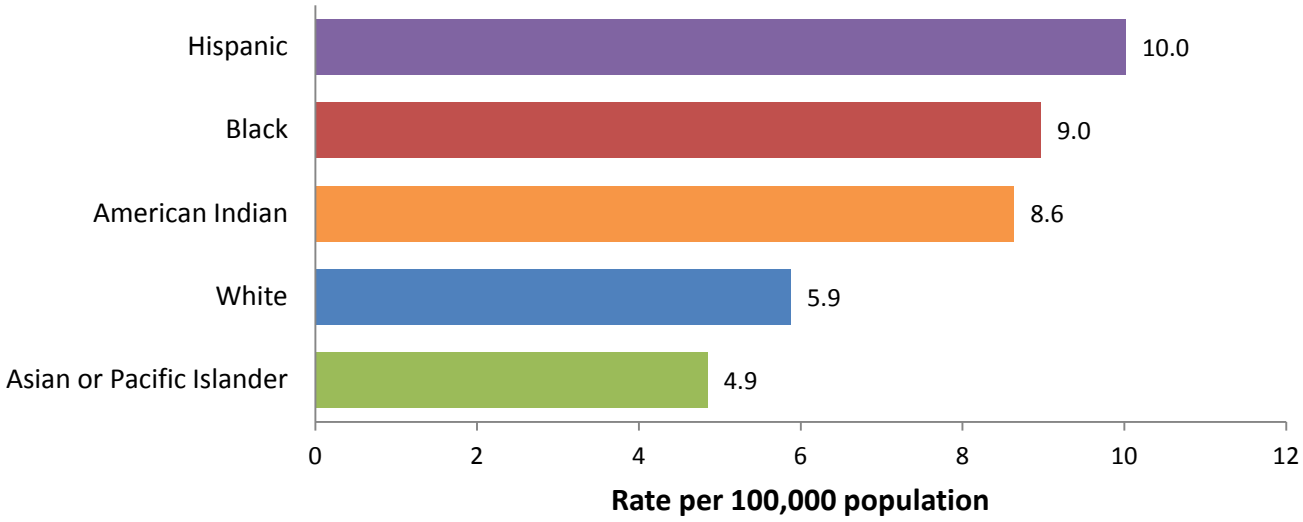


Table 4F shows the number of hepatitis C-associated deaths and crude rates per 100,000 population, by county. The counties with the highest rates of hepatitis C-associated mortality for this period were Gila, La Paz, Yavapai, and Mohave.

Table 4F. Deaths Documenting HCV Infection as a Cause or Contributing Condition to Death, by County, Arizona, 2011 – 2014

County	Number of Deaths Documenting HCV	Crude Rate per 100,000
Apache	13	4.5
Cochise	38	7.3
Coconino	20	3.7
Gila	29	13.5
Graham	12	7.9
Greenlee	2	5.2
La Paz	11	13.1
Maricopa	1122	7.2
Mohave	86	10.6
Navajo	27	6.2
Pima	376	9.5
Pinal	111	7.1
Santa Cruz	7	3.6
Yavapai	103	12.1
Yuma	53	6.4
Unknown/Other	2	N/A

Liver Disease

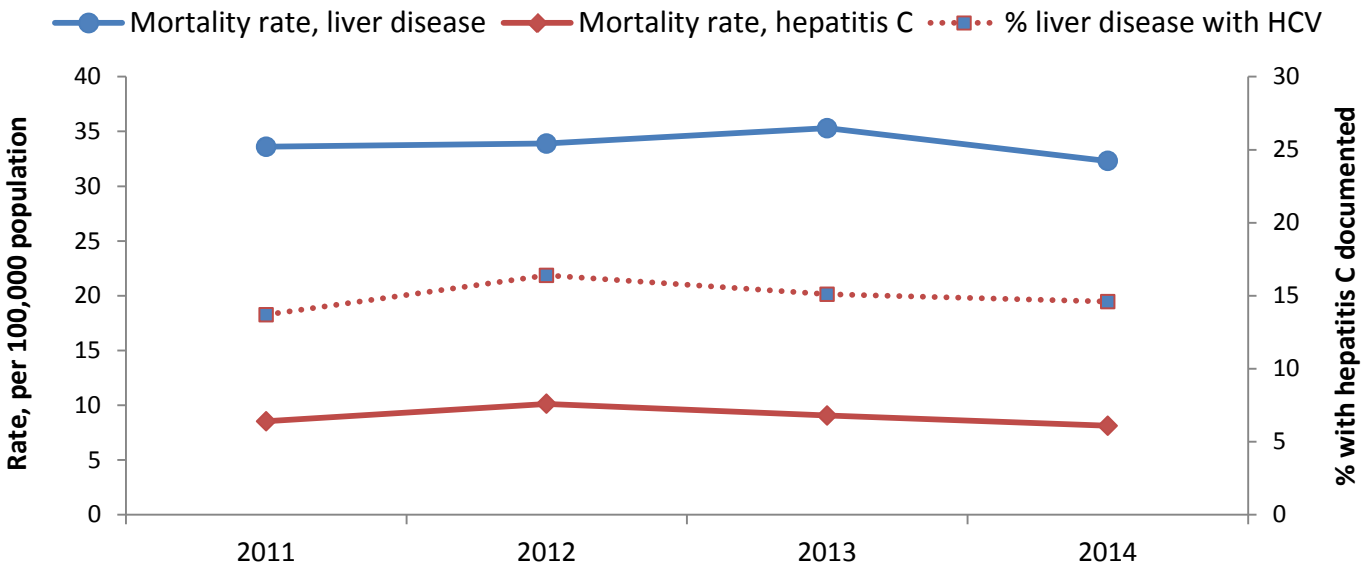
All records documenting liver disease as a cause or contributing condition to death were also identified from the Vital Records death database, and those records that also listed hepatitis C were noted. Numerous conditions, including viral hepatitis, can cause liver disease.

As shown in Table 4G and Figure 4F, the mortality rates for liver disease are approximately five times greater than those for hepatitis C in each of these years. Approximately 15% of deaths documenting mortality due to liver disease also mention hepatitis C. No trends in mortality rates, or the proportion of liver disease accounted for by hepatitis C, are apparent over this time period.

Table 4G. Deaths Documenting Liver Diseases as a Cause or Contributing Condition to Death in Arizona, 2011 – 2014

Year	Number of Deaths Documenting Liver Disease	Crude Mortality Rate for Liver Disease, per 100,000 Arizonans	Age-Adjusted Mortality Rate for Liver Disease, per 100,000 (95% CI)	Number (%) of Liver Disease Deaths with HCV Infection
2011	2368	36.8	33.6 (32.3 – 35.0)	325 (13.7)
2012	2458	37.8	33.9 (32.6 – 35.3)	403 (16.4)
2013	2605	38.6	35.3 (33.9 – 36.6)	393 (15.1)
2014	2486	37.3	32.3 (31.0 – 33.5)	364 (14.6)

Figure 4F. Deaths Documenting Liver Diseases as a Cause or Contributing Condition to Death, and Proportion with Hepatitis C, Arizona, 2011 – 2014

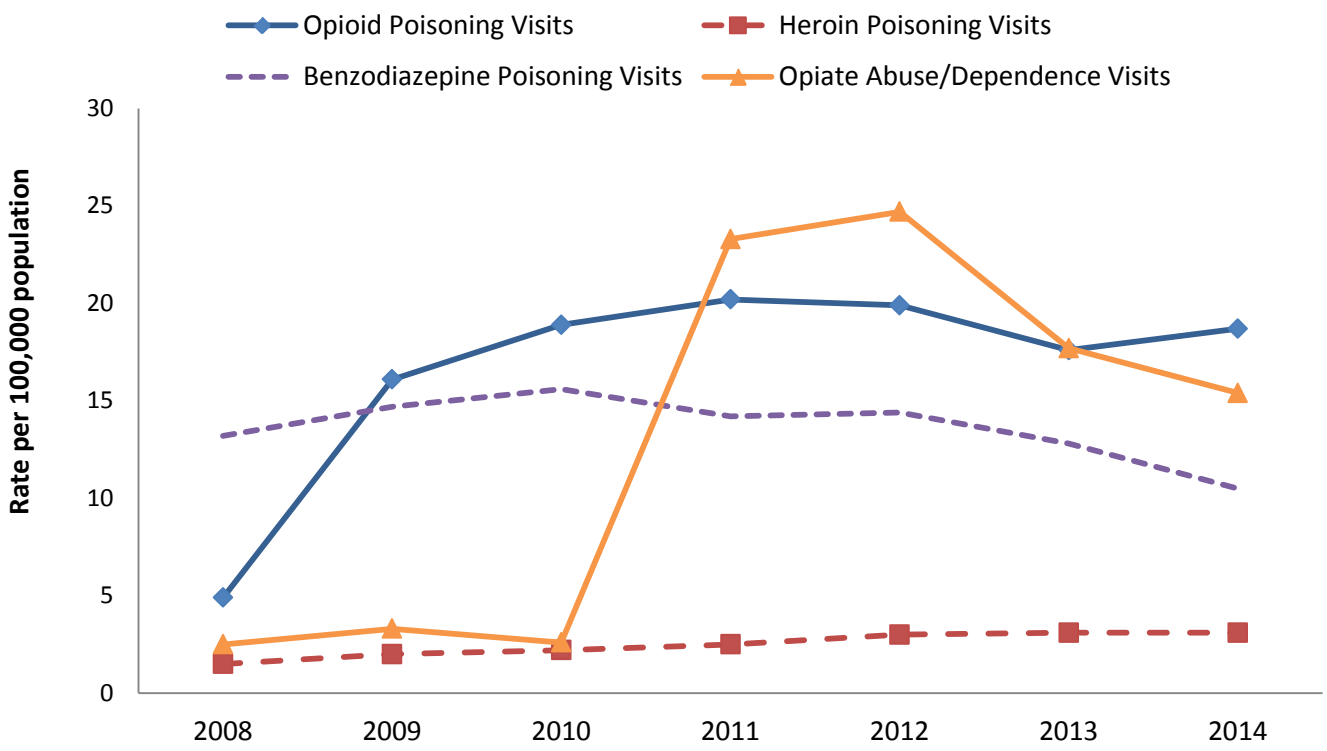


HEPATITIS C AND DRUG-RELATED HOSPITALIZATIONS

Drug use, specifically injection drug use, is a risk factor for hepatitis, since HBV and HCV are easily transmitted through infected blood and body fluids. Recent, national reports have described an increase in HCV infections among persons who inject drugs.

Misuse of prescription opiates has become a major epidemic in Arizona, with hospitalization rates from opiates poisonings increasing from 14.9 hospitalizations per 100,000 visits in 2008 to 18.7 hospitalizations per 100,000 visits in 2014. Heroin poisoning hospitalization rates have more than doubled during the same time period, increasing from 1.5 per 100,000 to 3.1 per 100,000. Figure 5A illustrates the rate increase by substance from 2008 through 2014.

Figure 5A. Select Drug Poisoning Rates by Year



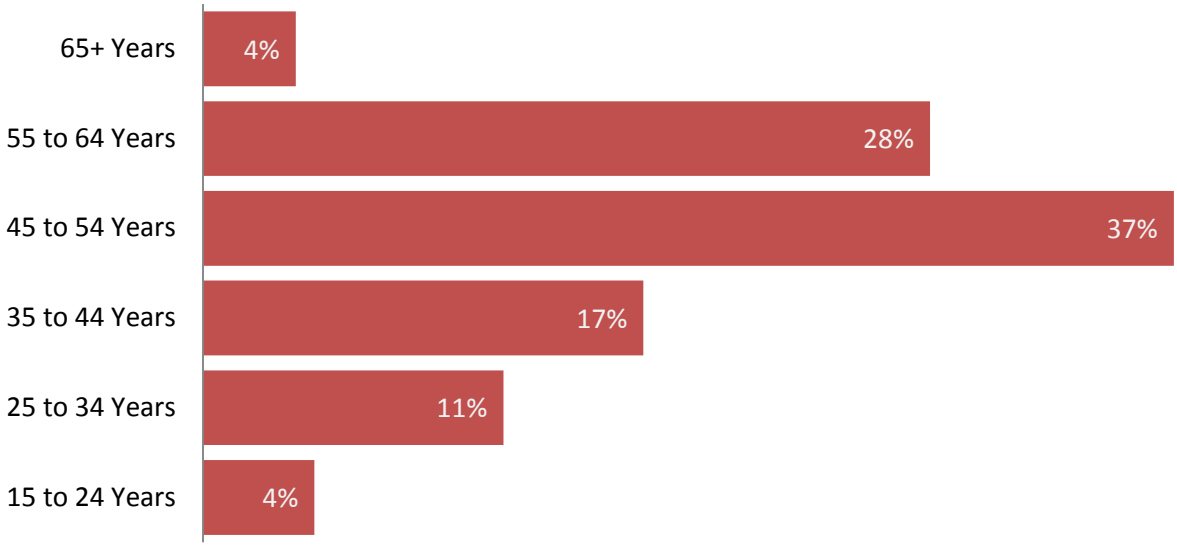
While injection drug use cannot be determined through the use of the Arizona Hospital Discharge Database (HDD), drugs that are commonly injected were identified and used for the purposes of this report. Opiate poisonings and abuse/dependence hospitalizations, including heroin and methadone, benzodiazepine hospitalizations, and stimulant-related hospitalizations (amphetamines and methamphetamines) were pulled from the HDD visits between 2008 and 2014 and analyzed for hepatitis B or C within the record.

Since 2008, the numbers of drug-related hospitalizations with a hepatitis C diagnosis have increased by 59% from just over 1,400 hospitalizations to over 2,250 hospitalizations in 2014. Overall, 13% of select drug-related hospitalizations also had co-occurring diagnosis of hepatitis C, while only 1.8% of the non-drug related hospitalizations had a co-occurring HCV diagnosis.

The percentage of drug-related hospitalizations with HCV varied by drug type with heroin poisonings comprising the largest percentage of co-occurring diagnoses, approximately 20% of the HCV hospitalizations between 2008 and 2014, with no significant percent change from year to year. Hospitalizations for opiate abuse or dependence had the second largest percentage of co-occurring diagnoses, averaging approximately 15% of the HCV hospitalizations between 2008 and 2014.

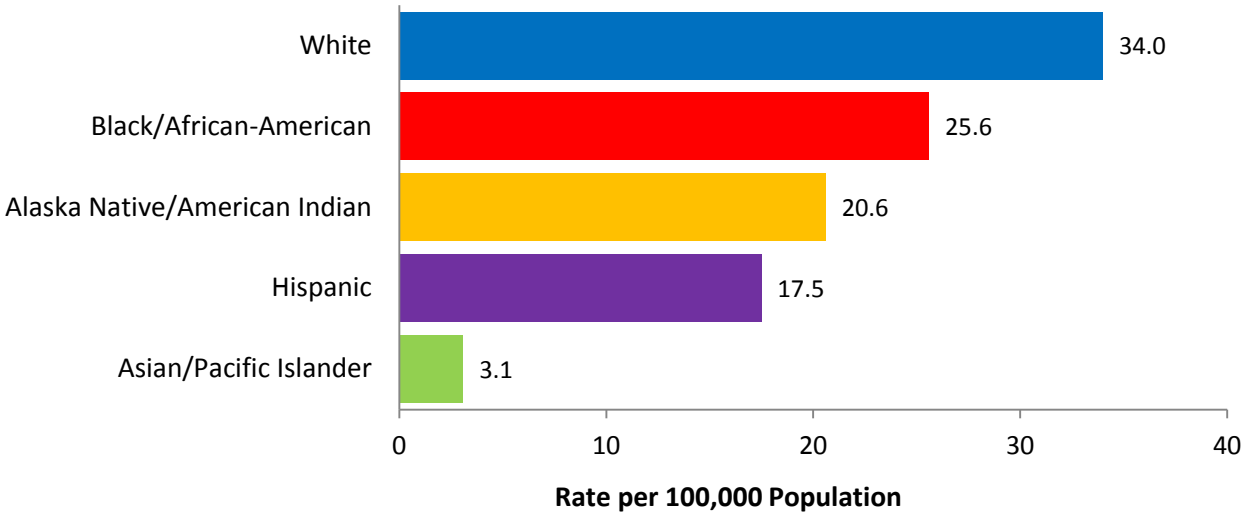
Males comprised over 65% of the total 12,603 HCV and drug-related hospitalizations between 2008 and 2014. Males had higher counts in every age group except those 85 years and older. The age group with the highest percentage of drug-related hospitalizations and HCV infections are those 45 to 54 years of age. The percentage of hospitalizations by age group is shown in Figure 5B.

Figure 5B. Percentage of Drug-related Hospitalizations with HCV Infection by Age Group, 2008 – 2014



The majority of the drug-related hospitalizations with co-occurring HCV infection by race/ethnicity were white, non-Hispanic residents. Figure 5C shows the average rate of select drug-related hospitalization with HCV infection by race/ethnicity.

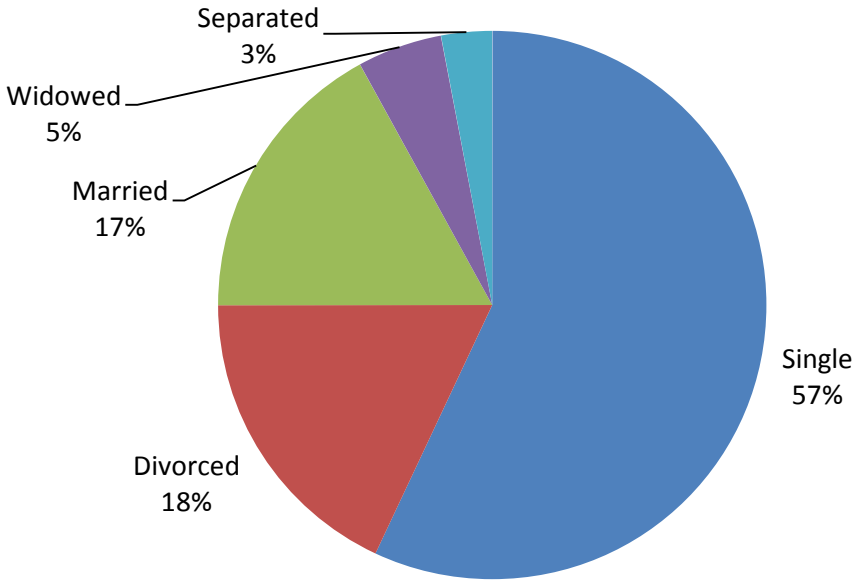
Figure 5C. Average Rate of Drug Hospitalizations with HCV by Race/Ethnicity, 2008 – 2014



The Arizona Health Care Cost Containment System (AHCCCS) is Arizona's Medicaid system that offers health care programs to serve Arizona's residents and was listed as the payer type in 50% of the drug-related hospitalizations with co-occurring HCV diagnosis. An additional 24% of the visits were paid for by Medicare or Medicare Advantage Plans. Only seven percent of the hospitalizations had an HMO or PPO listed and approximately nine percent were uninsured.

Over 57% of the HCV and drug-related hospitalizations listed their marital status as single with only 17% indicated they were married. Figure 5D shows the breakdown of hospitalizations by marital status.

Figure 5D. Percentage of Drug Hospitalizations with HCV by Marital Status, 2008 – 2014

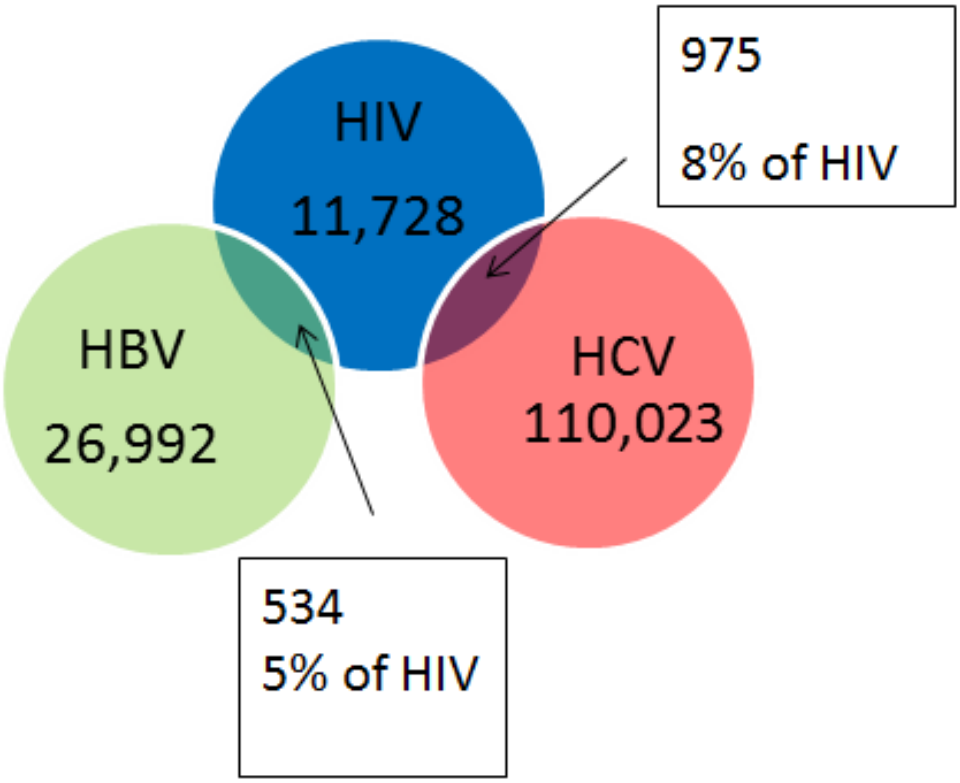


HEPATITIS-HIV CO-INFECTION

Since 1983, the ADHS HIV Surveillance Program has conducted thorough investigations and surveillance for HIV. Investigations for HBV and HCV are much less complete or comprehensive, due to more limited resources. Hepatitis B and hepatitis C data from 1998 – 2014 were cross-matched with HIV data from the same time period to identify individuals with co-infections.

From 1998 – 2014, there were a total of 11,728 HIV/AIDS cases, 26,992 HBV cases, and 110,023 HCV cases, respectively. Of the HIV/AIDS cases, 5% were co-infected with HBV and 8% were co-infected with HCV (Figure 6A).

Figure 6A. Proportion of Cases HIV-Hepatitis B Co-infected and HIV-Hepatitis C Co-infected, from Reports of HBV, HCV, or HIV in 1998 – 2014



Hepatitis B-HIV Co-infection

From 1998 – 2014, there were 90 acute HBV-HIV co-infected cases and 444 chronic HBV-HIV co-infected cases.

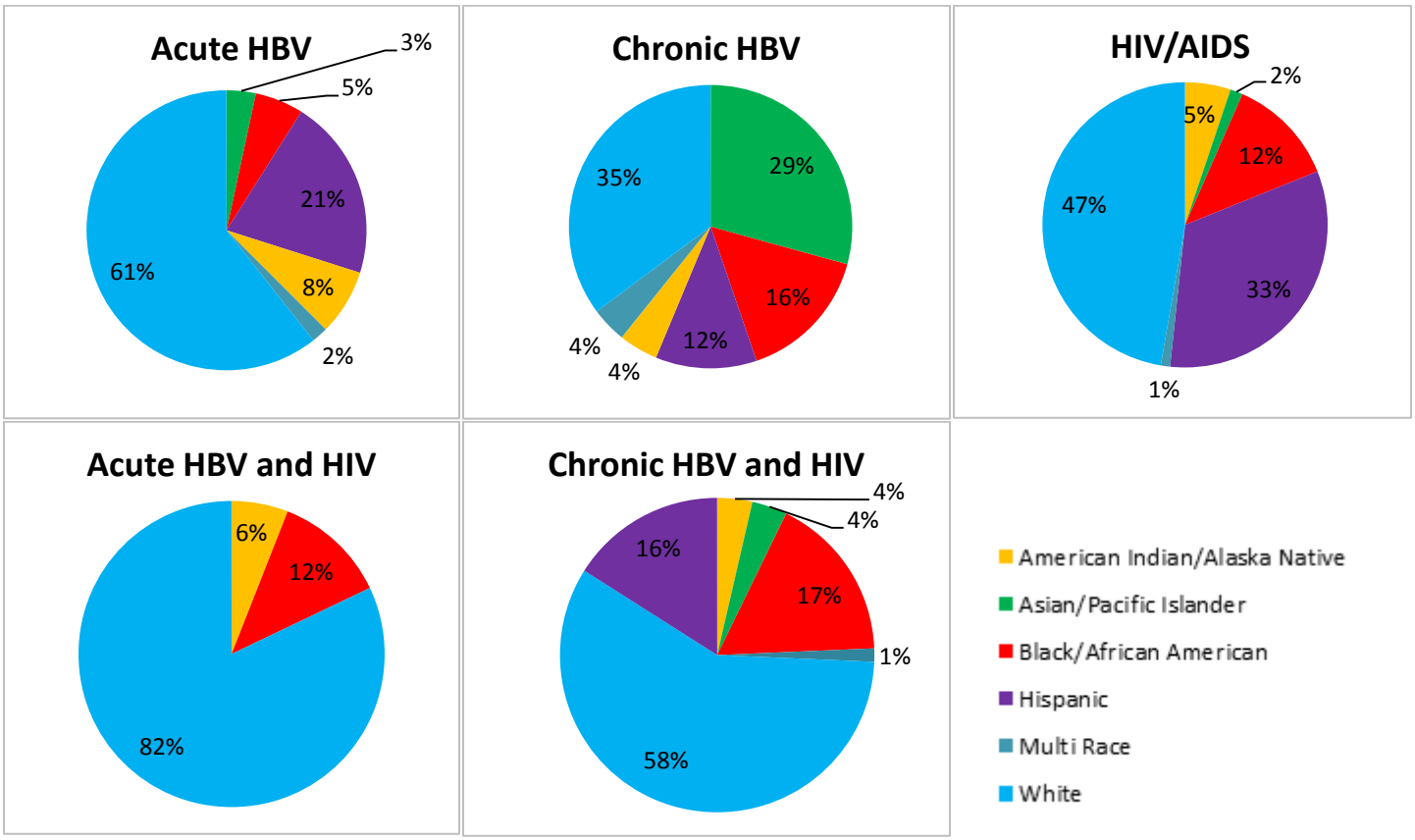
Ninety-seven percent of those co-infected with acute HBV and HIV were male and 95% of those co-infected with chronic HBV and HIV were male. This proportion of males is much higher than any of the infections overall: acute HBV 62% (2006 – 2015), chronic HBV 57% (2006 – 2015), HCV 66% (1998 – 2015), and HIV/AIDS 86% (1998 – 2014).

There are striking differences regarding racial and ethnic make-up, compared to the profile of HBV infections. Of note, Blacks make up 12% of acute HBV-HIV co-infected cases, which is similar to the distribution of Blacks amongst HIV/AIDS cases (Figure 6B). Although Hispanics make up 21% of acute HBV cases and 33% of HIV/AIDS cases, no Hispanics were indicated as having acute HBV/HIV co-infection.

Blacks make up 17% of the chronic HBV-HIV co-infected cases, which is similar to the distribution of Blacks amongst chronic HBV cases. Although 29% of chronic HBV cases are Asian/Pacific Islanders, only 4% of chronic HBV-HIV co-infected cases were Asian/Pacific Islanders.

Half of the acute HBV-HIV co-infected cases were reported for HBV prior to their HIV report. The mean and median age at the time of HBV report was 36 years and the mean and median age at HIV report was 37 years. Of those who were identified with HBV first, it took an average of 4.1 years (median 3.6) before they were reported to have HIV. Of those who were reported with HIV first, it took an average of 2.4 years (median 1.0) before they were reported to have HBV.

Figure 6B. HIV-Hepatitis B Co-infected Cases by Race/Ethnicity



Fifty-three percent of chronic HBV-HIV co-infected cases were reported with HBV prior to their HIV report. The average age at the time of HBV report was 39 years (median 40). Of those who were reported with HBV first, it took an average of 2.3 years (median 0.8) before they were reported to have HIV. Of those who were reported with HIV first, it took an average of 3.2 years (median 1.8) before they were reported to have HBV.

Risk factors for acute HBV-HIV co-infected and chronic HBV-HIV co-infected are similar, with the majority being adult men who have sex with men (MSM), and similar to the risk factors for HIV cases overall (Figure 6C).

Figure 6C. HIV-Hepatitis B Co-infected Cases by Risk Factors

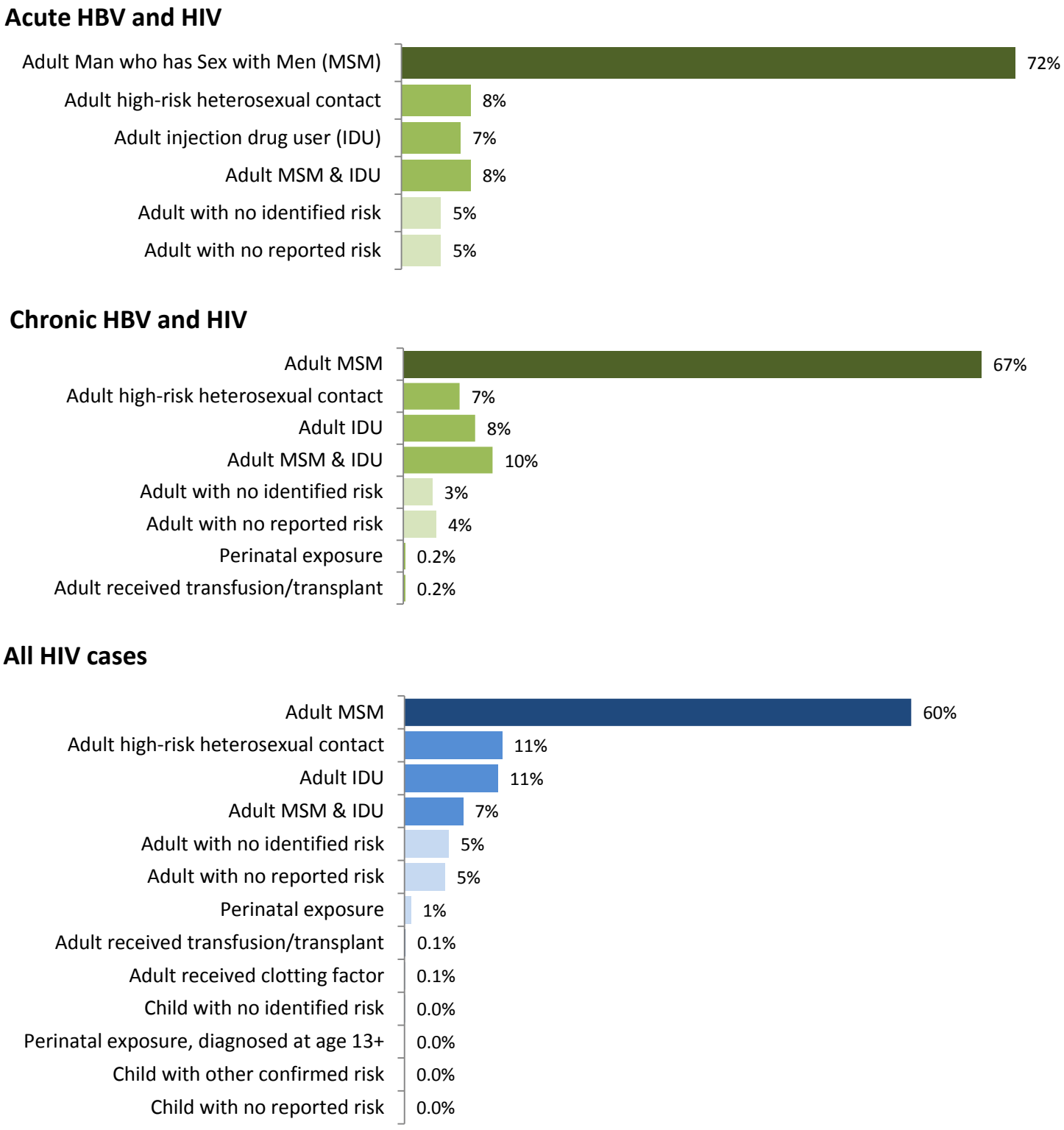
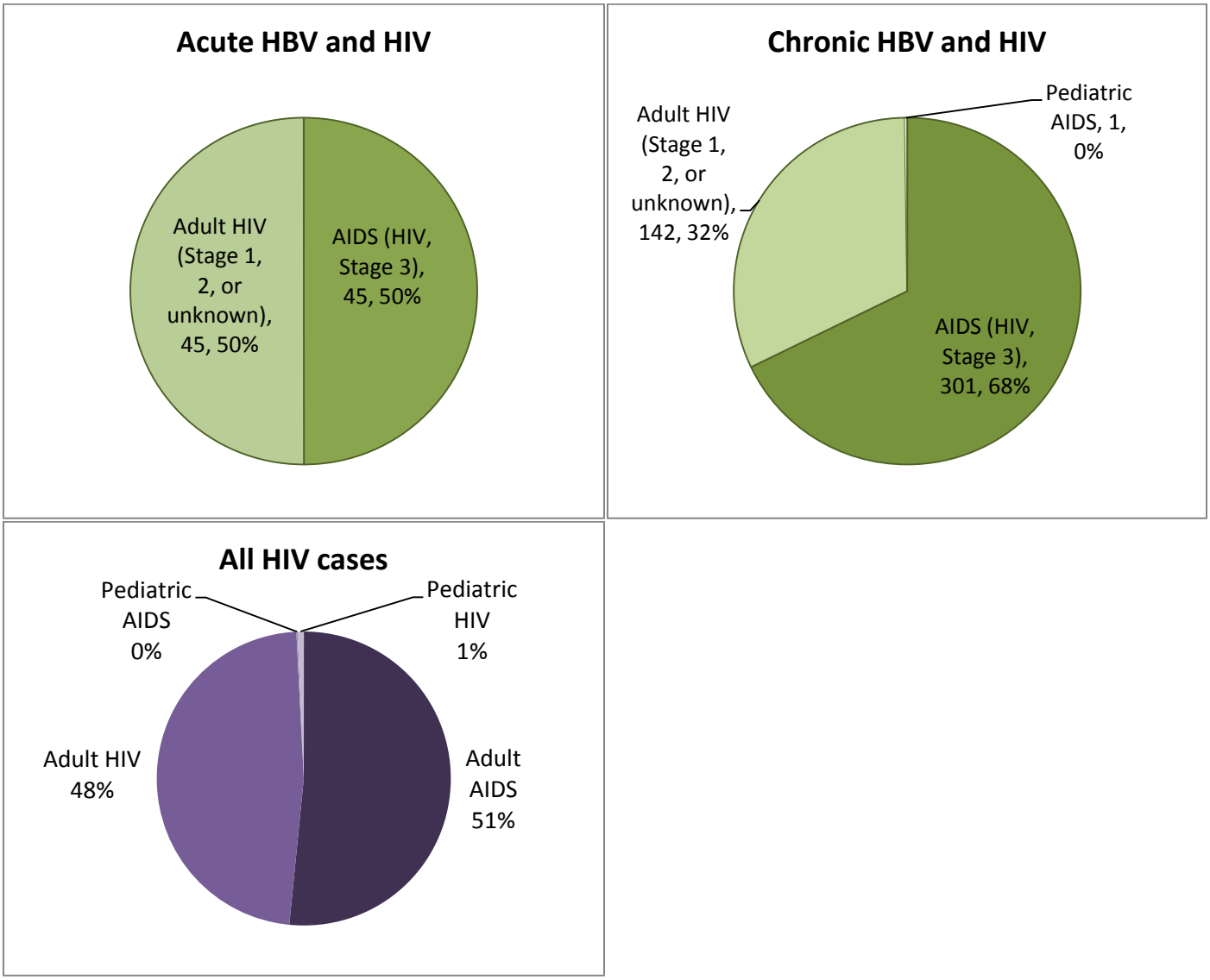


Figure 6D describes the HIV status of the HBV-HIV co-infected patients at the time of HIV diagnosis. Of note, a higher percentage of chronic HBV-HIV co-infected cases were at AIDS (HIV, Stage 3) status at the time of HIV diagnosis than HIV/AIDS cases overall.

Figure 6D. HIV-Hepatitis B Co-infected Cases by HIV Status



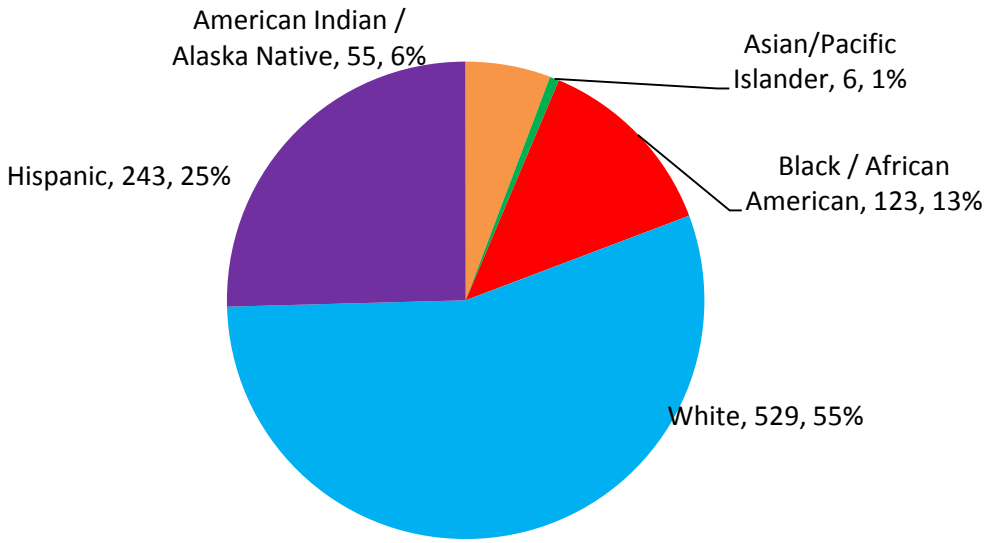
Hepatitis C-HIV Co-infection

From 1998 – 2014, there were 975 HCV-HIV co-infected cases. Eighty-three percent of those co-infected with HCV and HIV were male. In comparison, males made up 66% of the HCV cases from 1998 – 2015 and 86% of HIV/AIDS cases from 1998 – 2014.

Figure 6E depicts the race/ethnic distribution of HCV-HIV co-infected cases. Of note, Blacks make up 13% of HCV-HIV co-infected cases, which is similar to the distribution of Blacks amongst HIV/AIDS cases (Figure 6B) and higher than the proportion of Blacks among HCV cases from 1998 – 2008 (see Table 1A).

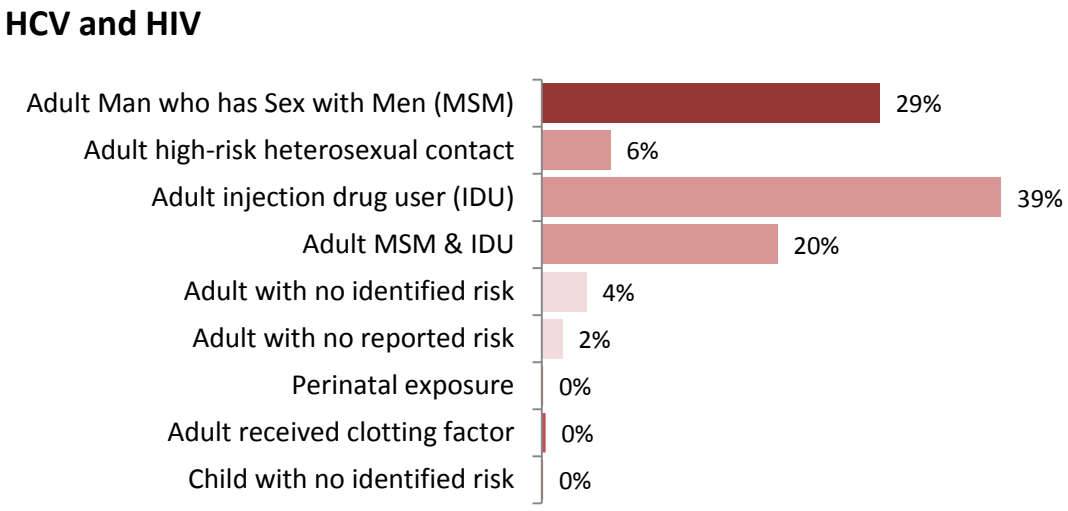
Seventy-seven percent of HCV-HIV co-infected cases were reported with HIV prior to their HCV report. For co-infected cases, the average age at the time of HIV report was 39 years (median 40) and the mean and median age of HCV report was 41 years. Of those who were reported with HIV first, it took an average of 3.9 years (median 2.6) before they were reported to have HCV. Of those who were reported with HCV first, it took an average of 2.4 years (median 0.8) before they were reported to have HIV.

Figure 6E. HIV-Hepatitis C Co-infected Cases by Race/Ethnicity



Risk factors for HCV-HIV co-infected cases differed from those that were HBV-HIV co-infected. Common risk factors included adult IDU (39%) and adult MSM (29%) (Figure 6F). This also differs from the distribution of risk factors amongst HIV cases shown in Figure 6C.

Figure 6F. HIV-Hepatitis C Co-infected Cases by Risk Factors



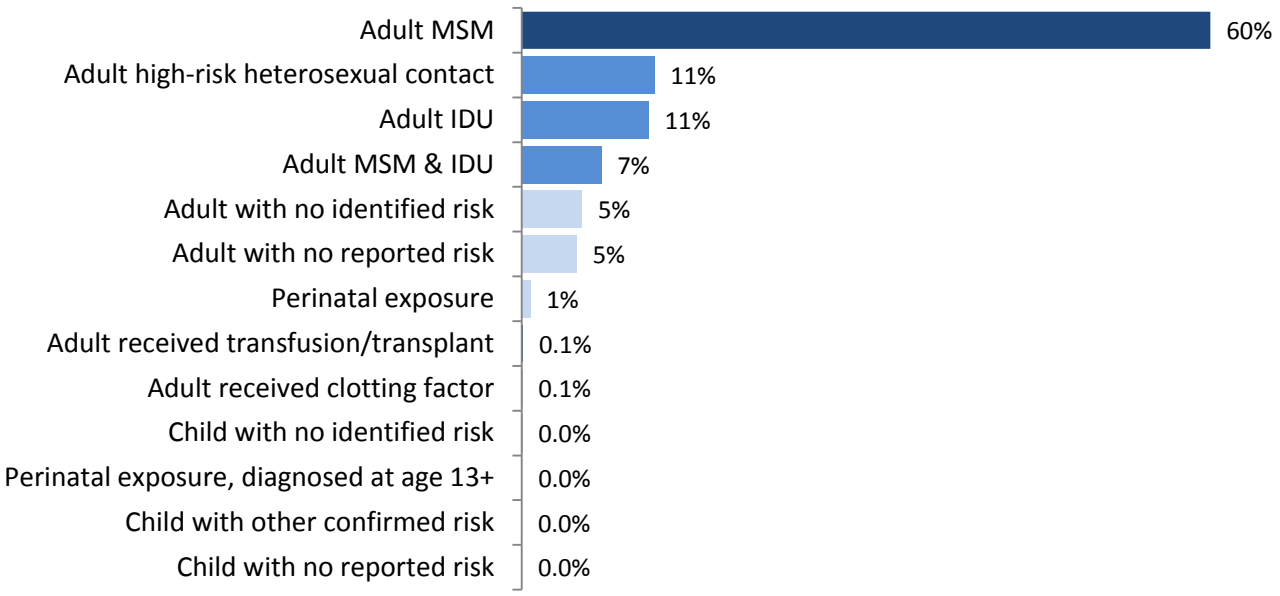
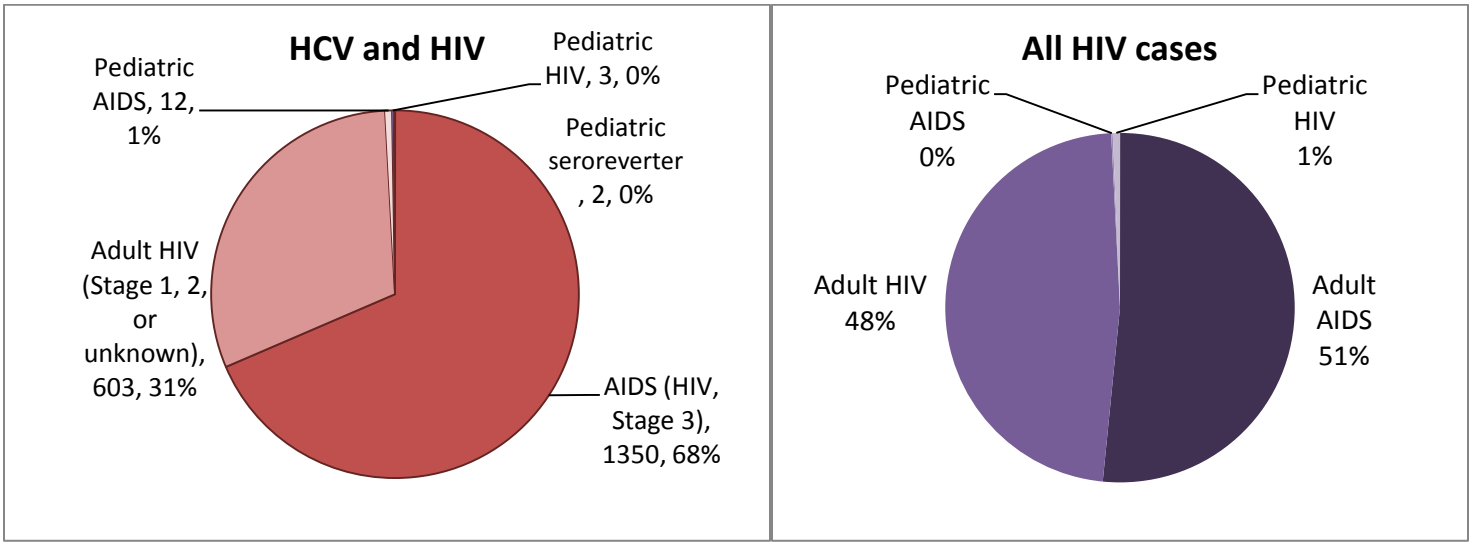


Figure 6G describes the HIV status of the HCV-HIV co-infected patients at the time of HIV diagnosis. Compared to HIV/AIDS cases, a higher percentage of HCV-HIV co-infected cases were at AIDS (HIV, Stage 3) status at the time of HIV diagnosis.

Figure 6G. HIV-Hepatitis C Co-infected Cases by HIV Status



HCV Rapid Antibody Testing

Hepatitis C rapid antibody tests were provided by ADHS, using Centers for Disease Control and Prevention (CDC) funding, to 12 healthcare facilities or service providers from April 2014 through May 2016, in order to facilitate testing of high-risk populations. During this time period, there were 3,254 clients that were tested who were not previously HCV positive. Out of those clients, 318 (9.8%) were positive for HCV on the rapid antibody test.

The race/ethnicity distribution of those tested for HCV using the rapid antibody test was 67% white, 17% Hispanic, 4% Black/African American, 6% American Indian/Alaska Native (AI/AN) 6% and 1% Asian/Pacific Islanders 1% (Figure 7A). The race and ethnicity of the general Arizona population in 2014 consisted of 57% whites, 28% Hispanic, 5% Blacks/African Americans, 6% AI/AN and 4% API.

The race/ethnicity distribution of those who were tested are similar to those who were positive, aside from American Indians/Alaska Natives who made up 6% of those tested but 12% of those that were positive on the HCV rapid antibody test.

The gender distribution of those tested and those positive are similar: of those tested, 52% were male, 47% were female, and 1% were transgender; of those that were positive, 54% were male, 45% were female, and 1% were transgender.

Figure 7A. Race/ethnicity of all clients tested or positive for HCV antibody

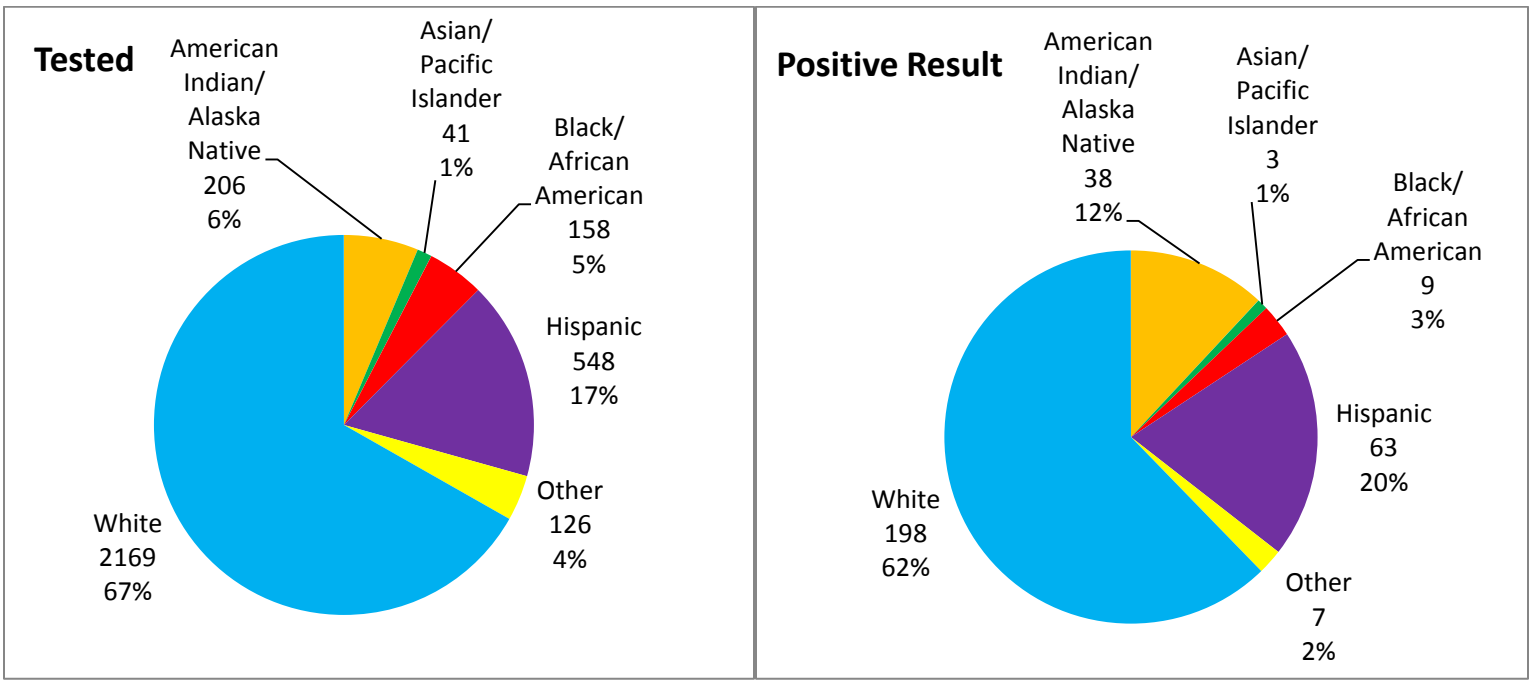


Figure 7B shows that clients 18-29 years old and 50-70 years old were slightly more likely to have a positive test, compared to those being tested among other age groups.

Figure 7B. Age groups of all clients tested for HCV and patients who had positive HCV results

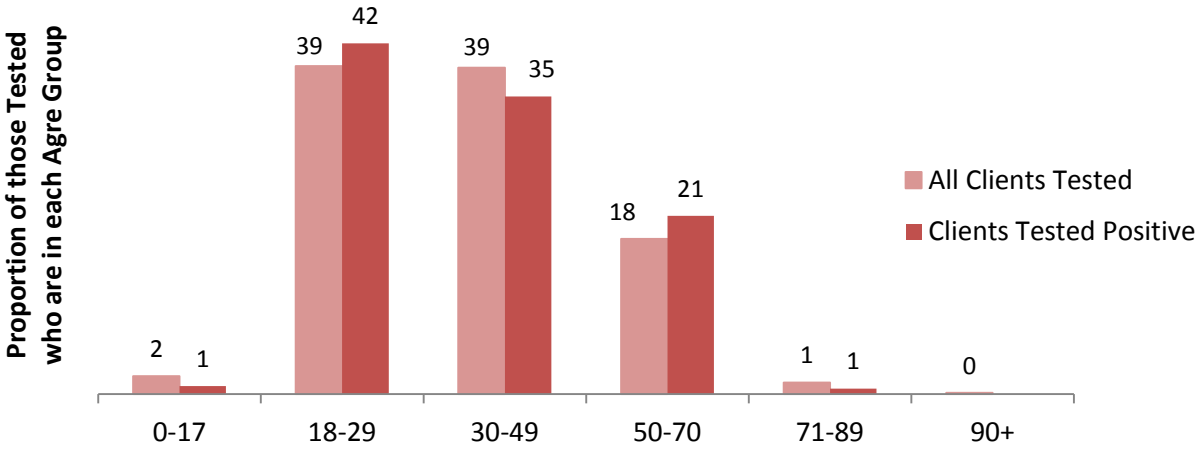


Figure 7C depicts the risk factors of all clients tested compared to clients that were HCV rapid antibody-positive. Clients that were positive for HCV antibody were more likely to report the following risk factors: intranasal drug use, injection drug use (IDU), or a history of incarceration. Eighty-eight percent of HCV antibody-positive clients had a history of intranasal drug use compared to 69% amongst all clients, 88% of those positive had a history of IDU compared to 48% amongst all clients, and 73% of those that were positive had a history of incarceration compared to 54% amongst all clients tested. Figure 7C also illustrates the percentage comparison of other risk factors amongst those tested and those that were positive.

Figure 7C. Risk Factors for all clients tested for HCV and patients who had positive HCV results

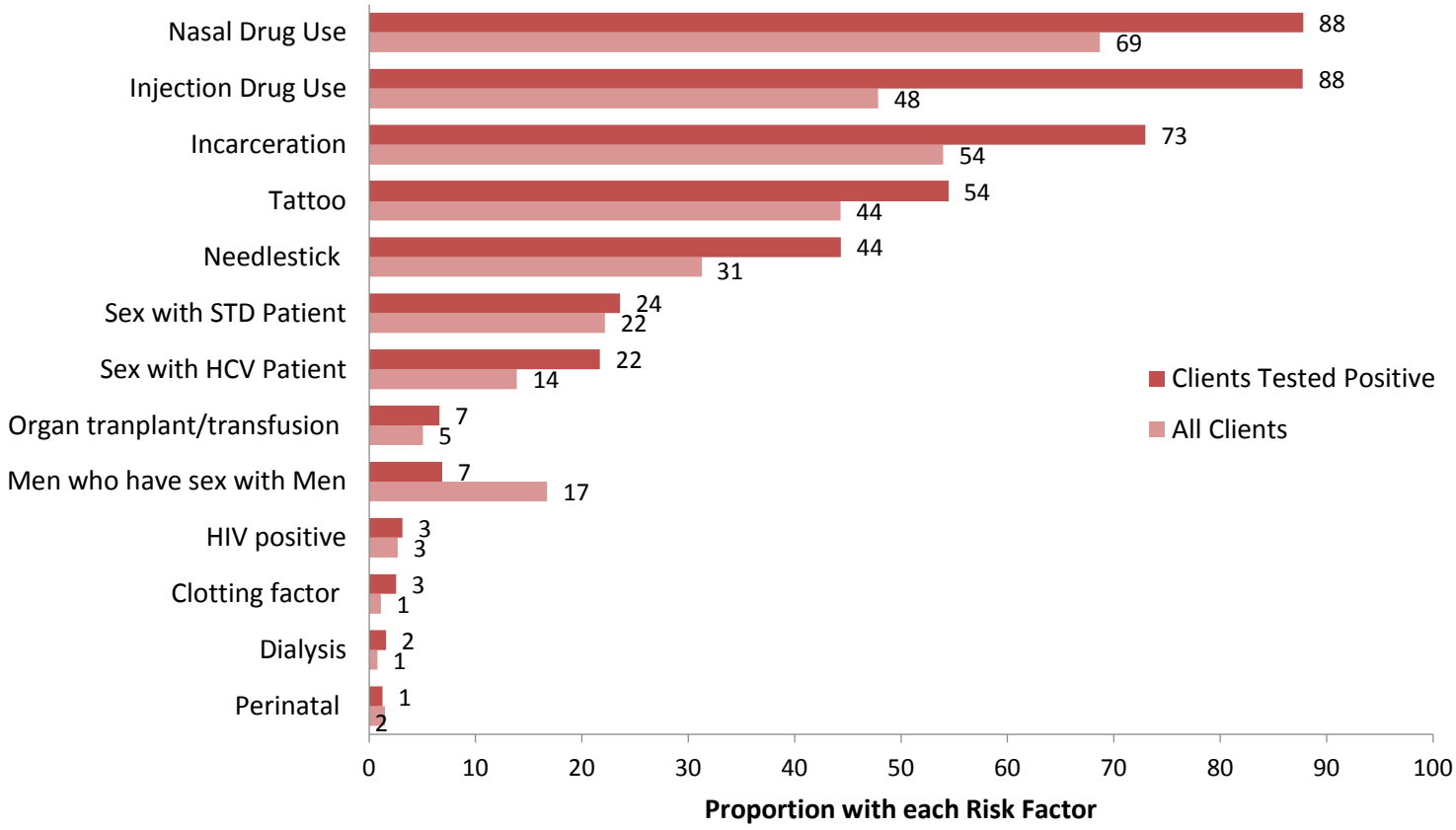
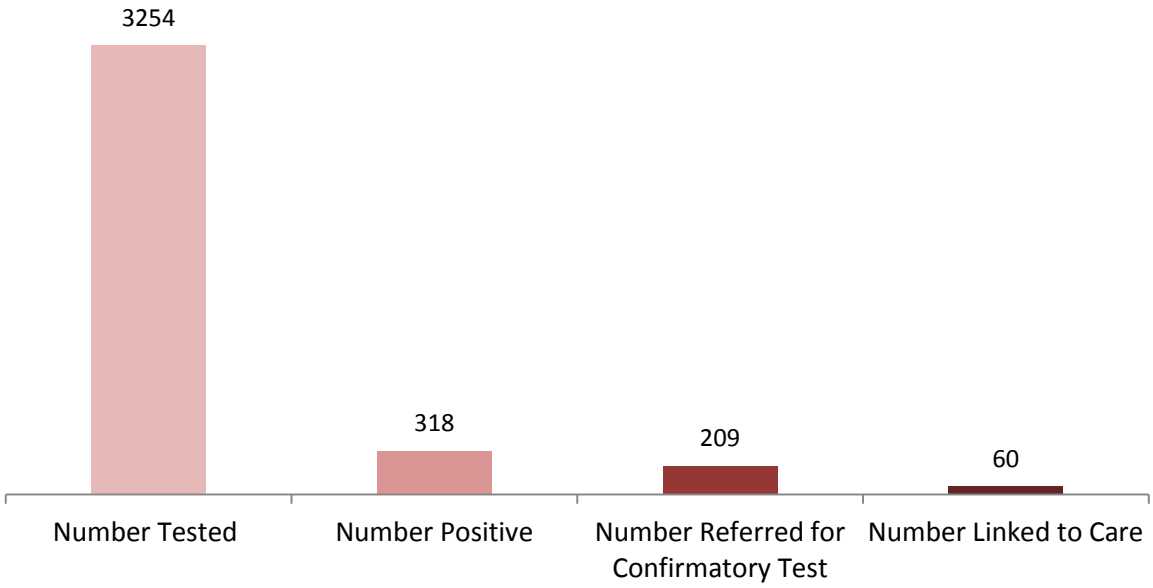


Figure 7D displays a continuum of care cascade for HCV rapid antibody-positive clients, based on the number of clients that were linked to care. Out of 3,254 clients tested, 318 (9.8%) were HCV rapid antibody-positive. Only 209 (65.7%) of these positive clients were referred to receive a confirmatory test, and 60 clients were then linked to care. It is unknown how many HCV rapid antibody-positive clients actually received a confirmatory test.

Figure 7D. Continuum of Care Cascade for HCV Rapid Antibody Positive Clients



HCV Testing at Major Commercial Labs

In Arizona, negative hepatitis C results are not reportable to the health department, only positive results. In 2015, the CDC partnered with two major commercial laboratories: Laboratory Corporation of America (LabCorp) and Quest Diagnostics and obtained data on HCV tests that were ordered, regardless of whether the results were negative or positive, as well as the paired results of positive antibody (Ab) tests and confirmatory tests (nucleic acid test/RNA). These data provide insight into the percentage positivity out of those tested for hepatitis C. Table 7A shows the testing statistics from Quest Diagnostics and LabCorp.

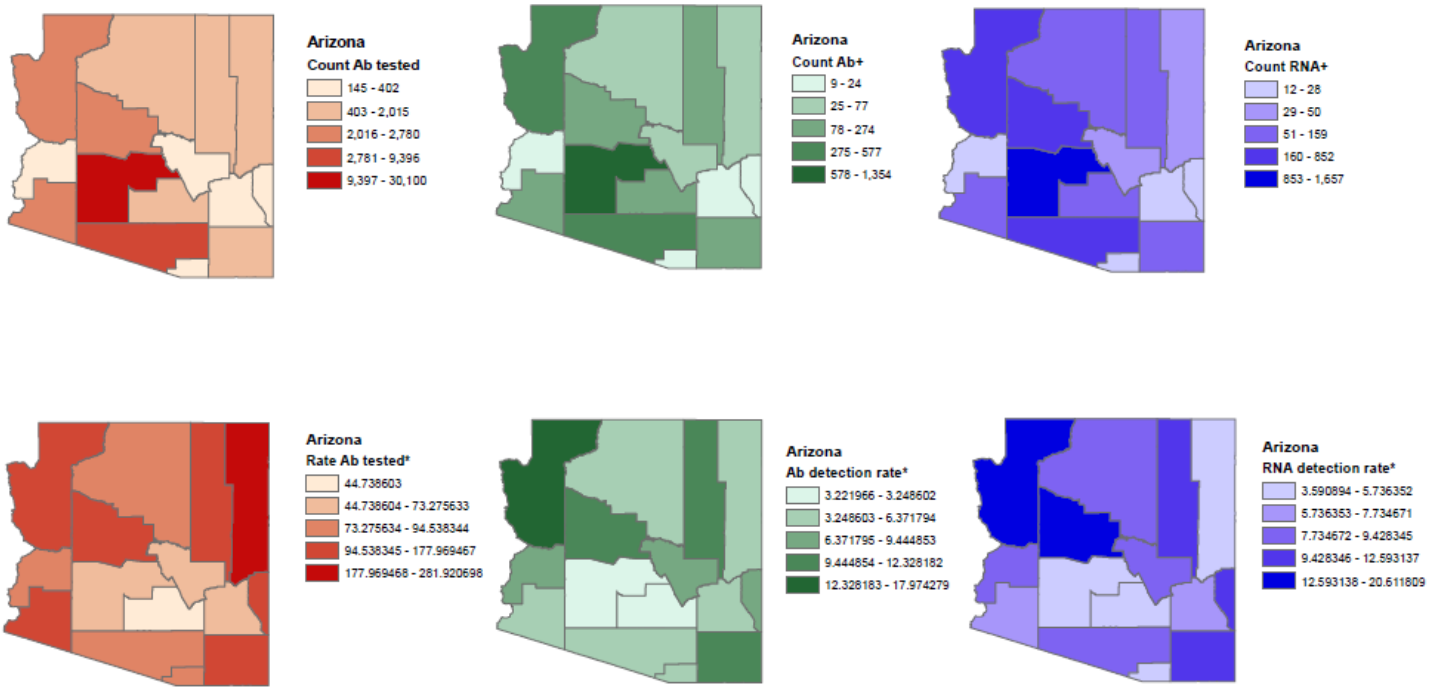
Further notes for this section are included in the Technical Appendix.

Figure 7E displays the number and rate of HCV tests conducted, the number and rate of positive antibody (Ab+) results, and the number and rate of positive confirmatory results (RNA+) by county from LabCorp. Interestingly, the data show a high rate of HCV tests being performed in Mohave County, compared to other counties, as well as high HCV antibody positive rates and HCV confirmatory positive (RNA+) rates.

Table 7A. HCV Testing Data from Two Laboratories, Arizona, 2015

	Quest Diagnostics			LabCorp			
County	HCV Ab tested (No.)	HCV Ab tested positive (%)	HCV RNA tested positive (No.)	HCV Ab tested (No.)	HCV Ab tested positive (%)	HCV RNA tested positive (No.)	HCV RNA tested positive (%)
Apache	3	0	0	2,020	2.1	127	32.3
Cochise	5	0	0	1,590	8.7	280	56.8
Coconino	7	0	1	1,419	6.3	230	57.4
Gila	2	0	4	330	13.0	86	58.1
Graham	1	0	5	276	8.7	48	58.3
Greenlee	0	-	-	145	6.2	23	52.2
La Paz	1	0	0	164	10.4	38	50.0
Maricopa	294	7.1	11	30,102	4.5	3455	48.0
Mohave	31	9.7	8	2,780	13.2	726	58.1
Navajo	4	0	0	1,927	6.0	230	54.3
Pima	113	0.9	23	9,412	6.2	1506	56.9
Pinal	14	14.3	0	1,735	7.0	257	54.1
Santa Cruz	3	0	0	390	5.6	43	48.8
Yavapai	10	10	0	2,634	10.4	713	61.4
Yuma	10	0	6	2,486	5.2	246	64.2
Total	**498**	**5.6**	**58**	**57410**	**5.8**	**8008**	**53.2**

Figure 7E. HCV Testing Data from LabCorp, Arizona, 2015



*per 10,000 county population

More than half (56.7%) of those persons with positive LabCorp antibody tests in 2015 were male. However, the profile of testing patterns, as shown in Figures 7F and 7G, differs from the profile of positive results. As shown in Figure 7F, almost two-thirds (64%) of the antibody tests performed were among women, although the positive rate of those tests was much lower than among males (4.0% positive among women compared to 9.3% positive among men). Also, while many younger women were tested in 2015 (26% of women tested were ages 25 – 34 years; 61% were ages 15 – 44), we can see that men and women ages 55 – 64 years were much more likely to have a positive test compared to persons tested in other age groups.

Figure 7F. HCV Testing Data from LabCorp, by Sex, Arizona, 2015

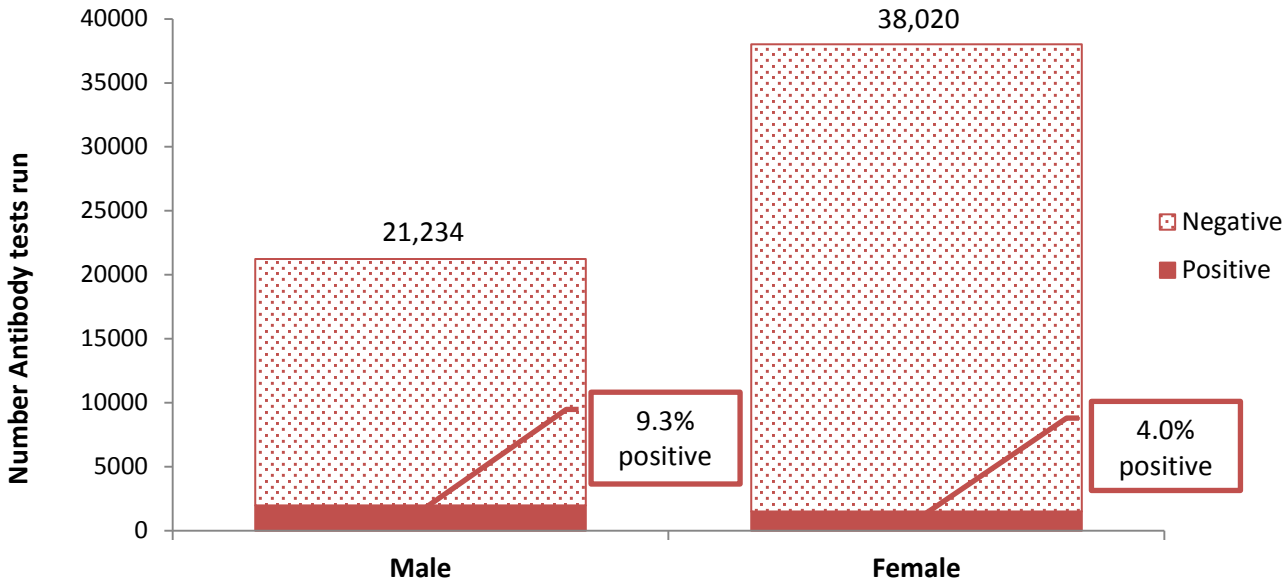
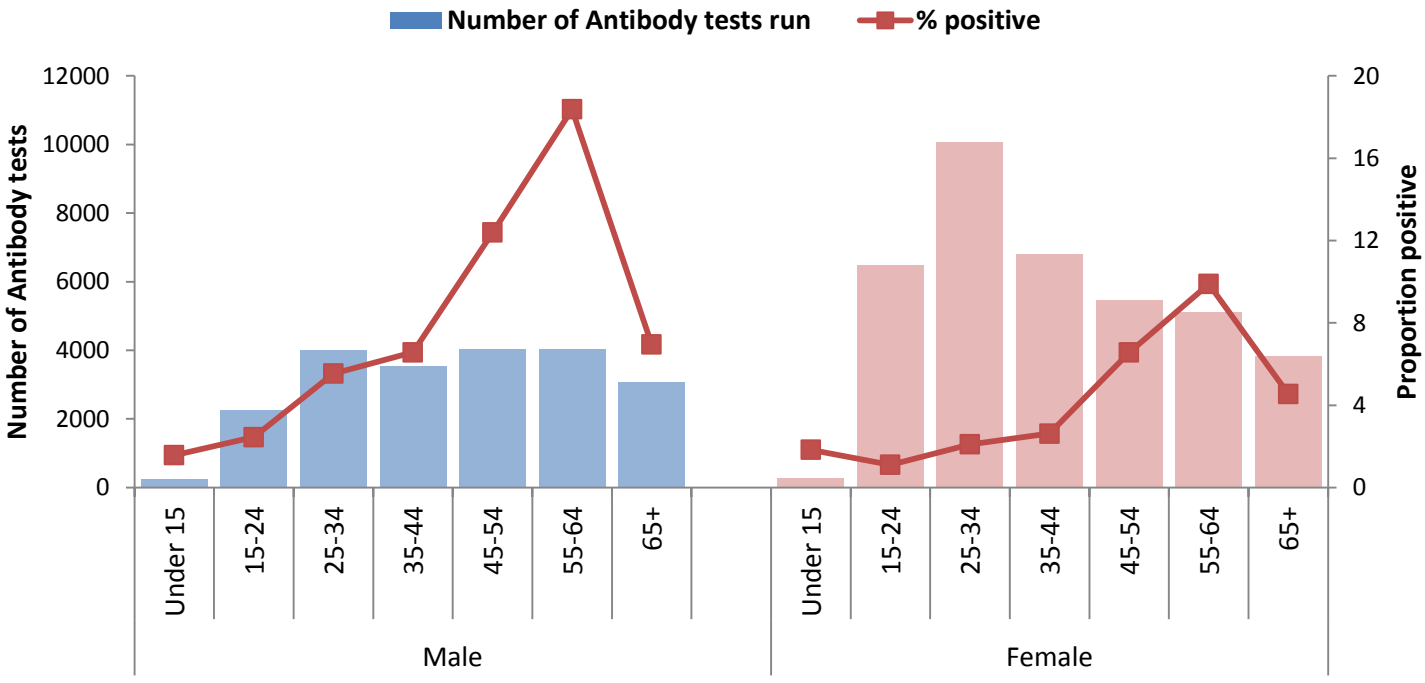


Figure 7G. HCV Testing Data from LabCorp, by Sex and Age Group, Arizona, 2015



Hepatitis C

Mohave County investigated 167 (28%) out of 600 HCV cases reported to the health department from January 2015 through May 4, 2016, including those reported through Electronic Laboratory Reporting (ELR). Table 8A compares the investigated HCV cases with those that were not investigated. Overall, the demographics of the investigated HCV cases were comparable to the non-investigated HCV cases.

Figure 8A shows various risk factors associated with the investigated HCV cases. Common risk factors include unprotected sex, having a tattoo, other surgery, injection drug use, and being incarcerated for greater than 24 hours.

Figure 8B shows additional characteristics amongst the investigated HCV cases. Only 5% presented with jaundice, 18% received a hepatitis B vaccination, 10% were hospitalized, and 1% were deceased, although information about these characteristics was missing for a large proportion of cases.

Table 8A. Characteristics of Investigated and Non-investigated HCV Cases, 2015-5/4/2016

Characteristic	Investigated HCV Cases (%)	Non-investigated HCV Cases (%)
Gender		
Male	104 (62%)	265 (61%)
Female	63 (38%)	168 (39%)
Race		
White	110 (94%)	41 (89%)
Black	2 (1.7%)	2 (4.3%)
Asian/Pacific Islander	0 (0%)	1 (2.2%)
American Indian/Native American	3 (2.6%)	1 (2.2%)
Other	2 (1.7%)	1 (2.2%)
Ethnicity		
Hispanic	10 (10%)	4 (11%)
Non-Hispanic	88 (90%)	31 (89%)
Age		
Mean	51	51
Median	55	55

Figure 8A. Risk Factors Associated with Investigated Hepatitis C Patients

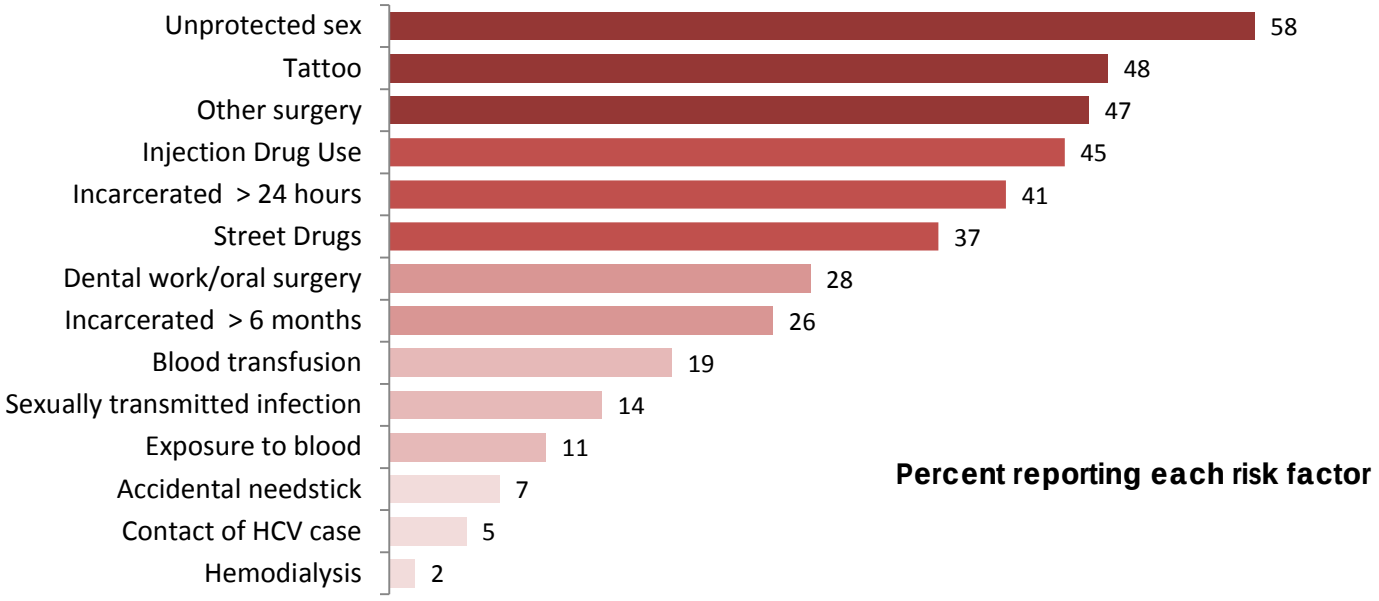
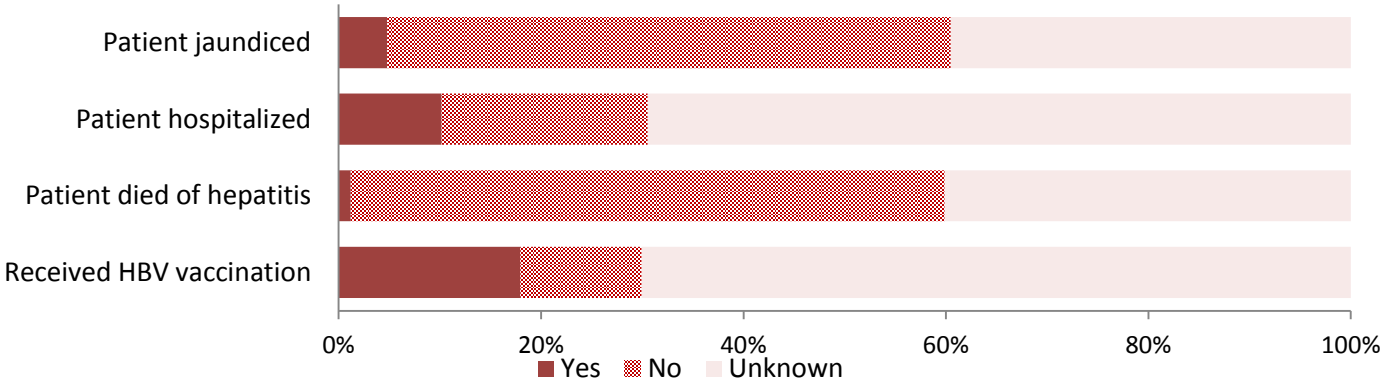


Figure 8B. Characteristics of Investigated HCV Cases



Surveillance Data (Reporting by Laboratories and Healthcare Providers, and Public Health Case Investigations)

Additional information about the Arizona communicable disease surveillance system, and changes that could affect surveillance data for this period, is available in the 2008 – 2013 Infectious Disease Epidemiology Report, currently available at http://www.azdhs.gov/preparedness/epidemiology-disease-control/index.php#data-home. This report also includes a possible explanation for the decrease in acute hepatitis B cases during this period:

> In Arizona from 2008–2013, reported cases and rates of acute hepatitis B declined from a high of 193 cases reported in 2009 to 50 cases reported in 2013. This decline in Arizona cases is consistent with a national decline in cases during this same time period. Rates could also have been affected by a change in the 2013 case definition for acute hepatitis B cases that required the presence of clinical symptoms in addition to laboratory results. The change in the case definition may play an important role in the 2013 decline in either of two ways: the inclusion of asymptomatic but laboratory-positive cases in earlier years, or exclusion of symptomatic persons in 2013 if lack of resources limited case investigations to determine whether a person had compatible symptoms.
>
> The 2013 acute hepatitis B case definition also included a slight change in laboratory criteria, in addition to requiring clinical symptoms: the presence of hepatitis B surface antigen AND positive Immunoglobulin M (IgM) antibody to hepatitis B core antigen, if performed, for a confirmed case, or positive IgM alone for a probable case. In the earlier years, a positive test for either hepatitis B surface antigen or IgM antibody was sufficient for both confirmed and probable cases.

Rates representing data from multiple years were calculated by summing the number of cases in each group (age, county, race/ethnicity) and dividing by the sum of the population denominators for that group for each year. While this method cannot show trends across years, the resulting rate will represent the average, annual, incidence of report for each year in the time period and can be compared with the yearly rates.

Rates for counties with small populations can vary greatly year-to-year with small changes in case numbers. The same is true for any small population group.

The hepatitis C laboratory results from ELR were de-duplicated by creating a unique patient identifier that included first and last name, date of birth, and gender. The HCV ELR cases from 2009 – 2015 were then cross-matched with the 1998 – 2008 HCV database by unique identifier to identify new (not previously reported) cases of HCV infection from 2009 – 2015.

Number and incidence rates of newly reported cases of acute and chronic hepatitis B, by county of residence, sex, and five-year age group, for each year, are available on the ADHS website at http://www.azdhs.gov/preparedness/epidemiology-disease-control/index.php#data-stats-archive.

Table 1. Number and Rate, per 100,000 population, of Reported Hepatitis B Cases, by Year

Year of first report	Number of cases reported		Rates per 100,000 population	
	Acute HBV	Chronic HBV	Acute HBV	Chronic HBV
2006	373	1101	5.98	17.64
2007	179	1056	2.78	16.41
2008	164	1138	2.51	17.41
2009	193	1118	2.96	16.95
2010	150	962	2.34	15.05
2011	185	860	2.87	13.36
2012	104	892	1.6	13.73
2013	50	816	0.76	12.4
2014	38	929	0.57	13.94
2015*	43	918	0.64	13.77

* 2014 population denominators were used for the 2015 rates.

Table 2. Number and Percent of Reported HBV Cases, by Race/Ethnicity, 2006 – 2015

	Acute HBV			Chronic HBV			AZ Population
	# of Cases	% (incl. Unknowns)	% (excl. Unknowns)	# of Cases	% (incl. Unknowns)	% (excl. Unknowns)	Percent
White, non-Hispanic	359	24%	62%	1112	11%	37%	59%
Hispanic	124	8%	21%	365	4%	12%	29%
Black/African American	33	2%	6%	489	5%	16%	4%
American Indian/Alaska Native	45	3%	8%	141	1%	5%	5%
Asian/Pacific Islander	20	1%	3%	925	9%	31%	3%
Unknown	898	61%		6758	69%		
Total	1479			9790			

Table 3. Rates of Reported Acute Hepatitis B, per 100,000 population, by County, 2006 – 2015

	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Apache	0.0	1.4	0.0	1.4	4.2	2.6	2.6	1.3	2.6	2.7
Cochise	0.0	0.0	0.0	0.0	1.5	0.7	1.4	1.4	3.6	3.7
Coconino	0.7	0.0	0.7	0.7	0.7	0.7	0.0	0.7	1.5	4.5
Gila	0.0	0.0	0.0	1.9	1.9	3.4	5.1	0.0	5.4	3.6
Graham	2.6	2.6	0.0	0.0	0.0	0.0	5.0	0.0	5.5	5.6
Greenlee	0.0	9.5	0.0	0.0	0.0	0.0	0.0	11.2	0.0	0.0
La Paz	0.0	0.0	0.0	0.0	4.8	4.6	0.0	4.6	0.0	9.3
Maricopa	0.7	0.4	0.9	1.9	3.5	2.4	3.7	3.0	2.8	7.0
Mohave	0.5	2.9	1.0	4.4	5.0	7.8	4.4	2.0	5.9	12.3
Navajo	1.8	0.0	1.8	2.8	3.7	1.7	2.6	3.5	0.9	6.2
Pima	0.8	0.9	0.2	0.7	1.3	1.6	1.2	1.5	1.6	3.0
Pinal	0.0	0.3	1.5	1.5	4.0	1.8	6.4	4.0	5.5	4.8
Santa Cruz	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0	2.2
Yavapai	1.4	0.0	0.9	1.4	1.4	1.3	0.4	1.3	1.4	2.8
Yuma	0.0	0.5	0.5	0.5	2.0	2.0	1.5	1.5	4.0	4.6

Table 4. Rates of Reported Chronic Hepatitis B, per 100,000 population, by County, 2006 – 2015

	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Apache	9.7	4.2	6.9	15.2	2.8	2.6	5.2	3.9	10.6	2.7
Cochise	9.3	11.6	6.9	4.6	6.1	7.1	9.2	10.0	9.4	11.9
Coconino	7.9	7.2	2.2	5.2	8.2	4.3	11.6	8.1	9.6	6.7
Gila	9.2	7.4	7.5	3.7	5.6	10.1	5.1	3.5	9.0	12.7
Graham	7.8	13.0	0.0	0.0	0.0	7.5	5.0	5.2	5.5	2.8
Greenlee	9.5	0.0	0.0	0.0	0.0	0.0	11.5	22.3	0.0	12.1
La Paz	14.1	0.0	9.5	4.8	4.8	4.6	13.8	4.6	13.8	9.3
Maricopa	16.3	17.5	14.9	17.5	16.8	19.0	21.6	21.1	20.3	22.1
Mohave	8.8	7.4	9.8	6.4	6.5	8.3	12.7	9.3	10.4	14.9
Navajo	5.5	6.4	1.8	2.8	3.7	0.9	8.7	4.4	7.8	7.1
Pima	13.6	9.7	12.2	10.9	11.3	9.3	11.8	16.5	13.1	13.7
Pinal	9.3	9.8	9.9	9.8	10.7	22.2	14.0	15.5	13.6	13.3
Santa Cruz	8.1	6.1	4.1	2.1	0.0	2.1	4.2	4.2	2.1	4.4
Yavapai	7.4	7.0	4.7	5.7	4.7	4.0	3.5	8.4	3.6	3.8
Yuma	1.9	7.1	5.7	5.8	5.5	8.3	4.4	5.9	7.9	7.7

Return to Surveillance Section

Hospitalizations

Rates are calculated using the number of visits for a given category divided by the Arizona population for that category (e.g., the Arizona population for a given year). Because one person may be represented in the numerator multiple times if multiple hospital visits occur, these rates overestimate the incidence of the number of people hospitalized in a given year. This may be an especially important consideration if there are differences in hospital utilization across the groups compared, or in groups with a small population denominator.

Rates representing data from multiple years were calculated by summing the number of inpatient visits in each group (age, race/ethnicity) and dividing by the sum of the population denominators for that group for each year.

The following definitions are used in the Hospital Discharge Database. For other definitions, see the ADHS website: http://azdhs.gov/preparedness/public-health-statistics/hospital-discharge-data/index.php#data-release.

> Principal diagnosis: The ICD Code describing the condition established after study to be chiefly responsible for occasioning the episode of care.
>
> Diagnosis 2 through Diagnosis 25: The ICD diagnosis codes corresponding to all conditions that coexist at the time of admission, that develop subsequently, or that affect the treatment received and/or the length of stay. Does not include diagnoses that relate to an earlier episode which have no bearing on the current hospital stay.
>
> Total charges: The total gross charges incurred by the patient for this episode of care.

The hospitalization rates associated with HBV and HCV, by race/ethnicity, are shown below. Rates for HBV were highest were amongst Asians or Pacific Islanders, followed by Blacks or African Americans (Figure 1). For HCV, rates were highest among Blacks or African Americans (Figure 2). However, these findings should be interpreted with caution, as multiple hospitalizations by a few individuals in a small population could distort these numbers.

Figure 1. Rate of Hospitalizations associated with HBV, per 100,000 population, by Race/Ethnicity, 2009 – 2014

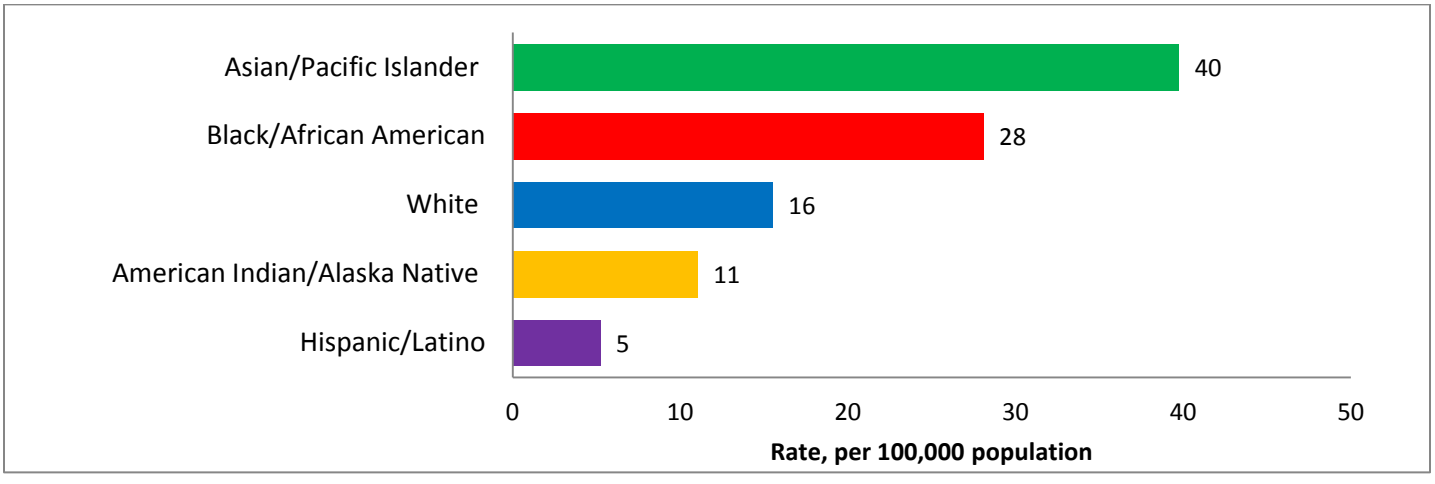
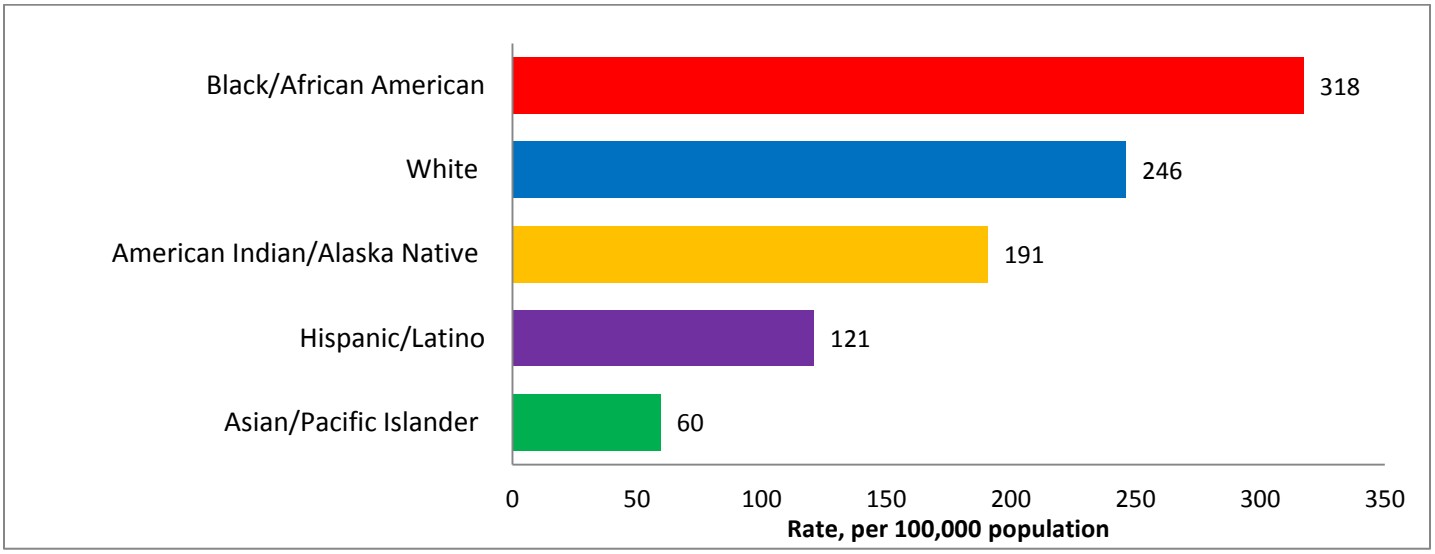


Figure 2. Rate of Hospitalizations associated with HCV, per 100,000 population, by Age Group, 2009 – 2014



Return to Hospitalizations Section

Deaths

The ADHS Office of Vital Records death certificate database contains records for all deaths occurring in Arizona as well as those occurring in other state among Arizona residents. For this analysis, only deaths among Arizona residents were considered.

Crude rates for periods of multiple years are calculated by summing the number of deaths for each year and dividing by the sum of the population for each year. These annualized rates can be compared to the mortality rate calculated for a single year. Mortality rates are age-adjusted to the U.S. census population for 2000 in order to allow better comparisons with data from other states.

Race and ethnicity are recorded separately on death certificates and combined during analysis.
The ICD-10 codes used to identify liver disease were: C220 – C229, I81, I850, K70 – K76, R160 – R162, R18.

Return to Deaths Section

HCV Testing at Major Commercial Labs

Although RNA testing is often used as a confirmatory test following a positive Ab test, the total number of RNA tests shown for each laboratory is greater than the number of positive Ab tests.

Additional notes provided by CDC:

- This report is limited to populations served by each respective laboratory and may not be generalizable or representative of state-wide testing patterns.

- State-specific data were extracted based on zip codes of patient accounts.
- Person level frequencies exclude tests with insufficient demographic information (~5%).
- HCV Antibody test excludes RIBA and other confirmatory tests.
- HCV RNA tests include quantitative and qualitative tests for detection of hepatitis C virus RNA and exclude genotype.
- Persons tested more than once in a given year are counted only once in the yearly total.
- County of residence was assigned based on zip code of patient residence with the use of SAS zip code to county crosswalk file dated Q4 2015 (http://support.sas.com/rnd/datavisualization/mapsonline/html/misc.html)

Return to Commercial Labs Section