

Viral Hepatitis Surveillance

United States, 2011



National Center for HIV/AIDS, Viral Hepatitis, STD & TB Prevention
Division of Viral Hepatitis



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SUMMARY

As part of CDC's National Notifiable Disease Surveillance System (NNDSS), viral hepatitis case-reports are received electronically from state health departments via CDC's National Electronic Telecommunications System for Surveillance (NETSS), a computerized public health surveillance system that provides CDC with data regarding cases of nationally notifiable diseases on a weekly basis. Although surveillance infrastructure is in place for reporting of acute infection, reports of chronic hepatitis B and C, which account for the greatest burden of disease, are not submitted by all states. As noted in a recent report from the Institute of Medicine (1), surveillance capacity to monitor both acute and chronic viral hepatitis is limited at the state and local levels, resulting in underreporting and incomplete variable quality data that is insufficient for understanding the magnitude of viral hepatitis.

Data in this report should be interpreted with the consideration that reported cases of acute or chronic viral hepatitis represent only those relatively few infected persons who were detected, diagnosed, met a stringent case definition, and eventually reported to CDC in 2011. Because most acute and chronic infections are not reported, this Summary is mainly useful in detecting major trends in viral hepatitis A (HAV), B (HBV) and C (HCV). In 2011 and 2012 a major effort was undertaken to improve methodologies for estimating total number of new cases of hepatitis A, B and C from the number of cases reported for each disease (2). Estimates in this report of incidence of new infections were obtained using the newly improved methodology. These estimates cannot be compared to previous years' estimates that were obtained using different (unpublished) procedures; however, trends seen in reported data still pertain, such as the increase in 2011 in acute HCV in young persons.

Because chronic HBV and HCV infection are largely hidden and part of what the current US Assistant Secretary for Health, Dr. Howard Koh has dubbed the "Secret Epidemic" (3), this report also provides data to inform our understanding of the current epidemic of chronic hepatitis B and C.

With progressive infant vaccination recommendations since 1996, vaccination rates and evidence of vaccine-induced immunity in young patients have been increasing continuously in the past decade (4,5). Half of all hepatitis A infections now apparently are acquired overseas by adult travelers (6). The major public health demands regarding hepatitis A relate to newly discovered HAV-infected foodhandlers, as these place a large burden on local public health departments to notify, test, and vaccinate potentially infected restaurant patrons (7). There were 1,398 reported cases of acute HAV in 2011. After asymptomatic infections and under-reporting were taken into account, it was estimated that approximately 2,800 (1,650-4,370) new infections occurred in 2011.

Acute hepatitis B has been declining in incidence since 1990 mainly due to effective vaccination strategies, but chronic HBV estimated at 700,000-1.4 million of the US population (8, 9), remains a major public health challenge. As the surveillance data in this report and other data indicate, about half of all chronic HBV infections are among persons born in Asia and Asian-Americans who were born to HBV-infected mothers in the United States. Identifying these chronically infected persons and linking them to care remains a challenge (10,11). There were 2,890 cases of acute HBV reported in 2011. After adjusting for asymptomatic infections and

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under-reporting, the estimated number of new HBV infections was approximately 18,800 (7,400-86,200).

After 6 years of receiving reports of about 800 cases of acute HCV each year, there was a marked increase of 44% in reported acute HCV infections (n=1,229) in 2011 compared with 2010. This increase is thought to reflect a trend of increasing HCV infections among adolescents and young adults particularly in eastern and mid-western states. Based on limited epidemiologic studies, cases of reported HCV infection among young persons are white, live in non-urban areas, have a history of injection drug use, and previous use of opioid agonists such as oxycodone (12,13). Some of the increase in reported acute HCV reflects increased ascertainment by states and local health departments funded by CDC to investigate such cases more actively—New York, Massachusetts, Wisconsin, Florida, and Philadelphia. However, in some locations where the number of cases has increased, notably in states that include rural Appalachian counties, those increases have occurred without any increased funding, or investigatory or ascertainment activities (14). There were 1,229 acute HCV cases reported in 2011. After adjusting for asymptomatic infections and under-reporting, an estimated 16,500 (7,200- 43,400) new infections with HCV occurred in 2011.

Chronic HCV infection affects at least 3 million US residents (15). However, prevalent chronic infections appear to be declining due, at least in part, to increasing mortality in HCV-infected persons—usually persons aged 45 to 65 years old—that now exceeds deaths from HIV/AIDS in the United States (16). A major public health challenge is to increase the proportion of people tested (17) and to increase the proportion of those who test positive who are referred for care and treatment (10,11).

BACKGROUND

Viral hepatitis is caused by infection with any of at least five distinct viruses: hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV), hepatitis D virus (HDV), and hepatitis E virus (HEV). Most symptomatic viral hepatitis infections in the United States are attributable to HAV, HBV, and HCV. All three of these unrelated viruses can produce an acute illness characterized by nausea, malaise, abdominal pain and jaundice, although many of these acute infections are asymptomatic or cause only mild disease. Thus, many persons infected with HBV or HCV are unaware they are infected and have clinically silent infections for decades until developing cirrhosis, end-stage liver disease and hepatocellular carcinoma.

Hepatitis A

Transmitted through the fecal-oral route, HAV is acquired primarily through close personal contact and foodborne outbreaks (18). Since 1995, effective vaccines to prevent hepatitis A virus infection have been available in the United States, increasing the feasibility of eliminating indigenous transmission. In 1996, CDC's Advisory Committee on Immunization Practices (ACIP) recommended administration of hepatitis A vaccine to persons at increased risk for the disease, including international travelers, men who have sex with men (MSM), non-injection and injection-drug users (IDUs), and children living in communities with high rates of disease (19). ACIP also recommended routine vaccination for children living in 11 states with average hepatitis A rates of ≥ 20 cases per 100,000 population and recommended that vaccination be considered for children in an additional six states with rates of 10–20 cases per 100,000 population (20). ACIP expanded these recommendations in 2006 to include routine vaccination of infants in all 50 states (4).

Hepatitis B

HBV is transmitted by percutaneous or mucosal exposure to the blood or body fluids of an infected person, from an infected mother to her newborn during childbirth, through close contact within households, through exposures to unscreened blood transfusion or unsafe injections in health care settings, through injection-drug use, and from sexual contact with an infected person. Adults with diabetes mellitus are at an increased risk of acquiring HBV infection. These persons are recommended to receive hepatitis B vaccination before the age of 60 and, if above that age, to be considered for vaccination (21).

The risk for chronic HBV infection decreases with increasing age at infection. Of infants who acquire HBV infection from their mothers at birth, as many as 90% become chronically infected, whereas 30%–50% of children infected at age 1–5 years become chronically infected. This percentage is smaller among adults, in whom approximately 5% of all acute HBV infections progress to chronic infection (22).

Effective vaccines to prevent hepatitis B virus infection have been available in the United States since 1981. Ten years later, a comprehensive strategy was recommended for the elimination of HBV transmission in the United States (23,24). This strategy encompassed the following four components:

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- universal vaccination of infants beginning at birth;
- prevention of perinatal HBV infection through routine screening of all pregnant women for HBV infection and the provision of immunoprophylaxis to infants born either to infected women or to women of unknown infection status;
- routine vaccination of previously unvaccinated children and adolescents; and
- vaccination of adults at increased risk for infection (including health-care workers, dialysis patients, household contacts and sex partners of persons with chronic HBV infection, recipients of certain blood products, persons with a recent history of having multiple sex partners concurrently, those infected with a sexually transmitted disease, MSM, and IDUs).

In addition to hepatitis B vaccination, efforts have been made to improve care and treatment for persons who are living with hepatitis B. In the United States, 700,000-1.4 million persons are estimated to be infected with the virus (8, 25), many of whom are unaware of their infection status (10). To improve health outcomes for these persons, in 2008 CDC issued recommendations to guide hepatitis B testing and public health management of persons with chronic hepatitis B infection (26). These guidelines stress the need for testing persons at high risk for infection, conducting contact management, educating patients, and administering FDA-approved therapies for treating hepatitis B.

Hepatitis C

HCV is transmitted primarily through percutaneous (parenteral) exposure that can result from injection-drug use, needle-stick injuries, and inadequate infection control in health-care settings. Much less often, HCV transmission occurs among HIV-positive MSM as a result of sexual contact with an HCV-infected partner (27,28), non-professionally applied tattoos (28) and among infants born to HCV-infected mothers (29). With an estimated 3.2 million chronically infected persons nationwide, HCV infection is the most common blood-borne infection in the United States (15).

Currently a single positive anti-HCV result cannot distinguish between acute and chronic (past or present) HCV infection, and making this distinction requires a health department to follow-up with a provider to determine if there were symptoms. Laboratory criteria in the 2011 case definition for past or present HCV infection require one or more of the following: anti-HCV positive (repeatedly reactive) by EIA, verified by at least one more specific assay, or HCV RIBA positive, or HCV nucleic acid test (NAT) positive, or anti-HCV screening-test positive with a signal-to-cutoff ratio predictive of a true positive for the particular assay as defined by CDC. No clinical symptoms are required; however, the case must be known to not be an acute case. Approximately 75%-85% of newly infected persons develop chronic infection (30).

Because of the high burden of chronic HCV infection in the United States and because no vaccine is available for preventing infection, national recommendations (31) emphasize other primary prevention activities, including screening and testing blood donors, inactivating HCV in plasma-derived products, testing persons at risk for HCV infection and providing them with risk-reduction counseling, and consistently implementing and practicing infection control in health-care settings. In 2010, the FDA approved point-of-care tests for HCV infection, which meant that patients could receive HCV test results within the same visit and faster referral to care (32). In 2012, CDC augmented existing risk-based recommendations for HCV testing by recommending

one-time screening for HCV infection among all those born during 1945-1965 (33). It is estimated that persons born during these years have a 3% prevalence of HCV antibodies, which is five times higher than the prevalence seen in adults born in other years. Of all persons living with HCV infection, about 75% were born during 1945-1965; a similar percentage of HCV-associated deaths can be attributed to this birth cohort (33). The goal of the new birth-cohort approach to HCV testing is to identify unrecognized infections among the segment of the population with the largest risk of HCV associated morbidity and mortality, thereby increasing opportunities for persons infected with HCV to benefit from appropriate care and treatment. Implementation of the birth cohort screening recommendation and point of care testing for HCV infection will facilitate testing, notification of results, post-test counseling and referral to care.

Linkage to care and treatment is critical to improving health outcomes for persons found to be infected with HCV. Such linkage is particularly important in light of the major advancements that have been made in HCV treatments. For patients infected with HCV, treatment has previously consisted of pegylated interferon combined with oral doses of ribavirin, a regimen that has improved health outcomes for many infected persons. Approximately 40% of HCV-infected patients receiving this therapy clear their infection. New direct acting agents against HCV (telaprevir, boceprevir) were licensed by the FDA in 2011 and are now standard-of-care. These agents, when given in combination with current therapy, can increase virologic cure rates to 80% while decreasing duration of therapy (34). Several drugs are now administered orally (a major advancement in how treatments are administered for this infection), leading to viral suppression in 90% of patients taking one of these new oral medications (35,36).

Notes on “Case Classification”

For analysis at the national level, cases of viral hepatitis are considered “confirmed” if they meet both the clinical case definition and laboratory criteria for diagnosis; however, these criteria are evaluated at the state or local level and are not validated by CDC. For hepatitis A, cases also are considered confirmed if they meet the clinical case definition and involve a person who is epidemiologically linked to someone with laboratory-confirmed hepatitis A (e.g., through household or sexual contact with an infected person during the 15–50 days before symptom onset).

Sources of Information

CDC relies on several sources of information to determine the incidence, prevalence, trends, and burden of viral hepatitis A, B, and C disease. The basis for most case reports is passive surveillance through the *National Notifiable Disease Surveillance System (NNDSS)*. State and local health departments report acute hepatitis A, B and C infections (incident cases) through this system. However, a number of states do not report cases of chronic viral hepatitis B and C through the NNDSS. Collecting, verifying and reporting the many chronic cases of hepatitis B and C in the United States (estimated at over 4 million) is beyond the capability of many health departments. Reports of chronic hepatitis B and C are included in this Surveillance Summary from NNDSS and the *Emerging Infections Program (EIP)*. This report includes the number or count of confirmed chronic cases reported to CDC through NNDSS from states that gave permission for CDC to publish those counts. Data on confirmed cases of chronic hepatitis B and C from selected sites that CDC funded, under the EIP to conduct more active case ascertainment and investigations are also included. Severity and burden of viral hepatitis A, B and C disease are

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measured by information obtained from death certificates through the National Vital Statistics System (NVSS) (37).

Surveillance activities also include the examination of other data sets which are not included in this report, such as the *National Ambulatory Medical Care Survey (NAMCS)* and the *National Hospital Ambulatory Medical Care Survey (NHAMCS)*. Additional special studies, including analysis of the *National Health and Nutrition Examination Survey (NHANES)*, which collects data from a nationally representative sample of about 5,000 non-institutionalized US residents each year, also are important in understanding the prevalence of chronic HCV (14; MM Denniston, manuscript submitted).

National Notifiable Disease Surveillance System (NNDSS)

Background

Each week, state and territorial health departments report cases of acute, symptomatic viral hepatitis to CDC's NNDSS. Since 1990, states have been electronically submitting individual case reports (absent of personal identifiers) to CDC. States' participation in reporting nationally notifiable diseases, including viral hepatitis, is voluntary.

National surveillance for viral hepatitis (including acute hepatitis A, hepatitis B, and hepatitis C; chronic hepatitis B; and chronic [past or present] hepatitis C) is based on case definitions developed and approved by the Council of State and Territorial Epidemiologists (CSTE) and CDC. In 2011, reported cases of acute and chronic viral hepatitis were required to meet the following CSTE-defined clinical and laboratory criteria (available at: <http://wwwn.cdc.gov/nndss/script/ConditionList.aspx?Type=0&Yr=2011>).

Enhanced Viral Hepatitis Surveillance Sites

Background

In 2011 CDC funded select sites for viral hepatitis surveillance through the Emerging Infections Program (EIP), a network involving CDC, state health departments, academic institutions, and local health departments. Since 2004, participating EIP sites have conducted routine surveillance for chronic HBV and chronic (past or present) HCV infections. All chronic cases of viral hepatitis obtained through these sites are de-duplicated; additionally, for a percentage of cases, follow-up is conducted to obtain clinical and laboratory data and information regarding risk behaviors and exposures. Each month, a dataset of cumulative cases from each site was sent to CDC's DVH via a secure electronic file transfer protocol.

Data Collection

CDC funded five states (Colorado, Connecticut, Minnesota, New Mexico, and Oregon), two cities (New York City and San Francisco), and 34 counties in New York State to conduct enhanced viral hepatitis surveillance, representing a combined population of approximately 40 million persons. In each of these jurisdictions, clinical laboratories are mandated to submit reports from persons with positive HBV and HCV test results. Participating health departments routinely review each report to assess whether the current case definition was met as established

by CSTE and CDC. To determine whether a case is new, each site matches new case reports to existing cases in the surveillance registry using personal identifying information. New cases are added to an electronic registry, whereas duplicate cases are used to update previous reports. Most health departments collect basic demographic data (e.g., age and sex) from the laboratory reports. Efforts vary by site regarding the level of investigation undertaken to collect and store supplemental information (e.g., risk factor data) from patients or their providers.

Analyses

Analyses were conducted on all serologically confirmed cases of chronic hepatitis B and chronic (past or present) hepatitis C infection reported by EIP sites during 2011 and submitted to CDC by January 24, 2013. Rates were calculated using appropriate jurisdiction-specific (state, county, or city) 2011 population estimates obtained from the U.S. Census Bureau.

Limitations

The number of chronic cases included in this report is likely an underestimate of the true prevalence of disease because chronic cases are generally asymptomatic and less likely to be discovered and reported. Additionally, data from these sites may not be representative of the U.S. population, and because not all sites conduct comprehensive follow-up, data regarding race/ethnicity, place of birth, and risk are missing for some case reports.

Mortality/Death Certificates

Background

Death certificates are completed for all deaths registered in the United States. Information from death certificates is provided by funeral directors, attending physicians, medical examiners, and coroners, and certificates are filed in vital statistics offices within each state and the District of Columbia. Through a program called the National Vital Statistics System (NVSS) (36), information from death certificates is compiled by CDC's National Center for Health Statistics (NCHS) to produce national multiple-cause-of-death (MCO) data (38); causes of death are coded in accordance with the International Classification of Diseases, Tenth Revision (ICD-10) (39). MCO data are used to determine the national burden of mortality associated with viral hepatitis infections and to describe the demographic characteristics of decedents.

A major study of these records from 1999 through 2007 showed that the annual number of deaths among HCV-infected persons now exceed the annual number of deaths among HIV-infected persons (16).

Methods

We analyzed national multiple-cause mortality data collected during 2006–2010 (the most recent years available) obtained from NCHS. The following case definitions were used to identify a death associated with hepatitis A, B, and C.

Any death record with a report of:

- hepatitis A (ICD-10: B15),
- hepatitis B (ICD-10: B16, B17.0, B18.0, and B18.1), or

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- hepatitis C (ICD-10: B17.1 and B18.2) listed as the underlying or one of the multiple (e.g., contributing) causes of death in the record axis.

Demographic information on age, race, and sex were examined. Deaths were divided into six age categories: 0–34, 35–44, 45–54, 55–64, 65–74, and ≥ 75 years. Race categories for 2006-2009 consisted of white (Hispanic and non-Hispanic), black (Hispanic and non-Hispanic), and non-black, non-white (which included all other racial and ethnic groups). For 2010, race/ethnicity categories consisted of white non-Hispanic, black non-Hispanic, Hispanic, Asian/Pacific Islander (API) and American Indian/Alaska Native (AI/AN) to be consistent with those used by DVH.

To calculate national mortality rates, the number of deaths was divided by the total U.S. Census population for each demographic subgroup. Rates on race, sex, and overall total were standardized to the age distribution of the standard U.S. population in 2000 (40). Data were analyzed using SAS software, version 9.2 (SAS Institute; Cary, NC).

Interpretation of Mortality Data

- Differences in recording practices of death certificate information may cause misclassification of ICD-10 codes and demographic information.
- Certain racial/ethnic populations likely are underrepresented in U.S. Census data (the denominator for calculating rates), potentially causing overestimated rates for these populations.
- Analyses do not adjust for deaths resulting from undiagnosed viral hepatitis infections.
- Death records listing more than one type of viral hepatitis infection were counted once for each type of infection. For example, a death with ICD-10 codes for both hepatitis B and C virus infections is counted once as a hepatitis B death and once as a hepatitis C death.
- The race category designated as “non-white/non-black” includes all other race groups (e.g., APIs, AI/ANs, and persons who are Hispanic). This lack of specificity limits race-specific interpretation of mortality data prior to 2010.

References

1. Institute of Medicine (IOM). Hepatitis and liver cancer: a national strategy for prevention and control of hepatitis B and C. Washington, DC: The National Academies Press, 2010: 1-232.
2. Klevens RM, Liu SJ, Roberts H, Jiles RB, Holmberg SD. Estimating acute viral hepatitis infections from nationally reported cases. *Am J Public Health*, in press.
3. Koh HK. “Viral Hepatitis: The Secret Epidemic.” Testimony before the Committee on Oversight and Governmental Reform, United States House of Representatives, June 17, 2010.
4. CDC. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices. *MMWR* 2006; 55(RR-07):1-23.
5. Klevens RM, Kruszon-Moran D, Wasley A, et al. Seroprevalence of hepatitis A antibodies in the United States: Results from the National Health and Nutrition Examination Survey. *Public Health Rep* 2011;126: 522-32.
6. Klevens RM, Miller J, Iqbal K, Thomas A, Rizzo EM, Hanson H, et al. The Evolving Epidemiology of Hepatitis A in the United States: Incidence and Molecular Epidemiology from Population-Based Surveillance. *Arch Intern Med* 2010; 170:1811-18.
7. Fiore AE: Hepatitis A transmitted by food. *Clin Inf Dis* 2004; 38:705-15.
8. Wasley A, Kruszon-Moran D, Kuhnert W, et al. The prevalence of hepatitis B virus infection in the United States in the era of vaccination. *J Infect Dis* 2010; 202: 192-201.
9. Kowdley KV, Wang CC, Welch S, Roberts H, Brosgart CL. Prevalence of chronic hepatitis B among foreign-born persons living in the United States by country of origin. *Hepatology* 2012; 56: 422-33.
10. Spradling PR, Rupp LB, Moorman AC, et al. Hepatitis B and C virus infection among 1.2 million persons with access to care: factors associated with testing and infection prevalence. *Clin Infect Dis* 2012; 55:1047-55.
11. Moorman AC, Gordon SC, Rupp LB, et al. Baseline characteristics and mortality among people in care for chronic viral hepatitis: The Chronic Hepatitis Cohort Study. *Clin Infect Dis* 2013; 56:40-50.
12. CDC. Hepatitis C virus infection among adolescents and young adults---Massachusetts, 2002---2009. *MMWR* 2011; 60:537--41.
13. CDC. Notes from the Field: Risk Factors for Hepatitis C Virus Infections among Young Adults --- Massachusetts, 2010. *MMWR* 2011; 60:1457-8.
14. Holmberg SD. Emerging epidemic of hepatitis C in young nonurban injection drug users (IDU). *Presented at: Report on Technical Consultation. Hepatitis C Virus Infection in Young*

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Persons who Inject Drugs. Dept. of Health and Human Services, Washington, DC, February 26-27, 2013. Available at: <http://aids.gov/pdf/hcv-and-young-pwid-consultation-report.pdf>

15. Armstrong GL, Wasley AM, Simard EP, et al. The prevalence of hepatitis C virus infection in the United States, 1999 through 2002. *Ann Intern Med* 2006;144:705–14.
16. Ly KN, Xing J, Klevens RM, Jiles RB, Ward JW, Holmberg, SD. The increasing burden of mortality from viral hepatitis in the United States between 1999 and 2007. *Ann Intern Med* 2012; 156:271-8
17. Roblin DW, Smith B, Weinbaum CM, Sabin ME: HCV Screening Practices and Prevalence in an MCO, 2000-2007. *Am J Manag Care*. 2011;17:548-55.
18. CDC. Epidemiology and prevention of vaccine-preventable diseases. Atkinson W, Wolfe S, Hamborsky J, McIntyre L, eds. 11th ed. Washington DC: Public Health Foundation, 2009.
19. CDC. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices. *MMWR* 1996; 45(RR-15):1-30.
20. CDC. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1999; 48(No. RR-12): 1-37.
21. CDC. Use of Hepatitis B Vaccination for Adults with Diabetes Mellitus: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2011; 60:1709-11.
22. CDC. The ABCs of hepatitis fact sheet. 2010. Publication No. 21–1076. Available at: <http://www.cdc.gov/hepatitis/Resources/Professionals/PDFs/ABCTable.pdf>
23. CDC. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States. Part 1: immunization of infants, children, and adolescents. *MMWR* 2005; 54(No. RR–16): 1-31.
24. CDC. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States—recommendations of the Advisory Committee on Immunization Practices (ACIP). Part 2: immunization of adults. *MMWR* 2006; 55 (No. RR–16):1-25.
25. Ioannou G. Hepatitis B virus in the United States: infection, exposure, and immunity rates in a nationally representative survey. *Ann Intern Med* 2011;145:319-28.
26. CDC. Recommendations for identification and public health management of persons with chronic hepatitis B virus infection. *MMWR* 2008; 57(No. RR-08):1-18.
27. CDC. Sexual transmission of hepatitis C virus among HIV-infected men who have sex with men—New York City, 2005-2010. *MMWR* 2011;60:945-950.

28. Tohme RA, Holmberg SD. Is sexual contact a major mode of hepatitis C transmission? *Hepatology* 2010; 52:1497–1505.
29. Mok J, Pembrey L, Tovo P-A, Newell ML: When does mother to child transmission of hepatitis C virus occur? *Arch Dis Child Fetal Neonatal Ed* 2005; 90:F156-F160.
30. CDC. National hepatitis C prevention strategy: a comprehensive strategy for the prevention and control of hepatitis C virus infection and its consequences. 2001. Available at: <http://www.cdc.gov/hepatitis/HCV/Strategy/PDFs/NatHepCPrevStrategy.pdf>
31. CDC. Recommendations for prevention and control of hepatitis C virus (HCV) infection and HCV-related chronic disease. *MMWR* 1998; 47(RR-19):1-54.
32. US Food and Drug Administration: FDA Approves Rapid Test for Antibodies to Hepatitis C Virus. News and Events. Available at: <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm217318.htm>.
33. CDC. Recommendations for the identification of chronic hepatitis C virus infection among persons born during 1945–1965. *MMWR* 2012;61(RR-04):1-36.
34. Asselah T, Marcellin P. New direct-acting antivirals' combination for the treatment of chronic hepatitis C. *Liver Int* 2011 Jan;31 Suppl 1:68-77.
35. Poordad F, Lawitz E, Kowldy KV, et al. Exploratory study of oral combination antiviral therapy for hepatitis C. *N Engl J Med* 2013; 368:45-53.
36. Barreiro P, Vispo E, Poveda E, Fernández-Montero JV, Soriano V. Hepatitis C therapy: highlights from the 2012 Annual Meeting of the European Association for the Study of the Liver. *Clin Infect Dis* 2013; 56:560-6.
37. Xu J, Kochanek KD, Murphy SL, Tejada-Vera B. Deaths: final data for 2007. *National Vital Statistics Report* 2010; 58:1–73.
38. National Center for Health Statistics. Mortality data. Accessed July 1 2010. Available at: <http://www.cdc.gov/nchs/deaths.htm>.
39. World Health Organization. International statistical classification of diseases and related health problems, 10th Revision, Version for 2007. Accessed April 23 2010 Available at: <http://apps.who.int/classifications/apps/icd/icd10online/>.
40. Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. *US Department of Health and Human Services*, 2001; 20:1–10.

Investigations of Acute Cases

For 2011, national surveillance data indicate an increasing number of reported HCV in persons younger than 25 years-old in several states (1,2). Based on this, recent investigations of viral

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hepatitis outbreaks in the United States demonstrate the increased risk of hepatitis C in mainly young, white, non-urban heroin injection drug users (IDUs) who started with oral prescription opioid analogues (oxycodone, hydrocodone) (1,2).

There continue to be instances of HBV and HCV transmission in the health care setting (3-13). Distinguishing cases of health-care-acquired viral hepatitis from those transmitted outside the health-care setting often depends on the quality of case reporting and therefore varies by state and locality. Cases must be detected by a health department with the capacity to detect and investigate suspected links to a single health care or long-term care facility (11). Investigation of suspected cases of health-care-associated viral hepatitis is multi-faceted, involving surveillance, epidemiologic, clinical, and laboratory components. State and local health departments generally consult CDC's DVH and the Division of Healthcare Quality Promotion (DHQP) to seek technical assistance and support regarding the proper approach to investigating a possible healthcare-associated transmission event. These outbreaks and clusters of infections for 2011 are listed in Table 1. Outbreaks reported through 2012, including 4 in 2011, are now available at: <http://www.cdc.gov/hepatitis/Outbreaks/HealthcareHepOutbreakTable.htm>.

Again, data regarding viral hepatitis outbreaks obtained through current surveillance mechanisms are subject to limitations. Because not all outbreaks are identified or investigated at the state and local level or reported to CDC, the number of reported outbreaks for all years, including 2011, is an underestimate of the actual number of viral hepatitis outbreaks that occurred in health-care or other congregant living facilities. In addition to the outbreak investigations shown in Table 1, CDC Division of Viral Hepatitis staff offered technical and laboratory assistance to health departments in over 40 consultations in 2011.

Investigations/Consultations

In 2011, CDC participated in 4 state-based investigations of outbreaks of viral hepatitis infection (two involving HBV and two involving HCV infection) (Table 1). Both outbreaks of HBV infection occurred in an assisted-living facilities. Investigations at these locations revealed that 117 persons were potentially exposed to viral hepatitis. Upon testing, 9 of these persons were found to be infected with HBV. At one facility, an additional 4 new chronic infections were detected; of these 3 had viral molecular sequencing performed and all matched, i.e. indicating they were a cluster of outbreak-related cases. Suspected modes of transmission included unsafe practices related to assisted blood glucose monitoring and breaches in infection control related to podiatric services.

The outbreaks of HCV infection occurred in an outpatient hemodialysis facility and an outpatient pain management clinic. A total of 555 persons were identified as being potentially exposed and were tested for HCV infection; 8 of these persons were found to be infected with HCV. Suspected modes of transmission involved breaches in infection control including suspected syringe reuse contaminating medication vials.

Table 1: Health-care-associated hepatitis B virus (HBV) and hepatitis C virus (HCV) outbreaks reported to CDC for investigation in 2011

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Agent	State/setting (reference)	No. persons identified for screening	No. confirmed cases	Suspected mode of transmission*
HBV	California Assisted-living facilities (14)	14	2	Use of blood glucose meter for >1 resident without cleaning and disinfection Failure to maintain separation of clean and contaminated podiatry equipment Improper reprocessing of contaminated podiatry equipment Failure to perform environmental cleaning and disinfection between podiatry patients
	Virginia Assisted living facility (15) <i>(most residents with neuropsychiatric disorders)</i>	103	7	Use of fingerstick devices for >1 resident
HCV	New York Outpatient pain management clinic (16)	466	2	Suspected syringe reuse contaminating medication vials
	Georgia Outpatient hemodialysis facility (17)	89	6	Failure to maintain separation of clean and contaminated workspaces

*All suspected modes of transmission are patient-to-patient unless otherwise indicated.

References

1. CDC. Hepatitis C virus infection among adolescents and young adults---Massachusetts, 2002--2009. *MMWR* 2011; 60:537--41.
2. CDC. Notes from the field: risk factors for hepatitis C virus infections among young adults -- Massachusetts, 2010. *MMWR* 2011; 60:1457-8.
3. Thompson ND, Perz JF, Moorman AC, Holmberg SD. Nonhospital health care-associated hepatitis B and C virus transmission: United States, 1998-2008. *Ann Intern Med* 2009; 150:33-9.
4. Nosocomial hepatitis B virus infection associated with reusable fingerstick blood sampling devices -- Ohio and New York City, 1996. *MMWR* 1997; 46:217-221.
5. Counard C, Perz J, Linchangco P, et al. Acute hepatitis B outbreaks related to fingerstick blood glucose monitoring in two assisted living facilities. *J Am Geriatr Soc* 2010; 58:306-311.
6. Wise ME, Marquez P, Sharapov U, et al. Outbreak of acute hepatitis B infections at a psychiatric long term care facility. *Am J Infect Control* 2012; 40:16-21.
7. CDC. Multiple outbreaks of hepatitis B virus infection related to assisted monitoring of blood glucose among residents of assisted living facilities -- Virginia, 2009-2011. *MMWR* 2012; 61: 339-43.
8. Bancroft E, Hathaway S. Hepatitis B Outbreak in an Assisted Living Facility. Acute Communicable Diseases Program, Special Studies Report 2010, Los Angeles County Department of Public Health, pages 41- 44. Available at: <http://publichealth.lacounty.gov/acd/reports/SpecialStudiesReport2010>
9. Deaths from acute hepatitis B virus infection associated with assisted blood glucose monitoring in an assisted-living facility — North Carolina, August–October 2010. *MMWR* 2011; 60:182.
10. Greeley RD, Semple S, Thompson ND, et al. Hepatitis B outbreak associated with a hematology-oncology office practice in New Jersey, 2009 *Am J Infect Contr* 2011; 39:663-70.
11. Fischer G, Schaefer M, Labus B, et al. Hepatitis C virus infections from unsafe injection practices at an endoscopy clinic in Las Vegas, Nevada, 2007-2008. *Clin Infect Dis* 2010; 51:267-273.
12. Centers for Disease Control and Prevention. Acute hepatitis C virus infections attributed to unsafe injection practices at an endoscopy clinic — Nevada, 2007. *MMWR* 2008; 57: 513-517.

13. Moore ZS, Schaefer MK, Hoffmann KK, Thompson SC, Guo-Liang X, Lin Y, et al. Transmission of hepatitis C virus during myocardial perfusion imaging in an outpatient clinic. *Am J Cardiol* 2011; 108:126-32.
14. Los Angeles County Department of Public Health, unpublished data, 2011.
15. Centers for Disease Control and Prevention. Multiple Outbreaks of Hepatitis B Virus Infection Related to Assisted Monitoring of Blood Glucose Among Residents of Assisted Living Facilities -- Virginia, 2009-2011. *MMWR* 2012; 61: 339-343.
16. New York City Department of Health and Mental Hygiene, unpublished data, 2011.
17. Mbaeyi C. Outbreak of hepatitis C virus infections in an outpatient dialysis facility—Georgia, 2011. Presented at the 61st Annual Epidemic Intelligence Service (EIS) Conference, Atlanta, April 16–20, 2012.

ADJUSTMENTS TO REPORTED CASES

The Surveillance Team has been reanalyzing the estimators (multipliers) traditionally used to convert reported cases to estimated (true) incidence of acute hepatitis A, B, and C in the United States. Briefly, this review and analysis has been of more recent data that allow better estimation of the numbers and percentages of acute viral hepatitis cases who have symptoms, seek medical care, and get reported to local, state and federal health authorities (I). A probabilistic model factored probabilities of symptoms (I), referral to care and treatment (II), and rates of reporting to local and state department (III). This analysis indicated that reported cases represent an estimated one of 2.0 acute hepatitis A (random-effects model, 95% Confidence Interval [CI], 1.6-2.2); one of 6.5 hepatitis B (95% CI, 4.5-9.5); and one of 13.4 hepatitis C (95% CI 6.8- 25.0) cases (1). Accordingly, these estimators are used in this Surveillance Summary. These estimates cannot be used to deduce trends by comparison with estimations obtained in previous years, as these latter were obtained from different (and unpublished) calculations; trends are best seen in reported cases, as in the increase in acute HCV in 2011 among nationally reported cases.

1. Kleven RM, Liu SJ, Roberts H, Jiles RB, Holmberg SD. Estimating acute viral hepatitis infections from nationally reported cases. *Am J Public Health*, in press..

HEPATITIS A

Acute Hepatitis A. There were 1,398 reported cases of acute HAV in 2011, representing an estimated 2,800 (1,650- 4,370) actual acute cases.

Case Definition

Clinical Description

Acute hepatitis is defined as acute illness with 1) discrete onset of symptoms (e.g., nausea, anorexia, fever, malaise, and abdominal pain) and 2) jaundice, dark urine, or elevated serum alanine aminotransferase (ALT) >200 IU/L.

Laboratory Criteria for Acute Hepatitis A

- Immunoglobulin M (IgM) antibody to hepatitis A virus (anti-HAV) positive.

Acute Hepatitis A

Most recent hepatitis A incident infections, investigations and reports to CDC have been of HAV-infected foodhandlers.

Recent HAV consultations: Food or Foodhandlers

Date	State	Known Cases	No. Exposed	No. receiving vaccine	Remarks
Jan 2011	NY	1*	1,300	>400	Priest giving communion
Mar 2011	CO	1*	-	-	Travel to Caribbean
Aug 2011	NC	1*	~2,000	>3,000	Foodhandler, major restaurant chain

*Infected foodhandler: no further transmission

Historically, acute hepatitis A rates vary cyclically, with nationwide increases every 10-15 years. The last peak was in 1995; since that time, rates of hepatitis A have steadily declined. In 2011, a total of 1,398 cases of acute hepatitis A were reported nationwide to CDC (Table 2.1). The overall incidence rate for 2011 was 0.4 cases per 100,000 population. No data were available for 2011 from the District of Columbia.

Surveillance for Viral Hepatitis — United States, 2011

Table 2.1. Reported cases of acute hepatitis A, nationally and by state — United States, 2007-2011

State	2007		2008		2009		2010		2011	
	Rate*	(No.)	Rate	(No.)	Rate	(No.)	Rate	(No.)	Rate	(No.)
Alabama	0.5	(24)	0.3	(12)	0.3	(12)	0.2	(8)	0.2	(8)
Alaska	0.7	(5)	0.7	(5)	0.3	(2)	0.7	(5)	0.6	(4)
Arizona	2.4	(152)	1.8	(118)	1.0	(68)	1.0	(61)	1.2	(77)
Arkansas	0.5	(14)	0.3	(10)	0.4	(12)	0.1	(2)	0.1	(3)
California	1.7	(603)	1.2	(446)	0.7	(273)	0.6	(242)	0.5	(186)
Colorado	0.5	(26)	0.7	(36)	1.0	(52)	0.7	(36)	0.4	(21)
Connecticut	0.7	(26)	0.7	(26)	0.5	(18)	0.8	(29)	0.5	(18)
Delaware	1.0	(9)	0.8	(7)	0.5	(4)	0.8	(7)	0.2	(2)
District of Columbia	U [†]	U	U	U	0.2	(1)	0.2	(1)	U	U
Florida	0.8	(152)	0.8	(146)	0.9	(171)	0.7	(139)	0.5	(87)
Georgia	0.7	(67)	0.6	(57)	0.5	(54)	0.4	(40)	0.3	(27)
Hawaii	0.5	(7)	1.6	(20)	0.8	(11)	0.6	(8)	0.6	(8)
Idaho	0.5	(8)	1.1	(17)	0.3	(5)	0.5	(8)	0.4	(6)
Illinois	0.9	(118)	0.9	(112)	1.0	(126)	0.4	(48)	0.6	(73)
Indiana	0.4	(28)	0.3	(20)	0.3	(17)	0.2	(12)	0.4	(24)
Iowa	1.6	(48)	3.6	(109)	1.3	(38)	0.4	(11)	0.3	(8)
Kansas	0.4	(11)	0.5	(15)	0.4	(12)	0.5	(14)	0.1	(4)
Kentucky	0.5	(20)	0.7	(30)	0.3	(12)	0.6	(26)	0.2	(10)
Louisiana	0.6	(28)	0.3	(12)	0.1	(6)	0.2	(11)	0.1	(5)
Maine	0.4	(5)	1.4	(18)	0.1	(1)	0.5	(7)	0.5	(6)
Maryland	1.3	(73)	0.8	(44)	0.8	(47)	0.4	(23)	0.4	(26)
Massachusetts	1.0	(66)	0.9	(58)	1.1	(71)	0.7	(48)	0.6	(39)
Michigan	1.0	(97)	1.2	(119)	0.7	(72)	0.7	(73)	0.7	(70)
Minnesota	1.8	(93)	0.9	(49)	0.6	(29)	0.7	(37)	0.5	(27)
Mississippi	0.3	(8)	0.2	(7)	0.3	(9)	0.1	(2)	0.2	(7)
Missouri	0.4	(22)	0.6	(35)	0.4	(21)	0.4	(21)	0.2	(13)
Montana	0.9	(9)	0.1	(1)	0.6	(6)	0.4	(4)	0.3	(3)
Nebraska	1.1	(19)	2.3	(41)	1.2	(21)	0.8	(14)	0.3	(5)
Nevada	0.5	(12)	0.5	(13)	0.6	(15)	0.5	(14)	0.2	(5)
New Hampshire	0.9	(12)	0.9	(12)	0.5	(7)	0.2	(2)	0	(0)
New Jersey	1.4	(124)	1.0	(86)	0.8	(71)	0.9	(76)	0.9	(79)
New Mexico	0.6	(12)	0.9	(18)	0.4	(8)	0.2	(5)	0.3	(7)
New York	1.2	(235)	0.9	(179)	0.7	(136)	0.8	(147)	0.6	(113)
North Carolina	0.7	(66)	0.7	(63)	0.4	(41)	0.5	(48)	0.3	(31)
North Dakota	0.3	(2)	0.3	(2)	0.3	(2)	0.6	(4)	0	(0)
Ohio	0.6	(68)	0.4	(51)	0.3	(36)	0.4	(47)	0.3	(39)

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Oklahoma	0.4	(13)	0.4	(13)	0.2	(7)	0.2	(6)	0.3	(11)
Oregon	0.8	(31)	0.7	(25)	0.5	(19)	0.4	(17)	0.3	(11)
Pennsylvania	0.8	(96)	0.5	(68)	0.5	(68)	0.4	(53)	0.5	(60)
Rhode Island	1.3	(14)	1.1	(12)	0.9	(9)	0.9	(9)	0.8	(8)
South Carolina	0.4	(18)	0.4	(19)	1.4	(63)	0.6	(26)	0.2	(11)
South Dakota	0.8	(6)	0.5	(4)	0.4	(3)	0.1	(1)	0.2	(2)
Tennessee	0.9	(57)	0.5	(32)	0.2	(13)	0.2	(12)	0.4	(23)
Texas	1.1	(264)	1.1	(259)	0.7	(184)	0.6	(139)	0.5	(138)
Utah	0.3	(9)	0.5	(13)	0.3	(7)	0.4	(12)	0.3	(8)
Vermont	1.3	(8)	0.3	(2)	0.3	(2)	0	0	1.0	(6)
Virginia	1.2	(89)	0.7	(51)	0.5	(42)	0.6	(52)	0.4	(30)
Washington	0.9	(59)	0.8	(51)	0.6	(42)	0.3	(21)	0.5	(31)
West Virginia	0.6	(11)	0.3	(6)	0.3	(6)	0.8	(15)	0.4	(8)
Wisconsin	0.6	(32)	0.6	(33)	0.6	(33)	0.4	(23)	0.1	(8)
Wyoming	0.6	(3)	0.6	(3)	0.4	(2)	0.7	(4)	0.4	(2)
Total	1.0	(2,979)	0.9	(2,585)	0.6	(1,987)	0.5	(1,670)	0.4	(1,398)

*Rate per 100,000 population.

†U=No data available for reporting.

Table 2.1 indicates that:

- The number of acute hepatitis A cases reported in the United States declined by approximately 53%, from 2,979 in 2007 to 1,398 in 2011.
- Of the 50 states that reported hepatitis A cases in 2011, 24 states had rates below the national rate.
- The rate of acute hepatitis A declined from 1.0 case per 100,000 population in 2007 to 0.4 cases per 100,000 population in 2011.
- In 2011, the case rate ranged from no cases in New Hampshire and North Dakota to 1.2 cases per 100,000 population in Arizona.

Table 2.2. Clinical characteristics of reported cases of acute hepatitis A* — United States, 2011

Clinical characteristic	Availability of valid data [†] for clinical characteristic		Cases with clinical characteristic [§]	
	No.	%	No.	%
Jaundice	788	56.4	497	63.1
Hospitalized for hepatitis A	798	57.1	343	43.0
Died from hepatitis A	730	52.2	5	0.7

* A total of 1,398 hepatitis A cases were reported during 2011.

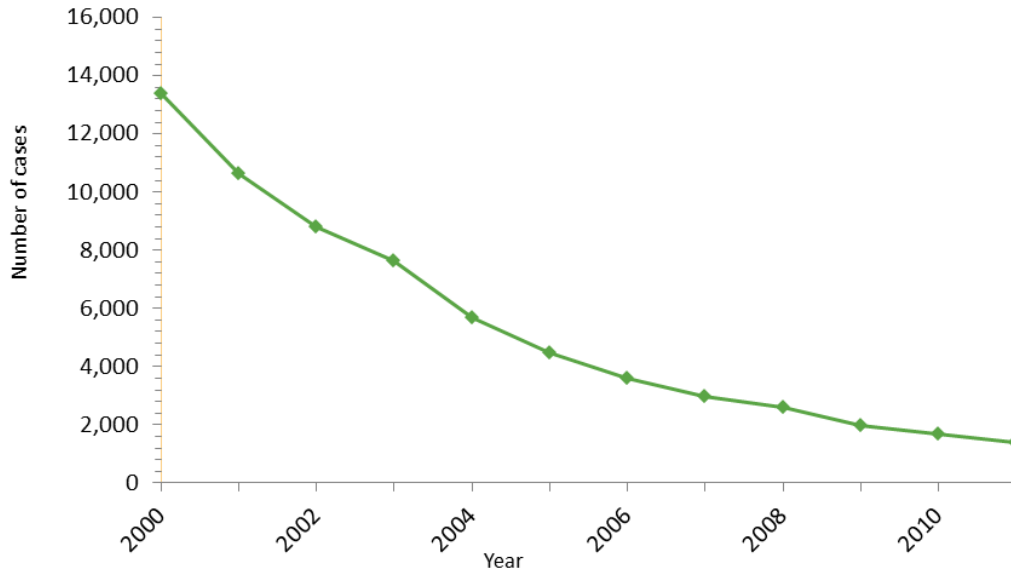
[†]Case reports for which questions regarding clinical characteristics were answered with “yes” or “no.” Reports with any other response were excluded.

[§]Numbers and percentages represent only those case reports for which data regarding clinical characteristics were available; numbers likely are underestimates.

Table 2.2 indicates that:

- Of the 1,398 case reports of hepatitis A received during 2011, 56.4% included information about whether the patient had jaundice, 57.1% had information regarding hospitalization caused by hepatitis A, and 52.2% included information on hepatitis A-associated death.
- In 2011, of all case reports with information regarding clinical characteristics,
 - 63.1% indicated the patient had jaundice;
 - 43.0% indicated the patient was hospitalized as a result of hepatitis A; and
 - 0.7% indicated the patient died from hepatitis A.

**Figure 2.1. Reported number of acute hepatitis A cases
— United States, 2000–2011**

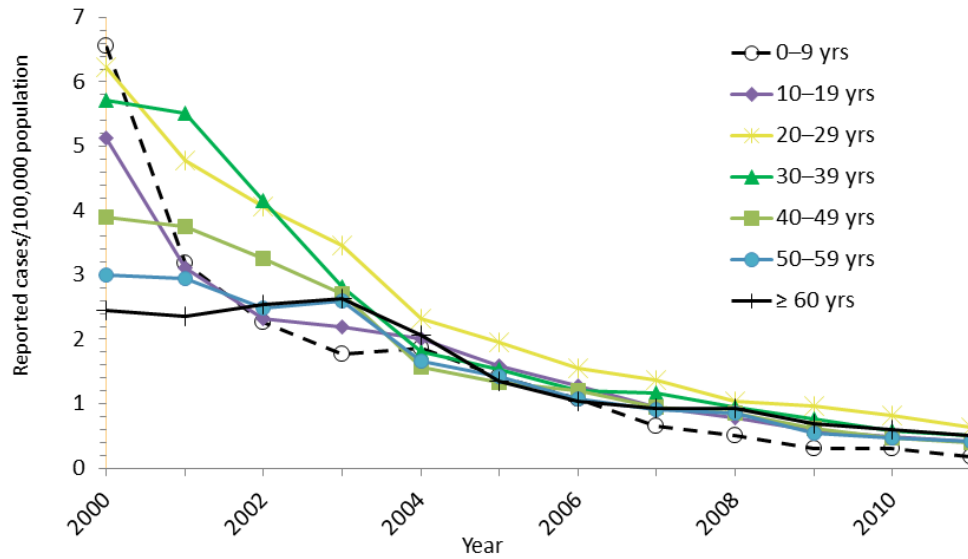


Source: National Notifiable Diseases Surveillance System (NNSS)

Figure 2.1 indicates that:

- The number of reported cases of acute hepatitis A declined by 90%, from 13,397 in 2000 to 1,398 in 2011.

Figure 2.2. Incidence of acute hepatitis A, by age group — United States, 2000–2011

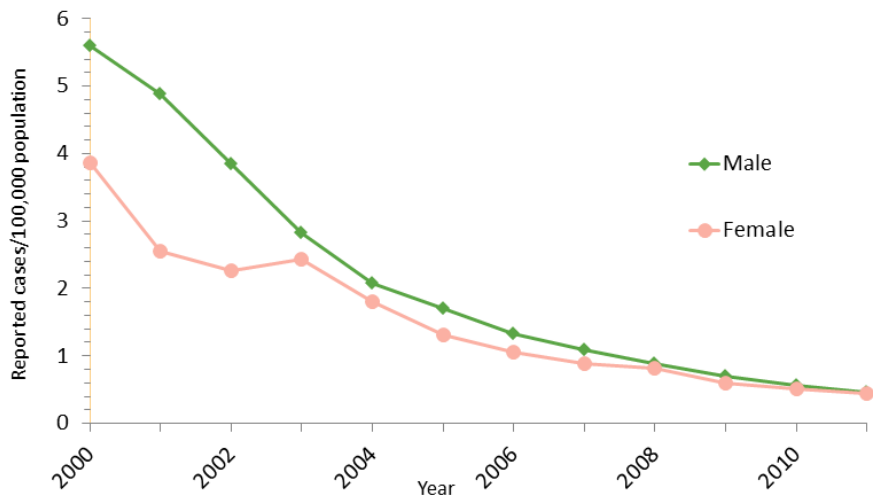


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 2.2 indicates that:

- Rates of acute hepatitis A declined for all age groups between 2000 and 2011.
- Rates were similar and low among persons in all age groups in 2011 (<1.0 case per 100,000 population; range: 0.18–0.64).
- In 2011, rates were highest for persons aged 20–29 years (0.64 cases per 100,000 population); the lowest rates were among children aged <9 years (0.18 cases per 100,000 population).

Figure 2.3. Incidence of acute hepatitis A, by sex — United States, 2000–2011

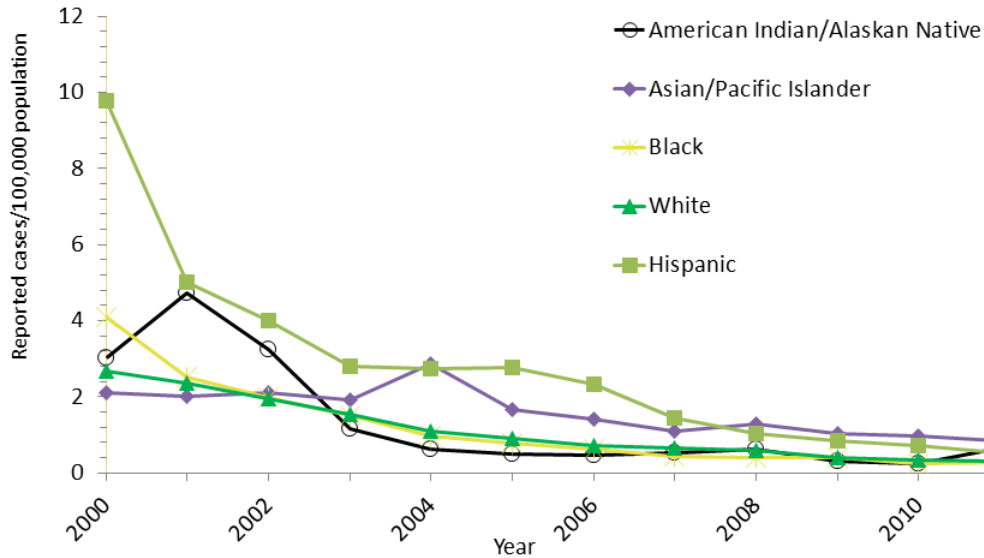


Source: National Notifiable Diseases Surveillance System (NNSS)

Figure 2.3 indicates that:

- Through 2007, rates of acute hepatitis A were higher among males than females.
- Since 2003, the rate of acute hepatitis A among males has decreased to become similar to that in females.
- In 2011, the incidence rate among males (0.5 cases per 100,000 population) was similar to that among females (0.4 cases per 100,000 population).

Figure 2.4. Incidence of acute hepatitis A, by race/ethnicity — United States, 2000–2011

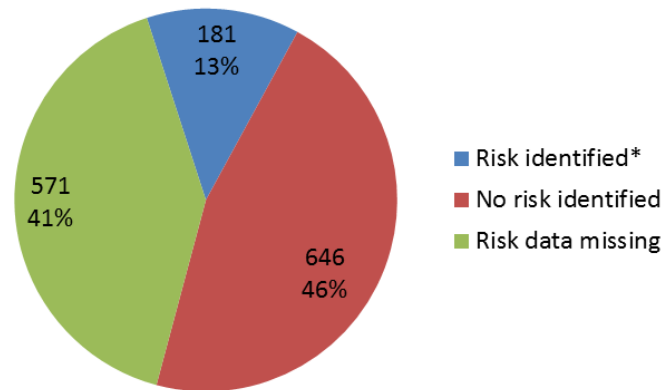


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 2.4 indicates that:

- Through 2007, rates among Hispanics were generally higher than those of other racial/ethnic populations. However, in 2011, the rate of hepatitis A among Hispanics was 0.53 cases per 100,000 population, the lowest rate recorded for this group.
- Although rates of acute hepatitis A among Asian/Pacific Islanders have continued to decline, this group has had the highest rate for the past 4 years and a rate of 0.84 per 100,000 population in 2011.
- During the past 10 years, there has been little difference between the rates of acute hepatitis A among white non-Hispanics and black non-Hispanics. The 2011 rates for these groups were 0.29 and 0.27 cases per 100,000 population, respectively.

Figure 2.5. Availability of information on risk behaviors/exposures associated with acute hepatitis A — United States, 2011



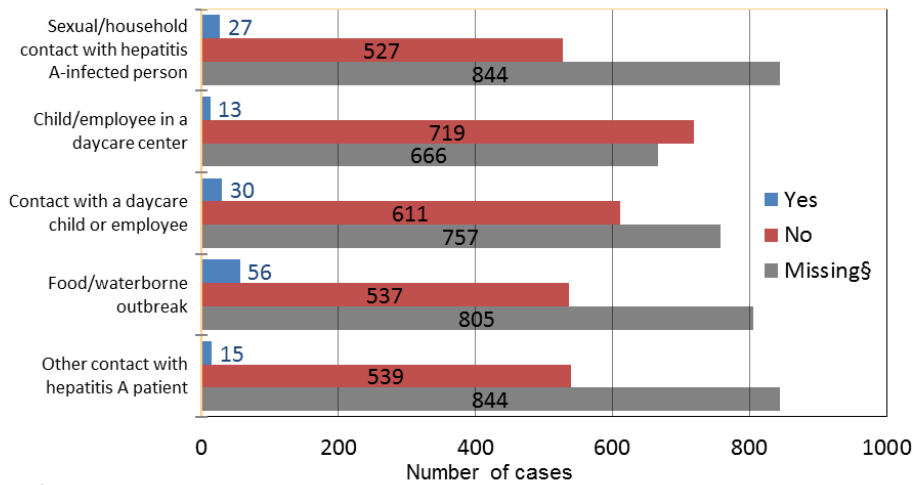
* Includes case reports indicating the presence of at least one of the following risks 2–6 weeks prior to onset of acute, symptomatic hepatitis A: 1) having traveled to hepatitis A-endemic regions of Mexico, South/Central America, Africa, Asia/South Pacific, or the Middle East; 2) having sexual/household or other contact with suspected/confirmed hepatitis A patient; 3) being a child/employee in day care center/nursery/preschool or having had contact with such persons; 4) being involved in a foodborne/waterborne outbreak; 5) being a man who has sex with men; and 6) using injection drugs.

Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 2.5 indicates that:

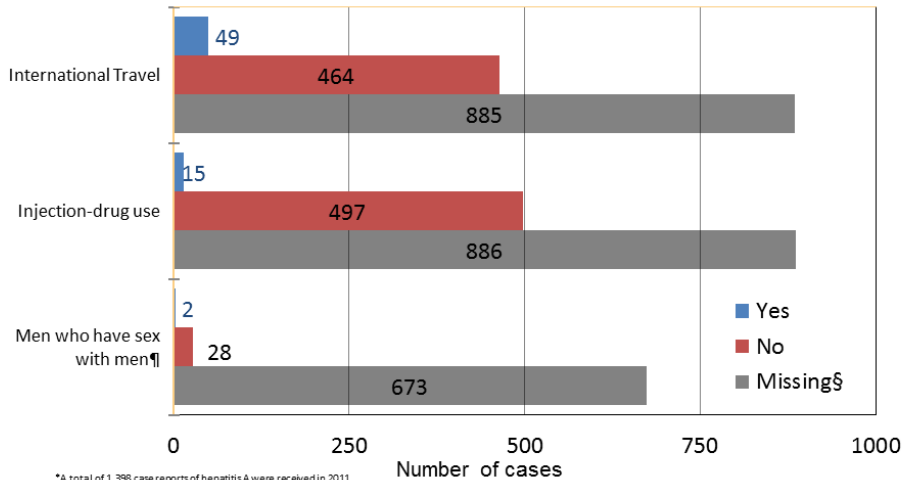
- Of the 1,398 case reports of acute hepatitis A received by CDC during 2011, a total of 571(41%) cases did not include a response (i.e., a “yes” or “no” response to any of the questions about risk behaviors and exposures) to enable assessment of risk behaviors or exposures.
- Of the 827 case reports that had a response:
 - 78% (n=646) indicated no risk behaviors/exposures for acute hepatitis A; and
 - 22% (n=181) indicated at least one risk behavior/exposure for acute hepatitis A during the 2–6 weeks prior to onset of illness.

Figure 2.6a. Acute hepatitis A reports*, by risk exposure† — United States, 2011



*A total of 1,398 case reports with hepatitis A were received in 2011.
 † More than one risk exposure may be indicated on each case report.
 § No risk data reported.
 Source: National Notifiable Diseases Surveillance System (NNSS)

Figure 2.6b. Acute hepatitis A reports*, by risk behavior† — United States, 2011



*A total of 1,398 case reports of hepatitis A were received in 2011.
 † More than one risk behavior may be indicated on each case report.
 § No risk data reported.
 ¶ A total of 703 hepatitis A cases were reported among males in 2011.
 Source: National Notifiable Diseases Surveillance System (NNSS)

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Figure 2.6a and 2.6b indicate that when patients were asked about engagement in selected risk behaviors and exposures during the incubation period, 2–6 weeks prior to onset of symptoms:

- Of the 554 case reports that contained information about contact, 4.9% (n=27) involved persons who had sexual or household contact with a person confirmed or suspected of having hepatitis A.
- Of the 732 case reports that included information about employment or attendance at a nursery, day-care center, or preschool, 1.8% (n=13) involved persons who worked at or attended a nursery, day-care center, or preschool.
- Of the 641 case reports that included information about household contact with an employee of or a child attending a nursery, day-care center, or preschool, 4.7% (n=30) indicated such contact.
- Of the 593 case reports that had information about linkage to an outbreak, 9.4% (n=56) indicated exposure that may have been linked to a common-source foodborne or waterborne outbreak.
- Of the 554 case reports that included information about additional contact (i.e., other than household or sexual contact) with someone confirmed or suspected of having hepatitis A, 2.7% (n=15) of persons reported such contact.
- Of the 513 case reports that had information about travel, 9.6% (n= 49) involved persons who had traveled outside the United States or Canada.
- Of the 512 case reports that included information about injection-drug use, 2.9% (n=15) indicated use of these drugs.
- Of the 30 case reports from males that included information about sexual preference/practices, 6.7% (n=2) indicated sex with another man.

Table 2.3. Number and rate* of deaths with hepatitis A listed as a cause of death†, by demographic characteristic and year — United States, 2006–2010

Demographic characteristic		2006		2007		2008		2009		2010	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Age Group (years)	0–34	1	0.00	6	0.00	0	0.00	1	0.00	3	0.00
	35–44	8	0.02	3	0.01	1	0.00	1	0.00	7	0.02
	45–54	15	0.03	21	0.05	23	0.05	14	0.03	25	0.06
	55–64	19	0.06	20	0.06	24	0.07	22	0.06	34	0.09
	65–74	13	0.07	14	0.07	12	0.06	12	0.06	10	0.05
	≥75	23	0.13	21	0.11	23	0.12	32	0.17	16	0.09
Race	White [§]	53	0.02	70	0.03	63	0.02	68	0.02		
	Black [¶]	18	0.06	14	0.04	13	0.04	13	0.04		
	Non-White, non-Black ^{**}	8	0.05	1	0.01	7	0.04	1	0.00		
Race/Ethnicity	White, non-Hispanic									65	0.03
	Black, non-Hispanic									15	0.04
	Hispanic									12	0.03
	Asian/Pacific Islander									2	0.02
	American Indian/Alaskan Native									1	0.05
Sex	Male	41	0.03	61	0.04	51	0.03	50	0.03	73	0.05
	Female	38	0.02	24	0.01	32	0.02	32	0.02	22	0.01
Overall		79	0.03	85	0.03	83	0.02	82	0.02	95	0.03

*Rates for race, sex, and overall total are age-adjusted per 100,000 U.S. standard population.

†Cause of death is defined as the underlying cause of death or one of the multiple causes of death and is based on the *International Classification of Diseases, 10th Revision* (ICD-10) codes B15 (hepatitis A).

[§]Included white, non-Hispanic and white Hispanic.

[¶]Included black, non-Hispanic and black Hispanic.

^{**}Included all other racial/ethnic groups.

Source: CDC. National Vital Statistics System

Table 2.3 indicates that:

- In 2010, the mortality rate of hepatitis A was 0.03 deaths per 100,000 population (n=95).
- From 2006 through 2010, mortality rates were higher among persons aged ≥45 years compared with younger age groups.
- In 2010, the highest mortality rates for race/ethnicity and sex were observed among American Indians and Alaskan Natives and males (0.05 deaths per 100,000 population for each group).

HEPATITIS B

Acute Hepatitis B. There were 2,890 reported cases of acute HBV in 2011, representing an estimated 18,800 (7,400- 86,200) actual acute cases.

Case Definition

Clinical Description

An acute illness with 1) discrete onset of symptoms (e.g., nausea, anorexia, fever, malaise, and abdominal pain) and 2) jaundice or elevated serum alanine aminotransferase (ALT) >200 IU/L.

Laboratory Criteria for Acute Hepatitis B

- IgM antibody to hepatitis B core antigen (anti-HBc) positive OR hepatitis B surface antigen (HBsAg) positive

AND

- IgM anti-HAV negative (if performed).

Acute Hepatitis B

In 2011, a total of 2,890 cases of acute hepatitis B were reported nationwide to CDC (Table 3.1). The overall incidence rate for 2011 was 0.9 cases per 100,000 population. No data were available for 2011 from Delaware, the District of Columbia and Rhode Island.

Table 3.1. Reported cases of acute hepatitis B, nationally and by state – United States, 2007–2011

State	2007		2008		2009		2010		2011	
	Rate*	(No.)	Rate	(No.)	Rate	(No.)	Rate	(No.)	Rate	(No.)
Alabama	2.8	(128)	2.3	(109)	1.9	(89)	1.4	(68)	2.5	(119)
Alaska	1.3	(9)	1.5	(10)	0.6	(4)	0.7	(5)	0.4	(3)
Arizona	1.3	(81)	1.2	(80)	0.6	(42)	0.4	(26)	0.2	(14)
Arkansas	2.5	(72)	2.3	(67)	2.2	(65)	2.3	(66)	1.9	(57)
California	1.1	(402)	0.8	(303)	0.7	(258)	0.7	(252)	0.4	(157)
Colorado	0.7	(35)	0.7	(33)	0.5	(27)	0.9	(46)	0.4	(23)
Connecticut	1.1	(38)	0.9	(30)	0.5	(16)	0.6	(22)	0.5	(19)
Delaware	1.7	(15)	U [†]	U	U	U	U	U	U	U
District of Columbia	U	U	U	U	1.7	(10)	0.5	(3)	U	U
Florida	1.8	(337)	1.9	(344)	1.6	(299)	1.6	(297)	1.1	(213)
Georgia	1.6	(155)	1.9	(187)	1.5	(144)	1.7	(165)	1.4	(142)
Hawaii	1.3	(17)	0.5	(7)	0.5	(6)	0.4	(6)	0.4	(6)
Idaho	1.0	(15)	0.8	(12)	0.7	(11)	0.4	(6)	0.1	(2)
Illinois	1.0	(129)	1.4	(184)	0.9	(118)	1.1	(135)	0.7	(85)
Indiana	1.0	(64)	1.0	(67)	1.2	(74)	1.2	(75)	1.1	(70)
Iowa	0.9	(26)	0.8	(24)	1.2	(37)	0.5	(15)	0.5	(15)
Kansas	0.3	(9)	0.3	(9)	0.2	(6)	0.4	(11)	0.5	(15)
Kentucky	1.8	(76)	2.4	(101)	2.1	(90)	3.1	(136)	3.5	(151)
Louisiana	2.3	(100)	2.1	(94)	1.6	(73)	1.2	(55)	1.4	(62)
Maine	1.4	(19)	1.1	(15)	1.1	(15)	1.0	(13)	0.6	(8)
Maryland	2.0	(113)	1.5	(85)	1.3	(72)	1.2	(67)	1.1	(62)
Massachusetts	0.6	(42)	0.3	(21)	0.3	(17)	0.2	(13)	1.0	(67)
Michigan	1.2	(120)	1.5	(149)	1.3	(132)	1.2	(122)	0.9	(91)
Minnesota	0.5	(25)	0.5	(25)	0.7	(38)	0.4	(23)	0.4	(20)
Mississippi	1.3	(37)	1.7	(50)	1.1	(33)	1.1	(33)	1.9	(57)
Missouri	0.7	(39)	0.6	(38)	0.8	(47)	1.1	(67)	1.0	(60)
Montana	0.1	(1)	0.2	(2)	0.1	(1)	0	(0)	0	(0)
Nebraska	0.7	(13)	0.5	(9)	1.2	(22)	0.7	(12)	0.7	(12)
Nevada	1.9	(49)	1.6	(43)	1.3	(34)	1.5	(41)	1.1	(29)
New Hampshire	0.4	(5)	0.6	(8)	0.5	(6)	0.4	(5)	0.2	(3)
New Jersey	1.9	(162)	1.4	(118)	1.1	(93)	0.9	(77)	0.8	(73)
New Mexico	0.7	(13)	0.6	(12)	0.4	(8)	0.2	(5)	0.5	(10)
New York	1.1	(211)	0.9	(173)	0.7	(129)	0.7	(139)	0.7	(134)
North Carolina	1.4	(128)	0.9	(81)	1.1	(104)	1.2	(113)	1.1	(109)
North Dakota	0.3	(2)	0.3	(2)	0	(0)	0	(0)	0	(0)
Ohio	1.1	(124)	1.0	(118)	0.8	(88)	0.8	(95)	0.8	(90)

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Oklahoma	4.2	(152)	3.5	(129)	3.3	(122)	3.1	(115)	2.6	(100)
Oregon	1.6	(59)	1.1	(41)	1.2	(44)	1.1	(42)	0.8	(32)
Pennsylvania	1.5	(188)	1.2	(157)	0.8	(106)	0.6	(72)	0.7	(84)
Rhode Island	1.5	(16)	U	U	U	U	U	U	U	U
South Carolina	1.5	(65)	1.6	(71)	1.2	(56)	1.3	(59)	0.8	(39)
South Dakota	0.9	(7)	0	(0)	0.5	(4)	0.2	(2)	0.2	(2)
Tennessee	2.3	(144)	2.4	(149)	2.2	(136)	2.4	(150)	3.0	(192)
Texas	3.1	(741)	2.3	(562)	1.7	(420)	1.6	(394)	0.8	(204)
Utah	0.6	(15)	0.5	(14)	0.2	(5)	0.3	(8)	0.4	(10)
Vermont	0.8	(5)	0.5	(3)	0	(0)	0.3	(2)	0	(0)
Virginia	1.9	(144)	1.7	(130)	1.4	(110)	1.2	(97)	1.0	(84)
Washington	1.0	(65)	0.9	(56)	0.7	(48)	0.7	(50)	0.5	(35)
West Virginia	4.5	(82)	4.6	(83)	4.6	(84)	4.7	(88)	6.1	(113)
Wisconsin	0.4	(20)	0.3	(18)	0.4	(24)	0.9	(54)	0.3	(17)
Wyoming	1.0	(5)	1.1	(6)	0.7	(4)	0.5	(3)	0	(0)
Total	1.5	4,519	1.3	(4,029)	1.1	(3,371)	1.1	(3,350)	0.9	(2,890)

*Rate per 100,000 population.

†U=No data available for reporting.

Table 3.1 indicates that:

- The number of acute cases of hepatitis B decreased by 36% overall during 2007–2011, from 4,519 cases to 2,890 cases; increases in Indiana, Kansas, Kentucky, Massachusetts, Mississippi, Missouri, Tennessee and West Virginia occurred during this time period.
- Of the 48 states that reported acute hepatitis B cases in 2011, 30 states had rates below the national rate of 0.9 per 100,000 population.
- Rates of acute hepatitis B in 2011 ranged from no cases reported in Montana, North Dakota, Vermont, and Wyoming to 6.1 cases per 100,000 population in West Virginia.

Table 3.2. Clinical characteristics of reported cases of acute, symptomatic hepatitis B* — United States, 2011

Clinical characteristic	Availability of valid data [†] for clinical characteristic		Cases with clinical characteristic [§]	
	No.	%	No.	%
Jaundice	1,920	66.4	1,477	76.9
Hospitalized for hepatitis B	1,864	64.5	1,021	54.8
Died from hepatitis B	1,682	58.2	22	1.3

*A total of 2,890 hepatitis B cases were reported during 2011.

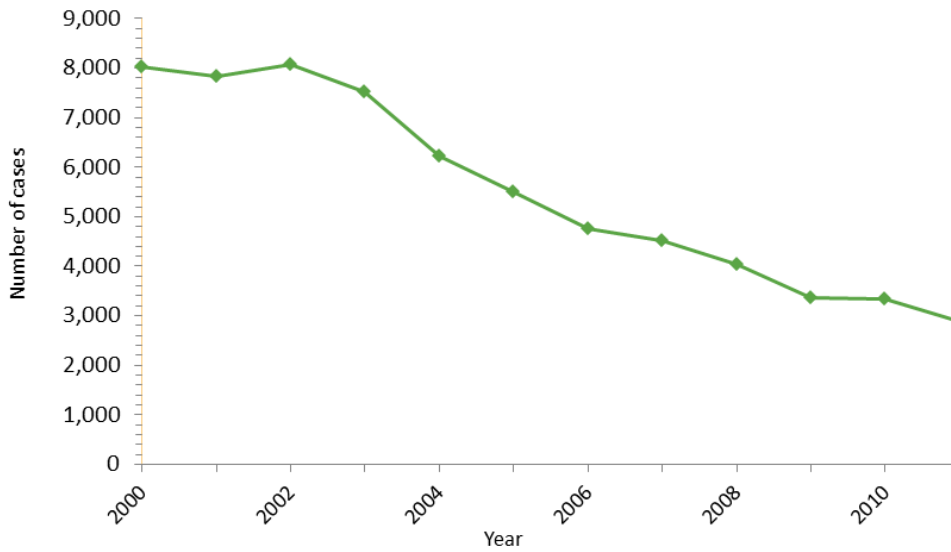
[†]Case reports for which questions regarding clinical characteristics were answered with “yes” or “no.” Reports with any other response were excluded.

[§]Numbers and percentages represent only those case reports for which data regarding clinical characteristics were available; numbers likely are underestimates.

Table 3.2 indicates that:

- Of the 2,890 case reports of acute hepatitis B received in 2011, 66.4% included information regarding whether the patient had jaundice, 64.5% had information regarding hospitalization caused by hepatitis B, and 58.2% included information on hepatitis B-associated deaths.
- In 2011, of all case reports with information about clinical characteristics,
 - 76.9% indicated the patient had jaundice;
 - 54.8% indicated the patient was hospitalized as a result of hepatitis B; and
 - 1.3% indicated the patient died from hepatitis B.

Figure 3.1. Reported number of acute hepatitis B cases — United States, 2000–2011

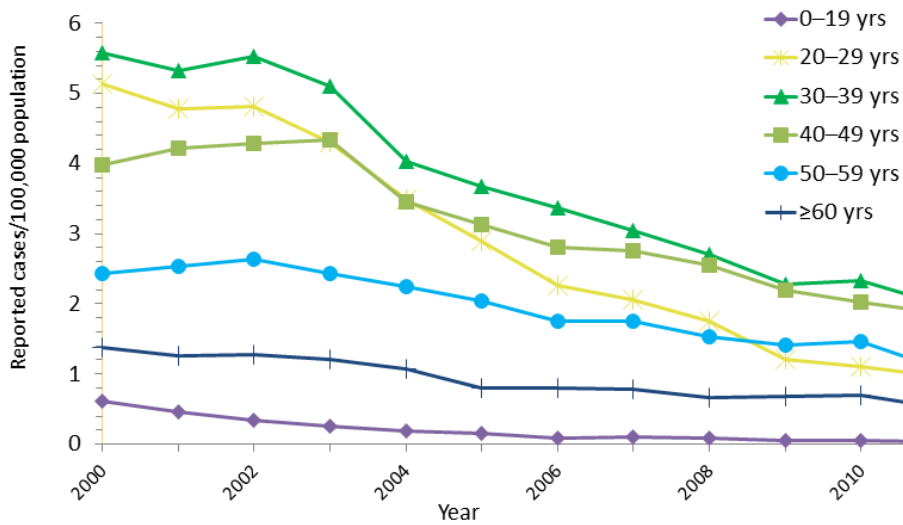


Source: National Notifiable Diseases Surveillance System (NNSS)

Figure 3.1 indicates that:

- The number of reported cases of acute hepatitis B decreased 64%, from 8,036 in 2000 to 2,890 in 2011.

Figure 3.2. Incidence of acute hepatitis B, by age group — United States, 2000–2011

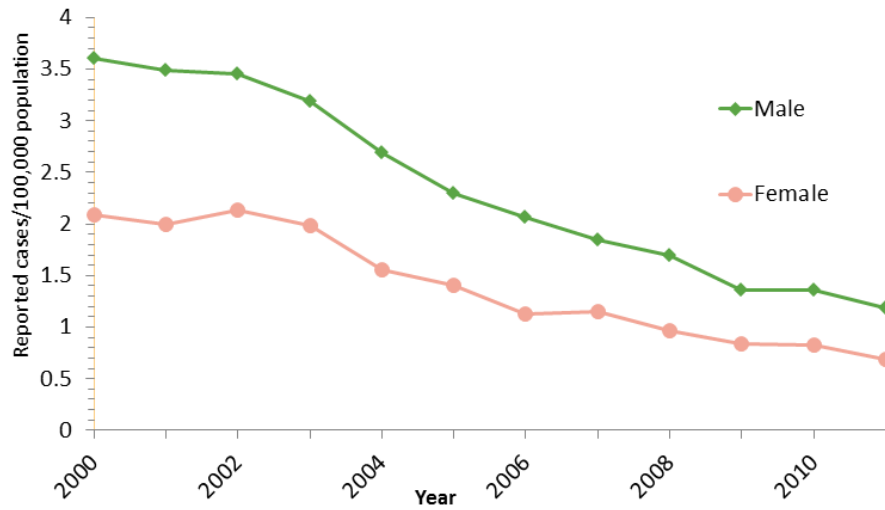


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 3.2 indicates that:

- Declines were observed in all age groups.
- In 2011, the highest rates were among persons aged 30–39 years (2.00 cases/100,000 population), and the lowest were among adolescents and children aged ≤ 19 years (0.04 cases/100,000 population).

Figure 3.3. Incidence of acute hepatitis B, by sex — United States, 2000–2011

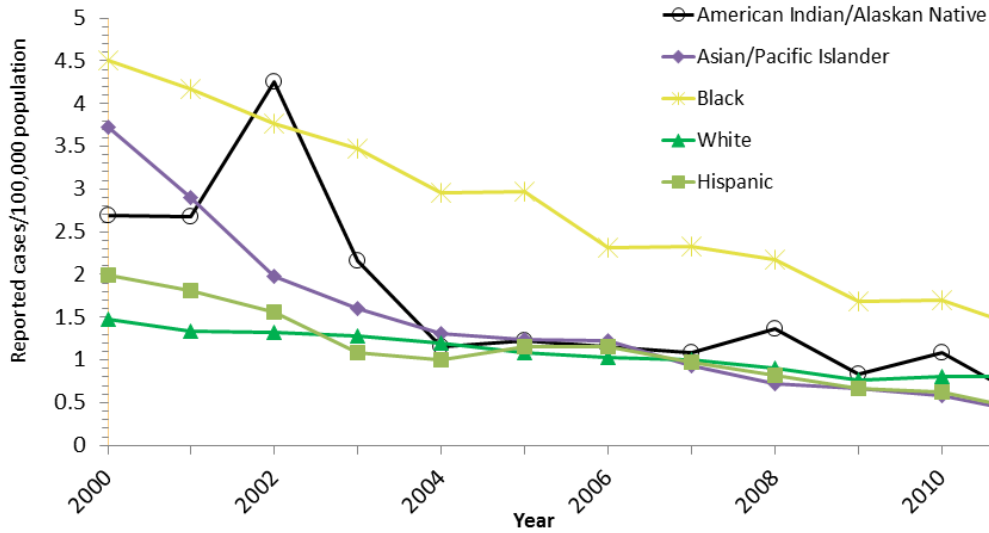


Source: National Notifiable Diseases Surveillance System (NNSS)

Figure 3.3 indicates that:

- While the incidence rate of acute hepatitis B remained higher for males than females, the gap has narrowed between 2000 and 2011.
- Incidence rates of acute hepatitis B decreased for both males and females from 2000 through 2011.
- In 2011, the rate for males was approximately 1.7 times higher than that for females (1.18 cases and 0.69 cases per 100, 000 population, respectively).

Figure 3.4. Incidence of acute hepatitis B, by race/ethnicity — United States, 2000–2011

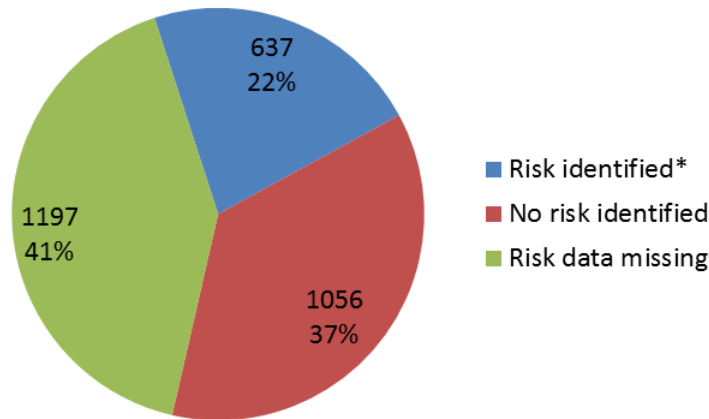


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 3.4 indicates that:

- The incidence rate of acute hepatitis B was < 1.5 cases per 100,000 population for all race/ethnic populations except black non-Hispanics from 2007 through 2011.
- In 2011, the rate of acute hepatitis B was lowest for Asian/Pacific Islanders and Hispanics (0.4 cases per 100,000 population for each group) and highest for Black non-Hispanics (1.4 cases per 100,000 population).

Figure 3.5. Availability of information on risk behaviors/exposures associated with acute hepatitis B – United States, 2011



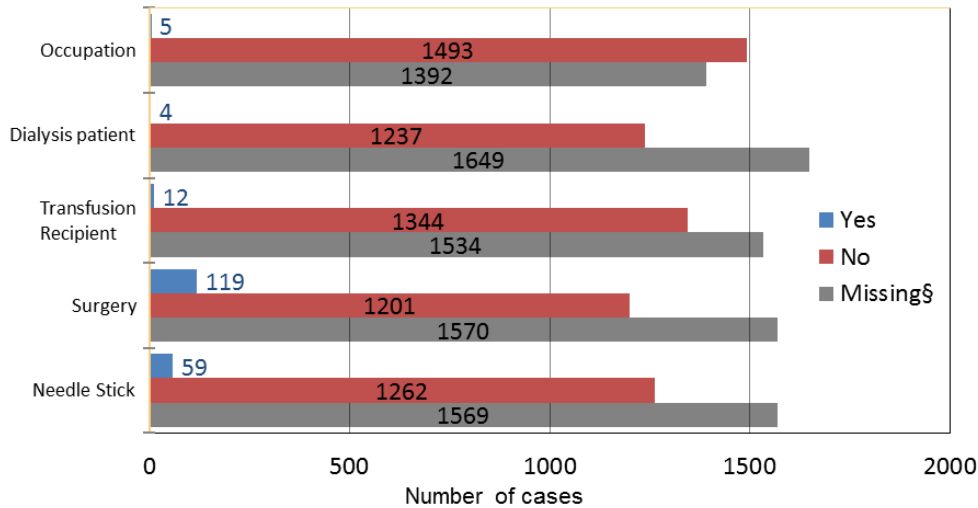
* Includes case reports indicating the presence of at least one of the following risks 6 weeks to 6 months prior to onset of acute, symptomatic hepatitis B: 1) using injection drugs; 2) having sexual contact with suspected/confirmed hepatitis B patient; 3) being a man who has sex with men; 4) having multiple sex partners concurrently; 5) having household contact with suspected/confirmed hepatitis B patient; 6) occupational exposure to blood; 7) being a hemodialysis patient; 8) having received a blood transfusion; 9) having sustained a percutaneous injury; and 10) having undergone surgery.

Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 3.5 indicates that:

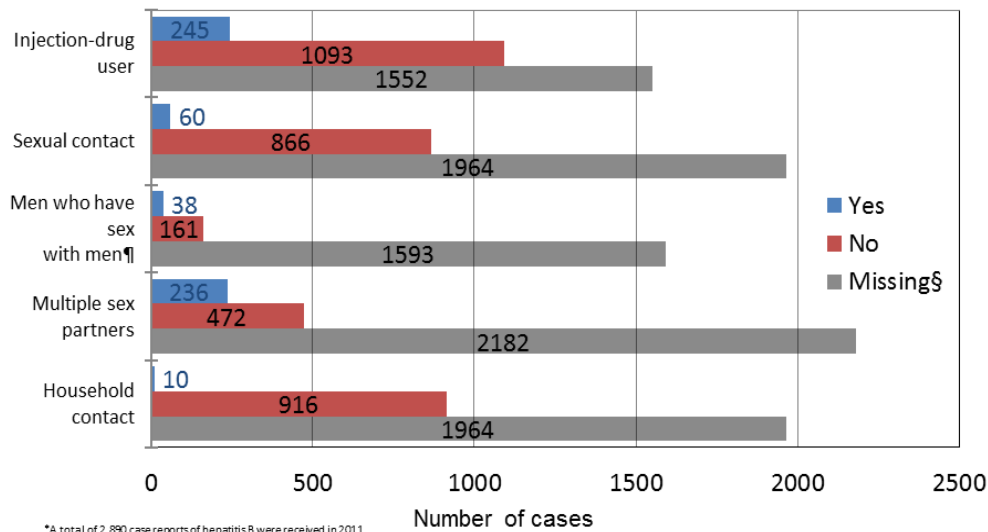
- Of the 2,890 case reports of acute hepatitis B received by CDC during 2011, a total of 1,197 (41%) did not include a response (i.e., a “yes” or “no” response to any of the questions about risk behaviors and exposures) to enable assessment of risk behaviors or exposures.
- Of the 1,693 case reports that had risk behavior/exposure information:
 - 62.4% (n=1,056) indicated no risk behaviors/exposures for hepatitis B; and
 - 37.6% (n=637) indicated at least one risk behavior/exposure for hepatitis B during the 6 weeks to 6 months prior to illness onset.

Figure 3.6a. Acute hepatitis B reports*, by risk exposure† — United States, 2011



*A total of 2,890 case reports of hepatitis B were received in 2011.
 †More than one risk exposure may be indicated on each case report.
 §Risk data not reported.
 Source: National Notifiable Diseases Surveillance System (NNSS)

Figure 3.6b. Acute hepatitis B reports*, by risk behavior† — United States, 2011



*A total of 2,890 case reports of hepatitis B were received in 2011.
 †More than one risk behavior may be indicated on each case report.
 §No risk data reported.
 ¶A total of 1,792 hepatitis B cases were reported among males in 2011.
 Source: National Notifiable Diseases Surveillance System (NNSS)

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Figure 3.6a and Figure 3.6b indicate that when patients were asked about engagement in selected risk behaviors and exposures during the incubation period, 6 weeks to 6 months prior to onset of symptoms.

- Of the 1,498 case reports that contained information about occupational exposures, 0.3% (n=5) indicated employment in a medical, dental, or other field involving contact with human blood.
- Of the 1,241 case reports that included information about receipt of dialysis or kidney transplant, 0.3% (n=4) reported receipt of dialysis or a kidney transplant.
- Of the 1,356 case reports that had information about receipt of blood transfusion, 0.9% (n=12) noted receipt of a blood transfusion.
- Of the 1,320 case reports that had information about surgery, 9.0% (n=119) reported surgery.
- Of the 1,321 case reports that had information about needle sticks, 4.5% (n=59) reported an accidental needle stick/puncture.
- Of the 1,338 case reports that had information about injection-drug use, 18.3% (n=245) noted use of these drugs.
- Of the 926 case reports that had information about sexual contact, 6.5% (n=60) indicated sexual contact with a person with confirmed or suspected hepatitis B infection.
- Of the 199 case reports from males that included information about sexual preference/practices, 19.1% (n=38) indicated sex with another man.
- Of the 708 case reports that had information about number of sex partners, 33.3% (n=236) were among persons with ≥ 2 sex partners.
- Of the 926 case reports that had information about household contact, 1.1% (n=10) indicated household contact with someone with confirmed or suspected hepatitis B infection.

Chronic Hepatitis B

Case Definition

Clinical Description

No symptoms are required. Persons with chronic HBV infection may have no evidence of liver disease or may have a spectrum of disease ranging from chronic hepatitis to cirrhosis or liver cancer.

Laboratory Criteria

- IgM anti-HBc negative

AND

- a positive result on one of the following tests: HBsAg, hepatitis B e antigen (HBeAg) or HBV DNA

OR

- Two positive tests for HBsAg, HBV DNA, or HBeAg when tests are performed at least 6 months apart (any combination of these tests performed 6 months apart is acceptable).

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Table 3.3. Number of laboratory-confirmed, chronic hepatitis B* case reports[†] — National Notifiable Diseases Surveillance System (NNDSS), 2011

State	No. chronic hepatitis B case reports submitted
Arizona	55
California	9,386 [§]
Iowa	55
Louisiana	144
Maine	64
Missouri	278
Montana	22
Oregon	180
Pennsylvania	1,333
South Carolina	147
South Dakota	51
Vermont	36
Wyoming	30
Total	11,781

*For case-definition, see

<http://www.cdc.gov/nndss/script/ConditionList.aspx?Type=0&Yr=2011>

[†]Reports may not reflect unique cases.

[§]Includes probable and confirmed case reports.

Table 3.3 indicates that:

- In 2011, a total of 39 states submitted 39,636 reports of chronic hepatitis B to CDC.
- Thirteen states agreed to publication of their NNDSS data for this report, representing 29.7% (n=11,781) of all reports of chronic hepatitis B received by CDC.
- In 2011, the greatest number of reports was received from California (n=9,386), representing 80.0% of all reports received; however, this count included both confirmed and probable case reports.
- The range in the number of reports of chronic hepatitis B which contained only confirmed reports was 22 received from Montana to 1,333 received from Pennsylvania.

Table 3.4. Reported cases of laboratory-confirmed, chronic hepatitis B virus (HBV) infection, by sex, race/ethnicity, age group, place of birth and case criteria — Emerging Infections Program (EIP) Hepatitis Surveillance Demonstration Sites, 2011

		CO		CT		MN		NM		NYS		NYC		OR		SF		Total	
		N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Sex	Female	67	43.0	174	49.4	314	44.4	24	38.7	804	41.9	3,174	45.6	195	45.9	444	48.3	5,196	45.2
	Male	89	57.1	178	50.6	391	55.2	38	61.3	1,117	58.2	3,779	54.3	229	53.9	475	51.6	6,296	54.7
	Missing	0	0.0	0	0.0	3	0.4	0	0.0	0	0.0	3	0.0	1	0.2	1	0.1	8	0.1
Race/ Ethnicity*	AI/AN	0	0.0	0	0.0	0	0.0	0	0.0	4	0.2	1	0.0	8	1.9	5	0.5	18	0.2
	API	55	35.3	141	40.1	246	34.8	34	54.8	577	30.0	1,218	17.5	246	57.9	514	55.9	3,031	26.4
	Black	25	16.0	58	16.5	187	26.4	4	6.5	310	16.1	448	6.4	24	5.7	19	2.1	1,075	9.3
	White	31	19.9	70	19.9	39	5.5	10	16.1	278	14.5	125	1.8	101	23.8	23	2.5	677	5.9
	Hispanic	7	4.5	36	10.2	5	0.7	7	11.3	87	4.5	109	1.6	9	2.1	7	0.8	267	2.3
	Other	4	2.6	5	1.4	12	1.7	0	0.0	31	1.6	29	0.4	0	0.0	6	0.7	87	0.8
Unknown/Miss	34	21.8	42	11.9	219	30.9	7	11.3	634	33.0	5,026	72.3	37	8.7	346	37.6	6,345	55.1	
Age group (years)	0 - 14	6	3.9	3	0.9	35	4.9	2	3.2	27	1.4	55	0.8	19	4.5	4	0.4	151	1.3
	15 - 24	17	10.9	20	5.7	114	16.1	6	9.7	123	6.4	670	9.6	20	4.7	28	3.0	998	8.7
	25 - 39	67	43.0	154	43.8	291	41.1	15	24.2	553	28.8	2,859	41.1	161	37.9	238	25.9	4,338	37.7
	40 - 54	44	28.2	103	29.3	169	23.9	22	35.5	735	38.3	2,206	31.7	143	33.7	328	35.7	3,750	32.6
	55 +	22	14.1	72	20.5	99	14.0	17	27.4	483	25.1	1,166	16.8	82	19.3	322	35.0	2,263	19.7
	Missing	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Place of birth	US	14	9.0	40	11.4	25	3.5	U	U	125	6.5	10	0.1	81	19.1	12	1.3	307	2.7
	Outside US	77	49.4	165	46.9	465	65.7	U	U	1,796	93.5	176	2.5	198	46.6	104	11.3	2,981	25.9
	Unknown/Miss	65	41.7	147	41.8	218	30.8	U	U	0	0.0	6,770	97.3	146	34.4	804	87.4	8,150	70.9
Positive Laboratory Tests[†]	HBV surface antigen	148	94.9	350	99.4	686	96.9	U	U	1,865	97.1	6,642	95.5	381	89.7	830	90.2	10,902	94.8

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HBV "e" antigen	25	16.0	51	14.5	184	26.0	U	U	365	19.0	1,379	19.8	83	19.5	117	12.7	2,204	19.2
HBV-DNA	64	41.0	131	37.2	464	65.5	U	U	1,294	67.4	5,487	78.9	163	38.4	629	68.4	8,232	71.6
Total new reported cases	156		352		708		62		1,921		6,956		425		920		11,500	
Estimated population 2011	5,116,796		3,580,709		5,344,861		2,082,224		11,220,287		8,244,910		3,871,859		812,826		40,274,472	
Rate per 100,000 population	3.0		9.8		13.2		3.0		17.1		84.4		11.0		113.2		28.6	

*Categorized in the following order: 1) Hispanic; 2) AI/AN; 3) API; 4) Black; 5) White; 6) Other;

† Cases can be reported with more than one laboratory test result

U=No data available for reporting

Table 3.4 indicates that:

- A total of 11,500 chronic hepatitis B cases were reported by eight sites in 2011.
- New York City reported the greatest number of cases (n=6,956; 60.5%) compared with other sites.
- San Francisco reported the highest rate of chronic HBV infection, with 113 cases per 100,000 population.
- The percentage of male cases at the eight sites ranged from 51% - 61%.
- Among the 5,155 cases for whom race/ethnicity was known, Asian/Pacific Islanders accounted for the highest number of chronic HBV cases (n=3,031, 59%) reported from all sites.
- For all sites, the highest proportion of cases (n=8,088; 70.3%) were among persons aged 25–54 years.
- Among all cases for whom place of birth was known, those born outside the United States accounted for the highest number of chronic HBV cases (n=2,981) reported from all sites.
- HBsAg was the most common HBV laboratory marker used to confirm a case of chronic hepatitis B (95 %); however, HBV DNA positive test results were also reported for 72% of cases.

Table 3.5. Number and rate* of deaths with hepatitis B listed as a cause of death†, by demographic characteristic and year – United States, 2006-2010

Demographic characteristic		2006		2007		2008		2009		2010	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Age Group (years)	0–34	48	0.03	62	0.04	44	0.03	39	0.03	48	0.03
	35–44	192	0.44	184	0.43	154	0.36	143	0.34	142	0.35
	45–54	527	1.22	532	1.21	533	1.20	469	1.05	448	1.00
	55–64	442	1.40	546	1.67	523	1.55	547	1.57	610	1.67
	65–74	270	1.43	266	1.37	271	1.35	254	1.22	296	1.36
	≥75	226	1.23	225	1.21	263	1.40	245	1.30	248	1.34
Race	White§	1,011	0.38	1,081	0.40	1,093	0.40	978	0.35		
	Black¶	344	1.01	359	1.03	327	0.92	320	0.87		
	Non-White, non-Black**	350	2.12	375	2.16	368	2.05	399	2.15		
Race/Ethnicity	White, non-Hispanic									856	0.34
	Black, non-Hispanic									356	0.94
	Hispanic									136	0.43
	Asian/Pacific Islander									421	2.95
	American Indian/Alaska Native									17	0.73
Sex	Male	1,256	0.85	1,345	0.88	1,315	0.85	1,267	0.80	1,316	0.81
	Female	449	0.27	470	0.28	473	0.27	430	0.24	476	0.27
Overall		1,705	0.54	1,815	0.56	1,788	0.54	1,697	0.51	1,792	0.52

*Rates for race, sex, and overall total are age-adjusted per 100,000 U.S. standard population.

†Cause of death is defined as the underlying cause of death or one of the multiple causes of death and is based on the *International Classification of Diseases, 10th Revision (ICD-10)* codes B15 (hepatitis A).

§Included white, non-Hispanic and white Hispanic.

¶Included black, non-Hispanic and black Hispanic.

**Included all other racial/ethnic groups.

Source: CDC. National Vital Statistics System

Table 3.5 indicates that:

- From 2006 through 2010, hepatitis B accounted for more deaths than hepatitis A but fewer deaths than hepatitis C.
- In 2010, the mortality rate for hepatitis B was 0.5 deaths per 100,000 population (n=1,792).

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- In 2010, the highest mortality rates by age, race/ethnicity and sex were observed among persons aged 55–64 years (1.7 deaths per 100,000 population), Asians and Pacific Islanders (3.0 deaths per 100,000 population), and males (0.8 deaths per 100,000 population) respectively.
- From 2006 through 2007, the mortality rate increased among persons aged 55–64 years, from 1.4 deaths per 100,000 population in 2006 to 1.7 deaths per 100,000 population in 2007. There was a slight decrease in 2008 to 1.6 deaths per 100,000 population and then an increase back to 1.7 deaths per 100,000 population in 2010.

HEPATITIS C

Acute Hepatitis C. There were 1,229 reported cases of acute HCV in 2011—a 44% increase over 2010 reported cases: the 2011 reported acute HCV cases represent an estimated 16,500 (7,200-43,400) actual acute cases.

Case Definition

Clinical Description

An acute illness with 1) discrete onset of symptoms (e.g., nausea, anorexia, fever, malaise, and abdominal pain) and 2) either jaundice/dark urine or serum alanine aminotransferase (ALT) >400 IU/L.

Laboratory Criteria for Acute Hepatitis C

- IgM anti-HAV negative and IgM anti-HBc negative

AND

- One or more of the following three criteria:
 - Antibody to hepatitis C virus (anti-HCV) screening-test positive, with a signal-to-cut-off ratio predictive of a true positive for the particular assay as defined by CDC (signal to cut-off ratios available at <http://www.cdc.gov/hepatitis/HCV/LabTesting.htm>)

OR

- Hepatitis C Virus Recombinant Immunoblot Assay (HCV RIBA) positive

OR

- Nucleic Acid Test (NAT) for HCV RNA positive (including genotype).

Acute Hepatitis C

In 2011, a total of 42 states submitted 1,229 reports of acute hepatitis C to CDC (Table 4.1). The overall incidence rate for 2011 was 0.4 cases per 100,000 population, an increase from 0.3 cases per 100,000 population during 2007-2010. Data for 2011 were unavailable from Alaska, Arizona, Delaware, the District of Columbia, Hawaii, Mississippi, New Hampshire, Rhode Island and South Dakota.

Table 4.1. Reported cases of acute hepatitis C, nationally and by state — United States, 2007–2011

State	2007		2008		2009		2010		2011	
	Rate*	(No.)	Rate	(No.)	Rate	(No.)	Rate	(No.)	Rate	(No.)
Alabama	0.2	(10)	0.3	(13)	0.2	(10)	0.1	(7)	0.5	(23)
Alaska	0.1	(1)	U [†]	U	U	U	U	U	U	U
Arizona	U	U	U	U	U	U	U	U	U	U
Arkansas	0	(0)	0	(1)	0.1	(2)	0	(1)	0	(0)
California	0.2	(72)	0.1	(30)	0.1	(43)	0.1	(32)	0.1	(48)
Colorado	0.4	(20)	0.3	(14)	0.6	(28)	0.4	(20)	0.5	(28)
Connecticut	0.6	(20)	0.5	(19)	1.5	(53)	1.0	(37)	1.3	(47)
Delaware	U	U	U	U	U	U	U	U	U	U
District of Columbia	U	U	U	U	0.2	(1)	0.3	(2)	U	U
Florida	0.1	(16)	0.2	(32)	0.3	(53)	0.3	(56)	0.3	(64)
Georgia	0.2	(18)	0.2	(16)	0.3	(31)	0.3	(32)	0.5	(53)
Hawaii	U	U	U	U	U	U	U	U	U	U
Idaho	0.3	(4)	0.2	(3)	0.5	(7)	0.7	(11)	0.8	(12)
Illinois	0.1	(16)	0.1	(10)	0	(6)	0	(1)	0	(6)
Indiana	0.2	(14)	0.2	(13)	0.3	(22)	0.4	(27)	1.3	(84)
Iowa	0	(0)	0	(0)	0.4	(11)	0	0	0	(0)
Kansas	0	(0)	0	(1)	0	(1)	0.1	(2)	0.3	(8)
Kentucky	0.7	(29)	1.6	(68)	1.5	(64)	2.5	(109)	3.2	(142)
Louisiana	0.1	(4)	0.2	(9)	0.2	(9)	0.1	(4)	0.2	(7)
Maine	0.1	(1)	0.2	(3)	0.2	(2)	0.2	(2)	0.9	(12)
Maryland	0.3	(15)	0.4	(22)	0.4	(23)	0.4	(24)	0.6	(35)
Massachusetts	0.2	(10)	0.2	(13)	0.2	(10)	0.2	(13)	0.3	(23)
Michigan	0.9	(89)	1.3	(129)	0.4	(35)	0.5	(45)	0.3	(32)
Minnesota	0.5	(28)	0.4	(22)	0.3	(15)	0.3	(16)	0.3	(17)
Mississippi	0.5	(16)	U	U	U	U	U	U	U	U
Missouri	0.1	(3)	0	(2)	0	(0)	0.1	(6)	0.1	(8)
Montana	0.1	(1)	0.6	(6)	0.1	(1)	0.4	(4)	0.9	(9)
Nebraska	0.1	(1)	0.1	(2)	0.2	(3)	0.1	(2)	0.1	(2)

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Nevada	0.4	(9)	0.8	(22)	0.2	(5)	0.3	(7)	0.4	(10)
New Hampshire	U	U	U	U	U	U	U	U	U	U
New Jersey	1.1	(95)	0.7	(61)	0.1	(7)	0.3	(28)	0.6	(53)
New Mexico	0.3	(5)	0.3	(5)	0.3	(6)	0.7	(14)	0.7	(14)
New York	0.2	(45)	0.2	(43)	0.3	(53)	0.3	(50)	0.3	(52)
North Carolina	0.2	(17)	0.5	(46)	0.3	(24)	0.4	(39)	0.6	(60)
North Dakota	0	(0)	0	(0)	0.3	(2)	0	(0)	0	(0)
Ohio	0.2	(20)	0.3	(40)	0.2	(26)	0.1	(10)	0.1	(6)
Oklahoma	1.4	(49)	0.5	(20)	0.7	(27)	1.1	(41)	1.4	(53)
Oregon	0.4	(16)	0.6	(23)	0.5	(19)	0.5	(19)	0.5	(20)
Pennsylvania	0.3	(34)	0.2	(27)	0.3	(39)	0.2	(26)	0.3	(35)
Rhode Island	0.8	(8)	U	U	U	U	U	U	U	U
South Carolina	0	(0)	0.1	(4)	0	(1)	0	(1)	0	(1)
South Dakota	U	U	U	U	U	U	U	U	U	U
Tennessee	0.6	(37)	0.4	(28)	0.5	(33)	0.7	(46)	1.3	(83)
Texas	0.3	(67)	0.2	(59)	0.1	(36)	0.1	(35)	0.1	(37)
Utah	0.2	(5)	0.4	(12)	0.2	(6)	0.4	(10)	0.4	(10)
Vermont	1.5	(9)	0.2	(1)	0.2	(1)	0.3	(2)	1.0	(6)
Virginia	0.1	(8)	0.1	(8)	0.1	(10)	0.2	(13)	0.3	(25)
Washington	0.3	(18)	0.4	(25)	0.3	(22)	0.4	(25)	0.6	(41)
West Virginia	1.0	(18)	1.2	(22)	1.7	(31)	1.1	(21)	2.5	(46)
Wisconsin	0	(1)	0.1	(3)	0.1	(3)	0.2	(10)	0.3	(15)
Wyoming	0	(0)	0	(0)	0	(0)	0	(0)	0.4	(2)
Total	0.3	(849)	0.3	(877)	0.3	(781)	0.3	(850)	0.4	(1,229)

*Rate per 100,000 population.

†U=No data available for reporting.

Table 4.1 indicates that:

- The number of acute cases of hepatitis C reported in the United States increased 44.7%, from 849 in 2007 to 1229 in 2011.
- The national rate of acute cases of hepatitis C remained stable, at 0.3 cases per 100,000 population from 2007 through 2010, but increased to 0.4 cases per 100,000 population in 2011.
- Of the 42 states that submitted reports of acute hepatitis C in 2011, 20 states had rates below the national rate (0.4 cases per 100,000 population).
- Rates of acute hepatitis C ranged from no cases reported in Arkansas, Iowa and North Dakota to 3.2 cases per 100,000 population in Kentucky.
- In 15 states the number of reported cases increased from 2007 to 2011 resulting in rates above the national average for 2011: Alabama, Colorado, Connecticut, Georgia, Indiana, Kentucky, Maine, Maryland, Montana, New Mexico, North Carolina, Oregon, Tennessee, Washington and West Virginia.

Table 4.2. Clinical characteristics of reported cases of acute hepatitis C* — United States, 2011

Clinical characteristic	Availability of valid data [†] for clinical characteristic		Cases with clinical characteristic [§]	
	No.	%	No.	%
Jaundice	861	70.1	585	67.9
Hospitalized for hepatitis C	822	66.9	446	54.3
Died from hepatitis C	715	58.2	1	0.1

* A total of 1,229 hepatitis C cases were reported during 2011.

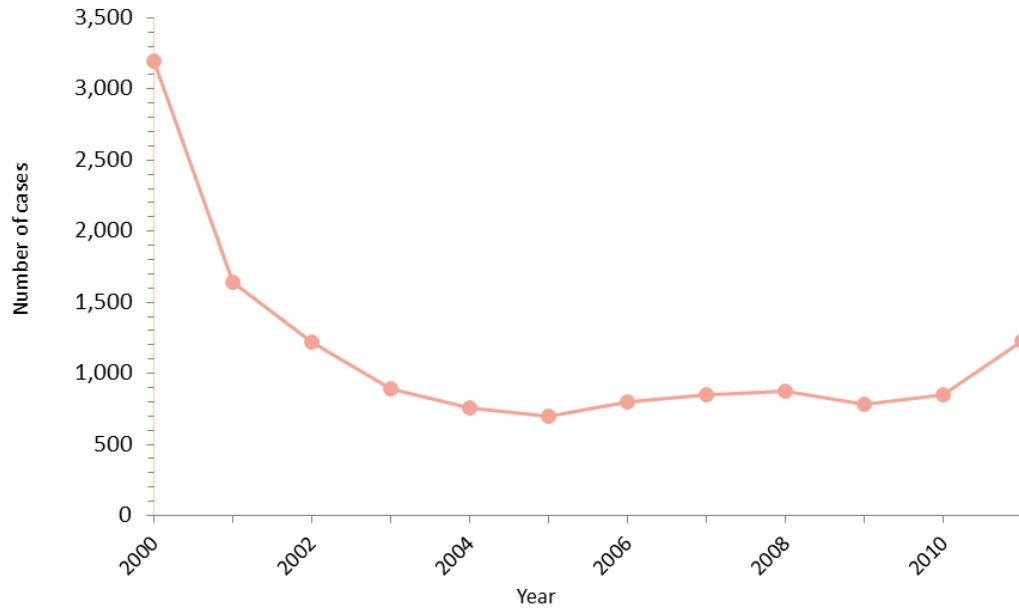
[†]Case reports for which questions regarding clinical characteristics were answered with “yes” or “no.” Reports with any other response were excluded.

[§]Numbers and percentages represent only those case reports for which data regarding clinical characteristics were available; numbers likely are underestimates.

Table 4.2 indicates that:

- Of the 1,229 case reports of acute hepatitis C received in 2011, 70.1% included information regarding whether the patient had jaundice, 66.9% had information regarding hospitalization caused by hepatitis C, and 58.2% included information on hepatitis C-associated deaths. (Note: more severe cases are likely to be ascertained and reported.)
- In 2011, of all case reports with information regarding clinical characteristics,
 - 67.9% indicated the patient had jaundice;
 - 54.3% indicated the patient was hospitalized as a result of hepatitis C; and
 - 0.1% indicated the patient died from hepatitis C.

Figure 4.1. Reported number of acute hepatitis C cases — United States, 2000–2011

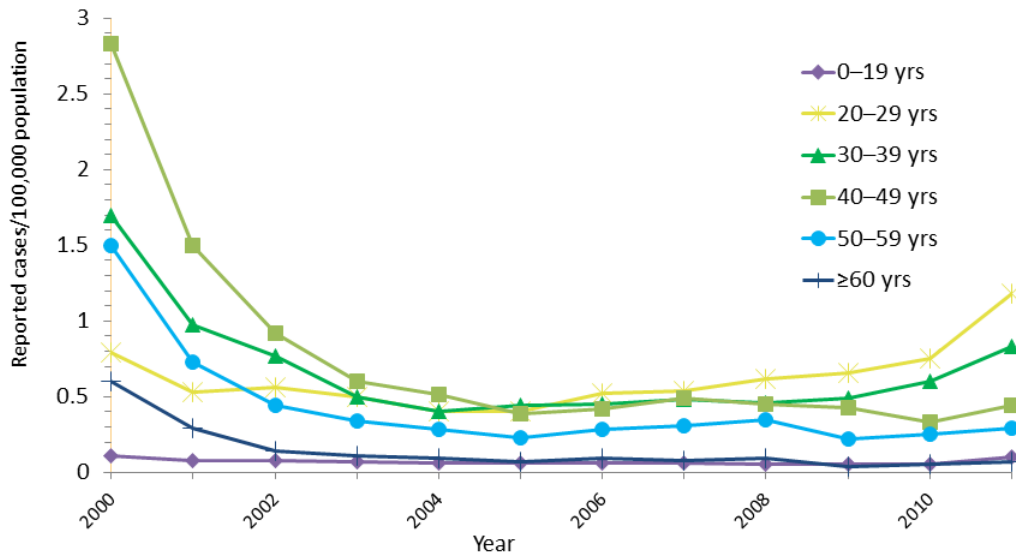


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 4.1 indicates that:

- The number of reported cases of acute hepatitis C declined rapidly until 2003 and remained steady until 2010. For 2011, there was a 45% increase in hepatitis C cases. There were 1,229 reported cases in 2011.

Figure 4.2. Incidence of acute hepatitis C, by age group — United States, 2000–2011

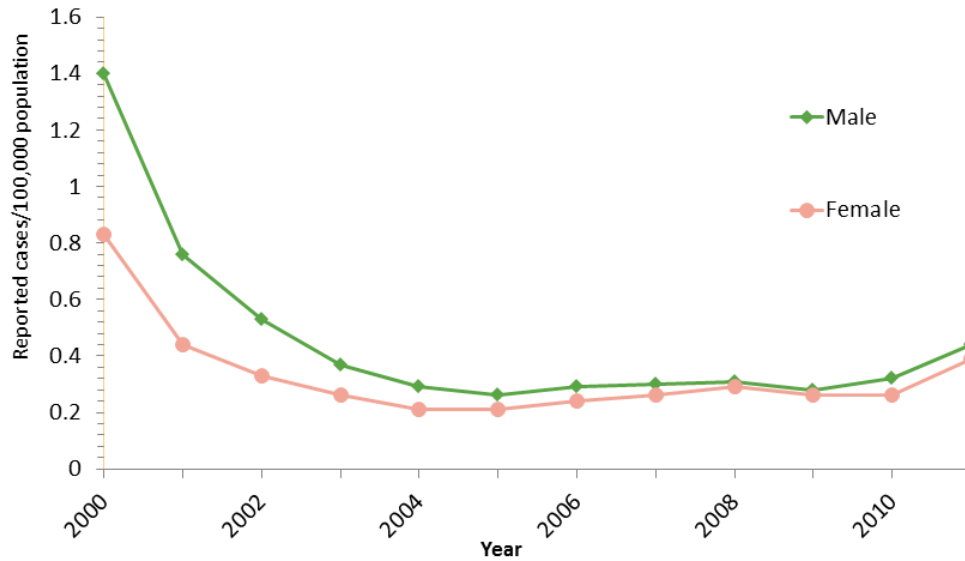


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 4.2 indicates that:

- Prior to 2002, incidence rates for acute hepatitis C decreased for all age groups (excluding the 0–19 year age group); rates remained fairly constant from 2002 through 2010.
- In 2011, the overall rate of acute hepatitis C increased from 2010, with the largest increases among persons aged 0-19 years (from 0.05 to 0.10 cases per 100,000 population) and 20–29 years (from 0.75 to 1.18 cases per 100,000 population). When compared to all age groups, persons aged 20–29 years had the highest rate and persons ≥60 years of age (0.07 cases per 100,000 population) had the lowest rate.

Figure 4.3. Incidence of acute hepatitis C, by sex — United States, 2000–2011

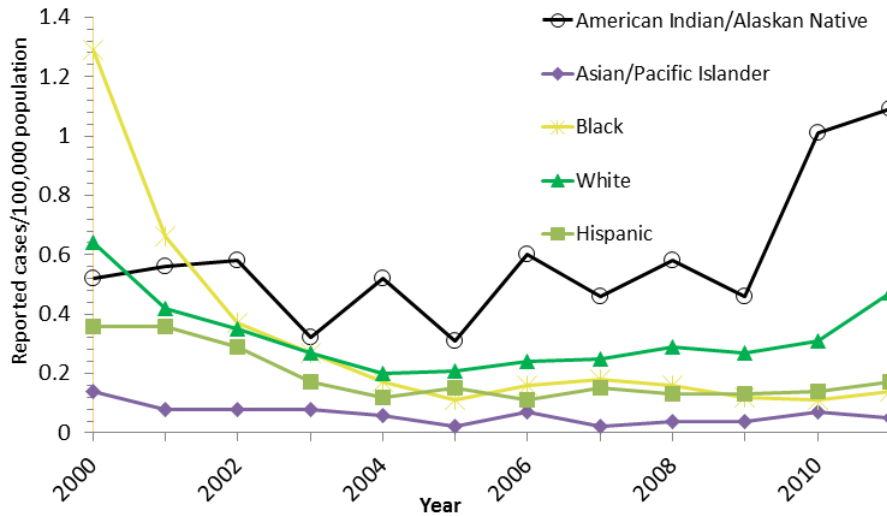


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 4.3 indicates that:

- Incidence rates of acute hepatitis C decreased dramatically for both males and females through 2003 and remained fairly constant from 2004 through 2010.
- In 2011, rates for males and females increased and were both estimated at 0.4 cases per 100,000 population.

Figure 4.4. Incidence of acute hepatitis C, by race/ethnicity — United States, 2000–2011

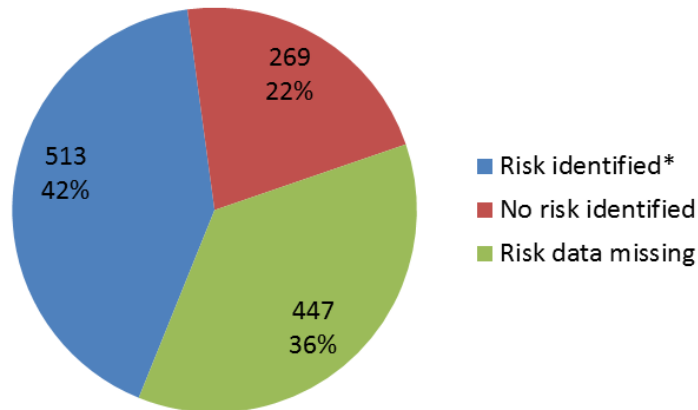


Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 4.4 indicates that:

- Rates for acute hepatitis C decreased for all racial/ethnic populations through 2003.
- During 2002–2010, the incidence rate of acute hepatitis C remained below 0.5 cases per 100,000 for all racial/ethnic populations except AI/ANs.
- Rates for AI/ANs have been higher than for other races/ethnicities, especially in 2010 and 2011.
- In 2011 the rate for hepatitis C increased 51.6% among White non-Hispanics to 0.47 case per 100,000 population.
- The rate of hepatitis C among Black non-Hispanics and Hispanics increased 27.3% (to 0.14 case per 100,000 population in 2011) and 21.4% (to 0.17 case per 100,000 population in 2011), respectively.
- In 2011 Asian/Pacific Islanders had the lowest rate for hepatitis C at 0.05 case per 100,000 population.

Figure 4.5. Availability of information on risk exposures/behaviors associated with acute hepatitis C — United States, 2011



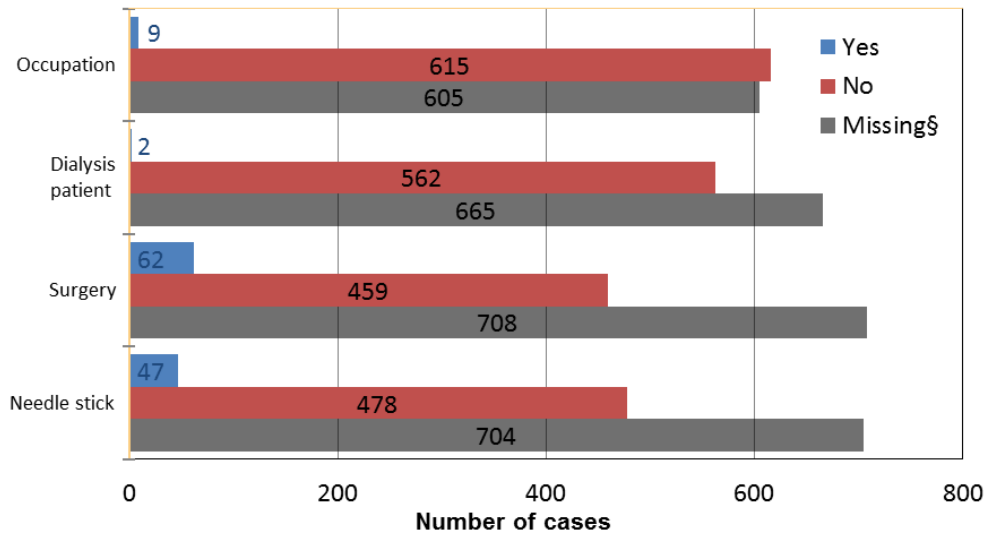
*Includes case reports indicating the presence of at least one of the following risks 6 weeks to 6 months prior to onset of acute, symptomatic hepatitis C: 1) using injection drugs; 2) having sexual contact with suspected/confirmed hepatitis C patient; 3) being a man who has sex with men; 4) having multiple sex partners concurrently; 5) having household contact with suspected/confirmed hepatitis C patient; 6) having had occupational exposure to blood; 7) being a hemodialysis patient; 8) having received a blood transfusion; 9) having sustained a percutaneous injury; and 10) having undergone surgery.

Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 4.5 indicates that:

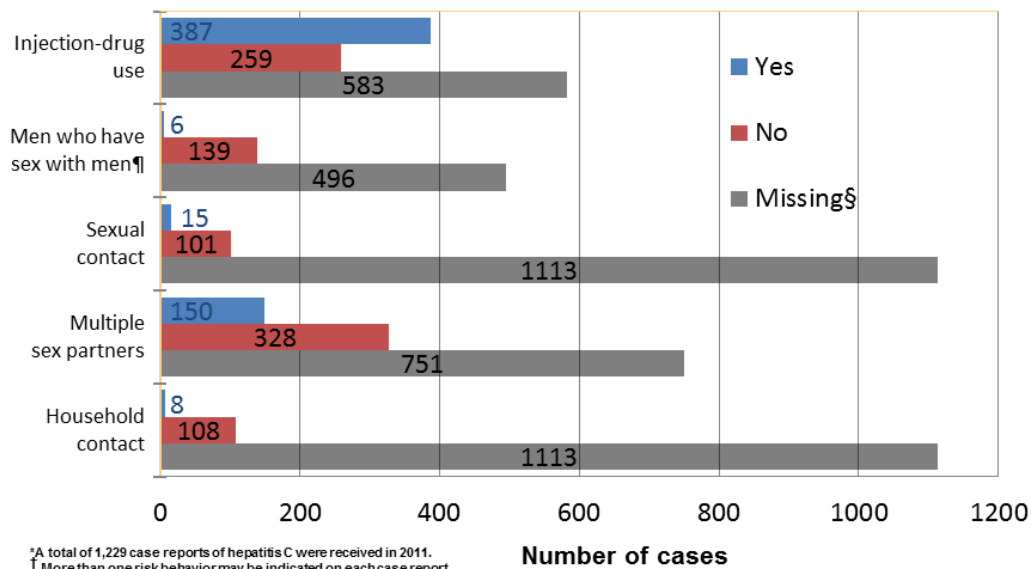
- Of the 1,229 case reports of acute hepatitis C received by CDC during 2011, 447 (36.4%) did not include a response (i.e., a “yes” or “no” response to any of the questions about risk behaviors and exposures) to enable assessment of risk behaviors or exposures.
- Of the 782 (63.6%) case reports that had risk factor/exposure information:
 - 34.4% (n=269) indicated no risk behaviors/exposures for hepatitis C infection; and
 - 65.6% (n=513) indicated at least one risk behavior/exposure for hepatitis C infection during the 2 weeks to 6 months prior to illness onset.

Figure 4.6a. Acute hepatitis C reports, by risk exposure[†] — United States, 2011



^{*}A total of 1,229 case reports of hepatitis C were received in 2011.
[†]More than one risk exposure may be indicated on each case report.
[§]Risk data not reported.
 Source: National Notifiable Diseases Surveillance System (NNDSS)

Figure 4.6b. Acute hepatitis C reports, by risk behavior[†] — United States, 2011



^{*}A total of 1,229 case reports of hepatitis C were received in 2011.
[†]More than one risk behavior may be indicated on each case report.
[§]Risk data not reported.
[¶]A total of 641 hepatitis C cases were reported among males in 2011.
 Source: National Notifiable Diseases Surveillance System (NNDSS)

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Figure 4.6a and Figure 4.6b indicate that when patients were asked about engagement in selected risk behaviors and exposures during the incubation period, 2 weeks to 6 months prior to onset of symptoms.

- Of the 624 case reports that contained information about occupational exposures, 1.4% (n=9) involved persons employed in a medical, dental, or other field involving contact with human blood.
- Of the 564 case reports that had information about receipt of dialysis or a kidney transplant, 0.4% (n=2) indicated patient receipt of dialysis or a kidney transplant.
- Of the 521 case reports that had information about surgery, 11.9% (n=62) were among persons who had undergone surgery.
- Of the 525 case reports that included information about needle sticks, 9.0% (n=47) indicated accidental needle stick/puncture.
- Of the 646 case reports that had information about injection-drug use, 59.9% (n=387) noted use of these drugs.
- Of the 145 case reports from males that included information about sexual preferences/practices, 4.1% (n=6) indicated sex with another man.
- Of the 116 case reports that had information about sexual contact, 12.9% (n=15) involved persons reporting sexual contact with a person with confirmed or suspected hepatitis C infection.
- Of the 478 case reports that had information about number of sex partners, 31.4% (n=150) involved persons with ≥ 2 sex partners.
- Of the 116 case reports that had information about household contact, 6.9% (n=8) indicated household contact with someone with confirmed or suspected hepatitis C infection.

Hepatitis C, Past or Present

Hepatitis C, Past or Present

- The current case definition for hepatitis C cases other than acute cases requires as little as a single positive anti-HCV test and that the case be known not to be acute to meet the case definition. Because no single current anti-HCV test can distinguish current active infections (present) from resolved infections (past), these cases are reported in a single category, hepatitis C, Past or Present.

Case Definition

Clinical Criteria

No symptoms are required. Most HCV-infected persons are asymptomatic; however, many have mild-to-severe chronic liver disease.

Laboratory Criteria

One or more of the following four criteria:

- Anti-HCV positive (repeat reactive) by EIA, verified by at least one additional more specific assay

OR

- HCV RIBA positive

OR

- Nucleic acid test for HCV RNA positive (including genotype)

OR

- Antibody to hepatitis C virus (anti-HCV) screening-test positive with a signal-to-cut-off ratio predictive of a true positive for the particular assay as defined by CDC (signal to cut-off ratios available at <http://www.cdc.gov/hepatitis/HCV/LabTesting.htm>)

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Table 4.3. Number of laboratory confirmed, hepatitis C (past or present)* case reports[†] — National Notifiable Diseases Surveillance System (NNDSS), 2011

State	No. chronic hepatitis C case reports submitted
California	33,190
Louisiana	2,096
Missouri	5,040
Montana	813
Oregon	4,527
Pennsylvania	7,735
South Carolina	3,572
South Dakota	356
Vermont	621
Wyoming	336
Total	58,286

*For case-definition, see

<http://www.cdc.gov/nndss/script/ConditionList.aspx?Type=0&Yr=2011>

[†]Reports may not reflect unique cases.

Table 4.3 indicates that:

- In 2011, a total of 185,979 reports of chronic hepatitis C (past or present) infection were submitted to CDC by 34 states.
- Ten states agreed to publication of their NNDSS data for this report, representing 31.3% (n=58,286) of all reports of chronic hepatitis C received by CDC in 2011.
- Of the 10 states, the greatest number of reports was received from California (n=33,190), representing 56.9% of all reports received; the smallest number of reports was received from Wyoming (n=336; 0.6%).

Table 4.4. Reported cases of laboratory-confirmed, hepatitis C (past or present) infection, by sex, race/ethnicity, age group, and positive lab tests — Emerging Infections Program (EIP), Hepatitis Surveillance Demonstration Sites, 2011

		CO		CT		MN		NM		NYS		NYC		OR		SF		Total	
		N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Sex	Female	1,030	35.5	957	33.0	649	36.0	884	31.8	2,467	35.8	3,146	36.0	1,639	36.4	526	27.1	11,298	34.8
	Male	1,864	64.3	1,940	66.9	1,142	63.4	1,897	68.2	4,408	63.9	5,595	64.0	2,865	63.6	1,418	72.9	21,129	65.1
	Unknown/Miss	4	0.1	1	0.0	11	0.6	0	0.0	23	0.3	8	0.1	0	0.0	0	0.0	47	0.1
Race/ Ethnicity*	AI/AN	24	0.8	5	0.2	97	5.4	46	1.7	28	0.4			63	1.4	13	0.7	276	0.8
	API	16	0.6	25	0.9	50	2.8	3	0.1	59	0.9	171	2.0	46	1.0	72	3.7	442	1.4
	Black	143	4.9	311	10.7	203	11.3	12	0.4	614	8.9	927	10.6	105	2.3	366	18.8	2,681	8.3
	White	992	34.2	1,222	42.2	737	40.9	283	10.2	2,284	33.1	667	7.6	1,964	43.6	624	32.1	8,773	27.0
	Hispanic	323	11.2	506	17.5	40	2.2	419	15.1	434	6.3	306	3.5	87	1.9	148	7.6	2,263	7.0
	Other	21	0.7	5	0.2	9	0.5	0	0.0	64	0.9	287	3.3	13	0.3	37	1.9	436	1.3
	Unknown/Miss	1,379	47.6	824	28.4	666	37.0	2,018	72.6	3,415	49.5	6,391	73.1	2,226	49.4	684	35.3	17,603	54.2
Age group (years)	0 - 14	11	0.4	8	0.3	5	0.3	10	0.4	12	0.2	42	0.5	5	0.1	4	0.2	97	0.3
	15 - 24	121	4.2	143	4.9	126	7.0	363	13.1	416	6.0	298	3.4	142	3.2	34	1.8	1,643	5.1
	25 - 39	613	21.2	597	20.6	316	17.5	923	33.2	1,337	19.4	1,629	18.6	655	14.5	242	12.5	6,312	19.4
	40 - 54	1,198	41.3	1,218	42.0	729	40.5	938	33.7	2,352	34.1	3,035	34.7	1,980	44.0	715	36.8	12,165	37.5
	55 +	948	32.7	932	32.2	626	34.7	547	19.7	2,753	39.9	3,744	42.8	1,719	38.2	948	48.8	12,217	37.6
	Missing	7	0.2	0	0.0	0	0.0	0	0.0	28	0.4	1	0.0	3	3.0	1	0.1	40	0.1
Positive Laboratory Tests†	RIBA	279	9.6	94	3.2	367	20.4	U		746	10.8	1,117	12.8	300	6.7	23	1.2	2,926	9.0
	HCV RNA	1,574	54.3	743	25.6	1,315	73.0	U		3,664	53.1	4,357	49.8	2,036	45.2	1,294	66.6	14,983	46.1
	Genotype	695	24.0	89	3.1	626	34.8	U		1,494	22.6	2,582	29.5	656	14.6	538	27.7	6,680	20.6
	Anti-HCV and	1,721	59.4	2,360	81.4	534	29.6	U		3,198	46.4	7,001	80.0	1,155	25.6	1,250	64.3	17,219	53.0

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s/co ratio									
Total new reported cases	2,898	2,898	1,802	2,781	6,898	8,749	4,504	1,944	32,474
Estimated population 2011	5,116,796	3,580,709	5,344,861	2,082,224	11,220,287	8,244,910	3,871,859	812,826	40,274,472
Rate per 100,000 population	57	81	34	134	61	106	116	239	81

*Categorized in the following order: 1) Hispanic; 2) AI/AN; 3) API; 4) Black; 5) White; 6) Other;

† Cases can be reported with more than one laboratory test result

U=No data available for reporting

Table 4.4 indicates that:

- A total of 32,474 chronic hepatitis C cases were reported by eight sites.
- More cases were reported by New York City (n=8,749; 27%) compared with other sites.
- San Francisco had the highest rate of chronic HCV infection, with 239 cases per 100,000 population.
- Overall, two-thirds (65.1%) of reported cases were among males. In each site, males made up at least 63% of all cases.
- Among all cases for whom race/ethnicity was known, non-Hispanic whites accounted for the highest number (n=8,773) of chronic HCV case reports from all sites.
- Among all cases, 75.1% were among persons aged 40+ years.
- Cases were most frequently reported with a positive anti-HCV test and high signal-to-cutoff ratio (53.0%); however, HCV RNA-positivity was reported among 46.1% of cases.

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Table 4.5. Number and rate* of deaths with hepatitis C listed as a cause of death†, by demographic characteristic and year — United States, 2006–2010.

Demographic characteristic		2006		2007		2008		2009		2010	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Age Group (years)	0–34	128	0.09	131	0.09	124	0.09	116	0.08	117	0.08
	35–44	1,083	2.49	999	2.32	878	2.07	828	1.99	712	1.73
	45–54	5,802	13.43	5,937	13.53	5,758	12.98	5,469	12.26	5,171	11.49
	55–64	4,191	13.28	5,145	15.72	5,967	17.71	6,683	19.21	7,431	20.37
	65–74	1,500	7.93	1,621	8.37	1,709	8.49	1,824	8.77	1,901	8.75
	≥75	1,241	6.76	1,273	6.85	1,332	7.11	1,333	7.10	1,293	6.97
Race	White§	10,783	4.05	11,798	4.31	12,261	4.37	12,682	4.43		
	Black¶	2,567	7.50	2,686	7.59	2,829	7.82	2,908	7.80		
	Non-White, non-Black**	595	3.61	622	3.59	678	3.78	663	3.61		
Race/Ethnicity	White, non-Hispanic									10,575	4.03
	Black, non-Hispanic									2,981	7.72
	Hispanic									2,318	6.83
	Asian/Pacific Islander									440	3.30
	American Indian/Alaska Native									248	9.90
Sex	Male	9,724	6.30	10,561	6.64	11,116	6.82	11,517	6.91	11,781	6.81
	Female	4,221	2.52	4,545	2.65	4,652	2.65	4,736	2.65	4,846	2.63
Overall		13,945	4.35	15,106	4.58	15,768	4.66	16,253	4.70	16,627	4.65

*Rates for race, sex, and overall total are age-adjusted per 100,000 U.S. standard population.

†Cause of death is defined as the underlying cause of death or one of the multiple causes of death and is based on the *International Classification of Diseases, 10th Revision (ICD-10)* codes B17.1 and B18.2 (hepatitis C).

§Included white, non-Hispanic and white Hispanic.

¶Included black, non-Hispanic and black Hispanic.

**Included all other racial/ethnic groups.

Source: CDC. National Vital Statistics System.

Table 4.5 indicates that:

- Of the three types of viral hepatitis (hepatitis A, B, and C), hepatitis C accounted for the most deaths and had the highest death rate.
- From 2006 through 2010, the mortality rate of hepatitis C increased from 4.4 deaths per 100,000 population in 2006 to 4.7 deaths per 100,000 population in 2010.

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- In 2006, the highest mortality rates were observed among persons aged 45–54 years and 55–64 years and the rates were similar (13.4 and 13.3 deaths per 100,000 population, respectively).
- From 2007 through 2010, the highest mortality rates were observed among persons aged 55–64 years.
- In 2010, the highest mortality rates by age, race/ethnicity and sex were observed among persons aged 55–64 years (20.4 deaths per 100,000 population), American Indians and Alaskan Natives (9.9 deaths per 100,000 population) and males (6.8 deaths per 100,000 population) respectively.

DISCUSSION

National surveillance data for acute viral hepatitis provide essential information for: identifying outbreaks and trends in viral hepatitis; targeting groups who need enhanced public health efforts; providing data for national and local estimates of the health burden of hepatitis A, B, and C; and evaluation of intervention efforts. National rates for acute hepatitis A and B have been published since 1966, and national rates for acute hepatitis C/non-A, non-B have been published since 1992. Major changes in the epidemiology of these diseases have occurred over these time periods, largely resulting from implementation of prevention strategies for each disease, including the introduction of effective vaccines against hepatitis A and hepatitis B.

NNDSS, the core of viral hepatitis surveillance, was designed to enable states to notify CDC of infectious diseases diagnosed with a single positive laboratory test. Cases of acute and chronic hepatitis B and C do not fit this pattern, as additional information beyond a single laboratory test is required to confirm a case (1). To better count and characterize cases of viral hepatitis and estimate the burden of disease, CDC's DVH supplements NNDSS data with those obtained from funded EIP sites, national surveys, and vital statistics.

Data from NNDSS indicate declining rates of acute hepatitis A, acute hepatitis B, and acute hepatitis C during 1995–2010. More recent data show the rate of decline has decreased, and incidence has become relatively stable for acute hepatitis A and B, whereas there was an increase for acute hepatitis C in 2011. However, most new infections with HAV, HBV, and HCV remain undetected and unreported. In 2011, after adjusting for asymptomatic cases and underreporting, the estimated incidence of HAV, HBV, and HCV infections was approximately: 2,800; 18,800; and 16,500 cases, respectively. As noted in “Adjustments to Reported Cases” (page 16), these estimates all have wide confidence intervals, and cannot be compared directly with estimates from previous years which were obtained using different calculations.

Despite decreases in acute viral hepatitis, chronic hepatitis infection continues to affect millions of Americans. In the United States, an estimated 700,000–1.4 million persons are living with chronic hepatitis B infection (2, 3), and an estimated 2.7–3.9 million persons are chronically infected with hepatitis C (4).

In 2011, almost 40,000 reports of chronic hepatitis B and nearly 186,000 reports of chronic hepatitis C were submitted to CDC through NNDSS. Of these, 11,781 reports of chronic hepatitis B infection and 58,286 reports of chronic hepatitis C infections were available for descriptive analyses.

Mortality data from 2006–2010, the latest year for which these data were available, reveal the serious health consequences associated with viral hepatitis: chronic liver disease, including cirrhosis, was the 12th leading cause of death in the United States in 2010 (5). Viral-hepatitis-associated death rates in 2010 were highest among persons infected with HCV (4.65 deaths per 100,000 population), followed by HBV (0.52 deaths per 100,000 population), and HAV (0.03 deaths per 100,000 population).

CDC and state health departments rely on surveillance data to track the incidence of acute infection, guide development and evaluation of programs and policies designed to prevent infection and minimize the public health impact of viral hepatitis, and monitor progress towards

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achieving goals established for these programs and policies. Effective systems for conducting surveillance for chronic HBV and HCV infections are needed to ensure accurate reporting of all cases and to support and evaluate prevention activities. Strong surveillance systems at the local, state, and national levels are essential to building strong prevention programs that interrupt transmission of viral hepatitis and improve the health of those who are already infected.

References

1. Klevens RM, Miller J, Vonderwahl C, et al. Population-based surveillance for hepatitis C virus, United States, 2006–2007. *Emerg Infect Dis* 2009;15: 1499–1502.
2. CDC. Recommendations for identification and public health management of persons with chronic hepatitis B virus infection. *MMWR* 2008;57(No. RR-08).
3. Ioannou G. Hepatitis B virus in the United States: Infection, exposure, and immunity rates in a nationally representative survey. *Ann Intern Med* 2011;145:319–328.
4. Armstrong GL, Wasley AM, Simard EP, et al. The prevalence of hepatitis C virus infection in the United States, 1999 through 2002. *Ann Intern Med* 2006;144:705–14.
5. Hovert DL, Xu JQ. Deaths: Preliminary data for 2011. National vital statistics reports: vol 61 no 6. Hyattsville, MD: National Center for Health Statistics. 2012.

ADDITIONAL RESOURCES

Epidemiology and Prevention of Vaccine-Preventable Diseases. The Pink Book: Course Textbook

- Hepatitis A: <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/hepa.pdf>
- Hepatitis B: <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/hepb.pdf>

Prevention of Hepatitis A through Active or Passive Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP):

<http://www.cdc.gov/mmwr/pdf/rr/rr5507.pdf>

A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus Infection in the United States — Part I: Immunization of Infants, Children, and Adolescents:

<http://www.cdc.gov/mmwr/PDF/rr/rr5416.pdf>

A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus Infection in the United States — Part II: Immunization of Adults:

<http://www.cdc.gov/mmwr/PDF/rr/rr5516.pdf>

Recommendations for Identification and Public Health Management of Persons with Chronic Hepatitis B Virus Infection: <http://www.cdc.gov/mmwr/pdf/rr/rr5708.pdf>

Recommendations for Prevention and Control of Hepatitis C Virus (HCV) Infection and HCV-Related Chronic Disease: <http://www.cdc.gov/mmwr/PDF/RR/RR4719.pdf>

2005 Guidelines for Viral Hepatitis Surveillance and Case Management:

<http://www.cdc.gov/hepatitis/PDFs/2005Guidelines-Surv-CaseMngmt.pdf>
