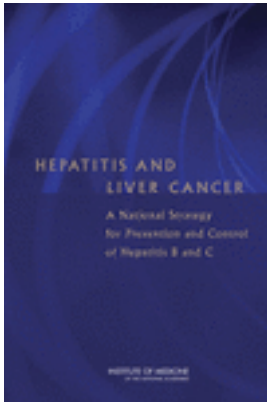


## Free Executive Summary



### **Hepatitis and Liver Cancer: A National Strategy for Prevention and Control of Hepatitis B and C**

Heather M. Colvin and Abigail E. Mitchell, Editors;  
Committee on the Prevention and Control of Viral  
Hepatitis Infections; Institute of Medicine

ISBN: 978-0-309-14628-9, 250 pages, 6 x 9, paperback (2009)

This free executive summary is provided by the National Academies as part of our mission to educate the world on issues of science, engineering, and health. If you are interested in reading the full book, please visit us online at <http://www.nap.edu/catalog/12793.html>. You may browse and search the full, authoritative version for free; you may also purchase a print or electronic version of the book. If you have questions or just want more information about the books published by the National Academies Press, please contact our customer service department toll-free at 888-624-8373.

*The global epidemic of hepatitis B and C is a serious public health problem. Hepatitis B and C are the major causes of chronic liver disease and liver cancer in the world. In the next 10 years, 150,000 people in the United States will die from liver disease or liver cancer associated with chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infections. Today, between 800,000 and 1.4 million people in the United States have chronic hepatitis B and between 2.7 and 3.9 million have chronic hepatitis C. People most at risk for hepatitis B and C often are the least likely to have access to medical services. Reducing the rates of illness and death associated with these diseases will require greater awareness and knowledge among health care workers, improved identification of at-risk people, and improved access to medical care. Hepatitis B is a vaccine-preventable disease. Although federal public health officials recommend that all newborns, children, and at-risk adults receive the vaccine, about 46,000 new acute cases of the HBV infection emerge each year, including 1,000 in infants who acquire the infection during birth from their HBV-positive mothers. Unfortunately, there is no vaccine for hepatitis C, which is transmitted by direct exposure to infectious blood. Hepatitis and Liver Cancer identifies missed opportunities related to the prevention and control of HBV and HCV infections. The book presents ways to reduce the numbers of new HBV and HCV infections and the morbidity and mortality related to chronic viral hepatitis. It identifies priorities for research, policy, and action geared toward federal, state, and local public health officials, stakeholder, and advocacy groups and professional organizations.*

**This executive summary plus thousands more available at [www.nap.edu](http://www.nap.edu).**

Copyright © National Academy of Sciences. All rights reserved. Unless otherwise indicated, all materials in this PDF file are copyrighted by the National Academy of Sciences. Distribution or copying is strictly prohibited without permission of the National Academies Press <http://www.nap.edu/permissions/> Permission is granted for this material to be posted on a secure password-protected Web site. The content may not be posted on a public Web site.

## SUMMARY

---

In the next 10 years, about 150,000 people in the United States will die from liver cancer and end-stage liver disease associated with chronic hepatitis B and hepatitis C. It is estimated that 3.5–5.3 million people—1–2% of the US population—are living with chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infections. Of those, 800,000 to 1.4 million have chronic HBV infections, and 2.7–3.9 million have chronic HCV infections. Chronic viral hepatitis infections are 3–5 times more frequent than HIV in the United States.

Because of the asymptomatic nature of chronic hepatitis B and hepatitis C, most people infected with HBV and HCV are not aware that they have been infected until they have symptoms of cirrhosis or a type of liver cancer, hepatocellular carcinoma (HCC), many years later. About 65% and 75% of the infected population are unaware that they are infected with HBV and HCV, respectively. Importantly, the prevention of chronic hepatitis B and chronic hepatitis C prevents the majority of HCC cases because HBV and HCV are the leading causes of this type of cancer.

Although the incidence of acute HBV infection is declining in the United States, due to the availability of hepatitis B vaccines, about 43,000 new acute HBV infections still occur each year. Of those new infections, about 1,000 infants acquire the infection during birth from their HBV-positive mothers. HBV is also transmitted by sexual contact with an infected person, sharing injection drug equipment, and needlestick injuries. African American adults have the highest rate of acute HBV infection in the United States and the highest rates of acute HBV infection occur in the southern region. People from Asia and the Pacific Islands comprise the largest foreign-born population that is at risk for chronic HBV infection. The number of people in the United States who are living with chronic HBV infection may be increasing as a result of immigration from highly endemic countries. On the basis of immigration patterns in the last decade, it is estimated that every year 40,000–45,000 people from HBV-endemic countries enter the United States legally.

There is no vaccine for hepatitis C. HCV is efficiently transmitted by direct percutaneous exposure to infectious blood. Persons likely to have chronic HCV infection include those who received a blood transfusion before 1992 and past or current injection-drug users (IDUs). Most IDUs in the United States have serologic evidence of HCV infection (that is, they have been exposed to HCV at some time). While HCV incidence appears to have declined over the last decade, a large portion of IDUs, who often do not have access to health-care services, are not identified by current surveillance systems making interpretation of that trend complicated. African Americans and Hispanics have a higher rate of HCV infection than whites.

## THE CHARGE TO THE COMMITTEE

Despite federal, state, and local public health efforts to prevent and control hepatitis B and hepatitis C, these diseases remain serious health problems in the United States. Therefore, the Centers for Disease Control and Prevention (CDC) in conjunction with the Department of Health and Human Services Office of Minority Health, the Department of Veterans Affairs, and the National Viral Hepatitis Roundtable sought guidance from the Institute of Medicine (IOM) in identifying missed opportunities related to the prevention and control of HBV and HCV infections. IOM was asked to focus on hepatitis B and hepatitis C because they are common in the United States and can lead to chronic disease. The charge to the committee follows.

The IOM will form a committee to determine ways to reduce new HBV and HCV infections and the morbidity and mortality related to chronic viral hepatitis. The committee will assess current prevention and control activities and identify priorities for research, policy, and action. The committee will highlight issues that warrant further investigations and opportunities for collaboration between private and public sectors.

## FINDINGS AND RECOMMENDATIONS

Upon reviewing evidence on the prevention and control of hepatitis B and hepatitis C, the committee identified the underlying factors that impede current efforts to prevent and control these diseases. Three major factors were found:

- There is a lack of knowledge and awareness about chronic viral hepatitis on the part of health-care and social-service providers.
- There is a lack of knowledge and awareness about chronic viral hepatitis among at-risk populations, members of the public, and policy-makers.
- There is insufficient understanding about the extent and seriousness of this public-health problem, so inadequate public resources are being allocated to prevention, control, and surveillance programs.

That situation has created several consequences:

- Inadequate disease surveillance systems underreport acute and chronic infections, so the full extent of the problem is unknown.
- At-risk people do not know that they are at risk or how to prevent becoming infected.
- At-risk people may not have access to preventive services.
- Chronically infected people do not know that they are infected.
- Many health-care providers do not screen people for risk factors or do not know how to manage infected people.
- Infected people often have inadequate access to testing, social support, and medical management services.

To address those consequences, the committee offers recommendations in four categories: surveillance, knowledge and awareness, immunization, and services for viral hepatitis. The recommendations are discussed below, and listed in Box S-1.

**BOX S-1 Recommendations**

**Chapter 2: Surveillance**

- 2-1. The Centers for Disease Control and Prevention should conduct a comprehensive evaluation of the national hepatitis B and hepatitis C public-health surveillance system.
- 2-2. The Centers for Disease Control and Prevention should develop specific cooperative viral-hepatitis agreements with all state and territorial health departments to support core surveillance for acute and chronic hepatitis B and hepatitis C.
- 2-3. The Centers for Disease Control and Prevention should support and conduct targeted active surveillance, including serologic testing, to monitor incidence and prevalence of hepatitis B virus and hepatitis C virus infections in populations not fully captured by core surveillance.

**Chapter 3: Knowledge and Awareness about Chronic Hepatitis B and Hepatitis C**

- 3-1. The Centers for Disease Control and Prevention should work with key stakeholders (other federal agencies, state and local governments, professional organizations, health-care organizations, and educational institutions) to develop hepatitis B and hepatitis C educational programs for health-care and social-service providers.
- 3-2. The Centers for Disease Control and Prevention should work with key stakeholders to develop, coordinate, and evaluate innovative and effective outreach and education programs to target at-risk populations and to increase awareness in the general population about hepatitis B and hepatitis C.

**Chapter 4: Immunization**

- 4-1. All infants weighing at least 2,000 grams and born to hepatitis B surface antigen-positive women should receive single-antigen hepatitis B vaccine and hepatitis B immune globulin in the delivery room as soon as they are stable and washed. The recommendations of the Advisory Committee on Immunization Practices should remain in effect for all other infants.
- 4-2. All states should mandate that the hepatitis B vaccine series be completed or in progress as a requirement for school attendance.
- 4-3. Additional federal and state resources should be devoted to increasing hepatitis B vaccination of at-risk adults.
- 4-4. States should be encouraged to expand immunization-information systems to include adolescents and adults.
- 4-5. Private and public insurance coverage for hepatitis B vaccination should be expanded.
- 4-6. The federal government should work to ensure an adequate, accessible, and sustainable hepatitis B vaccine supply.
- 4-7. Studies to develop a vaccine to prevent chronic hepatitis C virus infection should continue.

**Chapter 5: Viral Hepatitis Services**

- 5-1. Federally funded health-insurance programs—such as Medicare, Medicaid, and the Federal Employees Health Benefits Program—should incorporate guidelines for risk-factor screening for hepatitis B and hepatitis C as a required core component of preventive care so that at-risk people receive serologic testing for hepatitis B virus and hepatitis C virus and chronically-infected patients receive appropriate medical management.
- 5-2. The Centers for Disease Control and Prevention, in conjunction with other federal agencies and state agencies, should provide resources for the expansion of community-based programs that provide hepatitis B screening, testing, and vaccination services that target foreign-born populations.

- 5-3. Federal, state, and local agencies should expand programs to reduce the risk of hepatitis C virus infection through injection-drug use by providing comprehensive hepatitis C virus prevention programs. At a minimum, the programs should include access to sterile needle syringes and drug-preparation equipment because the shared use of these materials has been shown to lead to transmission of hepatitis C virus.
- 5-4. Federal and state governments should expand services to reduce the harm caused by chronic hepatitis B and hepatitis C. The services should include testing to detect infection, counseling to reduce alcohol use and secondary transmission, hepatitis B vaccination, and referral for or provision of medical management.
- 5-5. Innovative, effective, multicomponent hepatitis C virus prevention strategies for injection drug users and non-injection drug users should be developed and evaluated to achieve greater control of hepatitis C virus transmission.
- 5-6. The Centers for Disease Control and Prevention should provide additional resources and guidance to perinatal hepatitis B prevention program coordinators to expand and enhance the capacity to identify chronically infected pregnant women and provide case-management services, including referral for appropriate medical management.
- 5-7. The National Institutes of Health should support a study of the effectiveness and safety of peripartum antiviral therapy to reduce and possibly eliminate perinatal hepatitis B virus transmission from women at high risk for perinatal transmission.
- 5-8. The Centers for Disease Control and Prevention and the Department of Justice should create an initiative to foster partnerships between health departments and corrections systems to ensure the availability of comprehensive viral hepatitis services for incarcerated people.
- 5-9. The Health Resources and Services Administration should provide adequate resources to federally funded community health facilities for provision of comprehensive viral-hepatitis services.
- 5-10. The Health Resources and Services Administration and the Centers for Disease Control and Prevention should provide resources and guidance to integrate comprehensive viral hepatitis services into settings that serve high-risk populations such as STD clinics, sites for HIV services and care, homeless shelters, and mobile health units.

### Surveillance

The viral hepatitis surveillance system in the United States is highly fragmented and poorly developed. As a result, surveillance data do not provide accurate estimates of the current burden of disease, are insufficient for program planning and evaluation, and do not provide the information that would allow policy-makers to allocate sufficient resources to viral hepatitis prevention and control programs. The federal government has provided few resources—in the form of guidance, funding, and oversight—to local and state health departments to perform surveillance for viral hepatitis. Additional funding sources for surveillance, such as funding from states and cities, vary among jurisdictions. The committee found little published information on or systematic review of viral hepatitis surveillance in the United States and offers the following recommendation to determine the current status of the surveillance system:

**Recommendation 2-1. The Centers for Disease Control and Prevention should conduct a comprehensive evaluation of the national hepatitis B and hepatitis C public-health surveillance system.**

The evaluation should, at a minimum,

- Include assessment of the system's attributes, including completeness, data quality and accuracy, timeliness, sensitivity, specificity, predictive value positive, representativeness, and stability.
- Be consistent with CDC's Updated Guidelines for Evaluating Public Health Surveillance Systems.
- Be used to guide the development of detailed technical guidance and standards for viral hepatitis surveillance.
- Be published in a report.

The committee offers the following recommendations aimed at making viral hepatitis surveillance systems more consistent among jurisdictions and improving their ability to collect and report data on acute and chronic hepatitis B and hepatitis C more accurately:

**Recommendation 2-2. The Centers for Disease Control and Prevention should develop specific cooperative viral-hepatitis agreements with all state and territorial health departments to support core surveillance for acute and chronic hepatitis B and hepatitis C.**

The agreements should include

- A funding mechanism and guidance for core surveillance activities.
- Implementation of performance standards regarding revised and standardized case definitions, specifically through the use of
  - Revised case-reporting forms with required, standardized components.
  - Case evaluation and followup.
- Support for developing and implementing automated data-collection systems, including
  - Electronic laboratory reporting.
  - Electronic medical-record extraction systems.
  - Web-based, Public Health Information Network-compliant reporting systems.

**Recommendation 2-3. The Centers for Disease Control and Prevention should support and conduct targeted active surveillance, including serologic testing, to monitor incidence and prevalence<sup>1</sup> of hepatitis B virus and hepatitis C virus infections in populations not fully captured by core surveillance.**

- Active surveillance should be conducted in specific (sentinel) geographic regions and populations.
- Appropriate serology, molecular biology, and followup will allow for distinction between acute and chronic hepatitis B and hepatitis C.

### **Knowledge and Awareness**

The committee found that there is relatively poor awareness about hepatitis B and hepatitis C among health-care providers, social-service providers (such as staff of drug-treatment facilities and immigrant-services centers), and the public, especially important, among members

---

<sup>1</sup> Incidence refers to the number of new cases within a specified period of time. Prevalence refers to the number of existing cases in a specified population at a designated time.

of specific at-risk populations. Lack of awareness about the prevalence of chronic viral hepatitis in the United States and the target populations and appropriate methodology for screening, testing, and medical management of chronic hepatitis B and hepatitis C probably contributes to continuing transmission; missing of opportunities for prevention, including vaccination; missing of opportunities for early diagnosis and medical care; and poor health outcomes in infected people.

To improve knowledge and awareness among health-care providers and social-service providers, the committee offers the following recommendation:

**Recommendation 3-1. The Centers for Disease Control and Prevention should work with key stakeholders (other federal agencies, state and local governments, professional organizations, health-care organizations, and educational institutions) to develop hepatitis B and hepatitis C educational programs for health-care and social-service providers.**

The educational programs should include at least the following components

- Information about the prevalence and incidence of acute and chronic hepatitis B and hepatitis C both in the general US population and in at-risk populations, particularly foreign-born populations in the case of hepatitis B, and IDUs and incarcerated populations in the case of hepatitis C.
- Guidance on screening for risk factors associated with hepatitis B and hepatitis C.
- Information about hepatitis B and hepatitis C prevention, hepatitis B immunization, and medical monitoring of chronically infected patients.
- Information about prevention of HBV and HCV transmission in hospital and nonhospital health-care settings.
- Information about discrimination and stigma associated with hepatitis B and hepatitis C and guidance on reducing them.
- Information about health disparities related to hepatitis B and hepatitis C.

To increase knowledge and awareness about hepatitis B and hepatitis C in at-risk populations and the general population, the committee offers the following recommendation:

**Recommendation 3-2. The Centers for Disease Control and Prevention should work with key stakeholders to develop, coordinate, and evaluate innovative and effective outreach and education programs to target at-risk populations and to increase awareness in the general population about hepatitis B and hepatitis C.**

The programs should be linguistically and culturally appropriate and should advance integration of viral hepatitis and liver-health education into other health programs that serve at-risk populations. They should incorporate interventions that meet the following goals:

- Promote better understanding of HBV and HCV infections, transmission, prevention, and treatment in the at-risk and general populations.
- Promote increased hepatitis B vaccination rates among children and at-risk adults.
- Educate pregnant women and women of childbearing age about hepatitis B prevention.
- Reduce perinatal HBV infections and improve at-birth immunization rates.
- Increase testing rates in at-risk populations.

- Reduce stigmatization of chronically infected people.
- Promote safe injections among IDUs and safe drug use among non-injection drug users (NIDUs).
- Provide culturally and linguistically appropriate educational information for all persons who have tested positive for chronic HBV or HCV infections and those who are receiving treatment.
- Encourage notification of close household and sexual contacts of infected people to be tested for HBV and HCV and encourage hepatitis B vaccination of close contacts.

### Immunization

The longstanding availability of effective hepatitis B vaccines makes the elimination of new HBV infections possible, particularly in children. As noted above, about 1,000 newborns are infected by their HBV-positive mothers at birth each year in the United States, and that number has not declined in the last decade. To prevent transmission of HBV from mothers to their newborns, the Advisory Committee on Immunization Practices (ACIP) recommends that infants born to mothers who are positive for hepatitis B surface antigen (HBsAg) mothers receive hepatitis B immune globulin and a first dose of the hepatitis B vaccine within 12 hours of birth. To improve adherence to that guideline, the committee offers the following recommendation:

**Recommendation 4-1. All infants weighing at least 2,000 grams and born to hepatitis B surface antigen-positive women should receive single-antigen hepatitis B vaccine and hepatitis B immune globulin in the delivery room as soon as they are stable and washed. The recommendations of the Advisory Committee on Immunization Practices should remain in effect for all other infants.**

The ACIP recommends administration of the hepatitis B vaccine series to unvaccinated children and young adults under 19 years old. School-entry mandates have been shown to increase hepatitis B vaccination rates and to reduce disparities in vaccination rates. Overall, hepatitis B vaccination rates in school-age children are high (for example, about 80% of states reported at least 95% hepatitis B vaccine coverage of children in kindergarten in 2006–2007), but there is variability in coverage among states. Additionally, there are racial and ethnic disparities in childhood vaccination rates—Asian and Pacific Islander (API), Hispanic, and African American children have lower vaccination rates than non-Hispanic white children. Regarding vaccination of children and adults under 19 years old, the committee offers the following recommendation:

**Recommendation 4-2. All states should mandate that the hepatitis B vaccine series be completed or in progress as a requirement for school attendance.**

Hepatitis B vaccination for adults is directed at high-risk groups—people at risk for HBV infection from infected household contact and sex partners, from injection-drug use, from occupational exposure to infected blood or body fluids, and from travel to regions that have high or intermediate HBV endemicity. Only about half the adults who are at high risk for HBV infection receive the hepatitis B vaccine. Low coverage of high-risk adults is attributed to the lack of dedicated vaccine programs; limitations of funding, insurance coverage, and cost-sharing;

and noncompliance of the involved populations. To increase the rate of hepatitis B vaccination of at-risk adults, the committee offers the following recommendation:

**Recommendation 4-3. Additional federal and state resources should be devoted to increasing hepatitis B vaccination of at-risk adults.**

- Correctional institutions should offer hepatitis B vaccination to all incarcerated persons. Accelerated schedules for vaccine administration should be considered for jail inmates.
- Organizations that serve high-risk populations should offer the hepatitis B vaccination series.
- Efforts should be made to improve identification of at-risk adults. Health-care providers should routinely seek risk behavior histories from adult patients through direct questioning and self-assessment.
- Efforts should be made to increase rates of completion of the vaccine series in adults.
- Federal and state agencies should annually determine gaps in hepatitis B vaccine coverage among at-risk adults and estimate the resources needed to fill those gaps.

Immunization-information systems are used for collection and consolidation of vaccination data from multiple health-care providers, vaccine management, adverse-event reporting, and tracking lifespan vaccination histories. States have made progress on developing and implementing immunization-information systems, particularly with regard to collecting vaccination data on children. The committee believes that it is also important to include vaccination data on adolescents and adults in immunization-information systems and offers the following recommendation:

**4-4. States should be encouraged to expand immunization-information systems to include adolescents and adults.**

Coverage for hepatitis B vaccination is greater for children and youths than for adults. Except for Medicaid's Early Periodic Screening, Diagnosis, and Treatment entitlement, public-health insurance often contains cost-sharing, which may create a barrier to vaccination for some people. Private health insurance has gaps for vaccination coverage because it does not universally cover all ACIP-recommended vaccinations for children and adults. Furthermore, most privately insured persons are required to pay to receive vaccinations. To reduce barriers to children and adults for hepatitis B vaccination, the committee offers the following recommendation:

**4-5. Private and public insurance coverage for hepatitis B vaccination should be expanded.**

- Public Health Section 317 should be expanded with sufficient funding to become the public safety net for underinsured and uninsured adults to receive the hepatitis B vaccination.
- All private insurance plans should include coverage for all ACIP-recommended vaccinations. Hepatitis B vaccination should be free of any deductible so that first-dollar coverage exists for this preventive service.

There has not been a national shortage of the hepatitis B vaccine, however, temporary supply problems occurred with this vaccine in 2008 (adult and dialysis formulations of Recombivax HB) and 2009 (pediatric formulations of Recombivax HB and Pediatric Engerix-B). A shortage was avoided because other manufacturers were able to provide an adequate supply of the vaccine in adult and dialysis formulations, and CDC released doses of pediatric vaccine from its stockpile. To prevent future supply problems of the hepatitis B vaccine, the committee offers the following recommendation:

**4-6. The federal government should work to ensure an adequate, accessible, and sustainable hepatitis B vaccine supply.**

Efforts are going on to develop a vaccine for hepatitis C, which could substantially enhance hepatitis C prevention efforts. The committee recognizes the need for a safe, effective, and affordable hepatitis C vaccine and offers the following recommendation:

**4-7. Studies to develop a vaccine to prevent chronic hepatitis C virus infection should continue.**

### **Viral Hepatitis Services**

Health services related to viral hepatitis prevention, risk-factor screening and serologic testing<sup>2</sup>, and medical management are both sparse and fragmented among entities at the federal, state, and local levels. The committee believes that a coordinated approach is necessary to reduce the numbers of new HBV and HCV infections, illnesses, and deaths associated with these infections. Comprehensive viral hepatitis services should have five core components: outreach and awareness, prevention of new infections, identification of infected people, social and peer support, and medical management of infected people.

The committee identified major gaps in viral hepatitis services for the general population and specific groups that are heavily affected by HBV and HCV infections: foreign-born populations, illicit-drug users, and pregnant women. It also examined venues that provide services to at-risk groups: correctional facilities, community health facilities, STD and HIV clinics, shelter-based programs, and mobile health units. The committee offers recommendations to address major deficiencies for each group and health-care venue.

### **General Population**

Most people who are chronically infected with HBV or HCV are unaware of their infection status. As treatments for chronic hepatitis B and C improve, it becomes critical to identify chronically infected people. Therefore, it is important that the general population have access to screening and testing services so that people who are at risk for viral hepatitis can be identified. The federal government is the largest purchaser of health insurance nationally and is well positioned to be the leader in the development and enforcement of guidelines to ensure that the people for whom it provides health care have access to risk-factor screening, serologic testing for HBV and HCV, and appropriate medical management.

---

<sup>2</sup> Risk-factor screening is the process of determining whether a person is at risk for being chronically infected or becoming infected with HBV or HCV. Serologic testing is laboratory testing of blood specimens for biomarker confirmation of HBV or HCV infection.

**Recommendation 5-1. Federally funded health-insurance programs—such as Medicare, Medicaid, and the Federal Employees Health Benefits Program—should incorporate guidelines for risk-factor screening for hepatitis B and hepatitis C as a required core component of preventive care so that at-risk people receive serologic testing for hepatitis B virus and hepatitis C virus and chronically-infected patients receive appropriate medical management.**

### **Foreign-Born Populations**

Nearly half of US foreign-born people, or 6% of the total US population, originate in HBV-endemic countries. Thus, there is a growing urgency for culturally appropriate programs to provide hepatitis B screening and related services to this high-risk population. There is a pervasive lack of knowledge about hepatitis B among Asians and Pacific Islanders, and this is probably also the case for other foreign-born people in the United States. The lack of awareness in foreign-born populations from HBV-endemic countries is compounded by the gaps in knowledge and preventive practice among health-care and social-service providers, particularly those who serve a large number of foreign-born, high-risk patients. The committee believes that the needs of foreign-born people are best met with the approach outlined in Recommendations 3-1 and 3-2. The community-based approach as outlined in Recommendation 3-2 would be strengthened by additional resources to provide screening, testing, and vaccination services.

**Recommendation 5-2. The Centers for Disease Control and Prevention, in conjunction with other federal agencies and state agencies, should provide resources for the expansion of community-based programs that provide hepatitis B screening, testing, and vaccination services that target foreign-born populations.**

### **Illicit-Drug Users**

HBV and HCV infection rates in illicit-drug users are high, particularly in IDUs. HCV is easily transmitted among IDUs, and methods to promote safe injection can be considered essential for HCV control. However, safe-injection strategies alone are insufficient to control HCV transmission. Prevention of HCV infection is a function of multiple factors—safe-injection strategies, education, testing, and drug treatment—so an integrated approach that includes all these elements is more likely to be effective in preventing hepatitis C.

**Recommendation 5-3. Federal, state, and local agencies should expand programs to reduce the risk of hepatitis C virus infection through injection-drug use by providing comprehensive hepatitis C virus prevention programs. At a minimum, the programs should include access to sterile needle syringes and drug-preparation equipment because the shared use of these materials has been shown to lead to transmission of hepatitis C virus.**

Although illicit-drug use is associated with many serious acute and chronic medical conditions, health-care use among drug users is lower than among persons who do not use illicit drugs. Health care for both IDUs and NIDUs is sporadic and typically received in hospital emergency rooms, corrections facilities, and STD clinics. Given that population's poor access to health care and services, it is important to have prevention and care services in settings that IDUs and NIDUs are likely to frequent or to develop programs that will draw them into care.

**Recommendation 5-4. Federal and state governments should expand services to reduce the harm caused by chronic hepatitis B and hepatitis C. The services should include testing to detect infection, counseling to reduce alcohol use and secondary transmission, hepatitis B vaccination, and referral for or provision of medical management.**

Studies have shown that the first few years after onset of injection-drug use constitute a high-risk period in which the rate of HCV infection can exceed 40%. Preventing the transition from non-injection–drug use to injection-drug use will probably avert many HCV infections. The committee therefore offers the following research recommendation:

**Recommendation 5-5. Innovative, effective, multicomponent hepatitis C virus prevention strategies for injection drug users and non-injection drug users should be developed and evaluated to achieve greater control of hepatitis C virus transmission. In particular,**

- **Hepatitis C prevention programs for persons who smoke or sniff heroin, cocaine, and other drugs should be developed and tested.**
- **Programs to prevent the transition from noninjection use of illicit drugs to injection should be developed and implemented.**

### **Pregnant Women**

States and large metropolitan areas are eligible to receive federal funding to support perinatal hepatitis B prevention programs through CDC's National Center for Immunization and Respiratory Diseases. Comprehensive programs have been shown to be effective not only in identifying HBV-infected pregnant women but in providing other case-management services (for example, testing of household and sexual contacts and referral to medical care). However, most programs are understaffed and underfunded and cannot offer adequate case-management services.

**Recommendation 5-6. The Centers for Disease Control and Prevention should provide additional resources and guidance to perinatal hepatitis B prevention program coordinators to expand and enhance the capacity to identify chronically infected pregnant women and provide case-management services, including referral for appropriate medical management.**

Although an increasing number of effective HBV antiviral suppressive medications have become available for the management of chronic HBV infection, very little research has been done on the use of these medications during the last trimester of pregnancy to eliminate the risk of perinatal transmission. The committee believes that there is a need to fund research to guide the effective use of antiviral medications late in pregnancy to prevent maternofetal HBV transmission, and offers the following research recommendation:

**Recommendation 5-7. The National Institutes of Health should support a study of the effectiveness and safety of peripartum antiviral therapy to reduce and possibly**

**eliminate perinatal hepatitis B virus transmission from women at high risk for perinatal transmission.**

### **Correctional Facilities**

Incarcerated populations have higher rates of HBV and HCV infections than the general population. Screening of all incarcerated people for risk factors can identify those who need blood tests for infection and, if appropriate, treatment.

**Recommendation 5-8. The Centers for Disease Control and Prevention and the Department of Justice should create an initiative to foster partnerships between health departments and corrections systems to ensure the availability of comprehensive viral hepatitis services for incarcerated people.**

### **Community Health Centers**

The Health Resources and Services Administration administers grant programs across the country to deliver primary care to uninsured and underinsured people in community health centers, migrant health centers, homeless programs, and public-housing primary-care programs. In general, funding of viral hepatitis services at community health centers is inadequate. Because community health centers provide primary health care for many people who are at risk for hepatitis B and hepatitis C, it is important for them to offer comprehensive viral hepatitis services.

**Recommendation 5-9. The Health Resources and Services Administration should provide adequate resources to federally funded community health facilities for provision of comprehensive viral-hepatitis services.**

### **Other Settings That Target At-Risk Populations**

STD and HIV clinics, shelter-based programs, and mobile health units are settings that serve populations that are at risk for hepatitis B and hepatitis C. The populations that use the settings may not have access to care through traditional health-care venues. Integration of viral hepatitis services into those settings creates opportunities to identify at-risk clients and to get them other services that they need.

**Recommendation 5-10. The Health Resources and Services Administration and the Centers for Disease Control and Prevention should provide resources and guidance to integrate comprehensive viral hepatitis services into settings that serve high-risk populations such as STD clinics, sites for HIV services and care, homeless shelters, and mobile health units.**

## **RECOMMENDATION OUTCOMES**

The committee believes that implementation of its recommendations would lead to reductions in new HBV and HCV infections, in medical complications and deaths that result from these viral infections of the liver, and in total health costs. Advances in three major categories will be needed: in knowledge and awareness about chronic viral hepatitis among

health-care and social-service providers, the general public, and policy-makers; in improvement and better integration of viral hepatitis services, including expanded hepatitis B vaccination coverage; and in improvement of estimates of the burden of disease for resource-allocation purposes.



# Hepatitis and Liver Cancer:

## A National Strategy for Prevention and Control of Hepatitis B and C

Heather M. Colvin and Abigail E. Mitchell, *Editors*

Committee on the Prevention and Control of Viral Hepatitis Infections  
Board on Population Health and Public Health Practice

INSTITUTE OF MEDICINE  
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS  
Washington, D.C.  
[www.nap.edu](http://www.nap.edu)

PREPUBLICATION COPY: UNCORRECTED PROOF

Copyright National Academy of Sciences. All rights reserved.  
This executive summary plus thousands more available at <http://www.nap.edu>

**THE NATIONAL ACADEMIES PRESS      500 Fifth Street, N.W.      Washington, DC 20001**

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This study was supported by Contract 200-2005-13434, TO#16, between the National Academy of Sciences and the Department of Health and Human Services and by the Task Force for Child Survival and Development on behalf of the National Viral Hepatitis Roundtable. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the organizations or agencies that provided support for this project.

International Standard Book Number 0-309-XXXXXX-X (Book)

International Standard Book Number 0-309-XXXXXX-X (PDF)

Library of Congress Control Number: 00 XXXXXXX

Additional copies of this report are available from the National Academies Press, 500 Fifth Street, N.W., Lockbox 285, Washington, DC 20055; (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area); Internet, <http://www.nap.edu>.

For more information about the Institute of Medicine, visit the IOM home page at [www.iom.edu](http://www.iom.edu).

Copyright 2010 by the National Academy of Sciences. All rights reserved.

Printed in the United States of America.

The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. The serpent adopted as a logotype by the Institute of Medicine is a relief carving from ancient Greece, now held by the Staatliche Museen in Berlin.

Suggested citation: IOM (Institute of Medicine). 2010. *Hepatitis and Liver Cancer: A National Strategy for Prevention and Control of Hepatitis B and C*. Washington, DC: The National Academies Press

*“Knowing is not enough; we must apply.  
Willing is not enough; we must do.”*  
—Goethe



**INSTITUTE OF MEDICINE**  
*OF THE NATIONAL ACADEMIES*

**Advising the Nation. Improving Health.**

**PREPUBLICATION COPY: UNCORRECTED PROOF**

Copyright National Academy of Sciences. All rights reserved.  
This executive summary plus thousands more available at <http://www.nap.edu>

## **THE NATIONAL ACADEMIES**

*Advisers to the Nation on Science, Engineering, and Medicine*

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Charles M. Vest is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Charles M. Vest are chair and vice chair, respectively, of the National Research Council.

**[www.national-academies.org](http://www.national-academies.org)**

## COMMITTEE ON THE PREVENTION AND CONTROL OF VIRAL HEPATITIS INFECTIONS

---

**R. Palmer Beasley** (*Chair*), Ashbel Smith Professor and Dean Emeritus, University of Texas, School of Public Health, Houston, Texas

**Harvey J. Alter**, Chief, Infectious Diseases Section, Department of Transfusion Medicine, National Institutes of Health, Bethesda, Maryland

**Margaret L. Brandeau**, Professor, Department of Management Science and Engineering, Stanford University, Stanford, California

**Daniel R. Church**, Epidemiologist and Adult Viral Hepatitis Coordinator, Bureau of Infectious Disease Prevention, Response, and Services, Massachusetts Department of Health, Jamaica Plain, Massachusetts

**Alison A. Evans**, Assistant Professor, Department of Epidemiology and Biostatistics, Drexel University School of Public Health, Drexel Institute of Biotechnology and Viral Research, Doylestown, Pennsylvania

**Holly Hagan**, Senior Research Scientist, College of Nursing, New York University, New York, New York

**Sandra L. Hullett**, CEO and Medical Director, Cooper Green Hospital, Birmingham, Alabama

**Stacene R. Maroushek**, Staff Pediatrician, Department of Pediatrics, Hennepin County Medical Center, Minneapolis, Minnesota

**Randall R. Mayer**, Chief, Bureau of HIV, STD, and Hepatitis, Iowa Department of Public Health, Des Moines, Iowa

**Brian J. McMahon**, Medical Director, Liver Disease and Hepatitis Program, Alaska Native Tribal Health Consortium, Anchorage, Alaska

**Martín Jose Sepúlveda**, Vice President, Integrated Health Services, International Business Machines Corporation, Somers, New York

**Samuel So**, Lui Hac Minh Professor, Asian Liver Center, Stanford University School of Medicine, Stanford, California

**David L. Thomas**, Chief, Division of Infectious Diseases, Department of Medicine, Johns Hopkins School of Medicine, Baltimore, Maryland

**Lester N. Wright**, Deputy Commissioner and Chief Medical Officer, New York Department of Correctional Services, Albany, New York

### *Staff*

**Abigail E. Mitchell**, Study Director

**Heather M. Colvin**, Program Officer

**Kathleen M. McGraw**, Senior Program Assistant

**Norman Grossblatt**, Senior Editor

**Rose Marie Martinez**, Director, Board on Population Health and Public Health Practice

PREPUBLICATION COPY: UNCORRECTED PROOF

v

---

## REVIEWERS

---

This report has been reviewed in draft form by persons chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's (NRC's) Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individual's for their review of this report:

**Scott Allen**, Brown University Medical School  
**Jeffrey Caballero**, Association of Asian Pacific Community Health Organizations  
**Colleen Flanagan**, New York State Department of Health  
**James Jerry Gibson**, South Carolina Department of Health and Environmental Control  
**Fernando A. Guerra**, San Antonio Metropolitan Health District  
**Theodore Hammett**, Abt Associates Inc.  
**Jay Hoofnagle**, National Institute of Diabetes and Digestive and Kidney Diseases  
**Charles D. Howell**, University of Maryland School of Medicine  
**Walter A. Orenstein**, Bill and Melinda Gates Foundation  
**Philip E. Reichert**, Florida Department of Health  
**Charles M. Rice III**, The Rockefeller University  
**Tracy Swan**, Treatment Action Group  
**Su Wang**, Charles B. Wang Community Health Center  
**John B. Wong**, Tufts Medical Center

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations, nor did they see the final draft of the report before its release. The review of the report was overseen by **Bradford H. Gray**, Senior Fellow, The Urban Institute and **Elena O. Nightingale**, Scholar-in-Residence, Institute of Medicine. Appointed by the Institute of Medicine and the National Research Council, they were responsible for making certain that an independent examination of the report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of the report rests entirely with the author committee and the institution.

---

## ACKNOWLEDGMENTS

---

The committee acknowledges the valuable contributions made by the many persons who shared their experience and knowledge with the committee. The committee appreciates the time and insight of the presenters during the public sessions: **John Ward, Dale Hu, Cindy Weinbaum, and David Bell**, Centers for Disease Control and Prevention; **Chris Taylor and Martha Saly**, National Viral Hepatitis Roundtable; **Lorren Sandt**, Caring Ambassadors Program; **Joan Block**, Hepatitis B Foundation; **Gary Heseltine**, Council of State and Territorial Epidemiologists; **William Rogers**, Centers for Medicare and Medicaid Services; **Tanya Pagán Raggio Ashley**, Health Resources Services Administration; **Carol Craig**, National Association of Community Health Centers; **Daniel Raymond**, Harm Reduction Coalition; and **Mark Kane**, formerly of the Children's Vaccine Program, PATH. We are also grateful for the thoughtful written and verbal testimony provided by members of the public affected by hepatitis B or hepatitis C.

Several persons contributed their expertise for this report. The committee thanks **David Hutton**, of the Department of Management Science and Engineering at Stanford University; **Victor Toy, Beverly David, and Kathleen Tarleton**, of IBM; **Shiela Strauss**, of the New York University College of Nursing; **Ellen Chang and Stephanie Chao**, of the Asian Liver Center at Stanford University; **Gillian Haney**, of the Massachusetts Department of Public Health; and all the State Adult Viral Hepatitis Prevention Coordinators that provided information to the committee.

This report would not have been possible without the diligent assistance of **Jeffrey Efirid** and **Daniel Riedford**, of the Centers for Disease Control and Prevention. We appreciate the assistance of **Ronald Valdiserri**, of the Department of Veterans Affairs, for providing literature for the report.

The committee thanks the staff members of the Institute of Medicine, the National Research Council, and the National Academies Press who contributed to the development, production, and dissemination of this report. The committee thanks the study director, Abigail Mitchell, and program officer Heather Colvin for their work in navigating this complex topic and Kathleen McGraw for her diligent management of the committee logistics.

This report was made possible by the support of the Division of Viral Hepatitis and Division of Cancer Prevention and Control of the Centers for Disease Control and Prevention, the Department of Health and Human Services Office of Minority Health, the Department of Veterans Affairs, and the National Viral Hepatitis Roundtable.



## CONTENTS

Acronyms and Abbreviations.....	xii
SUMMARY .....	1
The Charge to the Committee .....	2
Findings and Recommendations .....	2
Surveillance .....	4
Knowledge and Awareness.....	5
Immunization .....	7
Viral Hepatitis Services .....	9
Recommendation Outcomes .....	12
1 INTRODUCTION .....	15
Prevalence and Incidence of Hepatitis B and Hepatitis C WorldWide.....	17
Prevalence and Incidence of Hepatitis B and Hepatitis C in the United States .....	20
Hepatitis B .....	20
Hepatitis C .....	22
Liver Cancer and Liver Disease From Chronic Hepatitis B Virus and Hepatitis C Virus	
Infections .....	23
The Committee’s Task .....	24
The Committee’s Approach to its Task .....	25
References .....	28
2 SURVEILLANCE .....	35
Applications of Surveillance Data .....	36
Outbreak Detection and Control.....	37
Resource Allocation.....	38
Programmatic Design and Evaluation .....	38
Linking Patients to Care .....	38
Disease-Specific Issues Related to Viral-Hepatitis Surveillance.....	38
Identifying Acute Infections .....	39
Identifying Chronic Infections.....	42
Identifying Perinatal Hepatitis B .....	44
Other Challenges for Hepatitis B and Hepatitis C Surveillance Systems .....	46
Infrastructure and Process-Specific Issues With Surveillance.....	47
Funding Sources .....	48
Program Design .....	49
Reporting Systems and Requirements .....	49
Capturing Data on At-Risk Populations .....	50
Case Evaluation, Followup, and Partner Services .....	51
Recommendations.....	52
Model for Surveillance.....	54
Core Surveillance.....	55

PREPUBLICATION COPY: UNCORRECTED PROOF

Targeted Surveillance .....	58
References .....	59
3 KNOWLEDGE AND AWARENESS ABOUT CHRONIC HEPATITIS B AND HEPATITIS C .....	67
Knowledge and Awareness Among Health-Care and Social-Service Providers .....	68
Hepatitis B .....	68
Hepatitis C .....	70
Recommendation .....	72
Community Knowledge and Awareness .....	75
Hepatitis B .....	75
Hepatitis C .....	78
Recommendation .....	80
References .....	84
4 IMMUNIZATION .....	91
Hepatitis B Vaccine .....	91
Current Vaccination Recommendations, Requirements, and Rates .....	92
Immunization-Information Systems .....	104
Barriers to Hepatitis B Vaccination .....	105
Hepatitis C Vaccine .....	111
Feasibility of Preventing Chronic Hepatitis C .....	111
Need for a Vaccine to Prevent Chronic Hepatitis C .....	112
Cost Effectiveness of a Hepatitis C Vaccine .....	112
References .....	113
5 VIRAL HEPATITIS SERVICES .....	121
Current Status .....	122
Components of Viral Hepatitis Services .....	126
Identification of Infected Persons .....	127
Prevention .....	134
Medical Management .....	134
Major Gaps in Services .....	137
General Population .....	137
Foreign-Born People .....	139
Illicit-Drug Users .....	141
Pregnant Women .....	146
Correctional Settings .....	148
Community Health Facilities .....	150
Targeting Settings That Serve At-Risk Populations .....	151
References .....	154
A COMMITTEE BIOGRAPHIES .....	171
B PUBLIC MEETING AGENDAS .....	175
FIRST MEETING-December 4, 2008 .....	175
SECOND MEETING-March 3, 2009 .....	176

PREPUBLICATION COPY: UNCORRECTED PROOF

X

## Boxes, Figures, and Tables

BOX S-1 Recommendations.....	3
BOX 2-1 Role of Disease Surveillance .....	35
BOX 2-2 CDC Acute Hepatitis B Case Definition.....	41
BOX 2-3 CDC Acute Hepatitis C Case Definition.....	42
BOX 2-4 CDC Chronic Hepatitis B Case Definition .....	43
BOX 2-5 CDC Hepatitis C Virus Infection Case Definition (Past or Present) .....	45
BOX 2-6 CDC Perinatal Hepatitis B Virus Infection Case Definition.....	46
BOX 3-1 Geographic Regions That Have Intermediate and High Hepatitis B Virus Endemicity	69
BOX 4-1 Summary of CDC’s Hepatitis B Vaccination Recommendations.....	94
BOX 5-1 Summary of Recommendations Regarding Viral Hepatitis Services .....	121
BOX 5-2 Mission Statement of Centers for Disease Control and Prevention Division of Viral Hepatitis .....	123
BOX 5-3 Components of Comprehensive Viral Hepatitis Services.....	126
BOX 5-4 Summary of CDC Risk Populations for Hepatitis B Virus Infection .....	127
BOX 5-5 Summary of CDC Risk Populations for Hepatitis C Virus Infection .....	129
BOX 5-6 Hepatitis B Virus-Specific Antigens and Antibodies Used for Testing.....	130
FIGURE 1-1 Approximate global preventable death rate from selected infectious diseases and other causes, 2003 .....	19
FIGURE 1-2 The committee’s approach to its task.....	28
FIGURE 2-1 Natural progression of hepatitis B viral infection .....	39
FIGURE 2-2 Natural progression of hepatitis C infection. ....	40
FIGURE 4-1 Estimated cost of adult hepatitis B vaccination per quality adjusted life years (QALY) gained for different age groups and different rates of acute hepatitis B virus (HBV) infection incidence.....	99
FIGURE 4-2 Trends in private health-insurance coverage.....	109
FIGURE 5-1 Viral hepatitis B services model. ....	128
FIGURE 5-2 Essential viral hepatitis services for illicit-drug users.....	145
TABLE 1-1 Key Characteristics of Hepatitis B and Hepatitis C.....	16
TABLE 1-2 Burden of Selected Serious Chronic Viral Infections in the United States .....	21
TABLE 4-1 Hepatitis B Vaccine Schedules for Newborns, by Maternal HBsAg Status.....	93
TABLE 4-2 Hepatitis B Immunization Management of Preterm Infants Who Weigh Less Than 2,000 g, by Maternal HBsAg Status .....	95
TABLE 4-3 Estimated Chance That an Acute Hepatitis B Infection Becomes Chronic with Age.....	98
TABLE 4-4 Studies of Hepatitis B Vaccination Rates in Injection-Drug Users.....	100
TABLE 4-5 Public Health-Insurance Plans .....	106
TABLE 5-1 Summary of Adult Viral Hepatitis Prevention Coordinators Survey .....	125
TABLE 5-2 Interpretation of Hepatitis B Serologic Diagnostic Test Results.....	131
TABLE 5-3 Interpretation of Hepatitis C Virus Diagnostic Test Results .....	132
TABLE 5-4 Studies of Association Between Opiate Substitution Treatment and Hepatitis C Virus Seroconversion.....	143

## ACRONYMS AND ABBREVIATIONS

AASLD	American Association for the Study of Liver Diseases
ACIP	Advisory Committee on Immunization Practices
ACOG	American College of Obstetricians and Gynecologists
AHRQ	Agency for Healthcare Research and Quality
AIDS	Acquired immunodeficiency syndrome
ALT	Alanine aminotransferase
anti-HBc	Hepatitis B core antibody
anti-HBs	Hepatitis B surface antibody
anti-HCV	Hepatitis C antibody
API	Asian and Pacific Islander
AST	Aspartate transaminase
AVHPC	Adult viral hepatitis prevention coordinators
CDC	Centers for Disease Control and Prevention
CHIP	Children's Health Insurance Program
CI	Confidence interval
CIA	Enhanced chemiluminescence
CMS	Centers for Medicare and Medicaid Services
DIS	Disease intervention specialist
DTaP	Diphtheria and tetanus toxoids and acellular pertussis adsorbed vaccine
DUIT	Drug user intervention trial
DVH	Division of Viral Hepatitis
EIA	Enzyme immunoassay
EIP	Emerging Infections Program
EPSDT	Early periodic screening diagnosis and treatment program
FDA	Food and Drug Administration
FEHBP	Federal Employee Health Benefit Program
FQHC	Federally qualified health centers
HAV	Hepatitis A virus
HBIG	Hepatitis B immunoglobulin
HBsAg	Hepatitis B surface antigen
HBV	Hepatitis B virus
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus
HCW	Health care workers
HDHP	High deductible health plan
HIAA	Health Insurance Association of America
HIB	Haemophilus influenzae type B
HIV	Human immunodeficiency virus
HMO	Health maintenance organization
HPV	Human papilloma virus
HRSA	Health Resources and Services Administration
IDU	Injection drug user
IIS	Immunization information systems
IOM	Institute of Medicine

PREPUBLICATION COPY: UNCORRECTED PROOF

IPV	Inactivated polio virus
MMTP	Methadone maintenance treatment program
NASTAD	National Alliance of State and Territorial AIDS Directors
NAT	Nucleic acid test
NCHHSTP	National Center for HIV/AIDS, Viral Hepatitis, Sexually Transmitted Diseases, and Tuberculosis Prevention
NEDSS	National electronic disease surveillance system
NETSS	National electronic telecommunications system for surveillance
NGO	Nongovernmental organization
NHANES	National health and nutrition examination survey
NIDU	Non-injecting drug users
NVAC	National Vaccine Advisory Committee
OB/GYN	Obstetrician/gynecologist
OMH	Office of Minority Health
OR	Odds ratio
PEI	Peer education intervention
PHIN	Public health information network
POS	Point of service
PPO	Preferred provider organization
PY	Person years
QALY	Quality adjusted life years
RCT	Randomized clinical trial
RIBA	Recombinant immunoblot assay
RNA	Ribonucleic acid
RSV	Respiratory syncytial virus
SAMHSA	Substance Abuse and Mental Health Services Administration
SARS	Severe acute respiratory syndrome
SEP	Syringe exchange program
STD	Sexually transmitted disease
STRIVE	Study to reduce intravenous exposures
TB	Tuberculosis
TCM	Traditional Chinese medicine
USPHS	US Public Health Service
USPSTF	US Preventive Services Task Force
VA	Department of Veterans Affairs
vCJD	Variant Creutzfeldt-Jakob disease
VFC	Vaccines For Children
WHO	World Health Organization

