2018

LIVER CANCER PREVENTION:
Putting Strategies into Action

National Center for Chronic Disease Prevention and Health Promotion
Division of Cancer Prevention and Control

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LIST OF ABBREVIATIONS

CCC	Comprehensive Cancer Control
CDC	Centers for Disease Control and Prevention
CNHS	Cherokee Nation Health Services
ECHO	Project Extension for Community Healthcare Outcomes
HBV	Hepatitis B virus
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus
ICCCP	Idaho Comprehensive Cancer Control Program
IIP	Idaho Immunization Program
IOM	Institute of Medicine (now the National Academies of Sciences, Engineering, and Medicine, NASEM)
NCCCP	National Comprehensive Cancer Control Program

SUMMARY

Purpose of This Document

This document was developed to:

1. Increase awareness and knowledge among public health professionals, healthcare providers, and community members in the area of comprehensive cancer prevention and control about the need to address viral hepatitis as a risk factor for liver cancer.
2. Raise awareness of liver cancer prevention as a priority for National Comprehensive Cancer Control Program (NCCCP) awardees with high-burden populations.
3. Provide guidance to NCCCP awardees on how to increase knowledge and awareness among their coalitions and partners about liver cancer prevention and its major risk factors.
4. Document promising strategies for the prevention of liver cancer that can be easily adapted and implemented by NCCCP awardees across different settings.

Audience of This Document

This document will be useful to:

1. Program directors and staff from states, territories, and tribal organizations who are interested in implementing liver cancer prevention activities.
2. NCCCP awardees and their partners, both internal and external, who are interested in implementing liver cancer prevention activities.
3. Comprehensive cancer control (CCC) coalition members.

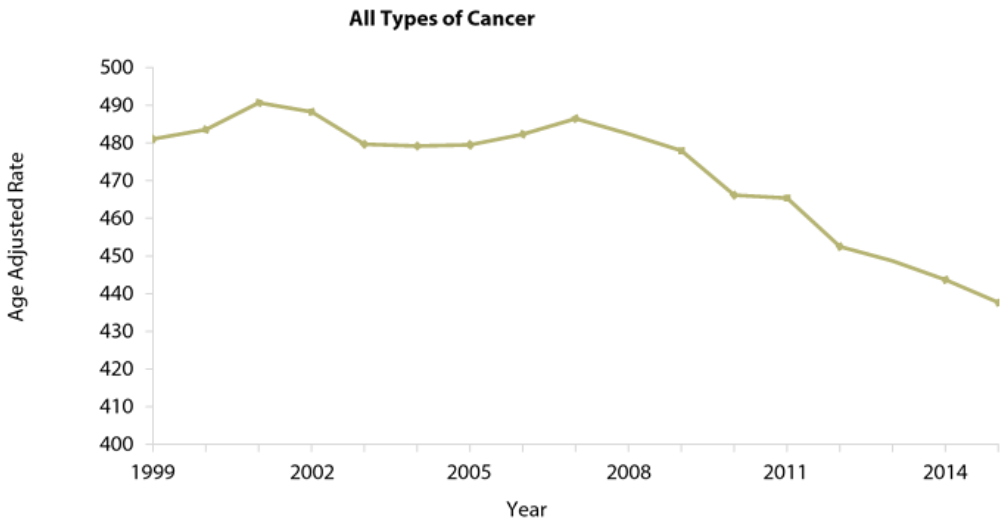
Goals for Users of This Document

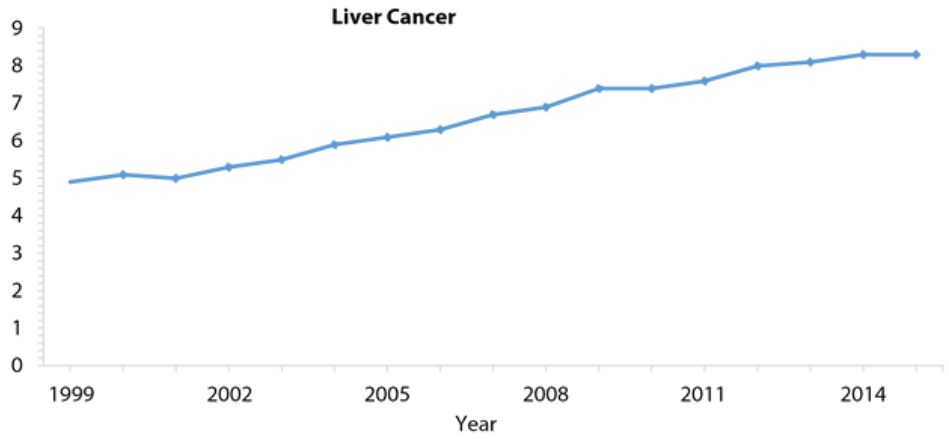
1. To share examples of liver cancer prevention activities related to hepatitis B and C, drawn from CCC plans as well as published literature.
2. To share the steps needed to put liver cancer prevention strategies into action.
3. To understand how two programs have adopted and implemented key strategies in their populations and based on the programs' work to:
    - Share program needs, key strategies implemented, partnerships, and how the success of their implementation efforts was measured.
    - Share program facilitators, challenges, lessons learned, and key resources for the planning and implementation of liver cancer prevention strategies.

Background

Worldwide, liver cancer is the fifth most common cancer among men, the ninth most common cancer among women, and the second most common cause of cancer death for men and women combined.[1] In the United States, each year approximately 33,000 new cases of liver cancer are diagnosed and almost 26,000 people die from the disease.[2] Liver cancer is more common in men than in women, and among Asian/Pacific Islander, Hispanic, and American Indian/Alaska Native populations compared with other racial and ethnic groups.[2]

Liver cancer incidence has been increasing in the United States since the mid-1970s.[3] A major factor contributing to the increase in hepatocellular carcinoma (HCC), the most common type of liver cancer, is a high prevalence of chronic hepatitis C virus (HCV) infection among baby boomers, or those born between 1945 and 1965.[3] Increases in obesity and type 2 diabetes over the past several decades have also likely contributed to the rise in liver cancer because of these factors' association with nonalcoholic fatty liver disease and nonalcoholic steatohepatitis.[4] Other notable risk factors for the development of HCC include chronic infection with hepatitis B virus (HBV) and alcoholic cirrhosis.[5]





Source: U.S. Cancer Statistics Working Group. U.S. Cancer Statistics Data Visualizations Tool, based on November 2017 submission data (1999–2015): U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; http://www.cdc.gov/cancer/dataviz, June 2018.

Due to recent advances, HCV is now curable with short and easily tolerable courses of treatment.[6] Most cases of HBV infection can be prevented through vaccination.[7] The extent to which hepatitis C treatment and hepatitis B vaccination are adopted within populations is unclear.

In 2010, the Institute of Medicine (IOM, now the National Academies of Sciences, Engineering, and Medicine) report Hepatitis and Liver Cancer: A National Strategy for Prevention and Control of Hepatitis B and C (hereafter the 2010 IOM report) stated that there are several barriers to HBV and HCV prevention and control efforts, including a lack of knowledge and awareness about chronic viral hepatitis among healthcare providers, at-risk populations, and the public.[8] Furthermore, the report noted that improved surveillance and better integration of viral hepatitis services are needed and included the following four categories of recommendations for improving the prevention and control of chronic HBV and HCV:

1. Improved viral hepatitis **surveillance**;
2. Improved **provider and community education to increase knowledge and awareness** of HBV and HCV;
3. Increased support for **vaccine-based strategies (immunization)** to eliminate HBV transmission; and
4. Integration and enhancement of **viral hepatitis services**, including risk factor screening and serologic testing.

Appendix 1 contains a detailed list of recommendations from the 2010 IOM report.

WORLDWIDE, HCC IS THE...

FIFTH
most common cancer among men

NINTH
most common cancer among women

SECOND
most common cause of cancer death for men and women combined[1]

IN THE UNITED STATES, EACH YEAR...

APPROXIMATELY
33,000
new cases of liver cancer are diagnosed

ALMOST
26,000
people die from the disease[2]

LIVER CANCER IS MORE COMMON IN...

MEN
than in women

&

ASIAN/PACIFIC ISLANDER, HISPANIC, AND AMERICAN INDIAN/ALASKA NATIVE POPULATIONS
compared with other racial and ethnic groups[2]

A major factor contributing to the increase in hepatocellular carcinoma (HCC), the most common type of liver cancer, is a **HIGH PREVALENCE OF CHRONIC HEPATITIS C VIRUS (HCV) INFECTION** among baby boomers, or those born between 1945 and 1965.[3]

INCREASES IN OBESITY AND TYPE 2 DIABETES over the past several decades have also likely contributed to the rise in liver cancer because of these factors' association with nonalcoholic fatty liver disease and nonalcoholic steatohepatitis.[4]

Other notable risk factors for the development of HCC include chronic infection with hepatitis B virus (HBV) and alcoholic cirrhosis.

ABOUT 78% of all liver cancer cases are related to the HBV/HCV virus

MORE THAN 75% of the up to 3.9 million Americans estimated to be living with HCV are baby boomers and many remain undiagnosed and unaware of their infection.

ABOUT 65-75% of the population infected with HBV/HCV are unaware they are infected

In the United States, **50%** of new HCV cases are associated with injection drug use.[5]

[1]Ferlay J, Soerjomataram I, Dikshit R, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012 [published online October 9, 2014]. Int J Cancer. 2015;136(5):E359-E386. doi:10.1002/ijc.29210

[2]US Cancer Statistics Working Group. United States Cancer Statistics: 1999-2014 Incidence and Mortality Web-based Report. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2017. http://www.cdc.gov/uscs.

[3]Ryerson AB, Eheman CR, Altekruse SF, et al. Annual Report to the Nation on the Status of Cancer, 1975-2012, featuring the increasing incidence of liver cancer [published online March 9, 2016]. Cancer. 2016;122(9):1312-1337. doi:10.1002/cncr.29936.

[4]Campbell PT, Newton CC, Freedman ND, et al. Body mass index, waist circumference, diabetes, and risk of liver cancer for US adults. Cancer Res. 2016;76(20):6076-6083.

[5]Ahmed F, Perz JF, Kwong S, Jamison PM, Friedman C, Bell BP. National trends and disparities in the incidence of hepatocellular carcinoma, 1998-2003 [published online June 15, 2008]. Prev Chronic Dis. 2008;5(3):A74.

CDC RECOMMENDATIONS FOR HEPATITIS B VACCINATION[9]

- Infants should get their first dose of the HBV vaccine at birth and will usually complete the series at 6 months of age.
- All children and adolescents younger than 19 years of age who have not yet received the vaccine should also be vaccinated.
- The HBV vaccine is recommended for unvaccinated adults who are at risk for HBV infection, including:
  - People whose sex partners have HBV
  - Sexually active people who are not in a long-term monogamous relationship
  - People seeking evaluation or treatment for a sexually transmitted disease
  - Men who have sexual contact with other men
  - People who share needles, syringes, or other drug-injection equipment
  - People who have household contact with someone infected with HBV
  - Healthcare and public safety workers at risk for exposure to blood or body fluids
  - Residents and staff of facilities for people with developmental disabilities
  - People in correctional facilities
  - Victims of sexual assault or abuse
  - Travelers to regions with increased rates of HBV
  - People with chronic liver disease, kidney disease, HIV infection, or diabetes
  - Anyone who wants to be protected from HBV

CDC RECOMMENDATIONS FOR HEPATITIS C TESTING[10]

- Adults born between 1945 and 1965 should be tested once (without prior ascertainment of HCV risk factors).
- HCV testing is recommended for those who:
  - Currently inject drugs.
  - Ever injected drugs, including those who injected once or a few times many years ago.
  - Have certain medical conditions, including people:
    - who received clotting factor concentrates produced before 1987
    - who were ever on long-term hemodialysis
    - who have persistently abnormal alanine aminotransferase levels
    - who have HIV infection
  - Were prior recipients of transfusions or organ transplants, including persons who:
    - were notified that they received blood from a donor who later tested positive for HCV infection
    - received a transfusion of blood, blood components, or an organ transplant before July 1992
- HCV testing based on a recognized exposure is recommended for:
  - Healthcare, emergency medical, and public safety workers after needle sticks, sharps, or mucosal exposures to HCV-positive blood
  - Children born to HCV-positive women

LIVER CANCER PREVENTION AND NATIONAL COMPREHENSIVE CANCER CONTROL PLANNING

Comprehensive cancer control (CCC) is an approach that brings together key partners and organizations to develop a plan to reduce the number of community members who get or die from cancer.[11] In 1998, CDC established the National Comprehensive Cancer Control Program (NCCCP) to support this wide-ranging and inclusive effort. The program provides funding and technical support for the development and implementation of CCC plans. These plans guide the work of many community partners, such as local health departments, community nonprofits, and health centers. These partners work on current and emerging cancer issues, including cancer prevention, early detection, treatment, rehabilitation, and survivorship, and they focus on creating policy, systems, and environmental changes to increase the public health impact of their work. CDC currently funds CCC programs in all 50 states, the District of Columbia, 6 U.S. Associated Pacific Islands and Puerto Rico, and 8 tribes or tribal organizations.[12]

In 2010 and 2015, CDC conducted focused reviews of NCCCP awardees' CCC plans to identify goals, strategies, and activities related to liver cancer prevention. These reviews revealed that most CCC plans did not address the connection between chronic HBV or HCV infections and liver cancer, and only a few CCC plans mentioned prevention activities to reduce the burden of liver cancer. States with large Asian/Pacific Islander populations, however, more commonly reported addressing HCC.[13, 14] Some plans also targeted specific populations, including American Indians and Alaska Natives, who have a death rate from liver cancer that is almost twice as high as that of non-Hispanic whites in the United States.[15]

> A concerted effort can address the general lack of awareness of viral hepatitis as a significant risk factor for liver cancer and, among NCCCP awardees in particular, increase the uptake of strategies and activities related to prevention.

PROMISING STRATEGIES FOR LIVER CANCER PREVENTION: EVIDENCE FROM THE FIELD

To supplement the 2015 review of CCC plans, a review of published literature was conducted to identify additional liver cancer prevention activities related to HBV and HCV that could potentially be used by NCCCP awardees and coalitions moving forward. Resources needed to implement those interventions were also identified (see Appendix 2). Momin and colleagues have published findings from the 2015 review of both CCC plans and published literature.[14]

Table 1 lists the promising strategies identified in CCC plans and published literature that align with the four categories of recommendations in the 2010 IOM report. In summary:

- For **surveillance**, activities noted in CCC plans include participating in state immunization registries to track and improve HBV vaccination uptake. The published literature recommends developing surveillance registries to facilitate notification, counseling, and treatment of persons with HBV infection.
- For **provider and communication education**, activities noted in CCC plans include educating parents, healthcare providers, and hospitals regarding the importance of the birth-dose HBV vaccine, the protocol for administering the vaccine, and appropriate HBV screening methods. Related to HCV, CCC plans focused on educating high-risk populations about HCV prevention and the importance of getting tested. The published literature identifies interventions that improved knowledge of HBV or HCV and screening behaviors among Asian American participants. This literature also recommends developing health education programs for the general public, high-risk populations, and decisionmakers to increase knowledge and awareness of HCV. Additionally, training for healthcare and social services providers is recommended in the areas of prevention and detection of HBV and HCV, as well as the care of people with HBV and HCV.
- For **immunization**, activities noted in CCC plans include systems changes such as implementing provider reminder and recall systems to discuss or administer the HBV vaccine, developing standing provider orders to administer the HBV vaccine, and implementing vaccine requirements at birth and in school settings. The published literature identifies an intervention that increased HBV vaccination and screening among Asian American participants by offering low-cost vaccinations with free screening.
- For **viral hepatitis services**, activities noted in CCC plans include systems changes such as providing training to state cancer program staff and key clinical staff regarding recommended HBV screening methods and technology, as well as implementing standing provider orders for HCV testing of adults born between 1945 and 1965 and other populations considered at high risk. The published literature identified interventions that increased HBV testing among Asian Americans.

Table 1: Liver Cancer Prevention Activities Related to HBV and HCV Drawn From CCC Plans and Published Literature

Surveillance

CCC Plans	HBV ▸ Monitor emerging science investigating the relationship between infectious agents and cancer. ▸ Participate in the state information immunization system to track vaccine uptake within clinics. ▸ Facilitate national and state coordination among immunization and cancer programs. ▸ Monitor HCC incidence trends related to HBV. ▸ Increase provider participation and improve completion of vaccination protocols in the state immunization information system. ▸ Informing decision-makers about the effect of making the state immunization registry an opt-out program and use this registry for adults. HCV ▸ Monitor emerging science investigating the relationship between infectious agents and cancer. ▸ Monitor HCC incidence trends related to HCV.
Published Literature	▸ One study recommended investing in surveillance of HBV and HCV to guide prevention efforts. In addition to reporting to the health department, surveillance for HBV and HCV should include identifying persons requiring counseling and linkage to care.[16] ▸ Another study recommended partnering with primary care providers on HCV care linkage interventions, including with clinics that have engaged extensively with homeless populations or people who inject drugs.[17] ▸ A third study recommended developing surveillance registries for HBV infection to facilitate the notification, counseling, and medical management of persons with chronic HBV. The registries can also be used to monitor cases and disease trends, and for follow-up and treatment of chronic viral hepatitis cases.[18]

Provider and Community Education

CCC Plans	HBV

- Educate parents about the vaccine as a cancer prevention method.
- Support the use of evidence-based interventions to reduce exposure to and infection with cancer-related infectious agents.
- Increase awareness of HBV vaccination.
- Provide training to state cancer program staff and key clinical staff regarding recommended HBV screening methods and technology.
- Enhancing access to vaccination services through home visits, cost reductions, and vaccination programs in nontraditional settings.
- Increasing community demand through incentives, reminder systems, and vaccine requirements for childcare, schools, and colleges.
- Implementing provider- or system-based intervention that includes immunization information tests, provider assessments, and feedback and standing orders.
- Increase the proportion of newborns getting a birth dose of the HBV vaccine by educating birth hospitals about the importance of the dose in improving rates of vaccine series completion.
- Maintain 2-year-old HBV coverage at 95% by assuring the public of the efficacy and safety of the HBV vaccine, and promoting its full use.
- Educate healthcare providers about the benefits of providers recommending the HBV vaccination to their patients.
- Support educational campaigns targeted to at-risk adolescents and adults regarding the benefits and risks of the HBV vaccine.
- Develop media messages on infectious disease vaccinations and cancer.
- Monitor emerging science investigating the relationship between infectious agents and cancer.
- Assess, monitor, promote, and provide the HBV vaccination series for people of all ages to prevent one type of liver cancer.
- Utilize multicomponent interventions that include education on the HBV vaccine for children.
- Increase awareness of the value of HBV vaccination.
- Implement policy, systems, and environmental change and other evidence-based strategies that address infectious disease causes related to cancer. Evidence-based strategies may include:
  - Conducting a statewide awareness campaign on the link between infectious diseases and cancer risk.
  - Informing decision-makers about the effect of making the state immunization registry an opt-out program and to use the registry for adults.
  - Implementing evidence-based programs that promote immunization of high-risk adults against HBV.
- Promote demonstration projects and research on screening for liver cancer.
- Improve health professional knowledge, practice behaviors, and system support related to increasing provision of or referral to immunization against HBV. Develop partnerships between health department and community organizations to develop a community education plan and educational materials on the HBV vaccine.
- Initiate patient education in primary care settings on HBV using bilingual, bicultural health professional staff.

	HCV ▸ Educate high-risk populations, including injection drug users, on how to prevent contracting HCV. ▸ Educate high-risk populations, including veterans and baby boomers, on the importance of getting tested for HCV. ▸ Support evidence-based interventions to reduce exposure to and infection with cancer-related infectious agents. ▸ Implement policy, systems, and environmental change and other evidence-based strategies that address infectious disease causes related to cancer. ▸ Promote safer healthcare practices to reduce exposure of patients and healthcare workers to hepatitis viruses by enforcing requirements for safer equipment and injury reporting, reducing needle-stick injuries. ▸ Launch HCV prevention campaign. ▸ Monitor emerging science investigating the relationship between infectious agents and cancer. ▸ Continue epidemiologic studies examining HCC risk and efforts to explore whether there are predictive markers or co-factors among HCV-infected persons.
Published Literature	▸ Research evaluating community education strategies includes culturally tailored interventions for Asian Americans to improve knowledge of HBV and increase HBV screening. • Two studies implemented lay health worker interventions that included baseline and follow-up community-based surveys to assess knowledge of HBV and receipt of HBV serologic testing, in-home educational sessions focusing on HBV, and dissemination of educational materials. One study targeted Cambodian American adults.[19] The other study targeted Hmong American adults and included patient navigators, who offered transportation to healthcare facilities for participants in need of testing or follow-up for positive results.[20] Both studies reported increased knowledge of HBV and serologic testing for the virus among groups assigned to the HBV interventions. • Another study used a lecture format to provide community-based HBV education in nine Asian communities, conducted pre-and posttest assessments of HBV knowledge, and offered participants serologic testing.[21,22] The researchers reported improved knowledge of HBV and its transmission at posttest. ▸ Recommendations for developing provider and community education programs include: • Develop and disseminate health education programs for the general public, high-risk populations, and policymakers through awareness campaigns, health communication activities, and community outreach. The purposes of these programs would be to promote education and knowledge about HCV risk factors, prevention, and transmission; to emphasize the importance of testing and counseling as well as medical management of infection to prevent chronic liver disease; and to identify clinical facilities that offer integrated care and services to infected individuals.[16] • Create a professional training program for healthcare and social service providers that focuses on the prevention, detection, and medical management of persons infected with HCV, HBV, and HIV to help them deliver better services to these patients.[16] • Conduct patient education in a culturally sensitive manner in the patient's primary language (both written and oral), whenever possible. Ideally, bilingual, bicultural, medically trained interpreters should be used when indicated.[18]

Immunization

CCC Plans	
	▸ Continue birth dose and school requirements for HBV vaccination. ▸ Promote vaccination programs and requirements in schools and hospitals. ▸ Implement vaccine reminder and recall systems targeted at providers and clients in pediatric and primary care provider offices. ▸ Implement provider assessment and feedback quality improvement processes. ▸ Implement provider reminder systems to discuss vaccines with parents or guardians. ▸ Implement standing provider orders for HBV vaccination. ▸ Improve health professional knowledge, practice behaviors, and system support related to increasing provision of, or referral to, immunization against HBV. Evidence-based strategies may include: • Enhancing access to vaccination services through home visits, cost reductions, and vaccination programs in nontraditional settings. • Increasing community demand through incentives, reminder systems, and vaccine requirements for childcare, schools, and colleges. • Implementing provider or system-based intervention that includes immunization information tests, provider assessments, and feedback and standing orders. ▸ Work with relevant partners to help implement effective primary-prevention policy, including HBV vaccine policies. ▸ Increase the proportion of newborns getting a birth dose of the HBV vaccine by educating birth hospitals about the importance of the dose in improving rates of vaccine series completion. ▸ Maintain 2-year-old HBV coverage at 95% by assuring the public of the efficacy and safety of the HBV vaccine, and promoting its full use. ▸ Encourage the use of immunizations—including influenza, pneumococcus, diphtheria-tetanus-pertussis, and HBV—as recommended by evidence-based guidelines in all cancer and transplant survivors, unless contraindicated by the cancer survivor's healthcare provider. ▸ Get the recommended cancer preventive immunizations, such as HBV. ▸ Institute reminder-recall systems in healthcare settings to increase the use of the HBV vaccine according to evidence-based guidelines. ▸ Ensure access to HBV vaccines for persons and communities at risk. ▸ Promote the use of the HBV vaccine in venues where people who are at risk for HBV access services, such as sexually transmitted disease clinics and needle exchange programs. ▸ Achieve completed HBV vaccination series in 90% of 2-year-old children. ▸ Promote the increase of pediatric and adult HBV vaccinations. ▸ Work with the Regional Comprehensive Cancer Program to implement the HBV vaccination program. ▸ Continue requirement of HBV vaccination for infants within six months of birth and for all students entering the seventh grade who were born before 1994. ▸ Assess, monitor, promote, and provide HBV vaccination series for people of all ages to prevent one type of liver cancer. ▸ Reduce the out-of-pocket expense for vaccination. ▸ Support vaccination programs in schools. ▸ Encourage parent reminder and recall systems. ▸ Increase awareness of the value of vaccination. ▸ Support vaccination requirements for child care, school, and college attendance. ▸ Continue support for vaccination of children against HBV in accordance with CDC guidelines.

	▸ Increase efforts to identify and vaccinate adults at risk for HBV and HCV. ▸ Support research in developing a vaccine against HCV. ▸ Increase provider participation and improve completion of vaccination protocols in the statewide immunization information system. ▸ Promote the universal HBV birth dose program and the importance of the HBV vaccine. ▸ Implement policy, systems, and environmental change and other evidence-based strategies that address infectious disease causes related to cancer. Evidence-based strategies may include: • Conducting a statewide awareness campaign on the link between infectious diseases and cancer risk. • Informing decision-makers about the effect of making the state immunization registry an opt-out program, and to use the registry for adults. • Implementing evidence-based programs that promote immunization of high-risk adults against HBV. • Promote demonstration projects and research on screening for liver cancer. ▸ Improve health professional knowledge, practice behaviors, and system support related to increasing provision of or referral to immunizations against HBV. ▸ Develop partnerships between health department and community organizations to develop a community education plan and educational materials on the hepatitis vaccine. ▸ Coordinate with Indian Health Service, clinics, health departments, and school programs on the availability of the HBV vaccine.
Published Literature	▸ CDC's recommendation to screen foreign-born Asians and Pacific Islanders for HBV informed development of one intervention.[23] A local health department collaborated with a university-based liver center for Asians to develop and implement a program offering low-cost HBV and HAV vaccinations, as well as free HBV serologic testing.[24] They targeted primarily foreign-born Chinese adults through ads in local media, cultural festivals, and community-based organizations. The researchers reported that most adults whose screening revealed they were unprotected against HBV subsequently completed the vaccine series (with or without HAV vaccination). ▸ An early study of a mass immunization program in Taiwan against HBV infection in infants of HBV surface antigen-carrier mothers concluded that vaccination was one of the most effective ways to prevent HCC associated with chronic HBV.[25]

Viral Hepatitis Services

CCC Plans	HBV ▸ Revise and update policies and procedures for screening program. ▸ Work with partners to identify who is not being screened, and target those populations. ▸ Expand HBV screening to other programs. ▸ Provide training to state cancer program staff and key clinical staff regarding recommended screening methods and technology. ▸ Work with relevant partners to help implement effective primary-prevention policy, including HBV vaccine policies. ▸ Promote the use of the HBV vaccine in venues where persons who are at risk for HBV access services, such as STD clinics and needle exchange programs. ▸ Increase efforts to identify and vaccinate adults at risk for HBV. ▸ Encourage the development of clinical trials that seek to improve survival in people diagnosed with HCC and to develop safe and effective antiviral drugs to treat people chronically infected with HBV. ▸ Consider establishing regulations to reduce HBV transmission that can occur in establishments engaged in tattooing, body piercing, or similar practices. ▸ Develop partnerships between health departments and community organizations to create community education plans and educational materials on the HBV vaccine. HCV ▸ Implement standing provider orders for HCV testing of adults born between 1945 and 1965 and those considered high risk. ▸ Promote access and coverage for hepatitis C treatment among public and private health plans. ▸ Promote evidence-based harm reduction through needle exchange programs, increasing the number of municipalities allowing needle exchange programs designed to educate injection drug users about infection prevention, supply sterile needles and syringes, and offer referral to substance use treatment. ▸ Support for HCV screening and treatment at tribal clinics. ▸ Increase efforts to identify adults at risk for HCV. ▸ Encourage the development of clinical trials that seek to improve survival in persons diagnosed with HCC and to develop safe and effective antiviral drugs to treat persons chronically infected with HCV. ▸ Consider establishing regulations to reduce HCV transmission that can occur in establishments engaged in tattooing, body piercing, or similar practices.
Published Literature	▸ One study assessed the effectiveness of electronic health record prompts to increase HBV testing in Chinese and Vietnamese patients within an academic health system.[26] Providers were more likely to order HBV surface antigen tests for patients when prompts were used. ▸ Studies conducted by Bastani et al.,[27] Taylor et al.,[19] and Chen et al.[20] described educational interventions conducted with Korean, Cambodian, and Hmong Americans, respectively, with the purpose of increasing the number of individuals who get tested for HBV. Each intervention included a culturally relevant educational session that reviewed HBV, liver cancer, and the importance of getting tested, as well as HBV vaccination. The study conducted by Chen and colleagues also included patient navigators who offered to take participants to a healthcare provider for testing and follow-up for those who received positive test results. Researchers followed up with participants six months post-intervention for each of these studies. All three interventions found that the intervention group was significantly more likely to report receiving an HBV test than the control group.

PUTTING STRATEGIES INTO ACTION: HIGHLIGHTS FROM NCCCP AWARDEES

From May 2017 through April 2018, two NCCCP awardees worked in partnership with CDC to plan and implement HBV- and HCV-related liver cancer prevention activities that aligned with recommendations in the 2010 IOM report. The purpose of the activities was to increase awareness and knowledge among healthcare providers, public health professionals, and community coalition members about the need to address viral hepatitis as a key risk factor for liver cancer. The anticipated outcome of this work was to identify promising strategies for liver cancer prevention that can be adopted and implemented in other NCCCP awardees.

STEPS FOR PUTTING LIVER CANCER PREVENTION STRATEGIES INTO ACTION

1. Assess the burden and define the need.
2. Choose the relevant strategy (or strategies).
3. Identify key partners needed to implement the strategy successfully.
4. Implement the strategy.
5. Measure success through evaluation.

Cherokee Nation Health Services

Background and Context

The mission of the Cherokee Nation Comprehensive Cancer Control Program is to:

- Implement a comprehensive and coordinated approach to inform policy, systems, and environmental change strategies to prevent and control cancer.
- Research and implement evidence-based strategies and best practices that will reduce the cancer mortality rate of the American Indians who reside in the Cherokee Nation.
- Develop, maintain, evaluate, and renew programs, resources, and interventions that will ensure the Cherokee Nation's capacity to diminish the cancer burden.
- Expand the knowledge base in medical, clinical, hospital, and community settings regarding cancer issues among Cherokee Nation citizens in order to promote prevention, decrease mortality, and increase quality of life for Cherokee people.

Cherokee Nation Health Services (CNHS) implemented an HCV screening and treatment program in 2013[28] that evolved into an HCV elimination program that began in 2015. The goals of the program are to expand HCV screening, establish programs that link to care, treat and cure patients with HCV, and implement harm-reduction interventions.

Need

HCC incidence more than tripled in the United States between 1976 and 2011, and the highest incidence is among American Indians/Alaska Natives.[29] More than 1,900 patients who are 20 to 69 years old are estimated to have chronic HCV in CNHS, of which approximately 1,300 have been identified.[30] Data show that approximately 23.8% of these patients have cirrhosis, and many of those

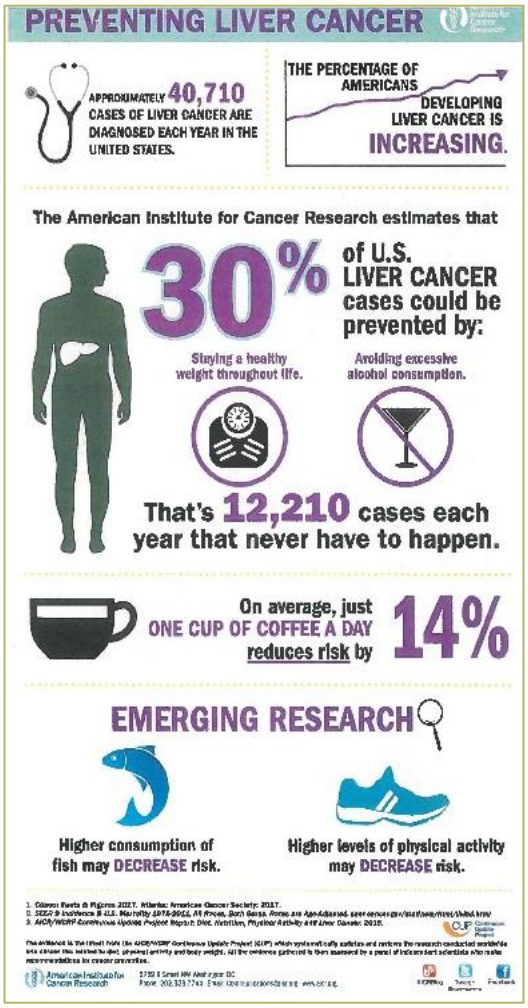
will go on to develop liver cancer.[28] In 2014, the incidence of liver cancer among American Indians in Cherokee Nation was 12.2 per 100,000 people, and the mortality rate was 9.3 per 100,000 people.[31]

Partnerships

In July 2017, the CNHS CCC program initiated a partnership with the CNHS Infectious Disease department, which leads the HCV elimination program. The two groups collaborated to plan, implement, and evaluate activities to increase knowledge and awareness of HCC among healthcare providers and the Cherokee Nation community. The CCC program was responsible for community outreach, and the Infectious Disease department was responsible for educating CNHS providers on HCC epidemiology, diagnosis, and surveillance. The Infectious Disease department also provided HCV screening services. Although lead staff from the CCC program and Infectious Disease department had collaborated on previous work, this was the first official partnership between the two programs.

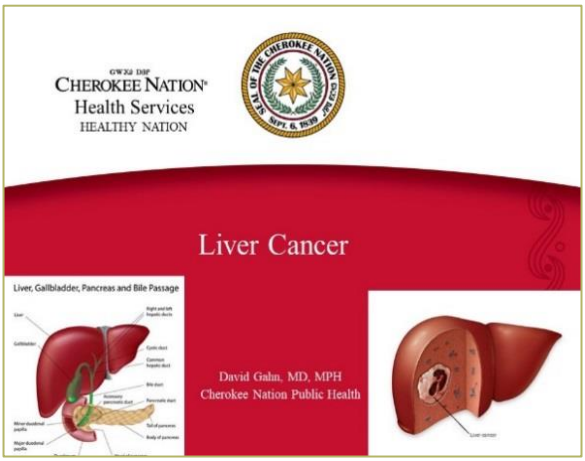
Program Strategies

The CNHS CCC and Infectious Disease programs implemented liver cancer prevention strategies between August 2017 and April 2018. Their prevention strategies fell within two categories of recommendations from the 2010 IOM report: **provider and community education** and **viral hepatitis services**. Examples of these strategies, including infographics and presentation slides, are shown below, and the strategies are described in Tables 2 and 3 on the next page.

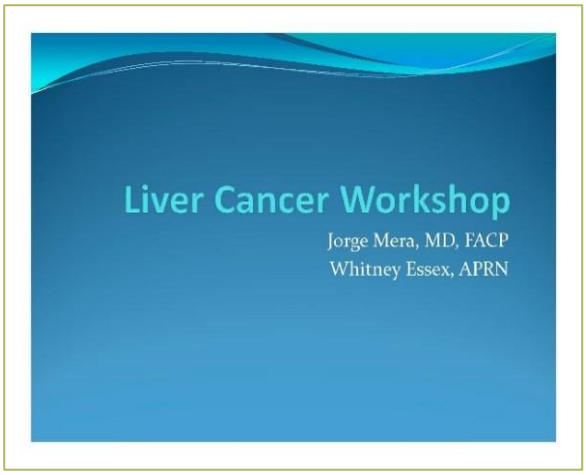


Infographic included in patient education packet*

**infographic developed by the American Institute for Cancer Research*



Presentation slides for community coalition meetings



Presentation slides for monthly ECHO meetings and provider education workshops

Table 2: Strategies Related to Provider and Community Education

Activity	Description	CNHS Lead
Conduct monthly ECHO[1] meetings	Fifteen-minute didactic sessions were conducted during eight ECHO clinics. Topics presented included incidence and prevalence of HCC, risk factors for and diagnosis of HCC, diagnosis of cirrhosis, and HCC surveillance.	Infectious Disease
Facilitate provider education sessions	Eight provider education workshops were conducted; one at CNHS hospital and the remaining seven at CNHS outlying clinics. Each workshop was two hours long. Topics included incidence and prevalence of HCC, risk factors for and diagnosis of HCC, diagnosis of cirrhosis, and HCC surveillance.	Infectious Disease
Conduct community coalition meetings	Five presentations at community coalition meetings were conducted in different venues and geographic locations. Each presentation was approximately 30 minutes long and intended for the general community. Topics included an overview of liver cancer, risk factors, prevention, diagnosis, and symptoms of liver cancer.	CCC
Distribute small media	6,000 trifold brochures were distributed to the local community and CNHS clinics. Information included in the brochures was adapted from the American Cancer Society and addressed information about liver cancer prevention, diagnosis, and risk.	CCC
Disseminate patient education packets	2,000 patient education packets were disseminated to patients with cirrhosis or who were at risk for developing cirrhosis. The packets included resources from the American Cancer Society and CDC, and included information about liver cancer risk factors, prevention of liver cancer, and viral hepatitis.	Infectious Disease

Table 3: Strategies Related to Viral Hepatitis Services

Activity	Description	CNHS Lead
Purchase and distribute HCV screening kits	400 HCV screening kits were purchased and distributed to one dental clinic to conduct HCV screening.	Infectious Disease

Measuring Success

Across the activities implemented, most participants reported an improvement in awareness of and knowledge about liver cancer prevention, especially as it relates to liver cancer statistics, the relationship between viral hepatitis and liver cancer, and ways that liver cancer can be prevented. Healthcare providers reported an improved ability to identify patients at risk for viral hepatitis and HCC, as well as an improvement in their intentions to talk to their patients about that risk. Among community participants, there was an improvement in ability and intention to talk to their healthcare

[1] The CNHS Infectious Disease group at Hastings Hospital facilitates twice-monthly teleconferences (via Lync) with CNHS providers that participate in Project Extension for Community Healthcare Outcomes (ECHO). Project ECHO is a collaborative model of education and care management that brings together healthcare providers in an effort to increase access to specialty treatment in rural and underserved areas (https://echo.unm.edu).

provider about their risk for liver cancer and getting tested for viral hepatitis. CNHS also provided HCV screening to 390 dental patients, 12 (3.1%) of whom received a positive HCV test result. All of these patients were immediately linked to an HCV ECHO provider for confirmatory (HCV RNA) testing.

Facilitators and Challenges in Planning and Implementation

CNHS experienced both facilitators and challenges in the implementation of their liver cancer prevention strategies. These are provided in Tables 4 and 5 below.

Table 4: Facilitators and Barriers in Implementing Strategies Related to Provider and Community Education

Activity	Facilitator	Challenge
Conduct monthly ECHO meetings	▸ Regularly scheduled meeting times with providers interested in the topic and who provide care for a relevant patient population increased participation rates and resulted in a captive audience and great discussion. ▸ Access to evaluation resources and expertise was essential to implementing and evaluating this activity.	▸ Developing the PowerPoint presentation used for didactic sessions and provider education workshops was time consuming.
Facilitate provider education sessions	▸ An established relationship with clinic directors facilitated scheduling of the workshops and helped boost attendance. Scheduling workshops during breakfast or lunch and providing food for participants also increased session attendance.	▸ Scheduling workshops was difficult, as session dates and times needed to be convenient for most providers in the clinic.
Conduct community coalition meetings	▸ Involving CNHS' public health educators in the coordination of coalition meetings ensured that the liver cancer prevention presentations were added to the agendas and space was identified for each meeting. ▸ Access to audiovisual equipment and printing resources made printing and disseminating information easier. ▸ A meeting facilitator with a flexible schedule helped accommodate the busy schedules of meeting participants. ▸ Access to evaluation resources and expertise ensured that outcomes could be measured.	▸ The competing responsibilities of public health educators made it difficult for them to dedicate a substantial amount of time for coordination of pilot activities. ▸ Facilitators spent approximately 2–3 hours traveling to each coalition meeting, which made scheduling difficult. ▸ Attendance was low at some meetings, possibly because of limited advertising or promotion of the presentations.
Distribute small media	▸ Access to a Cherokee Nation communications specialist helped in the design of the trifold pamphlet and ensured that it had cultural relevance.	▸ Insufficient funding was available for this activity, which limited CNHS' ability to design and print the trifold as envisioned.
Disseminate patient education packets	▸ N/A	▸ Limited availability of relevant educational resources made it difficult to identify appropriate materials to include in packets.

Table 5: Facilitators and Barriers in Implementing Strategies Related to Viral Hepatitis Services

Activity	Facilitator	Challenge
Purchase and distribute HCV screening kits	▸ The support of the dental clinic director was essential to successful implementation of this activity. The clinic director worked with the CNHS team to plan for and implement HCV screening and ensure that staff members were trained to screen patients.	▸ CNHS dental clinic records are not housed on the same electronic health record system as the medical clinic records, which made data collection difficult. Staff had to manually document screening in dental records, and a licensed transcriptionist had to enter the information into patients' medical records.

Lessons Learned

NCCCP awardees considering similar work can:

- Start small. CNHS successfully planned and implemented six unique liver cancer prevention activities simultaneously. However, both the CCC program and the Infectious Disease department found that this was a demanding workload, and they suggest focusing on just one or two activities at a time.
- Be realistic about the resources required (e.g., time, staff). Planning and implementation of pilot activities took a significant amount of time. CNHS reported that it had to continuously shuffle priorities in order to conduct the provider education sessions, train dental clinic staff to conduct HCV screening, and complete other time-intensive tasks associated with the pilot. In addition, there were many administrative tasks associated with the pilot (e.g., monthly reporting requirements, scheduling workshops, ordering and delivering food, completion of data tracking sheets). As a result, the CNHS team included an administrative staff member to ensure completion of these tasks.
- Be thoughtful and deliberate about advertising and promoting the planned activities. CNHS found that devoting time and resources to promoting meetings and workshops is essential to increasing attendance at these events.
- Identify and maximize resource efficiencies where possible. For both the CCC program and the Infectious Disease department, a significant amount of time was spent independently developing content for presentations. In future collaborations, the groups can work together to develop presentation content that fits the needs and intended audiences for all planned activities.

Suggested Resources

- Cancer Overall in the Cherokee Nation
- Causes of Mortality in Cherokee Nation: 2016 Brief Report
- Identification and Clinical Management of Persons with Chronic Hepatitis C Virus Infection — Cherokee Nation, 2012–2015.

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Idaho Department of Health and Welfare

Background and Context

The Idaho Comprehensive Cancer Control Program (ICCCP) works to address cancer through prevention, early detection, and survivorship activities. ICCCP's efforts help to:

- Reduce cancer risk
- Find cancers earlier
- Improve treatments
- Increase the number of people who survive cancer
- Improve quality of life for cancer survivors

Need

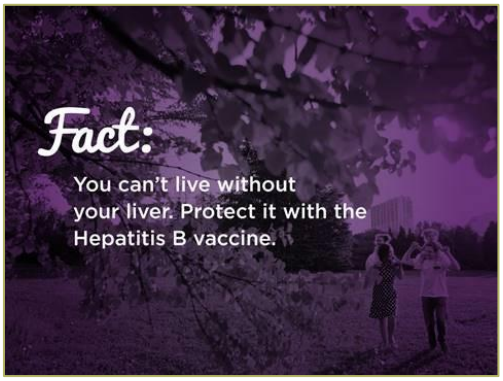
Ahead of national trends, cancer has been the leading cause of death in Idaho since 2008. In the same year, 2,789 Idahoans died from cancer. Liver cancer is ranked ninth for cancer mortality, with a rate of 5.3 deaths per 100,000 Idahoans.[32] Child National Immunization Survey vaccination data for Idaho showed that rates of the HBV birth dose decreased from 2014 to 2015 and are well below the Comprehensive Cancer Alliance for Idaho's goal of 85%.[33]

Partnerships

In April 2017, ICCCP partnered with the Idaho Immunization Program (IIP) to plan, implement, and evaluate activities intended to increase awareness and knowledge among the general public and healthcare providers about the importance of HBV vaccination in preventing liver cancer. The IIP is within the same division (public health) as ICCCP and works to reduce the incidence of vaccine-preventable diseases, manages the state immunization reminder system, coordinates trainings for medical providers, and educates the public on the importance of immunizations. The two programs had been working together to increase immunization for human papillomavirus and were eager to continue their partnership. The collaboration of these two programs is a step forward in meeting the Division of Public Health's strategic priority of increasing cross-bureau collaboration. The programs also had access to an external marketing contractor through a previous project.

Program Strategies

The ICCCP and IIP programs implemented liver cancer prevention strategies from August through December 2017. Their prevention strategies fell within two categories of recommendations from the 2010 IOM report: **provider and community education** and **immunization**. These strategies are described in Tables 2 and 3 on the next page, and examples from the print and social media campaign are shown below.



Examples of graphics developed for Idaho's print and social media campaign

Table 6: Strategies Related to Provider and Community Education & Immunization

Activity	Description
Print and social media campaign	New digital and print marketing content on liver cancer and HBV vaccination was developed and distributed throughout Idaho. This included a liver cancer infographic, two 11X14 posters resized from the infographic, 10–15 social media graphics, and a short form video. Print materials were distributed at Booster Shots workshops (described below); social media content was disseminated via Facebook.
Liver cancer and HBV presentations to healthcare providers	Booster Shots 2017 were immunization education workshops for healthcare providers, nurses, and office staff. These workshops, hosted by IIP, were held regionally throughout Idaho and provided updates and education about immunization best practices. During each of the six workshops, ICCCP staff led a 20-minute presentation on vaccine-preventable cancers and ways to increase vaccination rates in practice.
Informational table at Booster Shots immunization workshops	At each of the six Booster Shots workshops, print materials developed for this project were disseminated at an informational table staffed by ICCCP. Resources provided also included HBV fact sheets for healthcare providers, handouts for parents, and educational posters for the general public.

Measuring Success

Evaluation of the project demonstrated that the activities increased knowledge and awareness of liver cancer and HBV vaccination trends in Idaho among healthcare providers. The results also demonstrated that the general public's knowledge and awareness about the importance of HBV vaccination in preventing liver cancer improved. Healthcare providers also reported an increase in intentions to implement evidence-based interventions to increase vaccination and utilize existing resources to educate patients and promote HBV vaccination. Program staff reported that providing information tables at provider presentations was an effective way for ICCCP and IIP to network with healthcare providers. Social media was also an effective method to generate the greatest public reach of cancer prevention messages for the lowest cost.

Facilitators and Challenges in Planning and Implementation

Idaho experienced both facilitators and challenges in the implementation of their liver cancer prevention strategies. These are provided in Table 7 on the next page.

Table 7: Facilitators and Barriers in Implementing Strategies Related to Provider and Community Education & Immunization

Activity	Facilitator	Challenge
Pilot implementation	▸ ICCCP and IIP are housed within the same division, allowing for ease in planning and coordinating tasks. Additionally, because cross-bureau collaboration is a strategic priority for the division, the continued partnership between ICCCP and IIP was encouraged. This facilitated quick approval from bureau and division leadership, when needed.	
Print and social media campaign	▸ Having access to an external marketing firm was key in development of print and social media materials. Because ICCCP had worked with the firm previously on development of educational materials, some of those resources were easily adapted for this project.	▸ Because the external marketing firm responsible for developing print and social media content worked across multiple programs beyond the ICCCP and IIP, delays in developing print and social media were inevitable. ▸ Social media posts received some negative comments from members of the general public who were opposed to vaccination, especially when the posts were related to HBV vaccination in newborns.
Informational table at Booster Shots immunization workshops		▸ Traffic at the Booster Shots information tables was not as heavy as anticipated; therefore, print materials were not disseminated at the volume ICCCP had anticipated. ICCCP determined that print materials may not be the most efficient way to distribute information in the future.

Lessons Learned

NCCCP awardees considering similar work should:

- Identify opportunities to engage the healthcare provider audience. For ICCCP, partnering with the IIP and its regional Booster Shots workshops was an effective way to capitalize on educating healthcare providers already committed to attending an existing event.
- Utilize social media as a resource-efficient way to disseminate liver cancer prevention messages. For ICCCP and IIP, social media activities generated the greatest reach of HBV and cancer prevention messages at the lowest costs. Boosting of posts, which adds a small cost, is also a worthwhile investment to increase reach and engagement. ICCCP and IIP will continue to utilize social media to relay educational messages to the general population.
- In advance of posting social media content related to HBV vaccination, determine an approach for responding to negative feedback. Based on their experiences with responding to negative comments from individuals and groups opposed to vaccination, ICCCP and IIP learned that it is important to have a standardized operating policy in place to address negative feedback received during social media campaigns. ICCCP and IIP staff worked together to address this challenge and not engage with individuals responsible for these posts.

- Consider audience preferences for receipt of educational materials prior to development. Print materials were not heavily utilized by healthcare providers. For future campaigns, ICCCP will continue to focus on new content development, but the final product will primarily be available electronically.

Suggested Resources

- Idaho Comprehensive Cancer Strategic Plan 2016–2020
- Cancer Data Registry of Idaho—Annual Reports

For More Information

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FUTURE DIRECTIONS

While NCCCP awardees have made progress in addressing viral hepatitis as a key risk factor for liver cancer, they are encouraged to build and diversify their work in this area. In addition, NCCCP awardees are encouraged to stay abreast of other emerging trends contributing to the increasing incidence of liver cancer and liver cancer-related deaths.

The national increase in acute HCV infection is associated with the nation's opioid epidemic.[34] The national increase in acute HCV infection is associated with the nation's opioid epidemic. Increasing awareness among people who inject drugs of their risk for both HBV and HCV and the connection between chronic viral hepatitis and liver cancer is essential. Perhaps even more critical is finding opportunities to screen injection drug users for HBV and HCV and linking those who test positive to appropriate follow-up and treatment.

In addition, recent data has shown that between 1999 and 2016 annual deaths from HCC doubled, and this increase was driven predominantly by alcohol-induced disease.[35] The 2015 review of CCC plans indicated that few NCCCP awardees were planning liver cancer prevention activities related to alcohol; those that had developed relevant objectives focused on promoting limited alcohol use, reducing misuse, discouraging excess use or binge drinking, and reducing consumption beyond recommended levels.[14]

Finally, increases in obesity and type 2 diabetes over the past several decades have also likely contributed to the increasing liver cancer trend, because of these factors' association with nonalcoholic fatty liver disease and nonalcoholic steatohepatitis.[4] The rise in alcohol misuse, obesity, and type 2 diabetes and their connection to liver cancer are issues well within the purview of NCCCP awardees and their partners to address.

The NCCCP is well-positioned to raise awareness of the growing incidence of liver cancer and the critical role that prevention efforts can play in reducing future incidence and liver cancer-related morbidity and mortality. The successes of both CNHS and Idaho in their implementation of liver cancer prevention activities further attest to this point. Their identification of, and engagement with, relevant

partners in this work is a promising model that can be utilized by other NCCCP awardees interested in putting similar strategies into action, thus contributing to the prevention of liver cancer.

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APPENDIX 1. RECOMMENDATIONS LISTED IN THE 2010 IOM REPORT

In 2010, the Institute of Medicine (IOM, now the National Academies of Sciences, Engineering, and Medicine) report *Hepatitis and Liver Cancer: A National Strategy for Prevention and Control of Hepatitis B and C* (hereafter the 2010 IOM report) stated that there are several barriers to HBV and HCV prevention and control efforts, including a lack of knowledge and awareness about chronic viral hepatitis among healthcare providers, at-risk populations, and the public.[1] The report provided the following four categories of recommendations for improving the prevention and control of chronic HBV and HCV:

1. Improve viral hepatitis surveillance.
2. Improve provider and community education to increase knowledge and awareness of HBV and HCV.
3. Increase support for vaccine-based strategies (immunization) to eliminate HBV transmission.
4. Integrate and enhance viral hepatitis services, including risk factor screening and serologic testing.

The information below includes the recommendations in each of the four categories drawn verbatim from the 2010 IOM report.

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.

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.
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.
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 of hepatitis B virus and hepatitis C virus infections in populations not fully captured by core surveillance.

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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 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.

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.
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.

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) receive hepatitis B immune globulin and a first dose of the hepatitis B vaccine within 12 hours of birth.

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.
Recommendation 4-2	All states should mandate that the hepatitis B vaccine series be completed or in progress as a requirement for school attendance.
Recommendation 4-3	Additional federal and state resources should be devoted to increasing hepatitis B vaccination of at-risk adults.
Recommendation 4-4	States should be encouraged to expand immunization-information systems to include adolescents and adults.
Recommendation 4-5	Private and public insurance coverage for hepatitis B vaccination should be expanded.
Recommendation 4-6	The federal government should work to ensure an adequate, accessible, and sustainable hepatitis B vaccine supply.
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, 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.

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.
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.
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.
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.
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.
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.
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.
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.
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.
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.

APPENDIX 2. RESOURCES FOR IMPLEMENTING INTERVENTIONS IDENTIFIED IN THE PUBLISHED LITERATURE

To supplement the 2015 review of Comprehensive Cancer Control plans, a review of published literature was conducted to identify additional liver cancer prevention activities related to hepatitis B virus and hepatitis C virus that could potentially be used by National Comprehensive Cancer Control Program awardees and coalitions moving forward. Resources needed to implement those interventions also were identified. The resources identified relate to three of the categories of recommendations from the 2010 IOM report—**provider and community education, immunization,** and **viral hepatitis services**—and are included in the table below.

Provider & Community Education

Citation	Intervention Target	Intervention Type/ Description	Resources for Implementing Intervention
Maxwell, A. E., Bastani, R., Glenn, B. A., Taylor, V. M., Nguyen, T. T., Stewart, S. L., et al. (2014). Developing theoretically based and culturally appropriate interventions to promote hepatits B testing in 4 Asian American populations, 2006–2011. Preventing Chronic Disease, 11, 130245.	Asian Americans	**Health Behavior Framework Interventions:** Description of the approach used in 4 community based research projects in 4 different Asian American groups conducted from 2006-2011 in California and Washington State to develop theoretically based and culturally appropriate interventions to promote hepatitis B testing.	N/A
Chao, S., Chang, E., Le, P., Prapong, W., Kiernan, M., & So, S. (2009). The Jade Ribbon Campaign: A model program for community outreach and education to prevent liver cancer in Asian Americans. Journal of Immigrant & Minority Health, 11(4), 281–290 10p. doi:10.1007/s10903-007-9094-2	Asian Americans	**Mass Media Campaign:** The Jade Ribbon Campaign was a culturally targeted, community based outreach program used to promote the prevention, early detection and management of chronic HBV and liver cancer among Asian Americans.	▸ Costs associated with free HBV screening ▸ Materials for educational seminars ▸ Development and dissemination of public service announcements in newspapers geared towards the target audience ▸ Staff (e.g., undergraduate staff and interns to assist with clinic coordination activities, trained phlebotomists) ▸ Costs for development and printing intervention materials (e.g., consent forms, 15-item questionnaire, ethnically and culturally-focused brochures

			that include information about HBV risks)
Citation	**Intervention Target**	**Intervention Type/ Description**	**Resources Needed to Implement Intervention**
Marineau, M., Tice, A. D., Taylor-Garcia, D., Akinaka, K. T., Lusk, H., & Ona, F. (2007). Culturally sensitive strategies designed to target the silent epidemic of Hepatitis B in a Filipino community. Hawaii Medical Journal, 66(6), 154–156.	Filipino Americans	**Community Health Fair:** A community health fair used to educate the Filipino community about HBV, liver cancer and cirrhosis aimed at addressing viral hepatitis among high risk populations in Hawaii. Free blood tests were offered for hepatitis B and C and a survey assessed data related to risk factors.	▸ Staff ▸ Participation in a community health fair or event ▸ Costs for a health care booth ▸ HBV and HCV blood test screening materials ▸ Educational materials, surveys, informed consent documents
Hsu, C. E., Zhang, G., Yan, F. A., Shang, N., & Le, T. (2010, June). What made a successful hepatitis B program for reducing liver cancer disparities: An examination of baseline characteristics and educational intervention, infection status, and missing responses of at-risk Asian Americans. Journal of Community Health, 35(3), 325–335.	Asian Americans	**Education and Screening Intervention:** Community-based hepatitis B education and prevention program offered through lectures to reduce cancer health disparities of Asian Americans.	▸ Staff to conduct lectures on prevention of HBV ▸ Cost for development and printing of intervention materials (e.g., pre- and posttests, educational materials, supplies to conduct HBV screening) • Educational materials adopted from the Asian Liver Center of Stanford University : http://liver.stanford.edu/
Hsu, C., Liu, L., Juon, H., Chiu, Y., Bawa, J., Tillman, U., et al. (2007). Reducing liver cancer disparities: A community-based hepatitis-B prevention program for Asian-American communities. Journal of the National Medical Association, 99(8), 900–907.	Asian Americans	**Education and Screening Intervention:** Culturally and linguistically appropriate Asian health education materials delivered to the healthcare providers and the community.	▸ Staff to conduct the health education, screening and vaccination components the intervention ▸ Funding for screening and vaccination ▸ Cost for development and printing of intervention materials (e.g., HBV screening and vaccination materials, pre- and posttest questionnaires, culturally and linguistically education materials)
Juon, H. S., Lee, S., Strong, C., Rimal, R., Kirk, G. D., & Bowie, J. (2014). Effect of a liver cancer education program on hepatitis B screening among Asian Americans in the Baltimore-Washington metropolitan area, 2009–2010. Preventing Chronic Disease, 11, 130258.	Asian Americans	**Education and Screening Intervention:** A culturally integrated, 30 minute liver cancer education program developed using the PRECEDE-PROCEED (cost-benefit evaluation framework) planning model.	▸ Staff to conduct recruitment and data collection activities ▸ Materials (i.e., educational materials)

Citation	Intervention Target	Intervention Type/ Description	Resources Needed to Implement Intervention
Juon, H., Strong, C., Oh, T., Castillo, T., Tsai, G., & Oh, L. (2008). Public health model for prevention of liver cancer among Asian Americans. Journal of Community Health, 33(4), 199–205.	Asian Americans	**Education and Screening Intervention:** A faith-based HBV program, which educates, screens and vaccinates for HBV.	▸ Culturally integrated educational materials (e.g., booklet, Hepatitis B Initiative of Washington DC (HBI-DC) guidebook, awareness slides, and DVDs) ▸ Staff (i.e., volunteer coordinators at churches—clinical and administrative) • Staff availability for 3 training sessions that build on each other ▸ Cost for development and printing of intervention materials
Ma, G. X., Zhang, G. Y., Jung, M. Y., Ma, X. S., Zhai, S., Zhao, M., et al. (2015). HCV screening behaviors and infection status among Vietnamese Americans. American Journal of Health Behavior, 39(5), 640–651.	Vietnamese Americans	**Education and Screening Intervention:** An educational intervention delivered in workshop format that covers general information about HCV and liver cancer including transmission, the course of the disease, and risk factors.	▸ Staff to coordinate collaboration with Vietnamese CBOs, deliver intervention, conduct data collection, schedule workshop etc. ▸ Materials (e.g., baseline and post-intervention questionnaires, HCV specific educational materials)
Norton, B. L., Voils, C. I., Timberlake, S. H., Hecker, E. J., Goswami, N. D., Huffman, K. M., et al. (2014). Community-based HCV screening: Knowledge and attitudes in a high risk urban population. BMC Infectious Diseases, 14, 74	High-risk participants enrolled from homeless shelters, drug rehabilitation centers, and a women's drop-in center	**Education and Screening Intervention:** An educational assessment of attitudes about HCV screening and knowledge about HCV disease administered at several community-based testing sites that serve high-risk populations.	▸ Materials (pre- and post-intervention surveys, educational intervention materials including a spiral-bound flip-book with diagrams) ▸ Staff

Citation	Intervention Target	Intervention Type/ Description	Resources Needed to Implement Intervention
Taylor, V. M., Hislop, T. G., Tu, S. P., Teh, C., Acorda, E., Yip, M. P., et al. (2009). Evaluation of a hepatitis B lay health worker intervention for Chinese Americans and Canadians. Journal of Community Health, 34(3), 165–172.	Chinese Americans	**Education and Screening Intervention:** Intervention aimed to improve levels of HBV serologic testing and HBV related knowledge among Chinese in North America.	▸ Linguistically appropriate materials for use in a hepatitis B lay health worker intervention (video available in various languages, pamphlet, print materials emphasizing the importance of hepatitis B serologic testing for individuals of Chinese decent) ▸ Staff to conduct educational and motivational home visits—During home visits, lay health workers systematically asked participants if they could watch the video together, offered participants a copy of the video and pamphlet, and showed participants the two visual aids ▸ Other materials (i.e., follow-up questionnaire)

Immunization

Citation	Intervention Target	Intervention Type/ Description	Resources Needed to Implement Intervention
Chang, E. T., Sue, E., Zola, J., & So, S. K. (2009). 3 For Life: A model pilot program to prevent hepatitis B virus infection and liver cancer in Asian and Pacific Islander Americans. American Journal of Health Promotion, 23(3), 176–181.	Asian/Pacific Islander Americans	**Low-cost Hepatitis B screening/vaccination:** A pilot program that offered low-cost HBV vaccination with free HBV testing.	▸ Costs associated with planning a community based event/symposia ▸ Cost of symposia for attendees $20-$45 ▸ Costs associated with offering free HBV serologic testing and reduced cost HBV vaccine

Viral Hepatitis Services

Citation	Intervention Target	Intervention Type/ Description	Resources Needed to Implement Intervention
Bastani, R., Glenn, B. A., Maxwell, A. E., Jo, A. M., Herrmann, A. K., Crespi, C. M., et al. (2015). Cluster-randomized trial to increase hepatitis B testing among Koreans in Los Angeles. Cancer Epidemiology, Biomarkers and Prevention.	Korean Americans	**Health Behavior Framework Intervention:** Intervention consisting of a single-session, small-group discussion supplemented by print materials. Content and format of the intervention and control sessions and the accompanying print materials were developed on the basis of extensive input and pilot testing with Korean church goers.	▸ Staff to assist with recruiting churches, collecting eligibility information and baseline data, and facilitating group discussions ▸ Printing costs for intervention materials (i.e., eligibility screener, baseline surveys, other print materials) ▸ Audiovisual intervention materials
Chen, M. S., Jr., Fang, D. M., Stewart, S. L., Ly, M. Y., Lee, S., Dang, J. H., et al. (2013). Increasing hepatitis B screening for Hmong adults: Results from a randomized controlled community-based study. Cancer Epidemiology, Biomarkers & Prevention.	Hmong Americans	**Health Behavior Framework Intervention:** A lay health worker intervention designed to promote HBV testing among 260 Hmong adults through in-home education and patient navigation.	▸ Staff to conduct eligibility screenings, home visits, etc. ▸ Costs for development and printing of intervention materials (e.g., data collection tools, materials needed for educational session, baseline and post-tests)
Taylor, V. M., Bastani, R., Burke, N., Talbot, J., Sos, C., Liu, Q., et al. (2013). Evaluation of a hepatitis B lay health worker intervention for Cambodian Americans. Journal of Community Health, 38(3), 546–553.	Cambodian Americans	**Health Behavior Framework Intervention:** A lay health worker intervention on HBV testing and knowledge among Cambodian Americans.	▸ Culturally and linguistically appropriate intervention materials (e.g., flipchart, pamphlets, DVD, and physical activity (PA) lay health worker (LHW) intervention) ▸ Staff to assist with intervention activities
Hsu, L., Bowlus, C. L., Stewart, S. L., Nguyen, T. T., Dang, J., Chan, B., et al. (2013). Electronic messages increase hepatitis B screening in at-risk Asian American patients: A randomized, controlled trial. Digestive Diseases and Sciencies, 58(3), 807–814.	Asian Americans	**Education and Screening Intervention:** Electronic health record (EHR) prompts to increase ordering of HBV tests among primary care providers (PCPs) within an academic health system.	▸ Electronic health record (EHR) ▸ Development of an electronic prompt and database to track screening data ▸ Staff (e.g., a hepatologist to send prompt to provider's EHR inbox, physician/provider)

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