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Hepatitis Awareness Month and Testing Day — May 2017

May 19th is National Hepatitis Testing Day in the United States to emphasize the importance of testing persons at risk for hepatitis B virus (HBV) and hepatitis C virus (HCV) infections, most of whom are unaware of their infection status. Recognizing the effectiveness of testing and other preventive and treatment measures, the National Academies of Science, Engineering, and Medicine recently set goals for the elimination of HBV and HCV as public health threats in the United States.*

HCV is the most common form of viral hepatitis in the United States and in 2013, accounted for approximately 19,000 deaths per year, a number that was greater than that of 60 other nationally notifiable infectious diseases combined (*1*). During 2010–2015, HCV incidence increased by 294% with the highest rates among young persons who inject drugs (PWID).†

This issue of *MMWR* includes two reports describing trends in HCV incidence and the availability of HCV prevention and treatment services that stop transmission. In the first report, only three states had comprehensive laws providing full access to HCV preventive and treatment services for PWID. The second report estimates rates of HCV infection among pregnant women in the United States and Tennessee; in the United States, HCV rates nearly doubled during 2009–2014, and in Tennessee, the rate in 2014 was approximately three times the national rate. Data from both reports emphasize the importance of viral hepatitis surveillance to identify communities at risk for HCV and public health policies that make available interventions that prevent HCV transmission and disease.

* http://www.nationalacademies.org/hmd/reports/2017/national-strategy-for-the-elimination-of-hepatitis-b-and-c.aspx.
† https://www.cdc.gov/hepatitis/statistics/index.htm.

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1. Ly KN, Hughes EM, Jiles RB, Holmberg SD. Rising mortality associated with hepatitis C virus in the United States, 2003–2013. Clin Infect Dis 2016;62:1287–8. https://doi.org/10.1093/cid/ciw111

State HCV Incidence and Policies Related to HCV Preventive and Treatment Services for Persons Who Inject Drugs — United States, 2015–2016

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Hepatitis C is associated with more deaths in the United States than 60 other infectious diseases reported to CDC combined. Despite curative hepatitis C virus (HCV) therapies and known preventive measures to interrupt transmission, new HCV infections have increased in recent years (*1*,*2*). Injection drug use is the primary risk factor for new HCV infections (*2*). One potential strategy to decrease the prevalence of HCV is to create and strengthen public health laws and policies aimed specifically at reducing transmission risks among persons who inject drugs. To evaluate factors affecting access to HCV preventive and treatment services, CDC assessed state laws governing access to safe injection equipment and Medicaid policies related

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to sobriety requirements for approval of HCV treatment for persons who inject drugs. Acute HCV incidence rates were obtained from CDC's National Notifiable Disease Surveillance System (NNDSS). States were categorized based on analysis of laws related to access to clean needles and syringes and Medicaid HCV treatment policies associated with sobriety requirements. In 2015, HCV incidence remained high in the United States, with rates in 17 states exceeding the national average. Three states were determined to have state laws and Medicaid policies capable of comprehensively preventing and treating HCV among persons who inject drugs. Opportunities exist for states to adopt laws and policies that could help increase access to HCV preventive and treatment services reducing the number of persons at risk for HCV transmission and disease.

HCV transmission primarily occurs through percutaneous exposure to blood; thus, injection drug use is an important risk factor (*3*). HCV incidence has increased 294% nationally from 2010 to 2015 (*4*). This increase in acute cases of HCV is largely attributed to injection drug use (*2*). Access to safe injection equipment for persons who inject drugs can prevent HCV infection (*3*), and HCV therapy can cure >90% of infected persons, thereby reducing the risk for HCV-associated mortality and transmission of HCV to others. State laws and policies can enhance or limit access to HCV prevention and treatment services, particularly for persons who inject drugs (*5*). For example, recent studies have shown that states policies can reduce deaths associated with drug overdose (*6*).

Incidence of HCV per 100,000 population was calculated based on acute cases of HCV reported electronically by each state and the District of Columbia (hereafter referred to as states) to NNDSS in 2015 and U.S. Census data. Existing state laws in all states related to access to clean needles and syringes by persons who inject drugs were reviewed using the legal database WestlawNext. Once the relevant laws were identified, the legal findings were corroborated with findings from the Syringe Distribution Laws data set on LawAtlas.* The state laws were then provided to health departments in all states for review of accuracy of interpretation.

Three types of laws related to access to clean needles and syringes were researched: 1) authorization of syringe exchange programs; 2) the scope of drug paraphernalia laws; and 3) retail sale of needles and syringes. Two independent analysts qualitatively assessed the laws based on the presence of five elements in each type of law, and the potential impact of these elements on access to clean needles and syringes, in a method similar to other legal analyses (*7*). The elements assessed included whether state laws explicitly 1) authorize syringe exchange statewide or in selected jurisdictions; 2) exempt needles or syringes from the definition of drug paraphernalia; 3) decriminalize the possession and distribution of syringes or needles for participants of a legally authorized syringe exchange program; 4) allow for a person to avoid criminal prosecution for possession of drug

*http://lawatlas.org/datasets/syringe-policies-laws-regulating-non-retail-distribution-of-drug-paraphernalia.

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paraphernalia by disclosing to an arresting officer that they possess a needle or sharp object; and 5) allow for the retail sale of syringes without a prescription to persons who inject drugs. The analysts grouped the laws into five categories (most comprehensive, more comprehensive, moderately comprehensive, less comprehensive, and least comprehensive) based on the presence or absence of the five elements.

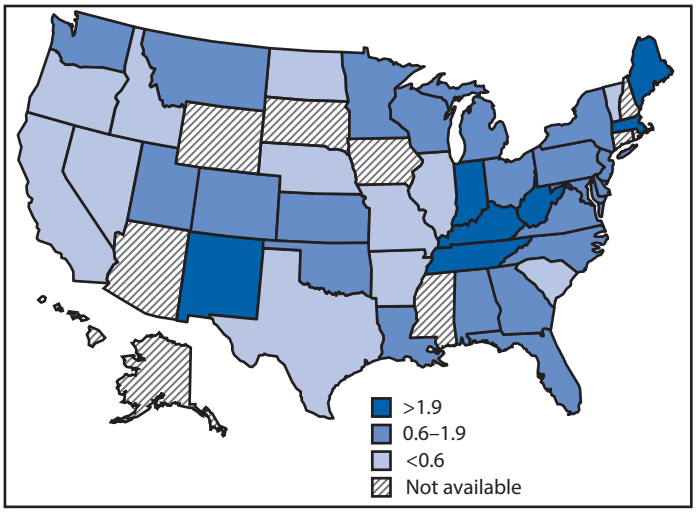
Data on Medicaid fee-for-service HCV treatment policies were collected from a report developed by the Center for Health Law and Policy Innovation of Harvard Law School and the National Viral Hepatitis Roundtable on Medicaid access to hepatitis C treatment (*8*). The Medicaid treatment policies were provided to the states for review of accuracy and updated, as needed. Based on the length of required sobriety from alcohol and/or drugs provided by the states, CDC characterized the state's Medicaid treatment policy as either restrictive or permissive depending on the presence or absence of a sobriety requirement. For this analysis, any required period of sobriety, including requirements that a person could not have any evidence of active injection drug use, was considered a barrier and, therefore, restrictive. Screening and counseling requirements were not considered barriers, and were therefore categorized as permissive, given that those services did not necessarily require a referral or postponement of treatment. A state policy that did not require any period of sobriety was also categorized as permissive.

In 2015, the national reported acute HCV incidence rate was 0.8 per 100,000 persons, representing 2,436 new infections reported from 40 state health departments; with adjustment to account for underascertainment and underreporting, the reported number of cases is estimated to represent 33,900 new HCV infections (*4*). Incidence in 17 states exceeded the national average, including seven states with rates at least twice the national average (Figure 1).

Eighteen states had laws that were categorized as least comprehensive related to the prevention of HCV transmission among persons who inject drugs. In particular, these 18 states had no laws authorizing a syringe exchange program, decriminalizing possession and distribution of syringes and needles, or allowing the retail sale of syringes without a prescription. Three states (Maine, Nevada, and Utah) had the most comprehensive laws related to prevention; each state had laws that authorized syringe exchange without jurisdictional limitations, removed barriers to possessing and distributing syringes and needles through drug paraphernalia laws, and explicitly allowed for the retail sale of syringes to persons who inject drugs (Figure 2).

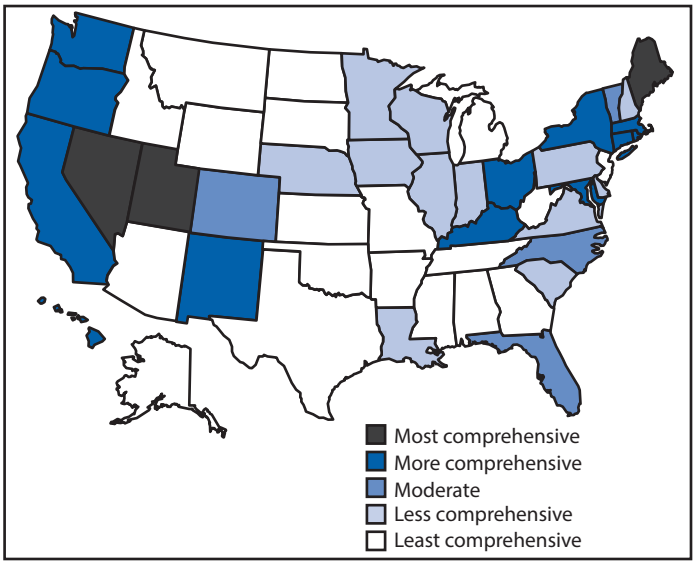
Twenty-four states had restrictive Medicaid treatment policies that required some period of sobriety to receive HCV

FIGURE 1. Acute hepatitis C virus infection incidence rate ratios* — United States,† 2015



* The national rate (0.8 per 100,000 population) is the denominator.
† Seven states have rates at least twice the national average: Indiana, Kentucky, Maine, Massachusetts, New Mexico, Tennessee, and West Virginia. Ten states have rates above the national average (but not twice the national average): Alabama, Montana, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, Utah, Washington, and Wisconsin.

FIGURE 2. Comprehensiveness* of state laws pertinent to prevention of hepatitis C virus infection among persons who inject drugs — United States, 2016



* Assessment of whether a state had established certain laws and the presence or absence of five elements in those laws, i.e., 1) authorization of syringe exchange statewide or in selected jurisdictions; 2) exemption of needles or syringes from the definition of drug paraphernalia; 3) decriminalization of possession and distribution of syringes or needles for participants of a legally authorized syringe service program; 4) avoidance of criminal prosecution for possession of drug paraphernalia by disclosing possession of a needle or sharp object to an arresting officer; and 5) allowance for the retail sale of syringes without a prescription to persons who inject drugs.

treatment through Medicaid, including 11 of the states with the least comprehensive set of laws related to prevention. Sixteen states had permissive Medicaid HCV treatment policies that did not require a period of sobriety or only required screening and counseling to receive HCV treatment through Medicaid (Figure 3). Among the seventeen states with high HCV incidence, five (Massachusetts, New Mexico, North Carolina, Pennsylvania, and Washington) had permissive Medicaid treatment policies.

Only three states (Massachusetts, New Mexico, and Washington) had both a most comprehensive or more comprehensive set of laws and a permissive Medicaid treatment policy that might affect access to both HCV preventive and treatment services for persons who inject drugs.

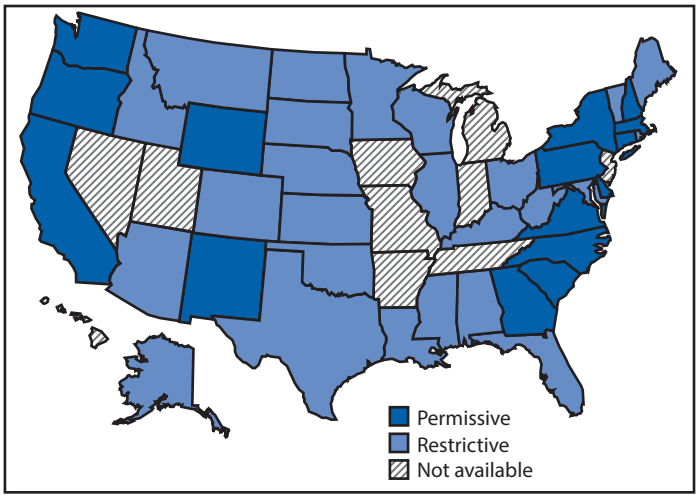
Discussion

The creation and implementation of law can be used to achieve public health objectives, including infectious disease prevention and control, and legislation can be an effective tool to address public health threats faced by a state's residents (*9*). To promote HCV prevention, state laws can facilitate access to clean injection equipment, and other services for persons who inject drugs and, thereby be an effective tool to reduce the risk for transmission and stop the increasing incidence of HCV infection in communities, particularly those most affected by the nation's current opioid epidemic.

The laws governing access to comprehensive HCV prevention services varied in the 17 states with high HCV incidence in 2015. For example among the three states with the highest HCV incidence rates (Kentucky, Massachusetts, and West Virginia), West Virginia had less comprehensive laws, and Kentucky and Massachusetts had more comprehensive laws. However, some of these laws did not take effect until 2015, suggesting that some laws might have been enacted in response to the increased HCV prevalence in these states.

In addition to legal strategies aimed at primary prevention, state Medicaid policies can either facilitate or hinder access to HCV treatment services for persons who inject drugs (*4*). Medicaid treatment policies with strict sobriety requirements can delay or even prevent access to effective and curative treatment (*5*), although access to HCV treatment cures infection, reducing viral transmission and ultimately, incidence, among persons who inject drugs (*10*). Although the costs of HCV therapies have raised budgetary issues for state Medicaid programs in the past, the costs of HCV treatment have declined in recent years, increasing the cost-effectiveness of treatment, particularly among persons who inject drugs and who might serve as an ongoing source of transmission to others (*10*).

FIGURE 3. State Medicaid fee-for-service hepatitis C virus treatment policy restrictions* — United States, 2016



* Permissive: Medicaid fee-for-service (FFS) did not require a period of sobriety or only required screening and counseling. Other restrictions, including restrictions based on liver disease or specialty provider requirements are not included; Restrictive: Medicaid FFS required a period of sobriety from drugs and/or alcohol; Not available: No information on Medicaid treatment policy available.

The findings in this analysis are subject to at least five limitations. First, the HCV incidence data provided are based on reports of acute HCV cases, representing persons who were recently tested for and received a diagnosis of HCV and were reported to public health authorities. Because most HCV infections are asymptomatic, NNDSS data largely underestimate the prevalence of disease. Furthermore, because HCV reporting requirements and practices differ by state, the degree of underreporting also likely differs by state and should be interpreted with caution. Second, the analysis was conducted at a state level. Local jurisdictions might have implemented different legal or policy interventions that were not captured in this assessment. In addition, this analysis did not consider the enforcement of laws. Third, this cross-sectional, descriptive analysis was based on the most recent surveillance data and the most recent legal data; it is not possible to associate the legal findings with particular incidence rates within states. Additional analysis is needed to understand the impetus behind the laws and to determine their direct impact on HCV incidence, including the impact of case reporting by syringe exchange programs. Fourth, only Medicaid policy data for fee-for-service programs were considered; restrictions in Medicaid managed care programs might differ, other Medicaid barriers to treatment were not assessed, and the direct association between Medicaid sobriety requirements and the number of persons being treated in each state was not assessed. Finally, legal analyses of this nature are largely qualitative, and categorizing states' policy environments might be subject to reviewer

Summary

What is already known about this topic?

The United States has experienced a sharp increase in hepatitis C virus (HCV) incidence that can be attributed to injection drug use. Some states have used public health laws and treatment policies to reduce the risk for transmission of HCV infections among persons who inject drugs.

What is added by this report?

In 2015, seventeen states were characterized as having acute HCV incidence rates above the national average. In an analysis of state laws governing access to safe injection equipment and Medicaid policies related to sobriety requirements for approval of HCV treatment for persons who inject drugs, only three states had state laws and Medicaid policies capable of comprehensively preventing and treating HCV among persons who inject drugs.

What are the implications for public health practice?

This report can be used as a tool for states in establishing laws and policies to address increases in HCV incidence in their own jurisdictions, and as a source of data for evaluating the long-term impact of these laws and policies. State laws that increase access to syringe exchange programs and clean needles and syringes, and policies that facilitate access to HCV treatment through state Medicaid programs can reduce HCV transmission risk.

interpretation. However, two separate analysts independently assessed the state laws and Medicaid policies, and their analyses were further validated by state personnel familiar with HCV prevention and treatment activities.

Legal and policy interventions can be tailored to a state's unique needs to serve as part of a comprehensive strategy for reducing HCV transmission through increased access to preventive services, including safe injection equipment and HCV treatment. The findings from this assessment of state laws and one component of Medicaid treatment policies can inform jurisdictions when building their capacity to prevent the spread of HCV in their communities. Whereas any one policy can have a positive impact on public health, many factors contribute to the prevalence of disease, and it is important for policy makers and public health officials to work together to understand the various needs of particular populations to prevent HCV transmission and disease.

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Hepatitis C Virus Infection Among Women Giving Birth — Tennessee and United States, 2009–2014

Stephen W. Patrick, MD[1]; Audrey M. Bauer, DVM[2]; Michael D. Warren, MD[2]; Timothy F. Jones, MD[2]; Carolyn Wester, MD[2]

Hepatitis C virus (HCV) affects an estimated 3.5 million persons in the United States (*1*), making it the most common bloodborne infection in the country. Recent surveillance data showed increased rates of HCV infection among adolescents and adults who are predominantly white, live in nonurban areas, and have a history of injection drug use.* U.S. birth certificate data were used to analyze trends and geographic variations in rates of HCV infection among women giving birth during 2009–2014. Birth certificates from Tennessee were used to examine individual characteristics and outcomes associated with HCV infection, using a multivariable model to calculate adjusted odds of HCV-related diagnosis in pregnancy among women with live births. During 2009–2014, HCV infection present at the time of delivery among pregnant women from states reporting HCV on the birth certificate increased 89%, from 1.8 to 3.4 per 1,000 live births. The highest infection rate in 2014 (22.6 per 1,000 live births) was in West Virginia; the rate in Tennessee was 10.1. In adjusted analyses of Tennessee births, the odds of HCV infection were approximately threefold higher among women residing in rural counties than among those in large urban counties, 4.5-fold higher among women who smoked cigarettes during pregnancy, and nearly 17-fold higher among women with concurrent hepatitis B virus (HBV) infection. HCV infection among pregnant women is an increasing and potentially modifiable threat to maternal and child health. Clinicians and public health officials should consider individual and population-level opportunities for prevention and risk mitigation.

Data from 2009–2014 were obtained from the National Vital Statistics System and Tennessee Department of Health vital records. The outcome of interest was HCV infection in pregnant women at the time of delivery (maternal HCV infection) as indicated on the infant's birth certificate. The maternal HCV infection rate per 1,000 deliveries in Tennessee was compared with that from hospital billing data in the Tennessee Hospital Discharge Data System, an all-payer administrative database that includes data for all inpatient admissions in the state. National data were compared with nationally weighted estimates obtained from the National Inpatient Sample, the largest all payer database in the United States.†

The first phase of the analysis examined rates of maternal HCV infection reported on infant birth certificates to approximate HCV infection among pregnant women in the United States. Because HCV infection is a revised 2003 birth certificate item, states gradually reported this item over time as they adopted the revised certificate; therefore, rates were calculated based on records from all states§ with available data at any time during 2009 and 2014.¶ The second phase of the analysis used data from Tennessee vital records to assess sociodemographic characteristics, gravidity, health behaviors, and other infections during pregnancy associated with HCV infection in pregnancy. Overall, <1% of data for variables included in the study were missing, with the exception of timing of prenatal care, which was missing for 6.2% of records. To account for missing data, multiple imputation using chained equations with 20 imputations was used. A multivariable logistic regression model was fit to the data to determine increased odds of HCV infection in pregnancy, simultaneously adjusting for maternal age, education, marital status, race/ethnicity, county of residence, number of previous pregnancies, late or no prenatal care, smoking during pregnancy, and other infections present at delivery, including chlamydia, gonorrhea, syphilis, herpes simplex virus, and HBV. The statistical significance level was set to $p<0.05$ for all tests. The study was approved by the Tennessee Department of Health's institutional review board.

During 2009–2014, the prevalence of maternal HCV infection among reporting states increased 89%, from 1.8 to 3.4 per 1,000 live births ($p<0.001$). There was substantial state-to-state variation in maternal HCV rates: in 2014, the highest rate (22.6 per 1,000 live births) was in West Virginia, and the lowest (0.7) was in Hawaii (Figure 1). In Tennessee, the prevalence of maternal HCV infection increased 163%, from 3.8 per 1,000 live births in 2009 to 10.0 in 2014 ($p<0.001$). Within Tennessee, there was substantial variation among 95 counties, with the highest rates in the 52 Appalachian counties in the eastern part of the state. For example, in 2014, Campbell County had the highest rate in Tennessee (78 per 1,000 births); 19 other counties had rates of ≤1 per 1,000 births, including 18 counties that reported no cases (Figure 2). Analysis of maternal

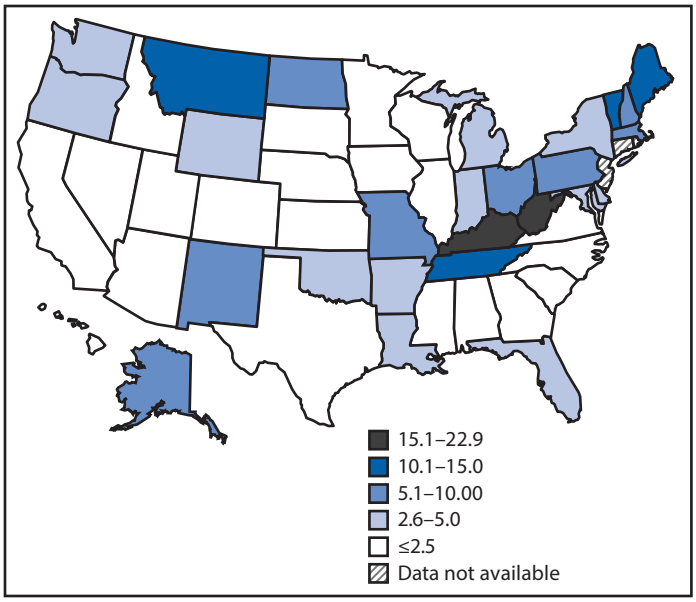
* https://www.cdc.gov/hepatitis/statistics/2014surveillance/index.htm.

† Maternal records were included in the analysis if they had one or more *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) diagnostic and procedure codes or Diagnosis Related Groups indicating delivery. HCV-positive women were identified using the following ICD-9-CM codes: 070.41, 070.44, 070.51, 070.54, 070.7, 070.70, and 070.71.

§ Data were available for all states except Connecticut, New Jersey, and Rhode Island. Data also were not available for the District of Columbia.

¶ Births records where HCV status was either unknown or not collected were excluded from national estimates. Percentage of total births excluded for each year: 31.9% (2009), 22.6% (2010), 14.2% (2011), 11.7% (2012), 9.6% (2013), and 3.6% (2014).

FIGURE 1. Rate of hepatitis C infection among pregnant women per 1,000 live births, by state — United States, 2014



HCV infection rates based on hospital discharge data resulted in similar findings.

In adjusted analyses of Tennessee births from 2009 to 2014, compared with women without HCV infection, women with diagnosed HCV at the time of live birth had higher odds of having a high school education or less, being unmarried, having late or no prenatal care, and smoking cigarettes. Compared with pregnant non-Hispanic white women, non-Hispanic black women had nearly 80% lower odds, and Hispanic women nearly 70% lower odds of having a diagnosis of HCV. Residing in a rural county was also associated with higher odds of maternal HCV infection. When compared with large central metro areas (counties with >1,000,000 population), the odds of HCV infection among pregnant women from rural areas (counties with <50,000 population) were threefold higher. Concurrent infections also were associated with higher odds of having an HCV diagnosis, with HBV infection resulting in nearly 17-fold increased odds of HCV (Table).

Discussion

From 2009 to 2014, the prevalence of HCV infection among U.S. women giving birth in reporting states nearly doubled. This increase in maternal HCV infection mirrors increases in HCV infection incidence among adults, particularly nonpregnant young adults in the United States. A recent study identified a similar increase in HCV prevalence among women with recent live births (*2*); this study builds upon those findings, identifying several patient-level characteristics associated with maternal HCV infection, including white race, rural county residence, cigarette smoking during pregnancy, having a high school education or less, and having a concurrent HBV infection. In the United States, CDC and the American College of Obstetricians and Gynecologists recommend selective screening of pregnant women at high risk for HCV infection (i.e., history of injection drug use or long-term hemodialysis) (*3*). These data might inform expansion of the definition of women at risk, thereby improving clinical detection, particularly in areas of a state reporting increasing or high rates of incident HCV infection.

The recent increase in maternal HCV infection appears to have disproportionately affected rural and white populations; states and Tennessee counties with the highest prevalence of HCV infection among pregnant women in 2014 were in predominately Appalachian regions.** A recent analysis of state surveillance data examining acute HCV infections in the general population found a near doubling of cases in the United States during 2006–2012, and also found that states in or near Appalachian regions had the highest numbers of cases (*4*), suggesting that primary prevention and testing and treatment strategies for HCV infection could be targeted to these populations and areas at high risk.

This increase in HCV infection is particularly concerning in light of recent research highlighting poor follow-up of HCV-exposed infants (*5*). The rate of vertical transmission from infected mothers to infants is estimated at 6% (11% if the mother is coinfected with human immunodeficiency virus [HIV]) (*6*); therefore, it is important that exposed infants be followed for evidence of seroconversion. Because passively acquired maternal antibodies can persist for up to 18 months, anti-HCV antibody tests cannot be completed until that time; however, testing for HCV RNA can be performed earlier (*7*). A recent study in Philadelphia found that only 16% of HCV-exposed infants were appropriately followed (*5*), suggesting that infected infants might go undetected.

The increase in maternal HCV infection coincides with the rising heroin and prescription opioid epidemics occurring in the United States that have also disproportionately affected rural and white populations (*8*,*9*). There has also been a recent surge in opioid use among pregnant women (*8*). Whereas HCV infections have historically been associated with heroin use, a recent outbreak of HIV and HCV in rural Indiana demonstrates that these infections can also be transmitted through use of injectable forms of prescription opioids (*10*).

The findings in this report are subject to at least three limitations. First, vital records data rely on accurate coding of birth

** https://www.arc.gov/counties.

FIGURE 2. Rate of hepatitis C infection among pregnant women per 1,000 live births, by county — Tennessee, 2014

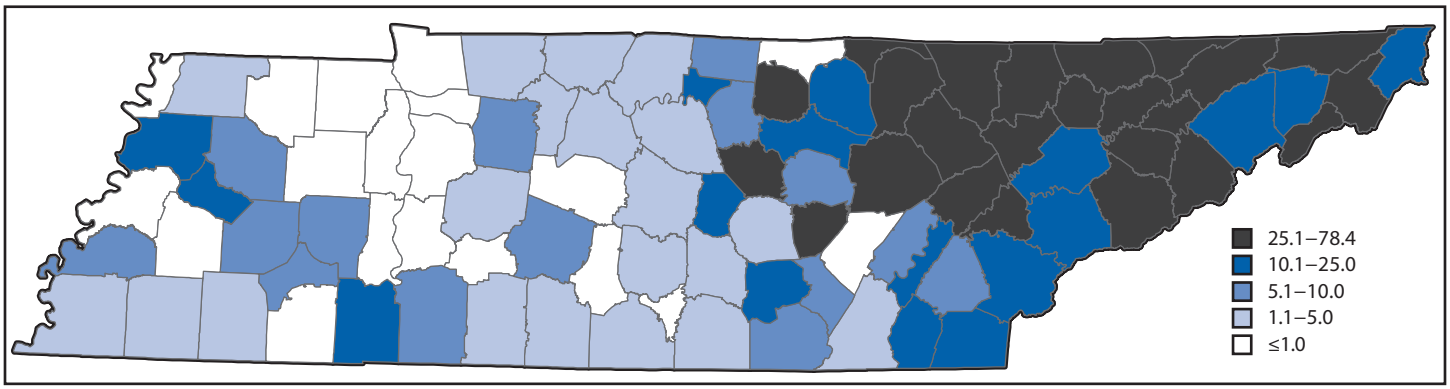


TABLE. Adjusted maternal characteristics associated with hepatitis C infection at the time of birth — Tennessee, 2009–2014

Characteristic	Adjusted odds ratio (95% CI)
Age/Education/Marital status	
Older age	1.05 (1.04–1.06)
High school graduate or less	1.90 (1.74–2.08)
Unmarried	2.12 (1.95–2.31)
Race/Ethnicity	
White, non-Hispanic	referent
Black, non-Hispanic	0.23 (0.19–0.27)
Hispanic	0.33 (0.26–0.41)
Other	0.61 (0.43–0.87)
Classification of residence county*	
Large central metro	referent
Large fringe metro	1.21 (0.99–1.48)
Medium metro	4.38 (3.72–5.15)
Small metro	4.65 (3.88–5.56)
Micropolitan	3.05 (2.56–3.64)
Noncore	3.07 (2.55–3.69)
Pregnancy	
One or more previous pregnancies	1.58 (1.44–1.74)
Late or no prenatal care	1.74 (1.61–1.88)
Smoked during pregnancy	4.49 (4.13–4.89)
Infections during pregnancy	
Chlamydia	1.35 (1.13–1.61)
Gonorrhea	1.67 (1.13–2.48)
Syphilis	1.57 (0.72–3.43)
Herpes simplex virus	1.96 (1.74–2.21)
Hepatitis B	16.60 (12.70–21.68)

Abbreviation: CI = confidence interval.

* Maternal residence county was classified using the 2013 National Center for Health Statistics Urban–Rural Classification Scheme. Large central metro = Counties in metropolitan statistical areas of ≥1 million population that 1) contain the entire population of the largest principal city of the metropolitan statistical area (MSA), or 2) have their entire population contained in the largest principal city of the MSA, or 3) contain at least 250,000 inhabitants of any principal city of the MSA. Large fringe metro = Counties in MSAs of ≥1 million population that did not qualify as large central metro counties. Medium metro = Counties in MSAs with populations of 250,000–999,999. Small metro = Counties in MSAs with populations of <250,000. Micropolitan = Counties in micropolitan statistical areas with populations of 10,000–49,999. Noncore = Nonmetropolitan counties that did not qualify as micropolitan.

† A multivariable logistic regression model was fit to the data to determine increased odds of HCV infection in pregnancy, simultaneously adjusting for maternal age, education, marital status, race/ethnicity, county of residence, number of previous pregnancies, late or no prenatal care, smoking during pregnancy, and other infections present at delivery, including chlamydia, gonorrhea, syphilis, herpes simplex virus and hepatitis B virus infection.

certificates; some variables such as HCV might be undercoded, and misclassification bias might occur. However, evaluation of hospital administrative data reporting of HCV infections suggests that this effect is small. Second, the proportion of live births from which data were collected on HCV status increased during the study period, as more states adopted the revised certificate each year. Because the original reporting states in 2009 were not held constant over time for this analysis, it is possible the trend could be subject to ascertainment bias; however, two additional confirmatory analyses were performed: 1) comparison with the National Inpatient Sample demonstrated similar rates of HCV infection during 2009–2013 (1.8 per 1,000 to 3.1 per 1,000), and 2) the same trend analysis was performed holding the original 28 reporting states in 2009 constant. Results were the same as when using all 47 states that incorporated reporting over time. Because women are not universally screened for HCV in pregnancy, these estimates and analyses do not represent the actual prevalence of HCV in pregnant women. However, the findings of increased disease prevalence among white and rural populations are similar to those of recent studies in nonpregnant populations (*4*). Instances of multiple births might have resulted in a slight overestimation of rates of maternal HCV infection. Finally, it is important to consider that HCV infections in a given state might represent not only the prevalence of a condition but also the public health efforts implemented to detect and treat the infection.

The prevalence of maternal HCV infection appears to have increased sharply in the United States, presenting concerns for maternal and child health. Ensuring that women of childbearing age have access to HCV testing and treatment and consideration of universal screening among women of reproductive age residing in areas with high HCV prevalence might mitigate risk and prevent transmission.

Summary

What is already known about this topic?

Hepatitis C virus (HCV) infection affects approximately 3.5 million persons in the United States, making it the most common bloodborne infection in the nation. Recent surveillance data demonstrate increased rates of HCV infection among adolescents and adults who are predominantly white, live in nonurban areas, and have a history of injection drug use.

What is added by this report?

During 2009–2014, maternal HCV infections nearly doubled among reporting states in the United States, with substantial state-to-state variation in prevalence. In adjusted analyses of Tennessee births, residence in a rural county was associated with a more than threefold increase in the odds of maternal HCV infection. Smoking during pregnancy and concurrent hepatitis B virus infection imparted fourfold and nearly 17-fold increased odds of maternal HCV infection, respectively.

What are the implications for public health practice?

Screening for HCV infection in women of childbearing age and provision of treatment services might reduce perinatal transmission of HCV, and monitoring of HCV-exposed infants can aid in early identification of HCV infection and related liver disease.

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Current and Binge Drinking Among High School Students — United States, 1991–2015

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Excessive drinking accounted for approximately 4,300 deaths each year among persons aged <21 years during 2006–2010,* and underage drinking cost the United States $24.3 billion in 2010 (*1*). CDC analyzed data from the national Youth Risk Behavior Survey (YRBS) for the years 1991–2015 to examine trends in drinking by U.S. high school students, and from the 2015 YRBS to assess the usual source of alcohol consumed† and binge drinking intensity (i.e., the average number of drinks consumed per binge drinking occasion).§ During 1991–2007, the prevalence of current drinking¶ among high school students declined significantly, from 50.8% (1991) to 44.7% (2007), and then significantly declined to 32.8% in 2015. The prevalence of binge drinking** increased from 31.3% in 1991 to 31.5% in 1999, and then significantly declined to 17.7% in 2015. Most high school students who drank were binge drinkers (57.8%), and 43.8% of binge drinkers consumed eight or more drinks in a row. Despite progress, current drinking and binge drinking are common among high school students, and many students who binge drink do so at high intensity (i.e., eight or more drinks in a row). Widespread use of evidence-based strategies for preventing excessive drinking (e.g., increasing alcohol taxes, regulating alcohol outlet density, and having commercial host liability laws) could help reduce underage drinking and related harms.††

The national YRBS is a cross-sectional, biennial school-based survey of 9th–12th grade students in U.S. public and private schools that monitors the prevalence of health risk behaviors. During 1991–2015, a three-stage cluster sample design was used to select nationally representative samples of students; sample sizes ranged from 10,904 to 16,410. During each cycle, students completed an anonymous, self-administered questionnaire. Response rates ranged from 60% to 71%. Data were weighted to account for oversampling of non-Hispanic black and Hispanic students and nonresponse, and to produce national estimates of health risk behaviors among U.S. high school students who attend public or private schools. Details of the YRBS methodology have been published previously.§§

Current drinking was defined as consuming one or more alcoholic drink on ≥1 days during the past 30 days. Binge drinking was defined as consuming five or more alcoholic drinks in a row on ≥1 days during the past 30 days. The usual source of alcohol and binge drinking intensity also were assessed. The prevalence of current drinking was calculated among students overall. The prevalence of binge drinking was calculated among students overall and current drinkers. The usual source of alcohol and binge drinking intensity were calculated among current drinkers only.

Data from 1991–2015 were used to examine trends in current drinking, binge drinking, and binge drinking among current drinkers, adjusted for sex, race/ethnicity, and grade. Trends were analyzed using logistic regression models and interaction terms. Time was modeled as a continuous variable¶¶ with linear and nonlinear (quadratic) components, which were considered significant at p-values <0.05. Joinpoint software*** was used, when significant quadratic trends were found, to determine the year in which the trend changed direction or leveled off. Percentage-point changes were calculated to compare the magnitude of trends, but differences between subgroups were not tested for significance. Data from 2015 were used to assess the prevalence of drinking patterns overall and by sociodemographic characteristics, using pairwise t-tests to assess differences by subgroup. Respondents who had missing information were excluded from analyses.††† The sample sizes presented are unweighted and the percentages are weighted.

The overall prevalence of current drinking among U.S. high school students declined significantly from 50.8% in 1991 to 44.7% in 2007, then further declined to 32.8% in 2015 (Figure 1). Trend analysis indicated that the prevalence of binge drinking increased from 31.3% in 1991 to 31.5% in 1999, then declined significantly to 17.7% in 2015. From 1991 to 2015, the percentage-point decline in the prevalence of current

* https://www.cdc.gov/ARDI.

† Determined by responses to the question, "During the past 30 days, how did you usually get the alcohol you drank?"

§ Determined by responses to the question, "During the past 30 days, what is the largest number of alcoholic drinks you had in a row, that is, within a couple of hours?"

¶ Defined as reporting the consumption of one or more drinks of alcohol on ≥1 days during the 30 days before the survey.

** Defined as reporting the consumption of five or more drinks in a row (i.e., within a couple of hours) on ≥1 days during the 30 days before the survey.

†† https://www.thecommunityguide.org/sites/default/files/assets/What-Works-Alcohol-factsheet-and-insert.pdf.

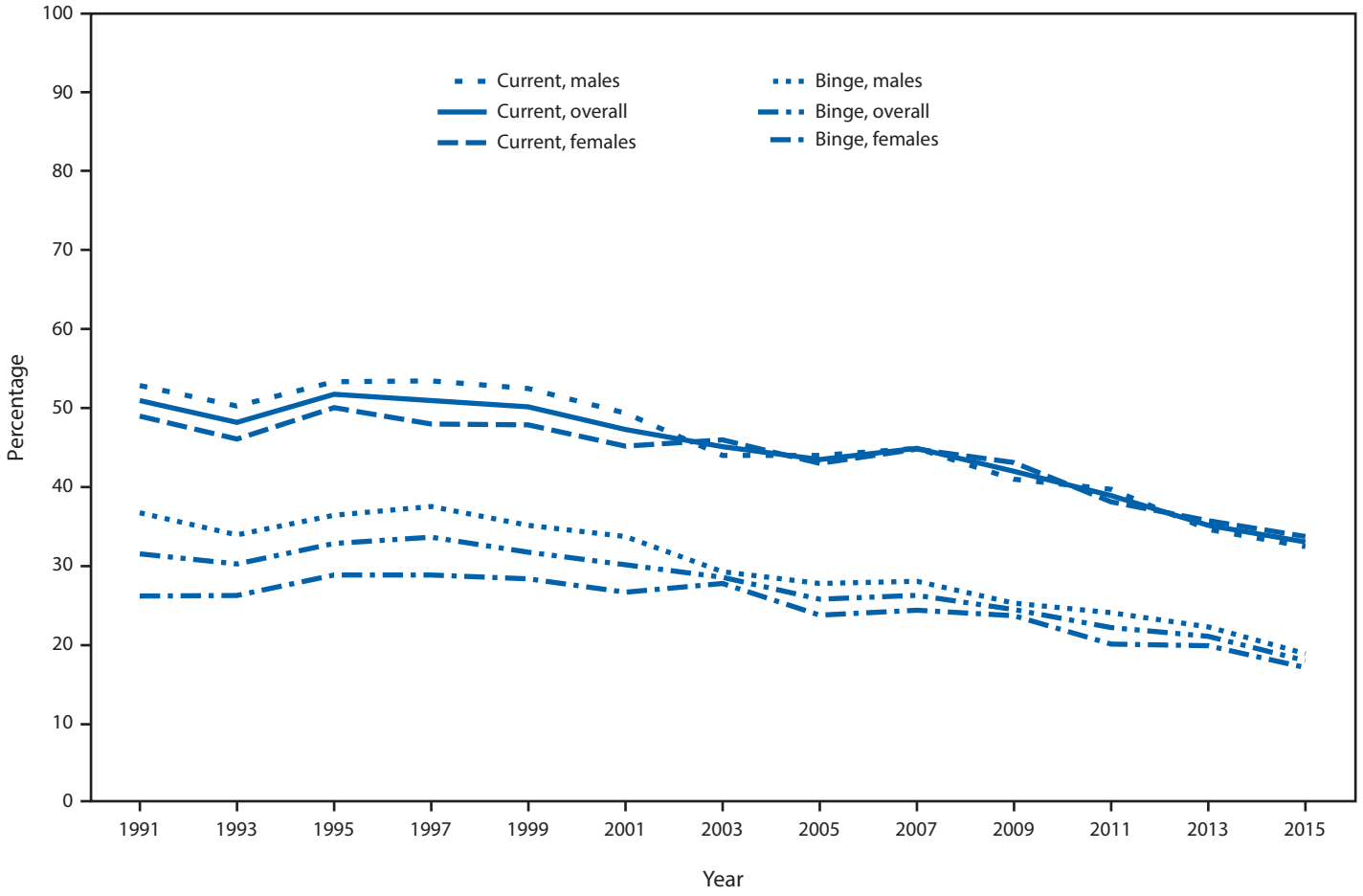
§§ https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6201a1.htm.

¶¶ For time modeled as a continuous variable, CDC used orthogonal coefficients reflecting the biennial spacing of the surveys.

*** https://surveillance.cancer.gov/joinpoint/.

††† The percentage missing ranged from 0.8% (sex) to 2.3% (race/ethnicity). Among all students, the percentage missing for current drinking was 9.7%, and for binge drinking was 4.2%.

FIGURE 1. Prevalence of self-reported current drinking* and binge drinking† among high school students, by sex — Youth Risk Behavior Surveys, United States, 1991–2015



* One or more drinks of alcohol on ≥1 days during the 30 days before the survey.
† Five or more drinks in a row (i.e., within a couple of hours) on ≥1 days during the 30 days before the survey.

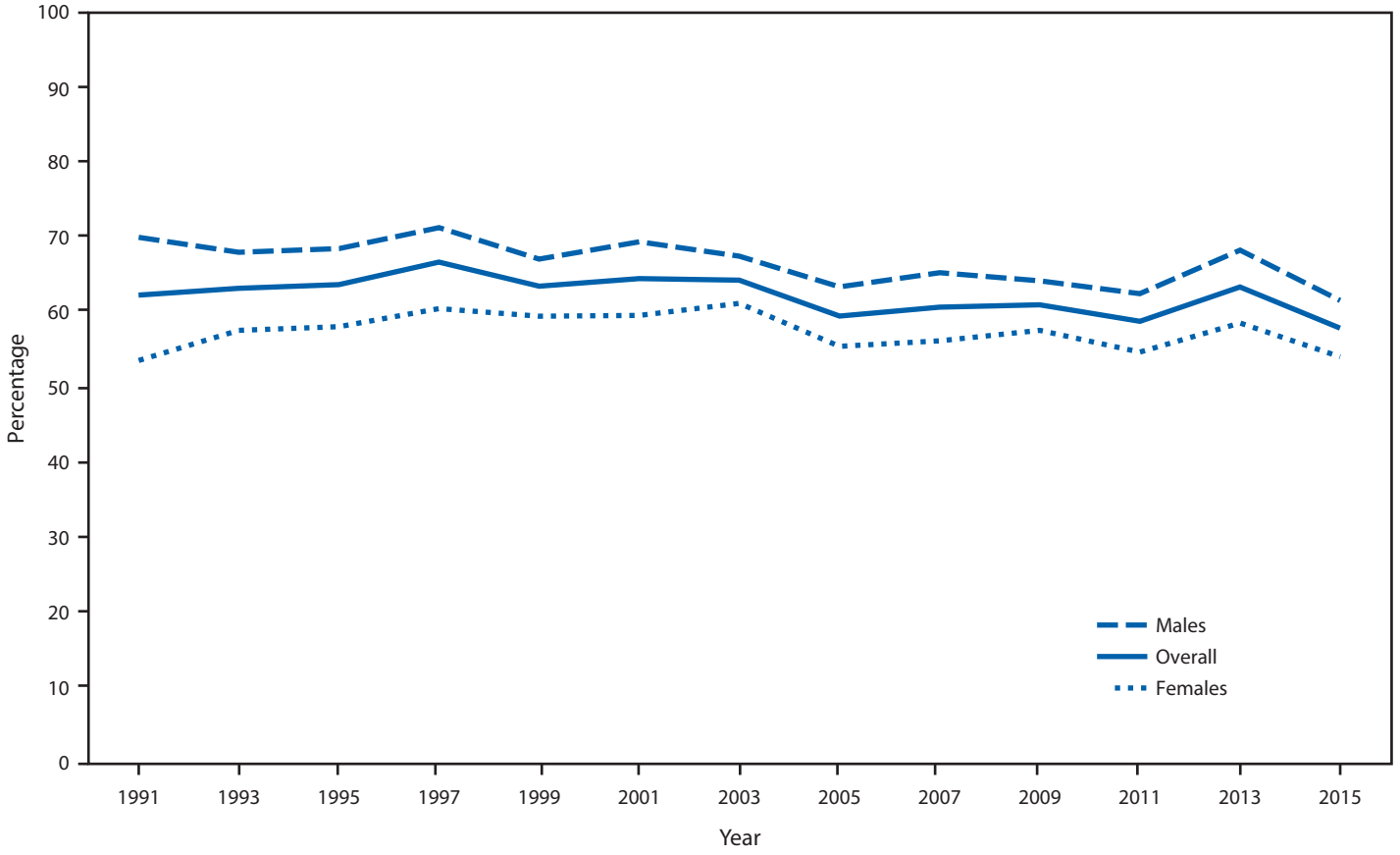
and binge drinking was greater among male students (current drinking declined 20.5 percentage points, and binge drinking declined 17.9 percentage points) than female students (current drinking declined 15.3 percentage points, and binge drinking declined 9.1 percentage points).

The prevalence of binge drinking among current drinkers increased significantly from 62.2% in 1991 to 66.6% in 1997, then declined significantly to 57.8% in 2015 (Figure 2). Among male current drinkers, the prevalence of binge drinking declined significantly from 69.9% in 1991 to 61.5% in 2015. Among female current drinkers, the prevalence of binge drinking increased from 53.5% in 1991 to 60.4% in 1997, then declined to 54.0% in 2015.

In 2015, the prevalence of current drinking increased significantly with school grade from 23.4% among 9th grade students to 42.4% among 12th grade students, as did the prevalence of binge drinking, which was 10.4% among 9th grade students and 24.6% among 12th grade students (Table). Similarly, the prevalence of binge drinking among current drinkers increased significantly with school grade from 47.0% (9th grade students) to 61.9% (12th grade students). The prevalence of current and binge drinking was significantly higher among non-Hispanic white and Hispanic students than among non-Hispanic black students. The prevalence of binge drinking among current drinkers was also significantly higher among non-Hispanic white than among non-Hispanic black students.

In 2015, 36.4% of binge drinkers and 55.7% of current drinkers who did not binge drink usually obtained alcohol from someone who gave it to them. Binge drinkers were more than three times more likely than current drinkers who did not binge drink to give someone money to purchase alcohol (30.7% compared with 8.8%) and to purchase alcohol themselves (8.8% compared with 2.8%). Among binge drinkers, 43.8% consumed eight or more drinks in a row. Among binge drinkers, the prevalence of consuming eight or more drinks in a row was significantly higher among male (50.5%) than female (35.3%) students.

FIGURE 2. Prevalence of self-reported binge drinking* among high school students who reported current drinking,† by sex — Youth Risk Behavior Surveys, United States, 1991–2015



* Five or more drinks in a row (i.e., within a couple of hours) on ≥1 days during the 30 days before the survey.
† One or more drinks of alcohol on ≥1 days during the 30 days before the survey.

TABLE. Weighted percentage of high school students who used alcohol, by selected characteristics — Youth Risk Behavior Survey, United States, 2015

Characteristic	All respondents (N = 15,624)		Current drinkers only (n = 4,659)
	Current drinking* Weighted % (95% CI)	Binge drinking† Weighted % (95% CI)	Binge drinking† Weighted % (95% CI)
Overall	32.8 (30.4–35.2)	17.7 (15.8–19.8)	57.8 (54.6–60.9)
Sex			
Male	32.2 (30.4–34.0)	18.6 (16.9–20.5)	61.5§ (57.4–65.4)
Female	33.5 (29.8–37.5)	16.8 (14.4–19.6)	54.0 (50.4–57.6)
High school grade			
9th	23.4 (20.9–26.1)¶,**	10.4 (9.1–11.8)¶,**,††	47.0 (40.6–53.6)¶,**,††
10th	29.0 (24.3–34.3)¶,**	15.1 (12.2–18.6)¶,**	56.5 (50.2–62.7)
11th	38.0 (34.6–41.4)**	22.1 (19.6–24.7)	61.4 (56.5–66.1)
12th	42.4 (38.4–46.4)	24.6 (21.5–28.0)	61.9 (57.8–65.9)
Race/Ethnicity			
White, non-Hispanic	35.2 (31.2–39.3)§§	19.7 (16.8–23.0)§§	59.5 (55.6–63.4)§§
Black, non-Hispanic	23.8 (18.6–30.0)¶¶	11.4 (8.8–14.7)¶¶	52.1 (47.0–57.2)
Hispanic	34.4 (31.9–37.0)	17.7 (15.8–19.7)	55.4 (51.6–59.2)

Abbreviation: CI = confidence interval.
* Had one or more drinks of alcohol on ≥1 days during the 30 days before the survey.
† Had five or more drinks in a row (i.e., within a couple of hours) on ≥1 days during the 30 days before the survey.
§ Significantly different from female students.
¶ Significantly different from 11th grade students.
** Significantly different from 12th grade students.
†† Significantly different from 10th grade students.
§§ Significantly different from non-Hispanic black students.
¶¶ Significantly different from Hispanic students.

Discussion

Overall, current and binge drinking declined significantly among U.S. high school students from 1991 to 2015.§§§ The percentage-point decrease was greater among male than female students, and the prevalence of current and binge drinking among male and female students converged in recent years. However, approximately one in three high school students still drank alcohol and one in six were binge drinkers in 2015. Most high school students who drank were also binge drinkers, and in 2015, more than two in five binge drinkers consumed eight or more drinks in a row, increasing the risk for alcohol-attributable harms (e.g., violence, unintentional injuries, and alcohol poisoning). High school students who drank usually obtained alcohol from others, but binge drinkers were three times more likely than current drinkers who did not binge drink to give others money to purchase alcohol for them.

Other national surveys have also reported declines in current and binge drinking among high school–aged students since the 1990s, although specific prevalence estimates vary (*2*,*3*). The decline in underage drinking might be related to increased implementation of state underage drinking policies (*4*). Previous studies have also shown that the age 21 minimum legal drinking age was associated with reduced youth drinking (*5*) and reduced alcohol-attributable harms (e.g., motor vehicle crashes).¶¶¶ However, enforcement of this law varies across jurisdictions (*6*).

The finding that high school students who drink usually obtain alcohol from others, potentially including parents and guardians, is consistent with the state-specific relationship between youth and adult drinking (*7*). Policies affecting adults' alcohol consumption have also been shown to reduce youth alcohol consumption significantly, and alcohol policies affecting the price and availability of alcohol consumption have been found to have the greatest impact on binge drinking by adults (*8*).

The findings in this report are subject to at least five limitations. First, YRBS data were only collected among teens who attended school, and therefore are not representative of all teens. Nationwide, in 2012, approximately 3% of persons aged 16–17 years were not enrolled in high school and had not completed high school.**** Second, YRBS data are self-reported, and alcohol consumption might not be accurately reported because of recall and social desirability biases. Third, the 1991–2015 YRBS period defines binge drinking for males and females as five or more drinks in a row, and the prevalence of binge drinking among females would likely be higher if it were assessed using a sex-specific, four-drink threshold (*9*). Fourth, data were not available to assess drinking by other racial/ethnic populations. Finally, it was not possible to evaluate reasons for the observed declines in current and binge drinking using YRBS data.

The Community Preventive Services Task Force recommends evidence-based strategies for reducing excessive alcohol use, including underage and binge drinking. These include increasing alcohol taxes, regulating alcohol outlet density, and having commercial host liability laws. Moreover, given the association between youth exposure to alcohol advertising and underage drinking, monitoring and reducing youth exposure to alcohol advertising through the implementation of "no-buy" lists (i.e., lists of television programming that risk overexposing youth to alcohol advertising based on the industry's self-regulatory alcohol marketing guidelines) might also help reduce underage drinking (*10*).

Summary

What is already known about this topic?

Each year from 2006 to 2010, excessive alcohol consumption was responsible for approximately 4,300 deaths among persons aged <21 years, and, in 2010, underage drinking cost the United States $24.3 billion.

What is added by this report?

The overall prevalence of current drinking among U.S. high school students declined significantly from 50.8% in 1991 to 44.7% in 2007, then further declined to 32.8% in 2015. The prevalence of binge drinking increased from 31.3% in 1991 to 31.5% in 1999, then declined significantly to 17.7% in 2015. However, in 2015, approximately one in three high school students drank alcohol during the past 30 days and one in six were binge drinkers. Most high school students who drank (57.8%) were also binge drinkers, and more than two in five binge drinkers consumed eight or more drinks in a row.

What are the implications for public health practice?

Despite progress, current and binge drinking remain common among high school students, and many students who binge drink do so at high intensity (i.e., eight or more drinks in a row). Widespread use of evidence-based prevention strategies for excessive drinking (e.g., increasing alcohol taxes, regulating alcohol outlet density, and having commercial host liability laws) could help reduce underage drinking and related harms.

§§§ The minimum legal drinking age of 21 years was implemented by all states by 1988.

¶¶¶ https://www.thecommunityguide.org/content/motor-vehicle-injury-alcohol-impaired-driving-maintaining-current-minimum-legal-drinking-age.

**** https://nces.ed.gov/pubs2015/2015015.pdf.

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CDC Grand Rounds: Public Health Strategies to Prevent and Treat Strokes

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Worldwide, stroke is the second leading cause of death and a leading cause of serious long-term disability. In the United States, nearly 800,000 strokes occur each year; thus stroke is the fifth leading cause of death overall and the fourth leading cause of death among women (*1*). Major advances in stroke prevention through treatment of known risk factors has led to stroke being considered largely preventable. For example, in the United States, stroke mortality rates have declined 70% over the past 50 years, in large part because of important reductions in hypertension, tobacco smoking, and more recently, increased use of anticoagulation for atrial fibrillation (*2*,*3*). Although the reduction in stroke mortality is recognized as one of the 10 great public health achievements of the 20th century (*4*), gains can still be made. Approximately 80% of strokes could be prevented by screening for and addressing known risks with measures such as improving hypertension control, smoking cessation, diabetes prevention, cholesterol management, increasing use of anticoagulation for atrial fibrillation, and eliminating excessive alcohol consumption (*5*,*6*).

Risk Factors and Special Populations

Approximately 75% of persons who have a stroke have hypertension, making hypertension the most potent modifiable risk factor for stroke. Hypertension causes weakening of the arteries and can lead to either of the two types of stroke: ischemic stroke and intracerebral hemorrhage. Currently, 29.3% of U.S. adults aged ≥18 years have hypertension, and only about half of these adults have their blood pressure controlled (54%) (*7*). Hypertension is more prevalent among non-Hispanic blacks (blacks) than non-Hispanic whites (whites) (41.2% compared with 28%). Blacks are two to three times more likely to have a stroke than are whites and do so at an earlier age than whites; hypertension is thought to be a more potent risk factor for stroke among blacks and Hispanics than among whites (*8*,*9*). Increasing evidence indicates that hypertension at older ages is an important contributor to vascular cognitive impairment or vascular dementia, which often coexists with other forms of dementia, such as Alzheimer's disease. Recent studies indicate that hypertension might potentiate the impact of Alzheimer's disease and its role in causing microbleeds, microinfarcts, white matter disease, and multiple small strokes that might not be clinically noticeable at the time but can lead to dementia, as well as possible involvement in the accumulation of amyloid plaques in the brain (*10*,*11*). Approximately two thirds of adults aged >60 years have hypertension (*12*), putting them at increased risk for both stroke and dementia. Having hypertension in mid-life (ages 45–64 years) is strongly associated with risk for vascular cognitive impairment and dementia later in life (*13*).

Although men have a higher age-adjusted incidence for stroke, women live longer and thus have a higher lifetime risk of stroke than men (*14*). Approximately twice as many women die from stroke than from breast cancer each year (*1*). Approximately 60% of persons who die from stroke are women, and women tend to have worse functional outcomes in terms of returning to baseline activities of daily living and quality of life after experiencing a stroke. Some risk factors that are unique to women include pregnancy, gestational diabetes, eclampsia and preeclampsia, changes in hormonal status, and postmenopausal hormone use. Several studies have shown that having preeclampsia or gestational hypertension increases a woman's risk for stroke approximately twofold, and women who experience preeclampsia have a fourfold increased risk for developing future hypertension (*14*). Among women who use oral contraceptives, obesity and hypercholesterolemia increase the risk for stroke 4.6 and 10.8 times, respectively, compared with women without the risk factor and not using oral contraceptives (*15*). Risk factors for stroke that are more potent or more prevalent among women include migraines with aura, atrial fibrillation, diabetes, depression, and psychosocial stress (*10*). Young women who experience migraines with aura have a twofold increase in the risk for stroke compared with women without migraines; for women with migraines with aura who also smoke and use oral contraceptives, the risk for stroke increases approximately seven times compared with women who do not smoke or use oral contraceptives (*16*). Depression and psychosocial stress increase the risk for stroke approximately 30% in both men and women (*17*).

Impact of Stroke Systems of Care

When a stroke occurs, recognition and prompt treatment is critical. Each minute that an ischemic stroke is left untreated, the brain can lose nearly two million neurons (*18*). Emergency treatments that quickly return blood flow to the brain by dissolving or removing the clot blocking a brain artery have been found to substantially improve outcomes in ischemic stroke patients (*19*). Providing the right care at the right time

This is another in a series of occasional MMWR *reports titled CDC Grand Rounds. These reports are based on grand rounds presentations at CDC on high-profile issues in public health science, practice, and policy. Information about CDC Grand Rounds is available at https://www.cdc.gov/cdcgrandrounds/.*

is critical; one challenge to this is the fragmentation of stroke care. Currently, most acute stroke care is provided in distinct care delivery settings (e.g., emergency medical services [EMS], emergency department, hospital, and home or next care setting). With each transition, the potential for inefficient or suboptimal care and confusion for patients and their families can arise because of a lack of effective communication from one care setting and professional to the next. Viewing these elements as a stroke system of care, where the multiple, distinct components function as an efficient and effective integrated system, can overcome the fragmentation and reduce morbidity and mortality for acute stroke patients.

Developing stroke systems of care requires leadership and support from within each element to build working relationships across the system. Potential collaborators include state and local public health agencies; state, regional, and local EMS personnel; and clinical leaders. There are three critical functions of a well-integrated stroke system of care. First, stroke systems of care should establish effective interaction and collaboration. Integration across agencies, services, and people assures efficient routing of patients from the location of stroke occurrence to the closest and most appropriate level of hospital care in a locality or region to ensure timely access to treatment (*20*). Second, stroke systems of care should promote the use of an organized, standardized approach to stroke care at each facility and component within the system. Current practice for stroke systems of care is based in part on evidence-based recommendations from the Brain Attack Coalition (https://www.brainattackcoalition.org), including recommendations for different levels of stroke care (e.g., comprehensive stroke centers, primary stroke centers, and acute stroke ready hospitals) (*18*), and when appropriate, the use of telemedicine to provide timely acute stroke care to remote stroke treatment hospitals (*21*,*22*). Telemedicine for acute stroke care, or "telestroke," allows stroke specialists to examine and communicate with potential stroke patients and physicians at remote hospitals using digital video technology, providing expert diagnosis and faster treatment for patients. Third, stroke systems of care must identify performance measures and outcomes that can be monitored to improve the quality of care provided. Through collaboration and use of the principles of continuous quality improvement, goals for the entire stroke system of care can be established to achieve better outcomes.

Federal Programs to Prevent Stroke and Improve Stroke Care

The CDC's Paul Coverdell National Acute Stroke Program (PCNASP) functions at the integration of clinical care and community-based public health. In 2001, PCNASP began funding academic principal investigators in eight states, and since 2004, has funded thirteen state health departments to improve the quality of care for acute stroke patients (*23*). The program works across the continuum of care to improve the quality of care provided, promote stroke prevention communication in communities, and improve transitions in care from EMS personnel to emergency department staff members and from hospital to rehabilitation and transition to home The goal of PCNASP is to implement effective, evidence-based, integrated systems for stroke prevention and treatment that provide 1) timely identification and transport of stroke patients to hospitals specializing in stroke care, 2) high-quality acute stroke treatment and rehabilitation, and 3) reintegration with primary care providers and the community to prevent recurrence of strokes by minimizing risk factors. From 2005 to 2015, approximately 620,000 acute stroke patients have benefited from care at PCNASP-participating hospitals, and each day many more patients are benefitting from the development of integrated stroke systems of care within PCNASP-funded states (*24*–*27*).

Since at least 2012, the National Institutes of Health has invested approximately $300 million annually to improve stroke prevention, treatment, and recovery (*28*). The National Institute of Neurologic Disorders and Stroke funds StrokeNet, a network, designed to maximize efficiencies in stroke research and to create balanced research in both preclinical and clinical trials. The National Institute of Neurologic Disorders and Stroke is also working to educate millions of Americans about the danger of uncontrolled hypertension through the Mind Your Risks campaign (https://mindyourrisks.nih.gov/).

The Million Hearts initiative (https://millionhearts.hhs.gov/), co-led by the CDC and the Centers for Medicare and Medicaid Services, focuses on a core set of strategies to prevent heart attacks and stroke. Community prevention includes tobacco control, sodium reduction, and physical activity. Clinical strategies include using aspirin when appropriate, hypertension control, cholesterol management, and smoking cessation, along with the use of health information technology to improve detection and management of patient-level risk factors for heart disease and stroke and patient and family engagement in health care decisions.

For strokes, prevention is the best medicine, whether the intervention is at the clinical or community level. Public health actions for stroke prevention include 1) employing epidemiology and surveillance to identify where progress is being made and where health care delivery gaps exist and to monitor and evaluate progress toward reducing those gaps; 2) promoting health system interventions to more effectively deliver high-quality preventive services; 3) improving community-clinical linkages to enhance access to community resources that can prevent, delay, and manage chronic diseases; and 4) implementing broad environmental approaches to improve the social and physical environment, promote healthy behaviors, and make healthy choices the easier choices (*29*). Collectively, these measures can prevent stroke.

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Recommendations of the Advisory Committee on Immunization Practices for Use of Cholera Vaccine

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Introduction

Cholera, caused by infection with toxigenic *Vibrio cholerae* bacteria of serogroup O1 (>99% of global cases) or O139, is characterized by watery diarrhea that can be severe and rapidly fatal without prompt rehydration. Cholera is endemic in approximately 60 countries and causes epidemics as well. Globally, cholera results in an estimated 2.9 million cases of disease and 95,000 deaths annually (*1*). Cholera is rare in the United States, and most U.S. cases occur among travelers to countries where cholera is endemic or epidemic. Forty-two U.S. cases were reported in 2011 after a cholera epidemic began in Haiti (*2*); however, <25 cases per year have been reported in the United States since 2012.

In 2016, lyophilized CVD 103-HgR (Vaxchora, PaxVax, Redwood City, California), a single-dose, live attenuated oral cholera vaccine, was approved by the Food and Drug Administration for the prevention of cholera caused by *V. cholerae* O1 in adults traveling to cholera-affected areas. Lyophilized CVD 103-HgR is the only cholera vaccine licensed for use in the United States. In June 2016, the Advisory Committee on Immunization Practices (ACIP) voted to recommend use of lyophilized CVD 103-HgR for prevention of cholera among adult travelers to areas with endemic or epidemic cholera caused by toxigenic *V. cholerae* O1, including areas with cholera activity during the last year that are prone to recurrence of cholera epidemics. ACIP considered evidence on safety and efficacy of the currently available formulation of CVD 103-HgR as well as that of a previously available formulation with identical phenotypic and genomic properties that was licensed and marketed in other industrialized countries before manufacture ceased in 2003 for business reasons (i.e., not because of safety or efficacy concerns) (*3*,*4*). This report provides new recommendations and guidance for vaccination providers and travelers about the use of lyophilized CVD 103-HgR. These recommendations apply to adults aged 18–64 years traveling to areas with endemic or epidemic cholera.

Recommendations for routine use of vaccines in children, adolescents and adults are developed by the Advisory Committee on Immunization Practices (ACIP). ACIP is chartered as a federal advisory committee to provide expert external advice and guidance to the Director of the Centers for Disease Control and Prevention (CDC) on use of vaccines and related agents for the control of vaccine-preventable diseases in the civilian population of the United States. Recommendations for routine use of vaccines in children and adolescents are harmonized to the greatest extent possible with recommendations made by the American Academy of Pediatrics (AAP), the American Academy of Family Physicians (AAFP), and the American College of Obstetricians and Gynecologists (ACOG). Recommendations for routine use of vaccines in adults are harmonized with recommendations of AAFP, ACOG, and the American College of Physicians (ACP). ACIP recommendations approved by the CDC Director become agency guidelines on the date published in the Morbidity and Mortality Weekly Report (MMWR). Additional information about ACIP is available at https://www.cdc.gov/vaccines/acip.

Methods

ACIP work groups meet regularly to review all relevant data and prepare draft policy recommendations for ACIP consideration. Work groups are chaired by an ACIP member and include at least two ACIP members and a CDC subject matter expert; relevant ex officio members, liaison representatives, members of academia, other CDC staff members, and consultants are included as needed (*5*). In addition to ACIP members and CDC participants, the Cholera Vaccine Work Group (Work Group) includes participants from the Department of Defense, the Infectious Diseases Society of America, the National Foundation for Infectious Diseases, and academia. Members include experts in cholera, travel medicine, immunology, infectious diseases, obstetrics and gynecology, epidemiology, public health, military health, immunization safety, vaccine policy, and the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach, a framework for evaluating scientific evidence. The Work Group convened monthly teleconferences starting in August 2015 to review cholera epidemiology and the evidence for the efficacy and safety of CVD 103-HgR according to the GRADE approach (https://www.cdc.gov/vaccines/acip/recs/grade/about-grade.html). During teleconferences, the Work Group reviewed and discussed a summary of findings and evidence quality for relevant outcomes. Questionnaires were used to collect and summarize Work Group opinions on key outcomes, evidence type, and proposed recommendations.

At the October 2015 ACIP meeting, the Work Group presented an overview of cholera epidemiology and CVD 103-HgR to ACIP. At the February 2016 meeting, the Work Group presented the GRADE review that summarized the strength of

evidence for each of the outcomes assessed (prevention of cholera death, life-threatening cholera diarrhea, severe cholera diarrhea, and cholera diarrhea of any severity; induction of vibriocidal antibody response; occurrence of serious and systemic adverse events; and impact on effectiveness of co-administered vaccines and medications; (https://www.cdc.gov/vaccines/acip/recs/grade/cholera-CVD-103-HgR.html). At the June 2016 meeting, the Work Group presented proposed recommendations, and after a public comment period, ACIP voted to approve recommendations for use of lyophilized CVD 103-HgR. Postmarketing surveillance studies and additional data pertaining to use of the vaccine will be reviewed by ACIP as they become available, and recommendations will be updated as needed.

Summary of Findings

Lyophilized CVD 103-HgR is the only cholera vaccine licensed for use in the United States. Its efficacy against severe diarrhea (defined here as fecal output >3 L/24 hours) after oral toxigenic *V. cholerae* O1 challenge is estimated to be 90% at 10 days after vaccination and 80% at 3 months after vaccination (*6*). Studies of the previously available formulation (discontinued in 2003) demonstrated similar efficacy (*7*). Both the previously and currently available formulations of the vaccine were effective in inducing a vibriocidal antibody response, the best available correlate of protection against cholera infection. No vaccine-related serious adverse events were reported in studies conducted using either of the two formulations. Studies with the currently available vaccine formulation found a slightly higher prevalence of diarrhea (mostly mild) among vaccine recipients (3.8%) than among unvaccinated groups (1.6%) (*8*). No other differences were detected between vaccinated and unvaccinated groups in the occurrence of any adverse events. Supporting evidence for the Work Group's findings can be found online (*7*).

Summary of Quality of Evidence Across Outcomes

The body of evidence, which included studies with the currently available lyophilized CVD 103-HgR formulation and studies with oral toxigenic *V. cholerae* O1 challenge, consistently indicated high vaccine efficacy and was judged to be GRADE evidence type 1 (evidence from randomized controlled trials or overwhelming evidence from observational studies), which is the strongest type of evidence. For safety outcomes, the data were more limited, because relatively few persons had received the currently available lyophilized vaccine formulation. Few studies evaluated coadministration of CVD 103-HgR with other vaccines or medications (*9*). Because of these limitations, the GRADE evidence for safety outcomes was judged to be type 3 (evidence from observational studies or randomized controlled trials with notable limitations).

Summary of Rationale for Cholera Vaccine Recommendations

Assessment of the risk for cholera in U.S. travelers was addressed through review of the cholera epidemiology literature and expert judgment. Although cholera is rare among travelers returning to the United States from cholera-affected areas, and cholera is treatable if medical services are readily accessible, certain populations are at higher risk for toxigenic *V. cholerae* O1 infection and severe outcomes, and a traveler's risk status is not always clear at the time of consultation.

Risk for Exposure to Toxigenic *V. cholerae* O1

Persons at higher risk for exposure might include travelers visiting friends and relatives, health care personnel, cholera outbreak response workers, and persons traveling to or living in a cholera-affected area for extended periods (*10*–*13*). The primary prevention strategy for cholera is consistent access to and exclusive use of safe water and food and frequent handwashing. Nonetheless, travelers to areas of active cholera transmission, which include areas with current or recent endemic or epidemic cholera activity, might be exposed to toxigenic *V. cholerae* O1 through inadvertent or unexpected means, despite efforts to adhere to prevention measures.

Risk for Poor Outcomes from Cholera

Cholera causes a profuse watery diarrhea leading to dehydration, which can be rapidly fatal unless reversed with fluid replacement therapy. Poor outcomes from toxigenic *V. cholerae* O1 infection might be more common in travelers with risk factors for severe disease, including the following: persons with blood type O; persons with low gastric acidity from antacid therapy, partial gastrectomy, or other causes; and travelers without ready access to medical services (*14*,*15*). Many travelers will not know their blood type at the time of consultation; however, an estimated 45% of persons in the United States have blood type O. Persons with medical conditions that would lead them to tolerate dehydration poorly, such as those with cardiovascular disease or kidney disease, might also be at increased risk for poor outcomes.

Work Group Findings

Through the GRADE systematic review, the Work Group found high-quality evidence that the vaccine is highly effective and lower quality evidence that it is safe. The available safety data indicate no harms except for a slightly elevated risk for mild diarrhea among vaccine recipients. Although cholera is rare, the Work Group concluded that a safe and effective vaccine that can prevent a potentially severe cholera infection can benefit certain travelers.

Recommendations for Prevention of Severe Cholera Among Travelers

Personal Protective Measures

All travelers to cholera-affected areas should follow safe food and water precautions and proper sanitation and personal hygiene measures as primary strategies to prevent cholera. Travelers who develop severe diarrhea should seek prompt medical attention, particularly fluid replacement therapy.

Use of CVD 103-HgR

CVD 103-HgR is recommended for adult travelers (aged 18–64 years) from the United States to an area of active cholera transmission. An area of active cholera transmission is defined as a province, state, or other administrative subdivision within a country with endemic or epidemic cholera caused by toxigenic *V. cholerae* O1 and includes areas with cholera activity within the last year that are prone to recurrence of cholera epidemics; it does not include areas where only rare imported or sporadic cases have been reported.

The vaccine is not routinely recommended for travelers who are not visiting areas of active cholera transmission. Most travelers from the United States do not visit areas with active cholera transmission (https://wwwnc.cdc.gov/travel/).

Booster Doses

At this time, no data exist about the safety and efficacy of booster doses of lyophilized CVD 103-HgR for the prevention of cholera. The duration of protection conferred by the primary dose beyond the evaluated 3-month period is unknown. There is no recommendation for use of booster doses at this time.

Coadministration of Other Medications or Vaccines

Before cholera vaccination. The Vaxchora package insert states that CVD 103-HgR should not be given to patients who have received oral or parenteral antibiotics in the preceding 14 days, because antibiotics might have activity against the vaccine strain. How long a person needs to be off antibiotics before receiving CVD 103-HgR is unknown; the duration will relate to the antimicrobial activity and half-life of the antimicrobial agent or agents. A duration of fewer than 14 days between stopping antibiotics and giving CVD 103-HgR might also be acceptable in certain clinical settings if travel is cannot be avoided before 14 days have elapsed after stopping antibiotics.

During or after cholera vaccination. A study of the previously available formulation of CVD 103-HgR found reduced immunogenicity when coadministered with chloroquine; thus, the manufacturer recommends that if chloroquine is indicated, it be started ≥10 days after CVD 103-HgR vaccination (*9*).

No data are available on concomitant administration of the currently available formulation of lyophilized CVD 103-HgR with other vaccines, including the enteric-coated oral live-attenuated typhoid vaccine (Ty21a, marketed as Vivotif). Based on expert opinion of how lyophilized CVD 103-HgR buffer might interfere with the enteric-coated Ty21a formulation, taking the first Ty21a dose ≥8 hours after ingestion of lyophilized CVD 103-HgR might decrease potential interference of the vaccine buffer with Ty21a vaccine.

The effect of oral or parenteral antibiotics given after vaccination with CVD 103-HgR is unknown; antibiotics might have activity against the vaccine strain and thus might reduce protection from vaccination. Most (83%) vaccine recipients have vibriocidal antibody seroconversion by 10 days after vaccination (*16*). Limited evidence suggests that some vaccine recipients who receive antibiotics ≤10 days after vaccination might still have vibriocidal antibody seroconversion (Lisa Danzig, PaxVax, personal communication, January 2017).

Contraindications and Precautions for Use of Lyophilized CVD 103-HgR

Allergy. CVD 103-HgR should not be administered to persons with a history of severe allergic reaction, such as anaphylaxis, to any component of this vaccine or any cholera vaccine.

Age. No data currently exist about the safety and effectiveness of the currently available lyophilized CVD 103-HgR vaccine in children and teens aged <18 years or adults aged ≥65 years.

Pregnancy and breastfeeding. No data exist on use of CVD 103-HgR in pregnant or breastfeeding women. Pregnant women are at increased risk for poor outcomes from cholera infection. Pregnant women and their clinicians should consider the risks associated with traveling to areas of active cholera transmission. The vaccine is not absorbed systemically; thus, maternal exposure to the vaccine is not expected to result in exposure of the fetus or breastfed infant to the vaccine. However, the vaccine strain might be shed in stool for ≥7 days after vaccination, and theoretically, the vaccine strain could be transmitted to an infant during vaginal delivery.

Immunocompromised persons. No data exist on use of the currently available lyophilized CVD 103-HgR formulation in immunocompromised populations. A study of the previously available CVD 103-HgR formulation among HIV-positive adults in Mali found that vibriocidal seroconversion was slightly lower among HIV-positive than HIV-negative participants (58% versus 71%) (*17*). No significant differences in occurrence of any systemic adverse events were found between vaccinated and comparison populations.

Shedding and transmission. Lyophilized CVD 103-HgR is an oral live attenuated vaccine that can be shed in stool and potentially transmitted to close contacts. The vaccine strain

was cultured from stool in 11.1% of vaccine recipients in the 7 days after vaccination with the previously available formulation (*16*). The currently available formulation of lyophilized CVD 103-HgR was not isolated from the stools of 28 household contacts whose stool was cultured 7 days after vaccination (*16*), and few (<1%) household contacts of persons vaccinated with the previously available CVD 103-HgR formulation had the vaccine strain isolated from stool cultured 5 days after vaccination. However, later transmission could have been missed. A study with the previously available vaccine formulation detected seroconversion among 3.7% of family contacts of vaccine recipients at 9 or 28 days after vaccination (*18*).

Reporting of Vaccine Adverse Events and Additional Information

Because surveillance for rare adverse events will add to information about the safety of CVD 103-HgR, all clinically significant adverse events should be reported to the Vaccine Adverse Events Reporting System at https://vaers.hhs.gov or at 1-800-822-7967. To enroll in a registry monitoring pregnancy outcomes in women exposed to lyophilized CVD 103-HgR, contact PaxVax at 1-800-533-5899. Additional information about cholera and CVD 103-HgR is available at https://www.cdc.gov/cholera/index.html.

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Notes from the Field

Severe Human Metapneumovirus Infections — North Dakota, 2016

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On May 27, 2016, CDC was informed by North Dakota Department of Health of a recent cluster of severe respiratory illnesses that included two deaths in children at a large hospital (hospital A) in Fargo, North Dakota, caused by human metapneumovirus (HMPV). An investigation was initiated to explore possible risk factors for illness. HMPV is a cause of both upper and lower respiratory tract infections, including bronchiolitis and pneumonia, particularly among young children (*1*) and older adults (*2*). In the United States, the typical HMPV season extends from November–February through May–July (*3*). No vaccine is currently available to prevent HMPV infection.

Six HMPV-positive pediatric inpatients (median age = 2.5 years) were identified at hospital A during April–May 2016. Diagnostic tests were performed at a commercial laboratory using a reverse transcription–polymerase chain reaction (RT-PCR)–based respiratory virus panel (RVP). The number of HMPV infections detected and the percentage of HMPV-positive respiratory virus panels from hospital A did not appear high compared with the same period in 2015 (hospital A, unpublished data, 2015 and 2016). Among the six patients identified in 2016 (Table), five had underlying medical conditions, including premature birth (three), congenital heart disease (three), bronchopulmonary dysplasia (two), developmental delay (three), and cerebral palsy (two). Four children required mechanical ventilation, and two of the four had acute respiratory distress syndrome and pneumothorax. Two of the six patients died; both had considerable medical comorbidities. Four of the patients were American Indian; all four survived, although two required mechanical ventilation and two required supplemental oxygen. Two of the four American Indian children were transferred to hospital A from an Indian Health Service facility. During preliminary discussions with the North Dakota Department of Health, local Indian Health Service personnel did not describe a notable increase in respiratory illness during the investigation period, although testing for HMPV was not routinely done.

Case finding was expanded to five additional large hospitals throughout North Dakota. A case was defined as a positive HMPV test in any pediatric or adult inpatient since June 1, 2015. In addition to the six cases initially reported, 11 pediatric cases from three hospitals and 27 adult patients from four hospitals were identified (Table). Medical chart abstractions were performed.

Among the 11 additional pediatric patients (median age = 10 months), none were American Indian. Nine had underlying medical conditions, including chronic lung disease (seven) and premature birth (four). One patient required mechanical ventilation; none died.

Among the 27 adult patients (median age = 69 years), all were white, and all had underlying medical conditions, particularly chronic lung disease (19) or chronic heart disease (16). This finding is consistent with previous descriptions of HMPV infection in hospitalized adults, in which elderly patients and those with underlying medical conditions had a more complicated clinical course (*4*). Twenty-two patients were current or previous smokers. Ten patients required either mechanical ventilation (two) or noninvasive ventilation (eight); among these 10 patients, nine reported chronic lung disease. Three adult patients died. Although 10 patients resided in long-term care facilities before hospital admission, no HMPV clusters were identified.

HMPV can cause severe respiratory illness in children and adults. Increased HMPV diagnostic testing could facilitate enhanced understanding of the clinical spectrum of illness, virus circulation, and populations at increased risk. Four of the six children in the hospital A cluster were American Indian. Although American Indian children are at increased risk for hospitalization with respiratory syncytial virus (*5*), whether HMPV disproportionately affects this population is unknown. Further study is needed to understand the epidemiology of HMPV in the American Indian population.

TABLE. Selected demographic and clinical characteristics of pediatric (aged <18 years) and adult inpatients with laboratory-confirmed human metapneumovirus infection—six hospitals, North Dakota, July 31, 2015–May 26, 2016

Characteristic, median (range)	Pediatric cluster, hospital A (N = 6)	Other pediatric cases (N = 11)	Adult cases (N = 27)
Age group	2.5 yrs (4 mos–9 yrs)	10 mos (2 mos–9 yrs)	69 yrs (49–95 yrs)
Length of hospitalization (days)	8.5 (2–47)	3 (1–11)	5 (1–38)
Characteristic, no. (%)			
Male sex	2 (33)	7 (64)	9 (33)
Reside in long-term care facility	0 (0)	0 (0)	10 (37)
Ever smoker	0 (0)	0 (0)	22 (81)
Race			
White	2 (33)	10 (91)	27 (100)
American Indian	4 (67)	0 (0)	0 (0)
Unknown	0 (0)	1 (9)	0 (0)
Underlying medical conditions reported*			
None	1 (17)	2 (18)	0 (0)
Chronic lung disease†	2 (33)	7 (64)	19 (70)
Chronic heart disease§	0 (0)	0 (0)	16 (59)
Congenital heart disease	3 (50)	1 (9)	0 (0)
Immunocompromised¶	1 (17)	0 (0)	5 (19)
Premature birth	3 (50)	4 (36)	0 (0)
Developmental delay	3 (50)	2 (18)	0 (0)
Genetic condition	2 (33)	1 (9)	1 (4)
Cerebral palsy	2 (33)	0 (0)	0 (0)
Diabetes	0 (0)	0 (0)	7 (26)
Chronic kidney disease	0 (0)	0 (0)	5 (19)
Hemodialysis	0 (0)	0 (0)	2 (7)
Common signs/Symptoms			
Cough	4 (67)	11 (100)	23 (85)
Fever (reported)	4 (67)	8 (73)	19 (70)
Stuffy nose/Congestion	1 (17)	10 (91)	3 (11)
Wheezing	5 (83)	2 (18)	10 (37)
Shortness of breath/Rapid or shallow breathing	3 (50)	3 (27)	21 (78)
Vomiting/Nausea	3 (50)	4 (36)	2 (7)
Clinical findings at admission			
Fever at admission (>100.4°F [>38.0°C])	2 (33)	4 (36)	3 (11)
Tachycardia (physician reported)	1 (17)	3 (27)	7 (26)
Tachypnea (physician reported)	1 (17)	4 (36)	6 (22)
Abnormal breathing sounds	4 (67)	6 (55)	20 (74)
Crackles	2 (33)	2 (18)	4 (15)
Wheezes	3 (50)	5 (45)	18 (67)
Codetected viruses			
Coronavirus	0 (0)	1 (9)	0 (0)
Respiratory syncytial virus	0 (0)	1 (9)	0 (0)
Rhinovirus or enterovirus	1 (17)	2 (18)	1 (4)
Maximum respiratory support required			
Mechanical ventilation	4 (33)	1 (9)	2 (7)
Noninvasive ventilation**	0 (0)	0 (0)	8 (30)
Supplemental oxygen	2 (33)	8 (73)	13 (48)
No oxygen support	0 (0)	2 (18)	4 (15)
Medication			
Bronchodilator	6 (100)	7 (64)	25 (93)
Steroid	4 (67)	6 (55)	19 (70)
Antiviral	0 (0)	0 (0)	1 (4)
Antibiotic	6 (100)	6 (55)	26 (96)
Outcome			
Died	2 (33)	0 (0)	3 (11)

* Some patients had multiple underlying conditions.
† Chronic lung disease included asthma, reactive airway disease, bronchopulmonary dysplasia, chronic obstructive pulmonary disease, or emphysema, or the requirement for home oxygen combined with other lung conditions such as chronic respiratory failure or pulmonary hypertension.
§ Chronic heart disease included congestive heart failure, diastolic heart failure, coronary artery disease, aortic stenosis, and arrhythmias. Reports of isolated hypertension were not included.
¶ Immunocompromised patients included those with an immune deficiency, such as hypogammaglobulinemia, or those taking immunosuppressive medications.
** Includes continuous positive airway pressure or bilevel positive airway pressure.

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Announcements

National Stroke Awareness Month — May 2017

May is National Stroke Awareness Month, an observance that highlights the importance of knowing the signs and symptoms of stroke and encourages persons to act FAST (Face drooping, Arm weakness, Speech difficulty, Time to call 9–1–1) if someone is having a stroke. Stroke is the fifth leading cause of death in the United States and a leading cause of severe disability (*1*,*2*). In the United States, one person dies from stroke approximately every 4 minutes (*2*).

Stroke is preventable and largely treatable. Yet, a recent CDC report notes that the age-adjusted death rate for stroke slightly increased from 36.5 deaths per 100,000 persons in the United States in 2014 to 37.6 in 2015 (*1*). Approximately 60% of persons who die from stroke are women, and women tend to have worse functional outcomes after experiencing a stroke (*3*). CDC urges everyone to learn the warning signs of stroke and take action to reduce their risk. Living a healthy lifestyle (e.g., being physically active, eating more fruits and vegetables and foods low in sodium and salt, maintaining a healthy weight, and avoiding smoking) can reduce the chances of having a stroke. Properly managing certain medical conditions (e.g., high blood pressure, high cholesterol, heart disease, and diabetes) also can lower the risk.

CDC promotes stroke prevention through several initiatives. The Million Hearts initiative, co-led by CDC and the Centers for Medicare & Medicaid Services, works to prevent stroke. The Paul Coverdell National Acute Stroke Program (https://www.cdc.gov/dhdsp/programs/stroke_registry.htm) funds state health departments to collect and use data to ensure high-quality, statewide systems of care to treat stroke. Additional information regarding stroke prevention is available at https://www.cdc.gov/stroke/.

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Community Preventive Services Task Force Recommendation for Family-Based Interventions to Increase Physical Activity

The Community Preventive Services Task Force recently posted new information on its website: "Physical Activity: Family-Based Interventions." This information is available at https://www.thecommunityguide.org/findings/physical-activity-family-based-interventions.

Established in 1996 by the U.S. Department of Health and Human Services, the task force is an independent, nonfederal, panel of public health and prevention experts whose members are appointed by the director of CDC. The task force provides information for a wide range of persons who make decisions about programs, services, and other interventions to improve population health. Although CDC provides administrative, scientific, and technical support for the task force, the recommendations developed are those of the task force and do not undergo review or approval by CDC.

Errata

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In the report "Addressing a Yellow Fever Vaccine Shortage — United States, 2016–2017," on page 457, the first sentence of the fourth paragraph should have read "In 2015, **approximately 9.5 million aviation passenger-journeys from the United States to 42 countries with endemic yellow fever virus transmission occurred** (*1*) (Data In, Intelligence Out [https://www.diio.net], unpublished data, 2016)."

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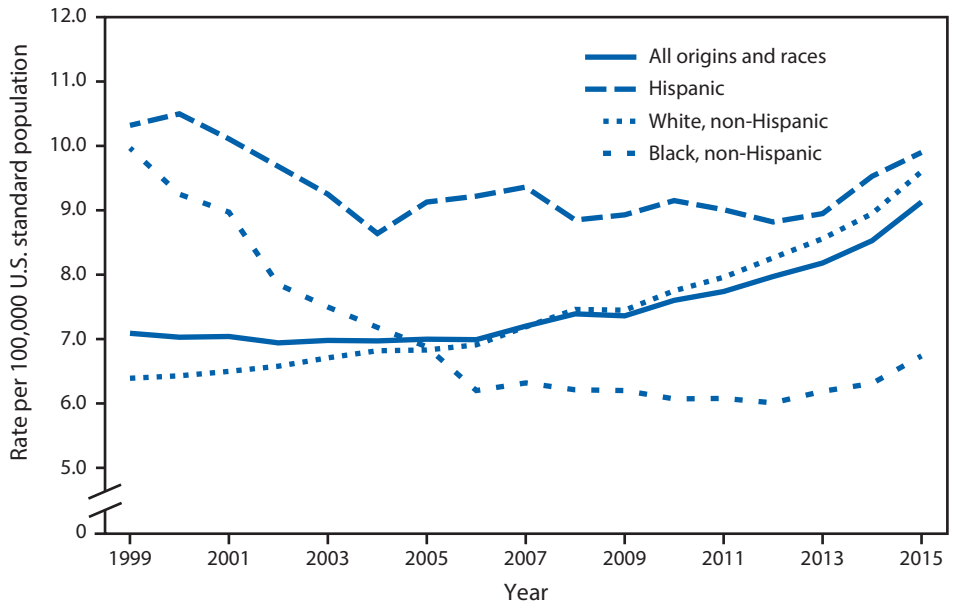
In the report "Vital Signs: Racial Disparities in Age-Specific Mortality Among Blacks or African Americans — United States, 1999–2015," on page 446, under "Results," the last sentence of the first paragraph should have read "Among adults aged ≥65 years, the death rate in 2015 relative to that in 1999 declined 27% for blacks and 17% for whites, resulting in a crossover in death rates **after 2010, when blacks had lower age-specific death rates** than whites."

On page 447, the first sentence of the first paragraph should have read, "Among persons aged ≥65 years, there was a black-white mortality crossover, whereby blacks had slightly lower **age-specific death rates than whites after 2010**."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Death Rates* Attributable to Alcohol-Induced Causes,† by Race/Ethnicity — United States, 1999–2015



* Age-adjusted rates per 100,000 based on the 2000 U.S. standard population. Populations used for computing death rates are postcensal estimates based on the 2010 census estimated as of July 1, 2015.

† Causes of death attributable to alcohol-induced mortality include *International Classification of Diseases, Tenth Revision* codes E24.4, alcohol-induced pseudo-Cushing's syndrome; F10, mental and behavioral disorders due to alcohol use; G31.2, degeneration of nervous system due to alcohol; G62.1, alcoholic polyneuropathy; G72.1, alcoholic myopathy; I42.6, alcoholic cardiomyopathy; K29.2, alcoholic gastritis; K70, alcoholic liver disease; K85.2, alcohol-induced acute pancreatitis; K86.0, alcohol-induced chronic pancreatitis; R78.0, finding of alcohol in blood; X45, accidental poisoning by and exposure to alcohol; X65, intentional self-poisoning by and exposure to alcohol; and Y15, poisoning by and exposure to alcohol, undetermined intent. Alcohol-induced causes exclude unintentional injuries, homicides, and other causes indirectly related to alcohol use, as well as newborn deaths associated with maternal alcohol use.

In 2015, mortality from alcohol-induced causes reached the highest rate during 1999–2015 of 9.1 deaths per 100,000 U.S. standard population. Alcohol-induced death rates for the Hispanic population remained the highest (9.9 per 100,000 U.S. standard population), followed by the non-Hispanic white population (9.6). For the non-Hispanic black population, the alcohol-induced death rate decreased 33% from 1999 to 2015, while the rate increased by 50% during the same period for the non-Hispanic white population. Overall, from 1999 to 2015, mortality from alcohol-induced causes increased 28% (7.1 to 9.1).

Source: National Vital Statistics System. Mortality public use data files, 1999–2015. https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm.

Reported by: Betzaida Tejada-Vera, MS, BTejadaVera@cdc.gov, 301-458-4231.

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