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World Hepatitis Day — July 28, 2018

World Hepatitis Day is commemorated each year on July 28 with the goal of promoting awareness and inspiring action to prevent and treat viral hepatitis. The World Health Organization's (WHO's) theme of this year's World Hepatitis Day is "Test. Treat. Hepatitis" to underscore the urgent need to scale up testing and treatment activities.

WHO estimated that globally in 2015, approximately 325 million persons were infected with hepatitis B virus (HBV) or hepatitis C virus (*1*). Among the estimated 257 million persons infected with HBV in 2015, nearly 900,000 died, primarily as a result of complications of cirrhosis and hepatocellular carcinoma (*1*). In 2016, the World Health Assembly endorsed viral hepatitis elimination goals set by WHO, defined as a global reduction of 90% in incidence of and 65% in mortality from hepatitis B and hepatitis C by 2030 (*1*).

This issue of *MMWR* features a report on progress toward access to hepatitis B treatment worldwide. Overall, hepatitis B treatment coverage is low among countries in all income strata. Increased awareness of, access to, and availability of affordable diagnostics, and training of health care providers might increase access to treatment. Additional information and resources are available at https://www.cdc.gov/hepatitis.

Reference

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Access to Treatment for Hepatitis B Virus Infection — Worldwide, 2016

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Worldwide, an estimated 257 million persons are living with chronic hepatitis B virus (HBV) infection (*1*). To achieve the World Health Organization (WHO) goals for elimination of HBV infection worldwide by 2030, defined by WHO as 90% reduction in incidence and 65% reduction in mortality, access to treatment will be crucial. WHO estimated the care cascade* for HBV infection, globally and by WHO Region. The patent and licensing status of entecavir and tenofovir, two WHO-recommended medicines for HBV treatment, were examined using the Medicines Patent Pool MedsPaL†

* The sequential steps or stages of hepatitis B care that persons living with hepatitis B virus infection go through, from diagnosis through viral suppression.
† http://www.medspal.org.

INSIDE

Continuing Education examination available at https://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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database. The international price of tenofovir was estimated using WHO's global price reporting mechanism (GPRM), and for entecavir from a published study (*2*). In 2016, among the estimated 257 million persons infected with HBV worldwide, approximately 27 million (10.5%) were aware of their infection, an estimated 4.5 million (16.7%) of whom were on treatment. In 2017, all low- and middle-income countries (LMICs) could legally procure generic entecavir, and all but two LMICs could legally procure generic tenofovir. The median price of WHO-prequalified generic tenofovir on the international market fell from $208 per year in 2004 to $32 per year in 2016. In 2015, the lowest reported price of entecavir was $427 per year of treatment (*2*). Increased availability of generic antivirals effective in treating chronic HBV infection has likely improved access to treatment. Taking advantage of reductions in price of antivirals active against HBV infection could further increase access to treatment. Regular analysis of the hepatitis B treatment care cascade can assist in monitoring progress toward HBV elimination goals.

Hepatitis B vaccination among infants has increased globally (*3*); in 2015, the prevalence of chronic HBV infection in children aged <5 years was estimated at 1.3% (*1*). However, HBV infection remains prevalent among adults, with an estimated 257 million persons (3.5% of the population) living with chronic HBV infection worldwide in 2015 (*1*). Persons with chronic HBV infection are at increased risk for cirrhosis and hepatocellular carcinoma, and nearly 900,000 persons die annually from HBV-related outcomes, primarily from these sequelae of infection (*1*).

In 2015, WHO issued guidelines for the management of chronic HBV infection, particularly for LMICs (*4*). The available medications suppress viral replication and can decrease mortality (*4*), but the need for treatment is potentially lifelong. Access to treatment is limited in LMICs, because of lack of awareness among patients, cost and availability of quality diagnostics, cost of medicines, and lack of trained health care providers (*1*). In 2016, the World Health Assembly endorsed WHO viral hepatitis elimination goals, defined as a 90% reduction in incidence and a 65% reduction in mortality worldwide for both hepatitis B and hepatitis C by 2030 (*1*). To reach the mortality reduction goals for HBV elimination, a major scaling up of treatment will be needed. This report assesses global progress in access to hepatitis B treatment in 2016 (*1*).

WHO described the sequential stages of hepatitis B care that persons living with HBV infection go through from diagnosis to viral suppression (the care cascade) (*5*). The 2015 WHO estimates of the number of persons infected with HBV were used as the denominator (*1*). In each country, the estimated size of the population infected with HBV, the number of persons treated, the proportion of infected persons who had received a diagnosis, and the proportion treated were obtained from published estimates (*6*). Estimates of the size of the population that had received a diagnosis of HBV infection were derived from the following data sources (in order of priority):

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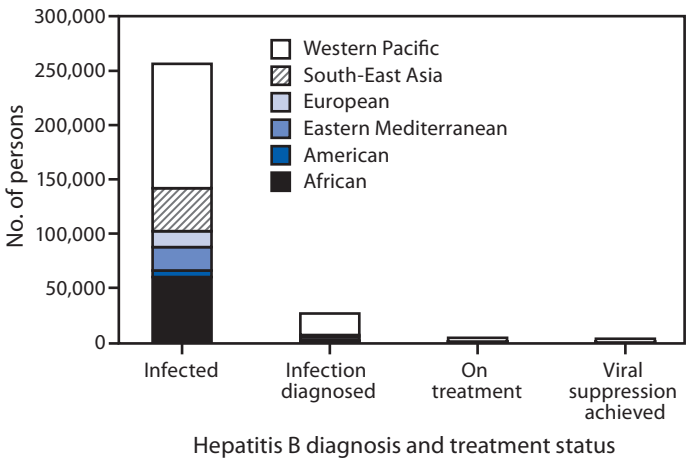
1) national notifications; 2) published studies; 3) blood donation screening data; and 4) extrapolations from neighboring countries. The number of persons treated for HBV infection was estimated using the following data sources (in order of priority): 1) national reports; 2) sales audit data of generic tenofovir; 3) published studies; and 4) national experts' estimates. To use medicine sales audit data, the annual number of treatment units sold were converted into the number of treated patients using the average number of units per patient. Assuming 90% viral suppression among patients with full adherence (*1*,*6*) and 80% treatment adherence, it was estimated that globally, 72% achieved effective viral suppression (*1*,*6*). The country cascade estimates were weighted by population size. Data from all regions were summed to generate a global estimate that was stratified by WHO region[§] and four World Bank income groups.[¶]

The patent and licensing status of entecavir and tenofovir, the two WHO-recommended HBV medications, influence medicine prices (*7*). The relevant U.S. patents of medicines were identified from the Food and Drug Administration Orange Book (*8*). Information on the patent status was then collected from the relevant offices, and the global coverage of tenofovir with voluntary licenses was analyzed using data obtained from the Medicines Patent Pool's database, MedsPaL.

The international price of tenofovir was estimated using WHO's GPRM,[**] which reports market price of WHO-prequalified commodities used for human immunodeficiency virus (HIV) response based on transactions reported by major purchasers (e.g., the President's Emergency Plan for AIDS Relief [PEPFAR], the Global Fund, South Africa, United Nations Children's Fund [UNICEF]). Because the GPRM does not monitor the price of entecavir, which is not a first-line HIV medicine, the price reported in a 2015 study was used to estimate the price of this medicine (*2*).

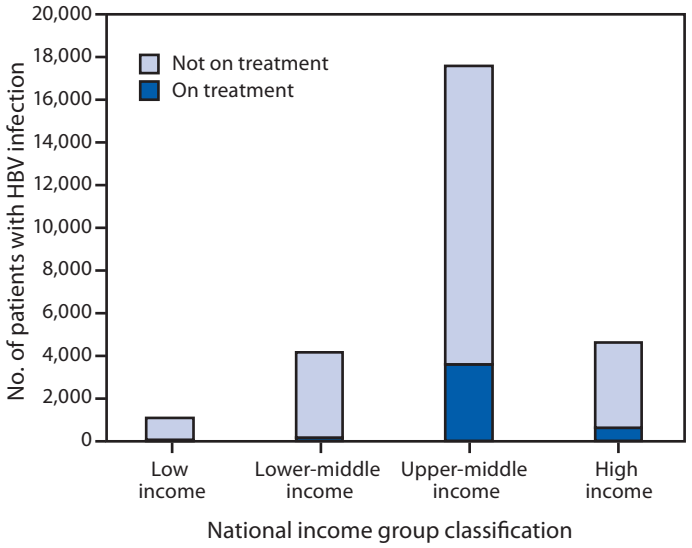
Among the estimated 257 million persons infected with HBV worldwide, an estimated 27 million (10.5%) had received a diagnosis and were aware of their infection in 2016, 4.5 million (16.7%) of whom were estimated to be receiving HBV treatment (Figure 1). Treatment coverage was low among countries in all income strata, but highest (22%) in upper middle-income countries (Figure 2). In 2017, all LMICs could legally procure generic entecavir, while all but two LMICs (China and Mexico) could legally procure generic tenofovir. However, the relevant patents in China and Mexico are set to expire in 2018. Tenofovir patents in the United States and Europe also expired

FIGURE 1. Care cascade* for hepatitis B treatment, by World Health Organization region, 2016



* The sequential steps or stages of hepatitis B care that persons living with hepatitis B virus infection go through, from diagnosis through viral suppression.

FIGURE 2. Hepatitis B virus (HBV) treatment coverage among the 27 million persons with diagnosed HBV infection, by national income group — worldwide, 2016



in 2017 and 2018. The median price of WHO prequalified generic tenofovir available on the international market fell by over 85%, from $208 per year of treatment in 2004 to $32 in 2016 (Figure 3), in tandem with expanding access to tenofovir-based antiretroviral treatment regimens for persons living with HIV infection. In 2015, the lowest reported price of entecavir was $427 per year of treatment (*2*).

Discussion

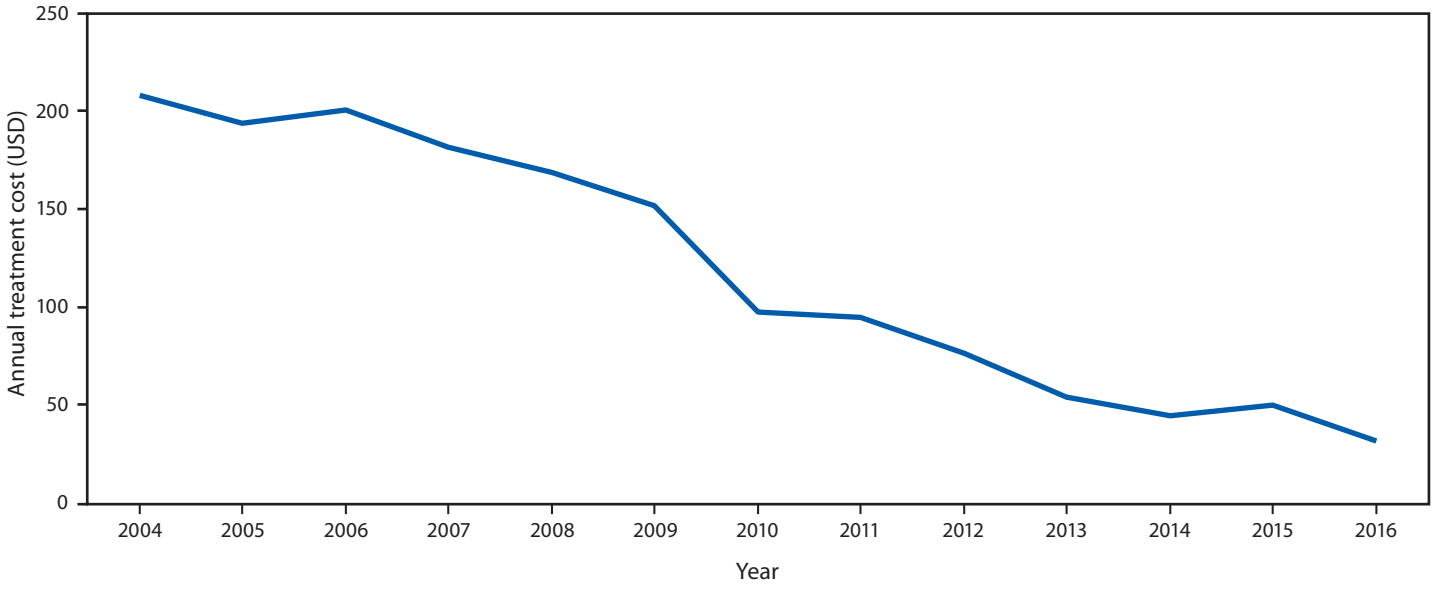
In 2016, only one in 10 persons living with HBV infection worldwide had received a diagnosis, and among those, one in six was receiving treatment. Treatment coverage varied by

[§] Africa, Americas, Eastern Mediterranean, Europe, South-East Asia, and Western Pacific.

[¶] Low-income countries; lower, middle-income countries; upper, middle-income countries; and high-income countries.

[**] http://apps.who.int/hiv/amds/price/hdd/; cost data was only available for tenofovir.

FIGURE 3. Reported annual cost of treatment for hepatitis B virus infection with tenofovir in countries that can access generic medicines — worldwide, 2004–2016



Source: World Health Organizations Global Price Reporting Mechanism.

WHO region and by national income group and was highest in the Western Pacific region and upper middle-income countries. Price reduction for antiviral medicines and inclusion of the treatment in the various health insurance packages in China (*1*) probably led to a major increase in the number of persons treated, which likely accounts for the higher treatment coverage in this region. Africa has among the highest prevalence of HBV infection and highest mortality from liver cancer in the world (*1*). However, in the African region, with the exception of a few demonstration projects (*9*), and for persons with HIV-HBV coinfection who are on antiretroviral regimens (current antiretroviral treatment regimens include medications active against HBV infection), no national programs are known to provide testing, care, and treatment services for all persons with HBV infection.

Although the price of medicines effective against HBV infection have decreased sharply in LMICs, the findings from this analysis indicate underutilization of low-price, generic medicines effective against HBV. Greater community awareness and better understanding of the national disease burden, access to and availability of affordable diagnostics, and trained providers are needed to promote increased access to care.

The findings in this report are subject to at least five limitations. First, WHO-endorsed global estimates of the proportion of patients with HBV infection eligible for treatment (not all HBV infected persons should be on treatment, based on disease stage) are not available (*4*); therefore, it was not possible to estimate how many more persons currently require treatment in addition to the 4.5 million already receiving treatment. Second, the estimates of the number of persons on treatment are based on data sources of variable quality, and the results needed to be generalized by region/country when data were not available. Third, methods used to obtain information on the price of entecavir and tenofovir came from different sources. However, the published study that estimated the price of entecavir reported prices for tenofovir that were comparable with the data obtained from the GPRM. Fourth, it was not always possible to determine whether tenofovir was prescribed as part of HIV-related antiretroviral regimen or for HBV infection alone. Finally, no systematic mechanism is available to monitor the prices of HBV medicines sold in the private sector.

Development and use of the global HBV care cascade can assist in monitoring progress toward the WHO 2030 HBV elimination goals. Refinements in the care cascade to account for the proportion of HBV-infected persons who are not eligible for treatment could improve estimate precision. Increased access to generic HBV medicines through price reductions might lead to a larger proportion of HBV-infected persons receiving treatment. Development of a national viral hepatitis control strategy is an important step for increasing access to treatment for persons with chronic HBV infection, particularly in countries with a large disease burden (*1*). Development of such strategies might open the way to public sector procurement of medicines and diagnostics that can lower prices. Among patients with HBV infection, those with cirrhosis should be prioritized for treatment, because they are

Summary

What is already known on the topic?

An estimated 257 million persons were living with chronic hepatitis B virus (HBV) infection in 2015.

What is added by this report?

Among persons living with HBV worldwide, approximately 27 million (10.5%) were aware of their infection, including 4.5 million (16.7%) who were on treatment. In 2017, all but two low- and middle-income countries could legally procure generic entecavir or tenofovir, the medicines active against HBV infection. The median price of generic tenofovir fell by >85% from 2004 to 2016. However, global treatment coverage of HBV was low.

What are the implications for public health practice?

Access to treatment could be increased by taking advantage of reductions in price of antivirals active against HBV infection.

at increased risk for developing life-threatening complications. WHO is in the process of establishing a reporting system to monitor the cascade of care globally to allow for regular reporting. The potential future availability of a functional cure for HBV infection will further improve the prospects of achieving the 2030 elimination targets (*10*).

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Homie Razavi, Center for Disease Analysis, Lafayette, Colorado.

Conflict of Interest

No conflicts of interest were reported.

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HIV Testing, Linkage to HIV Medical Care, and Interviews for Partner Services Among Black Men Who Have Sex with Men — Non–Health Care Facilities, 20 Southern U.S. Jurisdictions, 2016

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Identifying HIV-infected persons who are unaware of their human immunodeficiency virus (HIV) infection status, linking them to care, and reducing health disparities are important national HIV prevention goals (*1*). Gay, bisexual, and other men who have sex with men (collectively referred to as MSM) accounted for 70% of HIV infection diagnoses in the United States in 2016, despite representing only 2% of the population (*2*,*3*). African American or black (black) MSM accounted for 38% of all new diagnoses of HIV infection among MSM (*2*). Nearly two thirds (63%) of all U.S. black MSM with diagnosed HIV infection reside in the southern United States (*2*), making targeted HIV prevention activities for black MSM in this region critical. Analysis of CDC-funded HIV testing data for black MSM submitted by 20 health departments in the southern United States in 2016 revealed that although black MSM received 6% of the HIV tests provided, they accounted for 36% of the new diagnoses in non–health care facilities. Among those who received new diagnoses, 67% were linked to HIV medical care within 90 days of diagnosis, which is below the 2020 national goal of linking at least 85% of persons with newly diagnosed HIV infection to care within 30 days (*1*). Black MSM in the southern United States are the group most affected by HIV, but only a small percentage of CDC tests in the southern United States are provided to this group. Increasing awareness of HIV status through HIV testing, especially among black MSM in the southern United States, is essential for reducing the risk for transmission and addressing disparities. HIV testing programs in the southern United States can reach more black MSM by conducting targeted risk-based testing in non–health care settings and by routine screening in agencies that also provide health care services to black MSM.

In 2016, CDC funded 20 health departments and 24 community-based organizations (CBOs) to provide HIV testing and related services in the southern United States. Health departments and CBOs submitted deidentified program data about services provided through a secure, online CDC-supported system. Data from 2016, analyzed for this report, include the number of CDC-funded HIV tests,* new HIV-positive diagnoses, information on linkage of persons with newly or previously identified HIV infection to medical care within 90 days,† and interviews for partner services.§ Analyses were restricted to HIV tests provided in the 20 southern U.S. jurisdictions¶ in non–health care facilities,** to persons who reported their sex at birth and current gender identity as male, reported sex with a male in the preceding 12 months, and their age as ≥13 years. Non–health care facilities routinely collect HIV-related risk information from all clients, whereas health care facilities are only required to collect HIV risk information from HIV-positive clients. Data were stratified by the following characteristics: age group, first-time tested, and urbanicity. Urbanicity was based on the 2013 Urban-Rural Classification Scheme for Counties of the National Center for Health Statistics; for this analysis, the categories included metropolitan (population of ≥1,000,000), urban (50,000–999,999), or rural (<50,000). Multivariate binomial regression was used to assess the association between demographic characteristics and newly diagnosed HIV infections, linkage to HIV medical care, and interviews for partner services.

Among the 374,871 CDC-funded HIV tests provided in non–health care facilities in the 20 southern jurisdictions in 2016, a total of 22,183 (6%) were provided to black MSM, who accounted for 828 (36%) of 2,304 new diagnoses of HIV infection among all persons tested in non–health care facilities in these jurisdictions.††

* An HIV test is defined as the performance of one or more HIV tests to determine a person's HIV infection status. A person might be tested once (e.g., one rapid test or one conventional test) or multiple times (e.g., one rapid test followed by one conventional test to confirm a preliminary HIV-positive test result).

† Linkage to HIV medical care within 90 days means confirmation that persons attended their first HIV medical care appointment within 90 days of their HIV test date.

§ Partner services is a process through which HIV-infected persons are interviewed to elicit information about their partners, who can then be confidentially notified of their possible exposure or potential risk and offered services that can protect the health of partners and prevent HIV transmission to others.

¶ Southern U.S. jurisdictions included the following 16 states: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. Also included were the following four jurisdictions: Atlanta, Baltimore, District of Columbia, and Houston.

** Non–health care facilities are settings where HIV testing is performed using a targeted testing strategy rather than a routine screening strategy. Examples of non–health care facilities include HIV testing sites (such as an HIV testing event or HIV testing mobile van) and community settings (such as an AIDS service organization).

†† Among the 11,710 newly diagnosed HIV-positive persons identified by CDC-funded HIV tests provided in health care and non–health care facilities in 2016, 2,327 (20%) were white, 5,676 (48%) were black, 2,943 (25%) were Hispanic or Latino, 229 (2%) were Asian, 57 (0.5%) were American Indian or Alaska Native, 18 (0.2%) were Native Hawaiian or Pacific Islander, and 122 (1%) were multiracial.

Among black MSM in the jurisdictions, the highest percentages of tests were provided to men aged 25–34 years (43%), living in metropolitan areas (75%), and who had been tested previously (81%) (Table 1). Overall, 1,471 black MSM had positive tests for HIV infection in 2016; among these, 828 (56%) received a new diagnosis (Table 2) and 643 (44%) had previously received a diagnosis of HIV infection (Table 3). Among black MSM, new diagnoses of HIV infection were highest in persons aged 20–24 years (4.8%) followed by those aged 13–19 (4.1%) and 25–34 (4.0%) years. Compared with black MSM aged 25–34 years, those aged ≥35 years were less likely to receive a new diagnosis (adjusted prevalence ratio [aPR] 35–44 years = 0.56; aPR 45–54 years = 0.46; and aPR ≥55 years = 0.34). Compared with black MSM who had not been tested before, those who reported a previous HIV test were less likely to receive a new HIV diagnosis (aPR = 0.73). Overall, 608 (73%) new diagnoses of HIV infection were in persons tested in a metropolitan area. Compared with tests performed in metropolitan jurisdictions, tests performed in urban jurisdictions were more likely to yield new diagnoses, and tests performed in rural jurisdictions were less likely to yield new diagnoses (aPR = 1.23 and 0.48, respectively) (Table 1).

In this analysis, among the 828 black MSM in the southern U.S. jurisdictions with newly diagnosed HIV infection, 552 (67%) were linked to HIV medical care within 90 days of diagnosis, and 451 (55%) were interviewed for partner services. The percentage of black MSM with newly diagnosed HIV infection who were interviewed for partner services was higher among persons aged 20–24 years (61%) than among those aged 25–34 years (50%) (aPR = 1.23). In addition, the percentage of black MSM with newly diagnosed HIV infection who were interviewed for partner services was higher in rural jurisdictions (83%) than in metropolitan jurisdictions (53%) (aPR = 1.44) (Table 2). Black MSM with newly diagnosed HIV infections were significantly more likely to be linked to HIV medical care (odds ratio = 1.44, p = 0.0008) than were those with a previously diagnosed infection.

Among the 643 black MSM in the southern U.S. jurisdictions with a previously diagnosed HIV infection, 374 (58%) were linked to HIV medical care within 90 days of the test date. The adjusted prevalence ratio of being linked to HIV medical care within 90 days was higher for those living in urban areas (70%) than for those living in metropolitan areas (52%) (aPR = 1.36) (Table 3).

Discussion

HIV testing and prompt linkage to and retention in HIV medical care are essential to achieve viral suppression among those HIV-positive persons unaware of their infection or aware but not in care. (*4,5*). The findings from this study highlight the value of CDC's HIV testing program for reaching black MSM in the southern United States who are at highest risk for acquiring or transmitting HIV infection. Among black MSM in 20 southern U.S. jurisdictions, the percentage of HIV-positive results was highest among men aged <35 years (4.3%), highlighting the critical importance of prioritizing this population. However, given that black MSM accounted for only 6% of HIV tests but 36% of new diagnoses, efforts to increase HIV testing of black MSM in non–health care facilities in the southern United States are needed. Approximately half (44%) of the positive HIV test results were among black MSM with previously diagnosed infections, underscoring the need to prioritize testing among black MSM who have never been tested for HIV.

Approximately two thirds (67%) of HIV-positive black MSM in these southern jurisdictions with newly diagnosed infection, and 58% with previously diagnosed infection, were linked to HIV medical care, both short of the national goal of 85% (*1*). Black MSM with previously diagnosed HIV infection might have been linked to HIV medical care upon initial diagnosis and subsequently fallen out of care. Their return to HIV testing might indicate willingness to be linked or reengaged in care; however, these men with previously diagnosed infections might face more obstacles to accessing care than would someone with a new HIV diagnosis, particularly if they are linked back into the same health system that failed them initially (*6*). For black MSM in the southern United States, racism, lower educational levels, stigma, income inequality, and lack of access to health care are barriers to testing, linkage, and retention in HIV prevention and treatment services (*7,8*). In addition, some persons living with HIV infection in the rural southeastern United States might have to travel >50 miles to receive HIV care (*9*).

Summary

What is already known about this topic?

Black men who have sex with men (MSM) are disproportionately affected by human immunodeficiency virus (HIV) infection, accounting for 38% of all new HIV diagnoses among MSM in the United States in 2016.

What is added by this report?

Analysis of CDC-funded HIV testing for black MSM in 20 southern U.S. jurisdictions in 2016 revealed that black MSM received 6% of the HIV tests provided and accounted for 36% of the new HIV diagnoses in non–health care facilities.

What are the implications for public health practice?

HIV testing programs in the southern United States can be designed to reach more black MSM by conducting targeted risk-based testing in non–health care settings and by routine screening in agencies that also provide health care services to black MSM.

TABLE 1. HIV tests and newly diagnosed HIV infections among black gay, bisexual, and other men who have sex with men (MSM) in non–health care facilities, by selected characteristics — 20 southern U.S. jurisdictions, 2016

Characteristic	Total no. of HIV tests*	HIV tests among black MSM		Total no. of newly diagnosed HIV infections†	Newly diagnosed HIV infections among black MSM			
		No. (%)	(Row %)		No. (%)	(Row %)	% positive	aPR (95%CI)
Total	**374,871**	**22,183 (100.0)**	**5.9**	**2,304**	**828 (100.0)**	**35.9**	**3.7**	—
Age group (yrs)§								
13–19	30,815	1,404 (6.3)	4.6	99	58 (7.0)	58.6	4.1	0.97 (0.73–1.29)
20–24	81,589	6,060 (27.3)	7.4	571	289 (34.9)	50.6	4.8	1.16 (0.99–1.36)
25–34	121,731	9,508 (42.9)	7.8	921	378 (45.7)	41.0	4.0	Referent
35–44	61,739	2,645 (11.9)	4.3	353	63 (7.6)	17.9	2.4	0.56 (0.43–0.75)¶
45–54	44,662	1,556 (7.0)	3.5	238	27 (3.3)	11.3	1.7	0.46 (0.31–0.68)¶
≥55	32,434	949 (4.3)	2.9	113	12 (1.5)	10.6	1.3	0.34 (0.19–0.60)¶
First-time tested§								
Yes	79,967	3,630 (16.4)	4.5	513	163 (19.7)	31.8	4.5	Referent
No	224,395	17,848 (80.5)	8.0	1,690	635 (76.7)	37.6	3.6	0.73 (0.61–0.87)¶
Urbanicity§								
Metropolitan	235,666	16,559 (74.7)	7.0	1,669	608 (73.4)	36.4	3.7	Referent
Urban	89,010	4,076 (18.4)	4.6	531	188 (22.7)	35.4	4.6	1.23 (1.05–1.45)**
Rural	41,643	587 (2.7)	1.4	32	12 (1.5)	37.5	2.0	0.48 (0.27–0.86)**

Abbreviations: aPR = adjusted prevalence ratio; CI = confidence interval; HIV = human immunodeficiency virus.

* HIV tests were defined as tests for which a result (i.e., positive or negative) was known. Analyses excluded discordant and indeterminate results.

† Included are persons who tested HIV-positive and did not report a previous positive test result, calculated using HIV surveillance verification (if available) or a person's self-reported previous HIV status.

§ Missing/invalid data were excluded. In the column "HIV tests among black MSM," 61 (0.3%) records were excluded from the age group category, 705 (3.2%) from the first-time tested category, and 961 (4.3%) from the urbanicity category. In the column "Total no. of newly diagnosed HIV infections," nine (0.4%) records were excluded from the age group category, 101 (4.4%) from the first-time tested category, and 72 (3.1%) from the urbanicity category. In the section "Newly diagnosed HIV infections among black MSM," one (0.1%) record was excluded from the age group category, 30 (3.6%) from the first-time tested category, and 20 (2.4%) from the urbanicity category.

¶ p-value <0.001.

** p-value <0.05.

TABLE 2. Linkage to HIV medical care and interview for partner services among HIV-positive black gay, bisexual, and other men who have sex with men (MSM) with newly diagnosed HIV infection in non–health care facilities, by selected characteristics — 20 southern U.S. jurisdictions, 2016

Characteristic	No. of newly diagnosed HIV infections*	Linked to HIV medical care within 90 days of diagnosis†			Interviewed for HIV partner services§		
		No. (row %)	Missing no. (%)	aPR (95% CI)	No. (row %)	aPR (95% CI)	Missing, No. (%)
Total	**828**	**552 (66.67)**	**180 (21.74)**	—	**451 (54.5)**	—	**174 (21.0)**
Age group (yrs)							
13–19	58	43 (74.1)	8 (13.8)	1.08 (0.91–1.29)	35 (60.3)	1.26 (0.99–1.60)	8 (13.8)
20–24	289	187 (64.7)	65 (22.5)	0.94 (0.84–1.05)	177 (61.3)	1.23 (1.06–1.42)¶	55 (19.0)
25–34	378	262 (69.3)	81 (21.4)	Referent	189 (50.0)	Referent	87 (23.0)
35–44	63	38 (60.3)	14 (22.2)	0.90 (0.72–1.11)	34 (54.0)	1.08 (0.82–1.42)	13 (20.6)
45–54	27	16 (59.3)	8 (29.6)	0.85 (0.62–1.17)	13 (48.2)	1.00 (0.67–1.50)	5 (18.5)
≥55	12	6 (50.0)	4 (33.3)	0.72 (0.41–1.27)	3 (25.0)	0.52 (0.20–1.41)	6 (50.0)
First-time tested**							
Yes	163	105 (64.4)	36 (22.1)	Referent	86 (52.8)	Referent	48 (29.5)
No	635	423 (66.6)	139 (21.9)	1.04 (0.92–1.18)	342 (53.9)	1.07 (0.91–1.25)	121 (19.0)
Urbanicity**							
Metropolitan	608	413 (67.9)	138 (22.7)	Referent	323 (53.1)	Referent	136 (22.4)
Urban	188	123 (65.4)	38 (20.2)	0.97 (0.86–1.09)	105 (55.9)	1.05 (0.91–1.22)	37 (19.7)
Rural	12	6 (50.0)	1 (8.3)	0.75 (0.43–1.33)	10 (83.3)	1.44 (1.10–1.90)¶	0 (0.0)

Abbreviations: aPR = adjusted prevalence ratio; CI = confidence interval; HIV = human immunodeficiency virus.

* Included persons who tested HIV-positive during the current test and were not found to be previously reported in the health department jurisdiction's HIV surveillance system or who self-reported not having a previous HIV-positive test result if surveillance system verification was not available.

† Linkage to HIV medical care within 90 days of diagnosis means confirmation that persons attended their first HIV medical care appointment within 90 days of their HIV test date.

§ Partner services is a process through which HIV-infected persons are interviewed to elicit information about their partners, who can then be confidentially notified of their possible exposure or potential risk and offered services that can protect the health of partners and prevent HIV transmission to others.

¶ p-value <0.01.

** Missing/invalid data were excluded. In the column "No. of newly diagnosed HIV infections," one (0.1%) record was excluded from the age group category, 30 (3.6%) from the first-time tested category, and 10 (1.2%) from the urbanicity category. In the section "Linked to HIV medical care within 90 days of diagnosis," 24 (4.3%) records were excluded from first-time tested and 10 (1.8%) from the urbanicity category. In the section "Interviewed for HIV partner services," 23 (5.1%) records were excluded from first-time tested and 13 (2.9%) from urbanicity.

TABLE 3. Linkage to HIV medical care among HIV-positive black gay, bisexual, and other men who have sex with men (MSM) with a previous diagnosis of HIV infection in non–health care facilities — 20 southern U.S. jurisdictions, 2016

	Previously diagnosed HIV infection*	Previously diagnosed HIV-positive black MSM linked to HIV medical care†		
Characteristic	No.	No. (%)	aPR (95% CI)	Missing, No. (%)
Total	**643**	**374 (58.2)**	**—**	**116 (18.0)**
Age group (yrs)§				
13–19	25	19 (76.0)	1.19 (0.90–1.57)	3 (12.0)
20–24	149	86 (57.7)	0.96 (0.82–1.14)	27 (18.1)
25–34	309	189 (61.2)	Referent	57 (18.5)
35–44	81	47 (58.0)	0.94 (0.76–1.18)	13 (16.1)
45–54	51	21 (41.2)	0.70 (0.49–1.00)¶	11 (21.6)
≥55	25	11 (44.0)	0.73 (0.44–1.20)	4 (16.0)
First-time tested§				
Yes	75	52 (69.3)	Referent	4 (5.3)
No	551	311 (56.4)	1.04 (0.75–1.45)	110 (20.0)
Urbanicity§				
Metropolitan	443	232 (52.4)	Referent	94 (21.2)
Urban	112	78 (69.6)	1.36 (1.16–1.58)**	20 (17.9)
Rural	48	36 (75.0)	1.38 (0.94–2.04)	0 (0.0)

Abbreviations: aPR = adjusted prevalence ratio; CI = confidence interval; HIV = human immunodeficiency virus.

* Previously diagnosed HIV infections included persons who tested HIV-positive during the current test and were found to be previously reported in the health department's HIV surveillance system or who self-reported having a previous HIV-positive test result if the surveillance system verification was not available.

† Linkage to HIV medical care within 90 days of diagnosis means confirmation that persons attended their first HIV medical care appointment within 90 days of their HIV test date.

§ Missing/invalid data were excluded. In the section "Previously diagnosed HIV-positive black MSM who are linked to HIV medical care," one (0.3%) record was excluded from the age group category, 11 (2.9%) from first-time tester, and 28 (7.5%) from urbanicity.

¶ p-value <0.05.

** p-value <0.001.

The findings in this report are subject to at least four limitations. First, findings describe CDC-funded HIV tests only and are not generalizable to HIV testing rates among all black MSM in the southern United States or in the entire United States. Second, linkage data include records with missing or invalid data in the denominator, and therefore probably underestimate the percentage of persons linked to care. Third, when surveillance data are unavailable to verify prior HIV status, the number of new positive results might be overestimated if clients inaccurately report their HIV testing history. Finally, findings describe only tests provided in non–health care facilities because these facilities collect HIV-related risk information from all clients, whereas health care facilities only routinely collect HIV risk information from HIV-positive clients.

Increasing HIV testing among black MSM in the southern United States is essential for reducing HIV infection in this disproportionately affected population. However, the efficiency and effectiveness of this approach is contingent upon reaching MSM who are living with undiagnosed HIV infection. HIV testing programs in the southern United States can be designed to reach more black MSM who are unaware of their HIV status either by conducting targeted risk-based testing in non–health care settings (e.g., outreach) or routine screening in agencies that also provide health care services to black MSM. HIV testing programs in the southern United States also need to improve linkage to HIV medical care among HIV-positive black MSM who are not in care.

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Conflict of Interest

No conflicts of interest were reported.

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Identification of Primary Congenital Hypothyroidism Based on Two Newborn Screens — Utah, 2010–2016

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Newborn screening for primary congenital hypothyroidism is part of the U.S. Recommended Uniform Screening Panel (*1*,*2*). Untreated congenital hypothyroidism can result in cognitive impairment and growth complications (decreased height/length). Initial newborn screening for congenital hypothyroidism is typically performed 24–48 hours after birth. Fourteen states, including Utah, perform a routine second screen at approximately 2 weeks of age.* During 2010–2016, a total of 359,432 infants in Utah were screened for congenital hypothyroidism, and 130 cases were diagnosed; among these, 98 had an abnormal first screen, and 25 had an abnormal second screen (seven infants were excluded because of missing data). A retrospective examination of Utah's screening data indicated that 20% of congenital hypothyroidism cases could not have been efficiently identified by a single screen alone. This study highlights the utility of a two-screen process and demonstrates that differential cutoff values for the first and second screens could optimize both screening sensitivity and specificity.

Congenital hypothyroidism is a pediatric disorder with an observed prevalence in the United States of one in 2,000–4,000 live births (*3*) and a prevalence in Utah of one in 2,800. Early detection and initiation of treatment within the first 30 days of life substantially reduce the risk for permanent cognitive impairment (*4*). Newborn screening for congenital hypothyroidism in Utah is accomplished by measuring thyroid-stimulating hormone (TSH) from dried whole blood spots collected on a newborn screening card by heel stick. The first specimen (first screen) is collected within 24–48 hours of life; the second specimen (second screen) is collected during 7–28 days of life. All infants receive two screens, even if the first screen is positive. In Utah, during this study period, any TSH value ≥40 μIU/mL is considered abnormal for both the first and second screens; elevated screening results are followed by diagnostic testing. From the perspective of this study, a confirmed case is defined as an abnormal newborn screen (elevated TSH) as well as a clinical diagnosis of congenital hypothyroidism.

Among 130 confirmed cases of congenital hypothyroidism identified in Utah during 2010–2016, 123 cases with two screens were analyzed, including 98 cases identified by the first screen and 25 cases identified by the second screen; seven of the 130 cases were excluded because only one test result was available. Infants with confirmed congenital hypothyroidism were stratified into two groups: those with an abnormal first screen (group 1) and those with a normal first screen but an abnormal second screen (group 2). Mean TSH concentrations for both the first and second screens were computed and compared for both groups. Student's t-tests were performed to test for significant differences in TSH concentration as a function of group. A retrospective cutoff analysis was performed to determine whether all group 2 cases (those identified only on the second screen) could be identified by a single screen. This retrospective cutoff analysis involved analyzing the number of false positives and false negatives as a function of adjusting the first screen cutoff value (range = 5–40 μIU/mL). To ensure infants with persistent but only marginally elevated TSH concentrations are identified, the numbers of screened infants with a TSH concentration 20 μIU/mL–40 μIU/mL on the first or second screen during 2010–2016 were determined and compared.

Mean TSH concentrations varied as a function of group and by screen number (first vs. second) (Table). The highest TSH concentrations were observed in group 1 infants on the first screen. Among group 2 infants (those with cases diagnosed on the second screen), TSH concentrations were lower on the first screen, with all infants having concentrations below the cutoff value of 40 μIU/mL (range = 5.3–39.8 μIU/mL)

TABLE. Mean thyroid-stimulating hormone (TSH) levels on first and second congenital hypothyroidism screening tests among 123 infants with congenital hypothyroidism and comparison within and between groups — Utah, 2010–2016

Population	First screen*	Second screen*	P-value
Group 1 (n = 98)† (mean TSH [μIU/mL])	397.3	215.8	<0.001
Group 2 (n = 25)§ (mean TSH [μIU/mL])	23.9	107.8	0.002
All infants screened (n = 359,432) (mean TSH [μIU/mL])	10.7	3.9	<0.001
Comparison between groups			
Group 1 versus group 2 (p-value)	<0.001	0.022	NA
Group 1 versus all infants screened (p-value)	<0.001	<0.001	NA
Group 2 versus all infants screened (p-value)	<0.001	<0.001	NA

Abbreviations: IU = international unit; NA = not applicable.
* During the time frame of this study the normal TSH concentration level was <40 μIU/mL.
† Confirmed congenital hypothyroidism with abnormal TSH level on first screen.
§ Confirmed congenital hypothyroidism with normal TSH level on first screen and abnormal TSH level on second screen.

* https://www.newsteps.org/resources/number-required-newborn-screens-regional-genetics-networks-and-number-annual-births.

resulting in normal first screen designation, but with TSH concentrations above the cutoff level on the second screen (Figure 1). Compared with all infants screened, TSH levels in group 1 and group 2 infants were significantly elevated on both the first and second screens (Table).

When concurrently examining the number of cases with false-positive and false-negative results (missed cases) as a function of TSH concentration cutoff, an inverse relationship was observed (Figure 2). A moderate cutoff adjustment from 40 μIU/mL to 20 μIU/mL would have resulted in approximately 27,600 false-positive and 11 missed cases. To ensure that all group 2 cases were detected through a single screen, a TSH cutoff value of 5 μIU/mL would have been necessary, which would have resulted in approximately 282,850 false-positive cases or approximately 79% of the screened population.

Discussion

The goal of newborn screening is to not miss cases, while avoiding overwhelming the health care system with false-positive screens requiring unnecessary follow-up and diagnostic testing. In Utah, a two-screen program supports this goal. During 2010–2016, approximately 20% of all confirmed

FIGURE 1. Thyroid-stimulating hormone (TSH) levels among 25 infants with congenital hypothyroidism who had a normal first screen and an abnormal second screen (group 2 infants) — Utah, 2010–2016

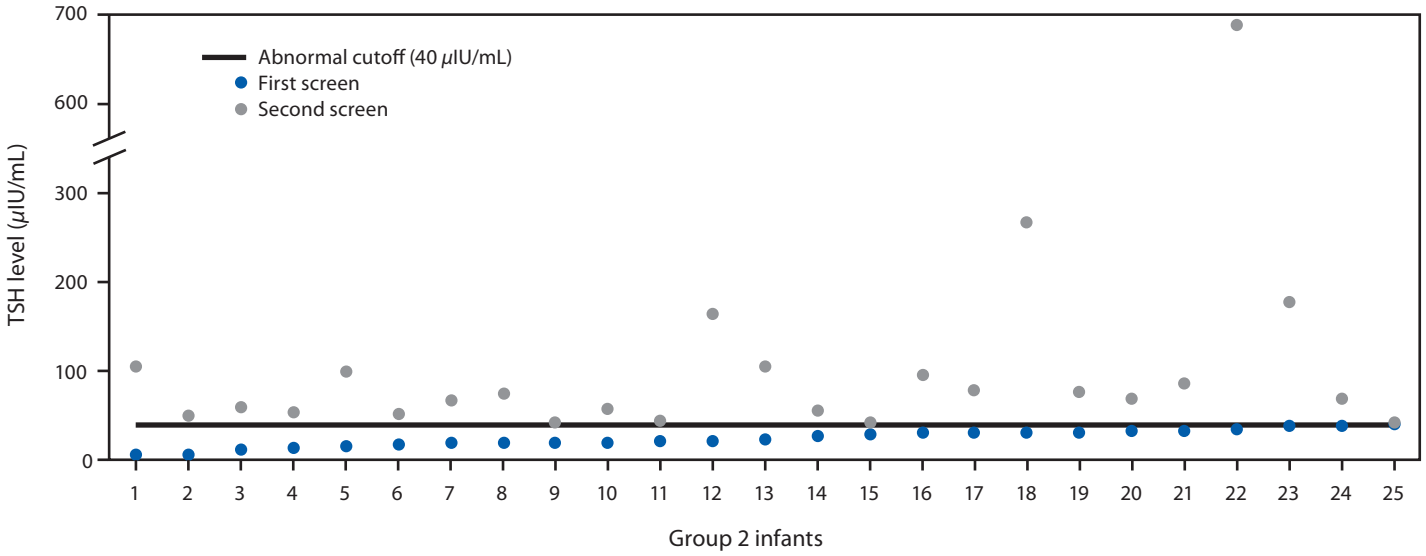
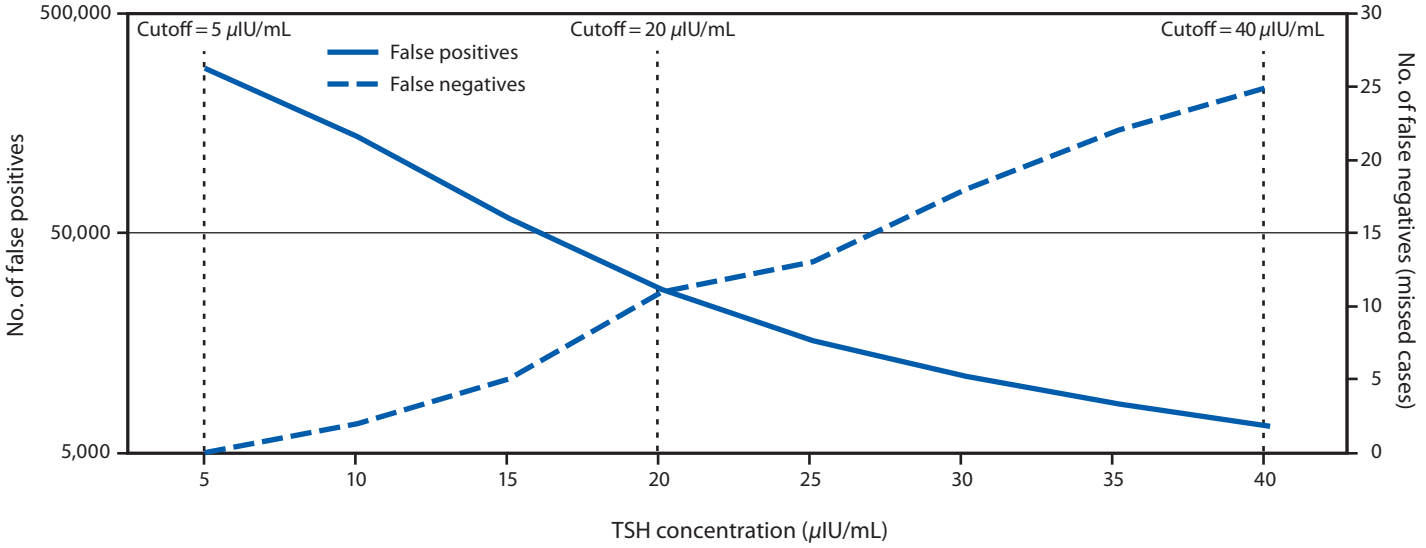


FIGURE 2. Retrospective comparison of number of false positives and false negatives on the first newborn screen using different thyroid-stimulating hormone (TSH) cutoff values — Utah, 2010–2016



congenital hypothyroidism cases were identified through the second screen. A retrospective analysis that examined lowering the abnormal TSH cutoff value indicated that cases identified only on the second screen could not have been identified through a single screen. Even with a moderate cutoff value adjustment from 40 μIU/mL to 20 μIU/mL, 44% (11/25) of cases would have been missed by a single screen.

Two-screen programs with a similar screening cutoff for both screens risk missing infants with marginally elevated TSH concentrations, who need to be treated (*5*,*6*). Congenital hypothyroidism detection is directly related to cutoff values, which vary among newborn screening programs (*7*). The 2016 CDC Newborn Screening Quality Assurance Program Annual Summary Report indicated that the mean and mode TSH cutoff values for U.S. newborn screening laboratories were 30.6 μIU/mL and 20 μIU/mL, respectively.† In light of higher TSH concentration observed during the first screen period, but lower TSH concentrations during the 7–28 day period, higher TSH cutoff values for the first period are advisable. This is consistent with the observed lower TSH concentrations of both groups (i.e., those with abnormal first or second screens) for the second screen.

Among infants screened during 2010–2016, TSH concentrations of 20 μIU/mL–40 μIU/mL were found for approximately 21,000 infants on the first screen with 85 remaining elevated on the second screen. A lower screening cutoff for the first screen would obligate reporting many infants with positive screens to primary care providers, potentially resulting in unnecessary additional testing as well as unnecessary stress for families and providers.

This data-driven analysis, with the goal of optimizing screening sensitivity and specificity, identified two potential workflow adaptations that would allow identification of all group 2 cases together with infants with marginally elevated TSH concentrations. For the first approach, infants with TSH concentrations 20 μIU/ml–40 μIU/ml on the first screen could be characterized as "borderline." These cases would be reported as "abnormal" only if the TSH concentration would exceed 20 μIU/ml during the second screen as well. A second approach would use a tiered cutoff, with a TSH concentration cutoff of 40 μIU/mL on the first screen and 20 μIU/mL on the second screen to identify these cases.

Retrospective analysis of Utah data indicated that a two-screen approach with a cutoff of 40 μIU/mL on the first screen and 20 μIU/mL on the second screen, followed by referral of infants with TSH values above each screen's cutoff for diagnostic evaluation, would result in approximately 1,000 infants per year, or approximately 2% of Utah's annual screening volume, requiring follow-up and diagnostic testing. This reflects a modest increase over the current workload of approximately 950 infants requiring follow-up and diagnostic testing for congenital hypothyroidism each year. This approach would detect infants with persistent marginally elevated TSH concentration (20 μIU/mL–40 μIU/mL), identify both group 1 and group 2 congenital hypothyroidism cases, and improve the sensitivity and specificity of congenital hypothyroidism screening.

The findings in this report are subject to at least one limitation based on the small size of the sample, which included only 130 confirmed cases of congenital hypothyroidism among a sample of 359,432 infants. Although the observed differential progression of TSH elevation might suggest heterogeneous disease mechanisms for congenital hypothyroidism, further elucidation of underlying differential pathophysiology and molecular mechanisms would require replication in larger cohorts. Such efforts could be further complicated by genetic and population heterogeneity. However, similar findings have been observed by other two-screen programs regarding the importance of a second screen for identifying cases of congenital hypothyroidism (*7*).

Analysis of 7 years of newborn screening data for congenital hypothyroidism in Utah demonstrated the value and benefits of a two-screen program. Identifying all congenital hypothyroidism cases through a single screen would have required a cutoff of 5 μIU/mL and would have required diagnostic testing for 79% of the population. Cases of congenital hypothyroidism identified through the first screen had significantly higher mean TSH concentrations compared with cases identified through the second screen. These significant differences suggest that applying the same screening cutoff limits to both first and second screens might result in missed cases of congenital

Summary

What is already known about this topic?

Screening for congenital hypothyroidism is conducted by all newborn screening programs in the United States.

What is added by this report?

Retrospective analysis of 7 years of Utah newborn screening data found that 20% of congenital hypothyroidism cases were in infants who had normal thyroid-stimulating hormone (TSH) concentrations on the first screen but elevated TSH concentrations on the second screen. One screen alone could not have identified all of these cases.

What are the implications for public health practice?

This study underscores the utility and power of a two-screen approach in identifying congenital hypothyroidism cases with normal TSH concentrations on the first screen but elevated TSH concentrations on the second screen. A two-screen approach also limits the number of false positive cases.

† https://www.cdc.gov/labstandards/pdf/nsqap/nsqap_summaryreport_2016.pdf.

hypothyroidism with marginally elevated TSH levels. Applying the same cutoffs might also miss cases because of the known physiologic TSH concentration changes in relation to age of the infant and specimen collection (*6*,*8*). The suggested workflow adaptations could help ensure that no cases of congenital hypothyroidism are missed.

Conflict of Interest

No conflicts of interest were reported.

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Notes from the Field

Occupational Carbon Monoxide Exposure in an Industrial Kitchen Facility — Wisconsin, 2017

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On September 6, 2017, the Wisconsin Poison Center was contacted by emergency department (ED) health care providers at two hospitals who requested consultation for management of multiple patients with occupational carbon monoxide (CO) exposure. CO is an odorless, colorless gas that kills approximately 400 persons annually in the United States (*1*). The Wisconsin Division of Public Health received a surveillance alert from the Wisconsin Poison Center and launched an investigation to characterize the exposures and provide public health recommendations. The Wisconsin Division of Public Health conducted key informant interviews with emergency responders and reviewed ED medical records.

According to key informant interviews, first responders had received a call on September 5 from a manufacturer of frozen appetizers who suspected a CO leak in the manufacturing facility. CO levels were obtained in multiple areas of the facility and reached a peak of 313 ppm (National Institute for Occupational Safety and Health ceiling recommended exposure limit is 200 ppm) in an area of the facility with gas-burning fryers. The facility was evacuated, and natural gas was turned off. Forty-five employees were triaged on site; 37 were transported to local EDs for assessment and treatment for CO exposure. Four symptomatic employees who had gone home sick were instructed to proceed to the nearest ED for evaluation.

During September 6–October 3, the Wisconsin Division of Public Health obtained medical records for 40 persons, including 36 (97%) of the 37 persons transported by emergency medical services and four employees who arrived at the ED by other means. Two persons who initially were treated and discharged returned to the ED with continuing symptoms. CO poisoning is defined as carboxyhemoglobin >5% for nonsmokers and >10% for smokers or those whose smoking status is unknown (*2*). Median age of those for whom medical records were obtained was 27 years (range = 20–63 years), 16 (40%) were female, and 15 (38%) smoked or had undocumented smoking status. The most commonly reported symptoms were headache, dizziness, and nausea, which were reported by 37 (93%), 16 (40%), and 15 (38%) patients, respectively. Mean blood carboxyhemoglobin level among 37 (93%) workers evaluated within 6 hours of the first responders' arrival was 11.7% (range = 4.1%–21.4%). Thirty-one (78%) patients met the Council of State and Territorial Epidemiologists' CO poisoning case definition (*2*). No patients required overnight inpatient admission or hyperbaric oxygen. There were no deaths.

An Occupational Safety and Health Administration (OSHA) investigation identified a CO source associated with gas burners on the fryer appliances; these burners had been replaced 4 days earlier. OSHA found that ventilation was inadequate to clear combustion products from the new burners, which resulted in a buildup of CO in the facility.

Gas-burning appliances in industrial kitchen facilities are not common occupational causes of CO-related morbidity and mortality (*3*). However, improperly maintained and ventilated appliances can be a source of CO exposure. Because symptoms of CO poisoning are nonspecific, CO poisoning might be underreported (*4*). Adequate ventilation in areas at risk for CO buildup, routine maintenance of gas-burning equipment, and detectors that alert to potentially unsafe levels are the best ways to prevent CO poisoning. OSHA does not specifically require CO detectors in industrial kitchen facilities; however, employers are required to evaluate all potential airborne contaminants that present a health hazard (*5*).

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Conflict of Interest

No conflicts of interest were reported.

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Notes from the Field

Widespread Transmission of Circulating Vaccine-Derived Poliovirus Identified by Environmental Surveillance and Immunization Response — Horn of Africa, 2017–2018

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After the declaration of eradication of wild poliovirus type 2 in 2015, all countries using oral poliovirus vaccine (OPV) switched from using trivalent OPV (tOPV) (containing vaccine virus types 1, 2, and 3) to bivalent OPV (bOPV) (containing types 1 and 3) in April 2016 (*1*). Vaccine-derived polioviruses (VDPVs), strains that have diverged from the live vaccine virus during prolonged circulation, can emerge rarely in areas with inadequate OPV coverage and can cause outbreaks of paralysis. Before the global switch from tOPV to bOPV, many circulating VDPV (cVDPV) outbreaks identified globally were caused by type 2 cVDPV (cVDPV2). After the switch, two large cVDPV2 outbreaks occurred in 2017 in the Democratic Republic of the Congo (continuing in 2018) and Syria (*2*,*3*).

Somalia, Kenya, and Ethiopia make up much of the Horn of Africa. Performance indicators for acute flaccid paralysis (AFP) surveillance, an indicator of the sensitivity of surveillance to detect a case of polio, indicate some subnational gaps in these countries, including in areas of Somalia that are inaccessible for polio vaccination activities (*4*,*5*). Sixteen environmental poliovirus surveillance (sewage sampling) sites have been established in these countries to supplement AFP surveillance (Figure).

Decades of civil unrest and protracted conflict in Somalia have weakened the country's governance and health care infrastructure, and routine vaccination coverage is estimated to be <50%. Several areas in Somalia are controlled by anti-government elements that ban vaccination services, leaving approximately 500,000 children aged <5 years unvaccinated (*4*,*5*). Approximately 2 million Somalis are internally displaced or living as refugees in neighboring countries; immunization services might not be effectively extended to a large proportion of displaced and refugee children.

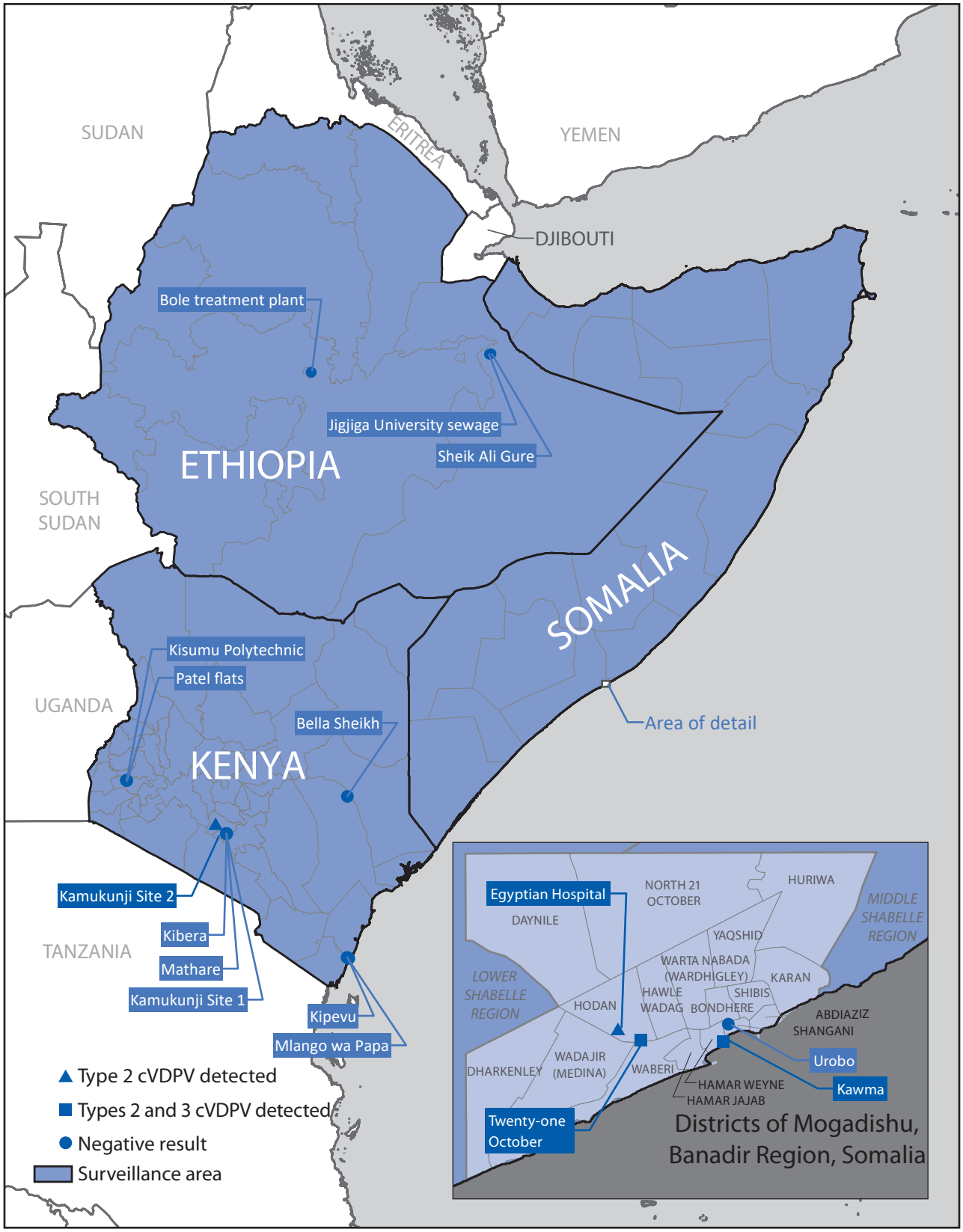
In October 2017, a VDPV2 isolate was detected from a sewage sample collected from one of four environmental surveillance sites in Banadir, Somalia. The isolate differed from the parental Sabin 2 strain by 38 nucleotides in the VP1 coding region, indicating undetected circulation for >3 years. Genetically related VDPV2 isolates were detected in November 2017 in a sewage sample from the same site. Subsequent detection of genetically related VDPV2 isolates from sewage samples collected in January 2018 from a second site in Banadir confirmed cVDPV2 transmission.

Two response vaccination campaigns using monovalent OPV type 2 (mOPV2) were conducted in December 2017 and January 2018, targeting children aged <5 years in Banadir and the neighboring provinces of Middle Shabelle and Lower Shabelle (Figure); no vaccination was possible in inaccessible areas within these provinces. After detection of a genetically related VDPV2 isolate from a sewage sample collected in February 2018 from a third site in Banadir, a third mOPV2 vaccination campaign was conducted in these same provinces in early May 2018. VDPV2 has not been detected from the fourth sampling site in Banadir.

In March 2018, a VDPV2 isolate differing by 47 nucleotides from the parental Sabin 2 strain was detected in a sewage sample collected in Kamukunji, Nairobi County, in neighboring Kenya. The isolate was genetically linked to the cVDVP2 isolates detected in Banadir (18–25 nucleotide changes), indicating independent circulation of the Banadir and Nairobi VDPV2 lineages for >1 year. VDPV2 has not been detected from samples collected from the other three environmental surveillance sites in Nairobi or from sites in other cities in Kenya, although sample collection was irregular. VDPV2 has not been detected from any of the three environmental surveillance sites in Ethiopia. A limited mOPV2 response vaccination campaign was conducted in Nairobi in May 2018, and two synchronized mOPV2 rounds are scheduled for July and August 2018 in southern and central Somalia, eastern Kenya (including Nairobi), and eastern Ethiopia.

In April 2018, cVDPV type 3 (cVDPV3) isolates (15–17 nucleotide differences from parental Sabin 3 strain) were detected in environmental samples from two sites in Banadir province. In May 2018, cVDPV3 related to the April sewage isolate was identified in stool specimens from two AFP cases in Middle Shabelle province and one AFP case in Hiran province (in which the patient had a coinfection with cVDPV2). A bOPV response vaccination campaign is planned for the southern and central provinces of Somalia. AFP surveillance has been intensified in all three countries through active case finding at health facilities and other reporting sites. This increased surveillance is aimed at closing the gaps in AFP surveillance in all three countries. Further field investigations are ongoing.

FIGURE. Environmental surveillance for detection of polioviruses — three countries, Horn of Africa region,* 2017–2018



Abbreviation: cVDPV = circulating vaccine-derived poliovirus.
* Ethiopia, Kenya, and Somalia. Borders for states (Ethiopia), counties (Kenya), and regions (Somalia) are indicated by lines within countries.

Conflict of Interest

No conflicts of interest were reported.

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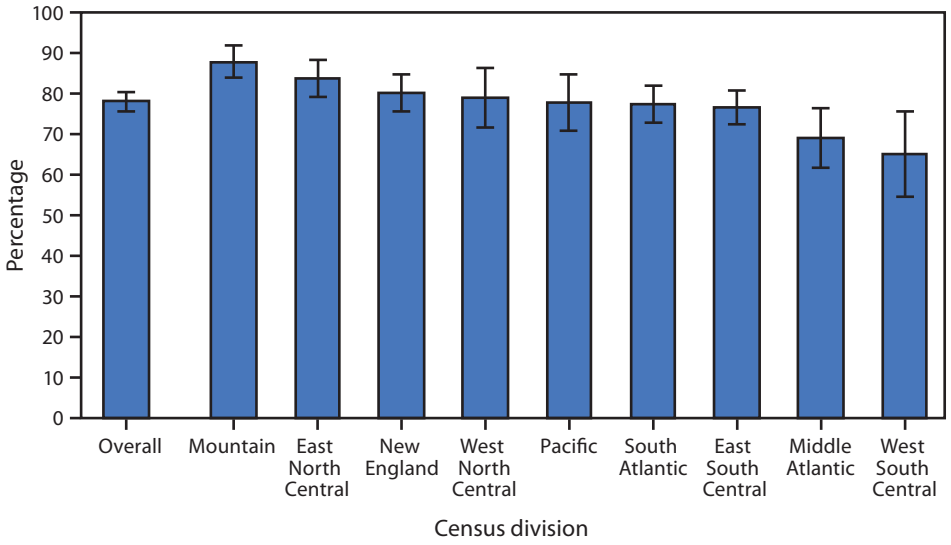
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Residential Care Community Residents with an Advance Directive,† by Census Division§ — National Study of Long-Term Care Providers, 2016



* With 95% confidence intervals shown with error bars.

† Based on the question "Of the current residents, how many have documentation of an advance directive in their file?" asked of the 98% of communities that responded "yes" to "Does this residential care community typically maintain documentation of residents' advance directives or have documentation that an advance directive exists in resident files?"

§ *New England*: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; *Middle Atlantic*: New Jersey, New York, and Pennsylvania; *East North Central*: Illinois, Indiana, Michigan, Ohio, and Wisconsin; *West North Central*: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota; *South Atlantic*: Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, District of Columbia, and West Virginia; *East South Central*: Alabama, Kentucky, Mississippi, and Tennessee; *West South Central*: Arkansas, Louisiana, Oklahoma, and Texas; *Mountain*: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming; *Pacific*: Alaska, California, Hawaii, Oregon, and Washington.

In 2016, 77.9% of residents in residential care communities had an advance directive documented in their files. By Census division, the highest percentage (87.8%) of residents who had an advance directive were located in the Mountain division, followed by residents in East North Central (83.7%), New England (80.0%), West North Central (78.9%), Pacific (77.6%), South Atlantic (77.4%), East South Central (76.4%), Middle Atlantic (68.8%), and West South Central (64.9%).

Source: National Center for Health Statistics, National Study of Long-Term Care Providers, 2016. https://www.cdc.gov/nchs/nsltcp/index.htm.

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