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# Influenza-Related Hospitalizations and Poverty Levels — United States, 2010–2012

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Annual influenza vaccine is recommended for all persons aged ≥6 months in the United States, with recognition that some persons are at risk for more severe disease (*1*). However, there might be previously unrecognized demographic groups that also experience higher rates of serious influenza-related disease that could benefit from enhanced vaccination efforts. Socioeconomic status (SES) measures that are area-based can be used to define demographic groups when individual SES data are not available (*2*). Previous surveillance data analyses in limited geographic areas indicated that influenza-related hospitalization incidence was higher for persons residing in census tracts that included a higher percentage of persons living below the federal poverty level (*3–5*). To determine whether this association occurs elsewhere, influenza hospitalization data collected in 14 FluSurv-NET sites covering 27 million persons during the 2010–11 and 2011–12 influenza seasons were analyzed. The age-adjusted incidence of influenza-related hospitalizations per 100,000 person-years in high poverty (≥20% of persons living below the federal poverty level) census tracts was 21.5 (95% confidence interval [CI]: 20.7–22.4), nearly twice the incidence in low poverty (<5% of persons living below the federal poverty level) census tracts (10.9, 95% CI: 10.3–11.4). This relationship was observed in each surveillance site, among children and adults, and across racial/ethnic groups. These findings suggest that persons living in poorer census tracts should be targeted for enhanced influenza vaccination outreach and clinicians serving these persons should be made aware of current recommendations for use of antiviral agents to treat influenza (*6*).

Influenza causes annual epidemics in the United States resulting in an estimated 4,900–27,000 deaths and 114,000–624,000 hospitalizations per year (*7*). Influenza vaccination recommendations have evolved from focusing on persons at higher risk for severe disease and influenza-associated complications to a recommendation for vaccination of all persons aged ≥6 months (*1*). In addition to the recommendation for universal influenza vaccination, enhancing vaccination efforts in specific demographic groups that experience higher rates of serious influenza-related disease can reduce their vulnerability and minimize disparities.

Influenza surveillance data have generally not included individual measures of SES. Thus, any potential association

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between influenza, particularly severe disease, and SES was unmeasured until area-based SES measures began to be used. During 1998–2005, the Public Health Disparities Geocoding Project recognized the potential for using area-based SES measures to describe and monitor the association between SES and reportable disease incidence. After comparing numerous possible area-based SES measures to describe SES disparities for selected health outcomes, the census tract poverty level of case residence was recommended to be used as a variable in addition to age, sex, and race/ethnicity in routine surveillance data analyses (*2*). During 2003–2005, the 10 Emerging Infections Programs (EIP)* established active surveillance for influenza-related hospitalizations. Analyses of data from New Haven County, Connecticut, and eight counties in Tennessee indicated that, during multiple influenza seasons, including those when influenza A(H1N1)pdm09 predominated, influenza-related hospitalization incidence was consistently higher for children and adults residing in census tracts with higher percentages of persons living below the federal poverty level (*3*–*5*).

To assess the association between census tract-level poverty and influenza hospitalization at a national level, participating sites in the Influenza Hospitalization Surveillance Network (FluSurv-NET), including all 10 EIP sites, participated in a multisite analysis. FluSurv-NET is a national sentinel surveillance system established in 2009 that conducts population-based surveillance for laboratory-confirmed influenza-associated hospitalizations annually during October–April. For this analysis, data were gathered from 78 counties in 14 FluSurv-NET states† representing approximately 9% of the U.S. population. Each site geocoded the residential address of all influenza-associated hospitalizations for the 2010–11 and 2011–12 influenza seasons. Geocoded addresses were assigned to census tracts. Census tract poverty level, defined as the percentage of households in the census tract living below the federal poverty level, was determined from the 2008–2012 American Community Survey 5-Year Estimates.§ Census tracts were categorized by their percentage of households living below the poverty level (<5%, 5%–9%, 10%–19%, ≥20%), and age-adjusted (2000 U.S. Standard Population) influenza-related hospitalization incidence overall and for each FluSurv-NET site was calculated, stratified by census tract poverty status. County and census tract-specific denominators were determined from the 2010 U.S. Census.

In total, 7,936 (96%) of 8,304 influenza-related hospitalizations were coded to census tract, including 5,624 in 2010–2011 and 2,312 in 2011–2012. For both seasons combined, the age-adjusted incidence of influenza-related hospitalizations per 100,000 person-years in high poverty (≥20% of persons

* California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee. http://www.cdc.gov/ncezid/dpei/eip/index.html.

† Ten EIP states plus Michigan, Ohio, Rhode Island, and Utah.

§ http://www.census.gov/programs-surveys/acs.

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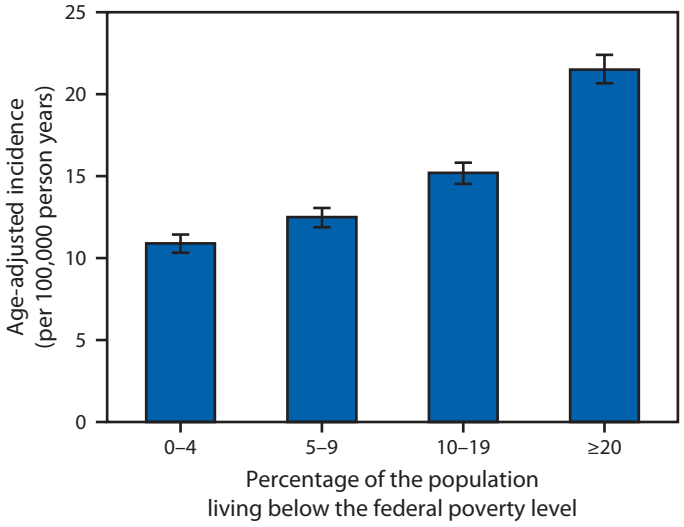
living below the federal poverty level) neighborhoods was 21.5 (95% CI: 20.7–22.4), nearly twice the incidence in low poverty (<5% of persons living below the federal poverty level) neighborhoods (10.9, 95% CI: 10.3–11.4), with a gradient of increasing incidence as census tract poverty category increased (Figure 1). This relationship was observed in all 14 surveillance sites (Table), within groups defined by age (0–4 years, 5–17 years, 18–49 years, 50–64 years, and ≥65 years), within each racial/ethnic group (Figure 2) and during each influenza season. The relationship also was observed for age-adjusted rates for hospitalizations requiring intensive care, for those requiring mechanical ventilation, and for deaths during or within 30 days of hospitalization. The incidence rate ratios for census tracts with ≥20% versus <5% of households living below the federal poverty level were 1.96 [95% CI: 1.7–2.3] for hospitalizations requiring intensive care; 2.03 [95% CI: 1.6–2.5] for hospitalizations requiring mechanical ventilation; and 1.82 [95%CI: 1.3–2.7] for deaths occurring within 30 days of hospitalization. The overall percentage of hospitalized influenza patients who were vaccinated was inversely associated with census tract poverty level, from a high of 48% in the census tracts with the lowest poverty levels to a low of 35% in the census tracts with the highest poverty levels, a finding driven by differences in vaccination rates among persons aged ≥65 years, who accounted for 94% of hospitalized cases in the lowest poverty census tracts compared with 80% in the highest.

**FIGURE 1. Age-adjusted incidence of influenza-related hospitalizations per 100,000 person-years,* by census tract poverty level — FluSurv-NET, 14 states, 2010-2012**




* With 95% confidence intervals.

## Discussion

The association of higher census tract-level poverty with higher influenza-related hospitalization rates appears to be robust, occurring across counties in 14 states, within pediatric and adult age groups, and across racial/ethnic groups. Possible contributing factors are lower vaccination rates in residents of poorer census tracts, poverty-related crowding with higher rates of influenza transmission, and higher prevalence of medical conditions predisposing persons to influenza complications in poorer areas. However, differences in vaccination rates cannot fully explain all the age-specific differences by census tract poverty observed: only hospitalized influenza patients aged ≥65 years had a large enough difference in vaccination rates to fully explain the findings. Regardless of the causes, to reduce poverty-associated disparities in influenza-related hospitalizations, there is a need to increase influenza vaccination levels in higher poverty neighborhoods and to more fully implement recommendations on the use of antivirals in the outpatient setting (*6*). This will require enhanced efforts by public health agencies and health care providers to address missed opportunities for vaccination and system barriers (*8*), as well as a better understanding of personal barriers (*9*) to influenza vaccination in these neighborhoods. In addition, it will require evaluation of use of antivirals and efforts to improve them.

Healthy People 2020 includes a public health infrastructure objective (PHI 7.3) to increase the percentage of population-based health objectives for which national data are available by socioeconomic status (*10*). Public heath surveillance data often lack information on the SES of individual persons, making it difficult to describe and monitor health disparities based on SES. When residential address data are available, it is possible to geocode the address, link it to census tract SES data and conduct analyses. The EIP, recognizing the potential to use geocoded addresses to examine possible SES-related disparities at a broad interstate level, formed a health equity workgroup to explore standardizing its use in all EIP states (*11*). This analysis demonstrates that multisite analyses using census tract SES can provide national-level data that are relevant to prevention efforts.

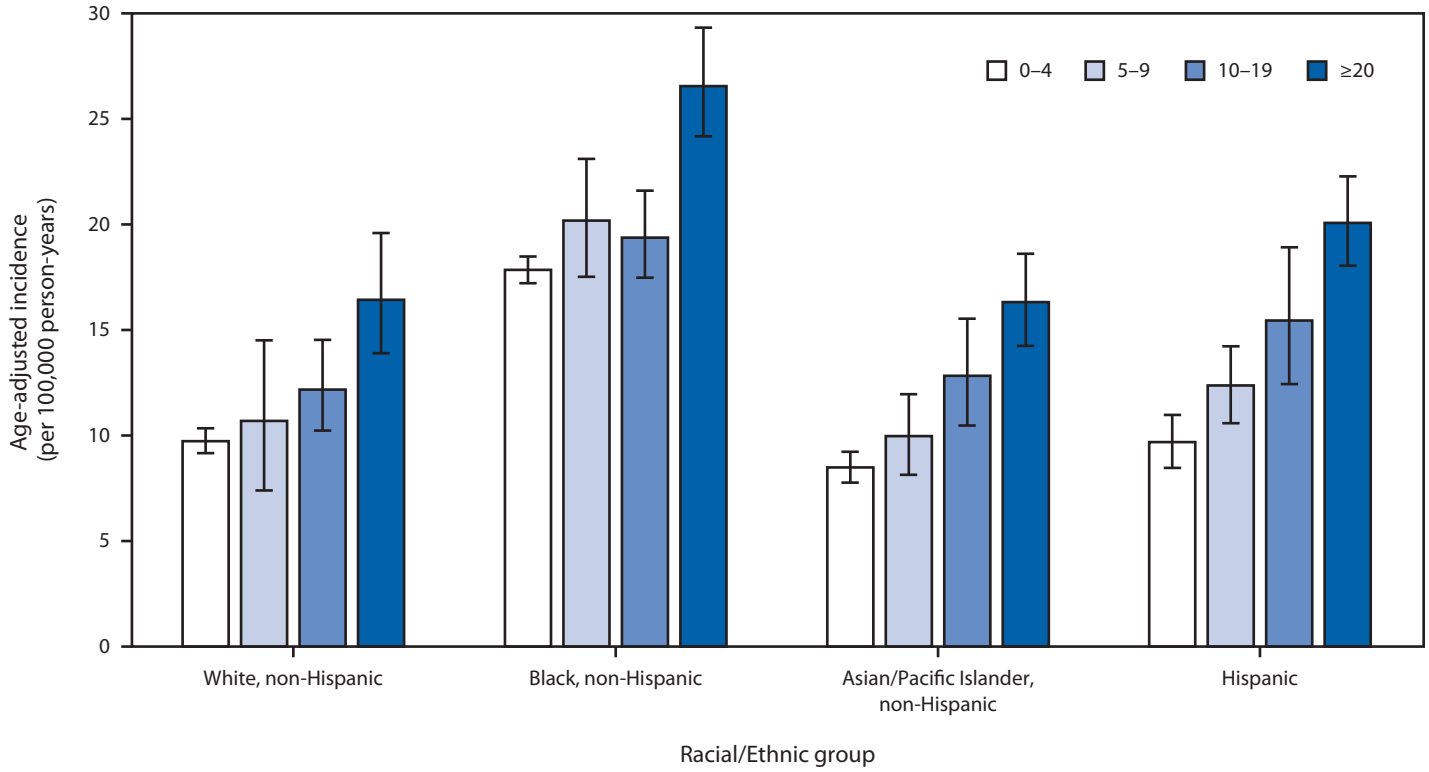
The findings in this report are subject to at least two limitations. First, a total of 4% of cases were unable to be geocoded and thus were not included in the analysis. Second, the data in the report were from two influenza seasons during which influenza A(H3N2) viruses predominated. The findings could be different during an A(H1N1) season or during an influenza pandemic. However, in the single site studies that stimulated this analysis (*3–5*), the association of higher census tract poverty with higher influenza-related hospitalization incidence was consistent throughout all seasons examined, regardless of the dominant circulating strain.

**TABLE. Age-adjusted incidence of influenza-related hospitalizations per 100,000 person-years, by census tract poverty level and state — FluSurv-NET, 14 states, 2010–2012**

| | Census tract poverty level* | | | |
|---|---|---|---|---|
| | 0%–4% | 5%–9% | 10%–19% | ≥20% |
| State | Incidence (95% CI) | Incidence (95% CI) | Incidence (95% CI) | Incidence (95% CI) |
| California | 11.5 (10.0–13.2) | 14.5 (13.0–16.3) | 15.9 (14.0–18.0) | 21.4 (18.8–24.4) |
| Colorado | 13.6 (12.8–17.0) | 16.5 (14.1–19.1) | 22.8 (20.1–25.8) | 25.0 (21.9–28.3) |
| Connecticut | 13.0 (11.4–14.8) | 16.1 (13.7–18.7) | 24.6 (21.1–28.4) | 33.5 (29.0–38.6) |
| Georgia | 9.1 (7.3–11.1) | 7.9 (6.5–9.5) | 10.3 (9.0–11.7) | 12.9 (11.2–14.7) |
| Maryland | 9.3 (8.0–10.7) | 14.0 (12.1–16.1) | 18.6 (16.1–21.3) | 26.0 (22.7–29.6) |
| Michigan | 8.5 (3.9–16.0) | 11.9 (7.9–17.3) | 14.9 (10.7–20.2) | 20.5 (14.8–27.7) |
| Minnesota | 7.3 (6.1–8.7) | 9.7 (8.2–11.4) | 15.1 (13.1–17.4) | 24.1 (20.6–28.1) |
| New Mexico | 7.5 (4.7–11.5) | 10.1 (7.1–14.0) | 14.6 (12.1–17.5) | 15.9 (13.6–18.5) |
| New York | 9.9 (8.1–11.9) | 10.1 (8.5–11.9) | 10.8 (9.0–12.8) | 28.6 (24.9–32.7) |
| Ohio | 7.8 (6.1–10.0) | 10.0 (7.9–12.5) | 11.2 (9.3–13.5) | 21.5 (18.6–24.7) |
| Oregon | 10.7 (7.9–14.2) | 9.6 (7.7–11.9) | 13.5 (11.4–15.8) | 18.4 (15.2–22.0) |
| Tennessee | 6.4 (4.5–8.7) | 7.3 (5.5–9.5) | 7.3 (5.6–9.5) | 12.4 (9.9–15.3) |
| Utah | 23.5 (19.0–28.7) | 26.5 (22.2–31.3) | 30.9 (26.4–36.1) | 38.9 (32.8–45.7) |
| Rhode Island | 14.1 (10.2–19.1) | 14.6 (10.9–19.0) | 14.4 (10.2–19.6) | 26.0 (21.1–31.6) |

**Abbreviation:** CI = confidence interval.
* Percentage of population living below the federal poverty level.

**FIGURE 2. Age-adjusted incidence of influenza-related hospitalizations per 100,000 person-years,* by racial/ethnic group and census tract poverty level,† — FluSurv-NET, 14 states, 2010–2012**




* With 95% confidence intervals.
† Percentage of population living below the federal poverty level.

Using census tract-based SES measures as variables for surveillance data analysis can contribute to achieving the Healthy People 2020 public health infrastructure goal of having national population-based data available by SES. It is important from an influenza control perspective that local vaccination efforts be emphasized in demographic groups found to have a higher incidence of more severe and costly complications of influenza, including hospitalization, intensive care and mechanical

**Summary**

What is already known on this topic?

Measures of socioeconomic status are infrequently used in public health surveillance. Several studies in small U.S. geographic areas found that higher census tract-level poverty is associated with higher population-level rates of influenza-related hospitalization, a finding with possible implications for influenza control efforts.

What is added by this report?

A collaborative initiative among 14 states that examined the association between census tract-level poverty and incidence of influenza-related hospitalization found increasing rates of influenza-related hospitalization with increasing census tract poverty. This finding was present during two influenza seasons, among all 14 sites, all age and racial/ethnic groups, and for more severe outcomes of hospitalization (intensive care, respiratory support, and death).

What are the implications for public health practice?

Persons who live in high poverty census tracts represent a demographic group at higher risk for severe influenza outcomes. Persons in poorer neighborhoods should be a focus for enhanced influenza vaccination outreach and early use of antiviral treatment. Analysis of surveillance data using census tract-level measures of socioeconomic status can provide new perspectives and directions for prevention of diseases of public health importance.

ventilation. Based on the consistency of the findings in this study across FluSurv-NET sites, persons who live in high poverty census tracts are one such demographic group. Enhanced influenza outreach to improve influenza vaccination coverage for persons living in poorer neighborhoods and efforts to increase use of antivirals by clinicians serving these neighborhoods could reduce poverty-related disparities in severe influenza outcomes.

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# HIV-Related Risk Behaviors Among Male High School Students Who Had Sexual Contact with Males — 17 Large Urban School Districts, United States, 2009–2013

Laura Kann, PhD[1]; Emily O'Malley Olsen, MSPH[1]; Steve Kinchen[1]; Elana Morris, MPH[2]; Richard J. Wolitski, PhD[3]

Young persons aged 13–24 years accounted for an estimated 22% of all new diagnoses of human immunodeficiency virus (HIV) infection in the United States in 2014. Most new HIV diagnoses among youths occur among males who have sex with males (MSM). Among all MSM, young black MSM accounted for the largest number of new HIV diagnoses in 2014 (*1*). To determine whether the prevalence of HIV-related risk behaviors among black male high school students who had sexual contact with males differed from the prevalence among white and Hispanic male students who had sexual contact with males, potentially contributing to the racial/ethnic disparities in new HIV diagnoses, CDC analyzed data from Youth Risk Behavior Surveys conducted by 17 large urban school districts during 2009–2013. Although other studies have examined HIV-related risk behaviors among MSM (*2*,*3*), less is known about MSM aged <18 years. Black male students who had sexual contact with males had a lower or similar prevalence of most HIV-related risk behaviors than did white and Hispanic male students who had sexual contact with males. These findings highlight the need to increase access to effective HIV prevention strategies for all young MSM.

Data from 32 Youth Risk Behavior Surveys conducted by 17 large urban school districts* during 2009–2013 were combined. In each survey in each district, a two-stage cluster sample design was used to produce representative samples of public school† students in grades 9–12. In the first sampling stage, in four of the districts, schools with any of grades 9–12 were sampled with the probability of selection proportional to school enrollment size; in the remaining 13 districts, all schools with any of grades 9–12 were sampled. In the second sampling stage, in 16 districts, classes from either a required subject (e.g., English or social studies) or a required period (e.g., homeroom or second period) were sampled randomly and all students in the sampled classes were eligible to participate. In one district all students were eligible to participate. School response rates ranged from 84% to 100%, student response rates ranged from 66% to 90%, overall response rates§ ranged from 66% to 90%, and total sample sizes ranged from 1,013 to 11,887. Data from each survey were weighted to provide large urban school district–level estimates, and statistical software was used to account for the complex sample designs during analyses. Data are presented for non-Hispanic black (black), non-Hispanic white (white), and Hispanic male students only. Pairwise t-tests were used to determine statistically significant ($p<0.05$) differences among subgroups.

Survey procedures were designed to protect students' privacy by allowing anonymous and voluntary participation. Local parental permission procedures were followed before survey administration. Students completed the self-administered questionnaire during one class period and recorded their responses directly on a computer-scannable booklet or answer sheet. Each district's questionnaire included the following question to ascertain the sex of the respondent's sexual contacts: "During your life, with whom have you had sexual contact?" No definition was provided for sexual contact. The four possible response options were, "I have never had sexual contact"; "females"; "males"; and "females and males." This report describes 17 risk behaviors related directly or indirectly to HIV transmission among male students in grades 9–12 who indicated they had sexual contact with only males or with both males and females (i.e., male students who had sexual contact with males). Specifically, two questions measuring alcohol use, 10 questions measuring other drug use, and five questions measuring sexual behaviors related to HIV infection were used in the analysis.¶ The final combined data set contained 1,681 records from male students who had sexual contact with males. Reflecting the urbanicity of the sample, 13.6% of the male students who had sexual contact with males were white, 40.6% were black, and 45.8% were Hispanic.

Among male students who had sexual contact with males, black students had a significantly lower prevalence than white students of drinking five or more drinks of alcohol in a row (22.9% versus 38.0%); and ever using inhalants (21.5% versus 35.0%), heroin (16.5% versus 29.1%), ecstasy (19.6% versus 40.0%), or prescription drugs without a doctor's prescription

* Located in Baltimore, Maryland (2013); Boston, Massachusetts (2009, 2011, 2013); Broward County, Florida (2013); Chicago, Illinois (2009, 2011, 2013); Detroit, Michigan (2011, 2013); District of Columbia (2013); Houston, Texas (2011, 2013); Los Angeles, California (2009, 2011, 2013); Memphis, Tennessee (2013); Milwaukee, Wisconsin (2009, 2011, 2013); New York City, New York (2009, 2011, 2013); Orange County, Florida (2013); Palm Beach, Florida (2013); Philadelphia, Pennsylvania (2013); San Diego, California (2011, 2013); San Francisco, California (2011, 2013); and Seattle, Washington (2011, 2013).

† Includes regular public schools but might also include charter schools and public alternative, special education, or vocational schools.

§ Overall response rate = (number of participating schools/number of eligible sampled schools) x (number of usable questionnaires/number of eligible students sampled).

¶ http://www.cdc.gov/healthyyouth/data/yrbs/questionnaires.htm.

(31.4% versus 47.8%); and drinking alcohol or using drugs before last sexual intercourse (32.6% versus 72.6%) (Table). Black students also had a significantly lower prevalence than Hispanic students of drinking five or more drinks of alcohol in a row (22.9% versus 34.5%) and ever using cocaine (17.9% versus 29.3%), inhalants (21.5% versus 32.9%), methamphetamines (18.1% versus 28.7%), ecstasy (19.6% versus 32.1%), or steroids without a doctor's prescription (14.9% versus 25.6%).

However, among male students who had sexual contact with males, black students had a significantly higher prevalence than white students of ever having had sexual intercourse (89.1% versus 67.4%) and using a condom during last sexual intercourse (among sexually active students) (47.4% versus 25.2%); black students also had a higher prevalence than Hispanic students of ever having sexual intercourse (89.1% versus 79.2%). No other statistically significant differences in risk behaviors were identified between black male students who had sexual contact with males and white and Hispanic male students who had sexual contact with males.

## Discussion

Black MSM are disproportionally affected by HIV infection. In 2014, the estimated number of new HIV diagnoses among MSM aged 13–24 years was 4,398 among blacks, 1,834 among Hispanics, and 1,366 among whites (*1*). Although risk

**TABLE. Percentage of male high school students who had sexual contact with males, by HIV-related risk behaviors and race/ethnicity — 17 large urban school districts, Youth Risk Behavior Surveys, United States, 2009–2013**

| Risk behavior | Race/Ethnicity | % (CI) | p value for black % versus white %* | p value for black % versus Hispanic %* |
|---|---|---|---|---|
| Current alcohol use† | Black§ | 49.9 (43.0–56.9) | 0.074 | 0.926 |
| | Hispanic | 50.4 (43.5–57.3) | | |
| | White§ | 61.3 (49.8–71.7) | | |
| Drank five or more drinks of alcohol in a row¶ | Black | 22.9 (17.6–29.3) | 0.017* | 0.005* |
| | Hispanic | 34.5 (29.0–40.5) | | |
| | White | 38.0 (28.1–49.0) | | |
| Ever used marijuana** | Black | 59.6 (52.3–66.5) | 0.320 | 0.502 |
| | Hispanic | 63.0 (56.2–69.3) | | |
| | White | 66.6 (54.3–76.9) | | |
| Current marijuana use†† | Black | 32.8 (27.0–39.1) | 0.161 | 0.518 |
| | Hispanic | 35.5 (30.4–40.9) | | |
| | White | 41.4 (31.6–52.0) | | |
| Ever used cocaine§§ | Black | 17.9 (13.1–24.1) | 0.122 | 0.002* |
| | Hispanic | 29.3 (24.5–34.6) | | |
| | White | 27.0 (18.5–37.5) | | |
| Ever used inhalants¶¶ | Black | 21.5 (15.9–28.3) | 0.036* | 0.008* |
| | Hispanic | 32.9 (27.3–39.0) | | |
| | White | 35.0 (24.5–47.1) | | |
| Ever used heroin*** | Black | 16.5 (11.9–22.5) | 0.036* | 0.095 |
| | Hispanic | 22.9 (18.1–28.5) | | |
| | White | 29.1 (19.3–41.4) | | |
| Ever used methamphetamines††† | Black | 18.1 (13.3–24.1) | 0.275 | 0.010* |
| | Hispanic | 28.7 (23.2–34.9) | | |
| | White | 23.8 (15.7–34.4) | | |
| Ever used ecstasy§§§ | Black | 19.6 (14.3–26.2) | 0.001* | 0.003* |
| | Hispanic | 32.1 (26.6–38.0) | | |
| | White | 40.0 (29.7–51.4) | | |
| Ever took steroids without a doctor's prescription¶¶¶ | Black | 14.9 (9.3–23.0) | 0.349 | 0.029* |
| | Hispanic | 25.6 (19.7–32.5) | | |
| | White | 21.0 (12.4–33.3) | | |
| Ever took prescription drugs without a doctor's prescription**** | Black | 31.4 (23.7–40.2) | 0.035* | 0.628 |
| | Hispanic | 34.3 (26.9–42.6) | | |
| | White | 47.8 (35.6–60.1) | | |
| Ever injected any illegal drug†††† | Black | 17.6 (11.9–25.1) | 0.357 | 0.819 |
| | Hispanic | 18.6 (14.0–24.2) | | |
| | White | 23.5 (14.6–35.5) | | |

See table footnotes on next page.

**TABLE. (*Continued*) Percentage of male high school students who had sexual contact with males, by HIV-related risk behaviors and race/ethnicity —17 large urban school districts, Youth Risk Behavior Surveys, United States, 2009–2013**

| Risk behavior | Race/Ethnicity | % (CI) | p value for black % versus white %* | p value for black % versus Hispanic %* |
|---|---|---|---|---|
| Ever had sexual intercourse | Black | 89.1 (83.0–93.2) | 0.012* | 0.004* |
| | Hispanic | 79.2 (74.1–83.4) | | |
| | White | 67.4 (50.1–80.9) | | |
| Had sexual intercourse with four or more persons during their life | Black | 36.0 (29.1–43.6) | 0.940 | 0.608 |
| | Hispanic | 33.6 (27.9–39.8) | | |
| | White | 35.4 (23.1–50.0) | | |
| Currently sexually active§§§§ | Black | 57.2 (49.8–64.3) | 0.234 | 0.423 |
| | Hispanic | 53.5 (47.9–58.9) | | |
| | White | 47.3 (33.6–61.4) | | |
| Drank alcohol or used drugs before last sexual intercourse¶¶¶¶ | Black | 32.6 (23.5–43.2) | <0.001* | 0.577 |
| | Hispanic | 29.2 (22.7–36.6) | | |
| | White | 72.6 (59.6–82.7) | | |
| Condom use during last sexual intercourse¶¶¶¶ | Black | 47.4 (37.4–57.7) | 0.011* | 0.844 |
| | Hispanic | 48.8 (40.2–57.4) | | |
| | White | 25.2 (14.1–40.7) | | |

**Abbreviation:** CI = 95% confidence interval.

* Statistically significant differences at p<0.05.
† Had at least one drink of alcohol on at least 1 day during the 30 days before the survey.
§ Non-Hispanic.
¶ Within a couple of hours on at least 1 day during the 30 days before the survey.
** Used marijuana one or more times during their life.
†† Used marijuana one or more times during the 30 days before the survey.
§§ Used any form of cocaine (e.g., powder, crack, or freebase) one or more times during their life.
¶¶ Sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high one or more times during their life.
*** Used heroin (also called "smack," "junk," or "China White") one or more times during their life.
††† Used methamphetamines (also called "speed," "crystal," "crank," or "ice") one or more times during their life.
§§§ Used ecstasy (also called "MDMA") one or more times during their life.
¶¶¶ Took steroid pills or shots without a doctor's prescription one or more times during their life.
**** Took prescription drugs (e.g., Oxycontin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription one or more times during their life.
†††† Used a needle to inject any illegal drug into their body one or more times during their life.
§§§§ Had sexual intercourse with at least one person during the 3 months before the survey.
¶¶¶¶ Among students who were currently sexually active.

behaviors are necessary for HIV transmission, the findings in this report do not provide evidence that differences in HIV-related risk behaviors alone are driving the higher numbers of HIV diagnoses among young black MSM compared with young Hispanic and white MSM. Indeed, black male students who had sexual contact with males in this report often had a lower prevalence of HIV-related risk behaviors.

Other explanations besides differences in HIV-related risk behaviors might help explain differences in HIV diagnoses by race/ethnicity among MSM (*2–4*). Key among these are higher prevalence of HIV, undiagnosed HIV infection, and other sexually transmitted infections among black MSM compared with MSM of other races/ethnicities. Because black MSM are more likely to have sex partners of the same race, black MSM are at greater risk for HIV infection within their sexual networks. In addition, black MSM who are infected with HIV are less likely to have health insurance, adhere to antiretroviral treatment, and have suppressed HIV viral load. These risks are compounded by social determinants of health associated with increased risk and poorer health outcomes that include higher rates of unemployment and incarceration and lower incomes and educational attainment.

The findings in this report are subject to at least four limitations. First, these data apply only to youths who attend public school and, therefore, are not representative of all persons in this age group. Nationwide in 2014, approximately 8% of all students enrolled in grades 9–12 were enrolled in a private school (*5*); in 2009, among persons aged 16–17 years, approximately 4% were not enrolled in a high school program and had not completed high school (*6*). MSM might represent a disproportionate percentage of high school dropouts and other youths who are absent from or do not attend school (*7*), which might also help explain why racial/ethnic differences in HIV diagnoses are not reflected in racial/ethnic differences in HIV-related risk behaviors among high school students. Second, these data are representative only of the large urban school districts that included a question in their Youth Risk Behavior Survey on the sex of sexual contacts during 2009–2013 and might not be representative of male students who had sexual contact with males in other urban jurisdictions, in nonurban

**Summary**

What is already known on this topic?

Most new human immunodeficiency virus (HIV) diagnoses among youths occur among males who have sex with males (MSM). Among all MSM, young black males accounted for the largest number of new HIV diagnoses in 2014.

What is added by this report?

The findings in this report do not provide evidence that HIV-related risk behaviors alone drive the higher numbers of HIV diagnoses among young black MSM compared with young Hispanic and white MSM. In fact, young black male students who had sexual contact with males in this report often had a lower prevalence of HIV-related risk behaviors.

What are the implications for public health practice?

Access to comprehensive effective HIV prevention strategies that specifically address not only young black MSM but young MSM of all races/ethnicities is needed to stop the epidemic of HIV infection in the United States.

jurisdictions, in private schools, or nationwide. It is possible that using a different combination of sites would have yielded different results. Third, the extent of underreporting or overreporting of behaviors cannot be determined, although the survey questions demonstrate good test-retest reliability (*8*). Finally, these analyses are based on cross-sectional surveys and thus can only provide an indication of association, not causality.

To stop the epidemic of HIV infection among young black MSM, increased access to effective programs developed for this population is needed. In March 2015, CDC announced the availability of $185 million in funding for 3 years to support a comprehensive approach to HIV prevention among MSM, with an emphasis on males of color. Essential elements of this approach include HIV testing, linkage to and retention in medical care for persons living with HIV, and biomedical and behavioral interventions (including preexposure prophylaxis [PrEP]) to reduce HIV risk. CDC also provides ongoing funding and technical support for school-centered HIV/sexually transmitted disease prevention for young MSM. Schools can facilitate access to youth-friendly health care in schools or via referrals to other youth-serving organizations; provide safe and supportive environments; help improve relationships among students, staff, families, and the community; reduce bullying and harassment; and improve academic achievement.

To be most effective, further research could help to develop practical information and guidance for youths, their families, educators, and pediatricians or other clinicians who care for young people regarding HIV risk assessment, medications and monitoring, medication adherence, parental consent requirements, payment options, and other potential barriers to new prevention and treatment technologies. Reducing HIV infection among young MSM, particularly young black MSM, is key to reducing HIV infection in the United States.

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# Occupational HIV Transmission Among Male Adult Film Performers — Multiple States, 2014

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In 2014, the California Department of Public Health was notified by a local health department of a diagnosis of acute human immunodeficiency virus (HIV) infection* and rectal gonorrhea in a male adult film industry performer, aged 25 years (patient A). Patient A had a 6-day history of rash, fever, and sore throat suggestive of acute retroviral syndrome at the time of examination. He was informed of his positive HIV and gonorrhea test results 6 days after his examination. Patient A had a negative HIV-1 RNA qualitative nucleic acid amplification test (NAAT)† 10 days before symptom onset. This investigation found that during the 22 days between the negative NAAT and being informed of his positive HIV test results, two different production companies directed patient A to have condomless sex with a total of 12 male performers. Patient A also provided contact information for five male non–work-related sexual partners during the month before and after his symptom onset. Patient A had additional partners during this time period for which no locating information was provided. Neither patient A nor any of his interviewed sexual partners reported taking HIV preexposure prophylaxis (PrEP). Contact tracing and phylogenetic analysis of HIV sequences amplified from pretreatment plasma revealed that a non–work-related partner likely infected patient A, and that patient A likely subsequently infected both a coworker during the second film production and a non–work-related partner during the interval between his negative test and receipt of his positive HIV results. Adult film performers and production companies, medical providers, and all persons at risk for HIV should be aware that testing alone is not sufficient to prevent HIV transmission. Condom use provides additional protection from HIV and sexually transmitted infections (STIs). Performers and all persons at risk for HIV infection in their professional and personal lives should discuss the use of PrEP with their medical providers.

During the first production (a 1-day film shoot on the day before his symptoms began and 9 days after his negative NAAT), Patient A had condomless insertive and receptive anal sex with two HIV-negative performers (contacts 1 and 2) (Table) and condomless receptive and insertive oral sex with four HIV-infected performers (contacts 3–6). Patient A reported that the production company informed him before the film shoot that contacts 3–6 were HIV-infected with undetectable viral loads. During the second production (a 3-day film shoot that began the day after patient A's symptom onset and 11 days after his negative NAAT), patient A had condomless receptive and insertive oral sex and condomless insertive anal sex with three HIV-negative performers (contacts 7–9), and condomless receptive and insertive oral sex with three HIV-negative performers (contacts 10–12).

After obtaining consent from patient A, local health department staff contacted the two production companies and obtained contact information for each of his work-related sexual partners. The performers and patient A's non–work-related sexual contacts lived in seven U.S. states and four foreign countries. The production companies were based in two other states, and filming occurred in yet another state. The local or state health department of each performer confidentially notified all eight performers previously known to be HIV-negative, two performers previously known to be HIV-infected, and all five named non–work-related sexual partners to inform them of their potential HIV and gonorrhea exposures. Two other performers previously known to be HIV-infected could not be located. All persons contacted were offered immediate and follow-up (30-day) HIV NAAT and STI testing. Pre-treatment plasma was collected from patient A and all his contacts with newly diagnosed HIV infections. Using established methods (*1*), HIV-1 polymerase (*pol*; 997-bp) and p17 gag (*gag*; 411-bp) sequences were independently polymerase chain reaction–amplified from plasma specimens.

Among patient A's work-related sexual contacts from the first film production, contacts 1 and 2 had negative HIV NAATs 62 and 53 days after filming, respectively, indicating that patient A did not infect any work-related sexual contacts from the first film production. Contact 4 received a diagnosis of early latent syphilis 13 days after filming, and contact 2 received a diagnosis of genital chlamydia infection 23 days after filming. No evidence of prefilming HIV testing was made available to investigators from this production company.

Among patient A's work-related sexual contacts from the second film production, contact 7 (hereafter referred to as patient B) experienced fever and sore throat suggestive of

* Positive HIV chemiluminescent antigen/antibody test, negative HIV-1/2 rapid immunoconcentrating assay, and quantitative HIV RNA viral load (viral load) >10 million/mL.

† NAAT is a highly sensitive test capable of detecting HIV 10–15 days after infection.

**TABLE. Occupational and nonoccupational exposure to and transmission of HIV among contacts* of a male adult film performer (patient A) — multiple states, 2014**

| Contact no. (Patient ID) | Setting of sexual contact with patient A | HIV status at last sexual contact with patient A | Type of sexual contact with patient A | Day of last sexual contact with patient A† | Day of last negative HIV test | Day of symptom onset | Day of positive HIV test | STIs§ |
|---|---|---|---|---|---|---|---|---|
| (A)* | — | — | — | — | 6† | 16¶ | 28¶ | Rectal GC |
| 1 | Film production 1 | Negative | Condomless anal I/R | 15 | 62** | — | — | |
| 2 | Film production 1 | Negative | Condomless anal I/R | 15 | 53** | — | — | Genital CT |
| 3 | Film production 1 | Chronically infected, VL undetectable | Condomless oral I/R | 15 | — | — | — | |
| 4 | Film production 1 | Chronically infected, VL undetectable | Condomless oral I/R | 15 | — | — | — | Early latent syphilis |
| 5 | Film production 1 | Chronically infected, VL undetectable | Condomless oral I/R | 15 | — | — | — | |
| 6 | Film production 1 | Chronically infected, VL undetectable | Condomless oral I/R | 15 | — | — | — | |
| 7 (B)* | Film production 2 | Negative | Condomless oral I/R; Condomless anal R | 17 | — | 4** | 18** | |
| 8 | Film production 2 | Negative | Condomless oral I/R; Condomless anal R | 17 | 36** | — | — | |
| 9 | Film production 2 | Negative | Condomless oral I/R; Condomless anal R | 17 | 14**,†† | — | — | |
| 10 | Film production 2 | Negative | Condomless oral I/R | 17 | 30** | — | — | |
| 11 | Film production 2 | Negative | Condomless oral I/R | 17 | 57** | — | — | |
| 12 | Film production 2 | Negative | Condomless oral I/R | 17 | 16**,†† | — | — | |
| 13 (C)* | Non-work | Negative | Condomless oral I/R; Condomless anal I/R | 24 | — | 15** | 16** | Rectal CT, latent syphilis |
| 14 | Non-work | Chronically infected, VL undetectable | Condomless oral I/R; Condomless anal I/R | 22 | — | — | — | |
| 15 | Non-work | Negative | Condomless oral I/R; Condomless anal I/R | 24 | 16**,†† | — | — | Rectal CT |
| 16 (D)* | Non-work | Chronically infected, VL = 127,000 copies/mL§§ | Condomless oral I/R; Condomless anal I/R | 0 | — | unknown | 47** | Pharyngeal CT |
| 17 | Non-work | Negative | Condomless oral I/R; Condomless anal I/R | ~ -20 | ~38** | — | — | Rectal GC |

**Abbreviations:** — = not applicable; CT = chlamydia; GC = gonorrhea; HIV = human immunodeficiency virus; I = insertive; R = receptive; STI = sexually transmitted infection; VL = viral load.

* Letters in parentheses indicate patient A and his contacts who became patients during the investigation.
† Relative to patient A's last sexual contact with patient D (source case).
§ At time of HIV test.
¶ Relative to last sexual contact with patient D.
** Relative to last sexual contact with patient A.
†† Refused subsequent HIV testing.
§§ VL was measured 46 days after last sexual contact with patient A.

acute retroviral syndrome 4 days after filming concluded, and received a diagnosis of acute HIV infection 18 days after filming.[§] Contacts 8, 10, and 11 tested negative by HIV NAAT 36, 30, and 57 days, respectively, after filming. Contacts 9 and 12 tested negative by HIV NAAT 14 and 16 days, respectively, after filming, but refused subsequent HIV NAAT testing. All six performers from the second production (patient B and contacts 8–12) had recent, documented HIV-negative testing before the second film production (contacts 8–12 had a documented negative HIV-1 NAAT 3–10 days before filming, and Patient B had a negative immunochemiluminometric HIV-1/2 antibody 3 days before filming).

[§] Negative HIV-1/2 immunochemiluminometric antibody, HIV viral load >10 million/mL.

Patient A was the only performer common to both productions. He reported no non–work-related sexual contact with performers from either production company. Patient B reported non–work-related sexual contact with one performer (contact 11) from the second film production company after filming was completed.

During the 1 month before as well as after symptom onset, patient A engaged in condomless insertive and receptive oral and insertive and receptive anal sex with five named male non–work-related partners (contacts 13–17). Based on dates of sexual contact, contacts 13–15 were considered at risk for infection (i.e., potential spread partners), and contacts 16 and 17 were considered potential sources of patient A's HIV infection. Among non–work-related potential spread partners, contact 13 had multiple sexual contacts with patient A during the 8 days

after patient A's symptom onset. Contact 13 was HIV NAAT-negative 5 days after his last sexual contact with patient A, but was found to have rectal chlamydia and latent syphilis. However, 15 days after his last sexual contact with patient A, contact 13 experienced onset of sore throat, fever, and body aches suggestive of acute retroviral syndrome. Contact 13, hereafter referred to as patient C, received a diagnosis of acute HIV infection 1 day after his symptom onset.¶ Contact 14 had sexual contact with patient A 6 days after patient A's symptom onset and was previously known by his local health department (but not to patient A) to be HIV-infected, on treatment, and to have an undetectable viral load. Contact 15 had sexual contact with patient A 8 days after patient A's symptom onset, had a negative HIV Ag/Ab chemiluminescent antigen/antibody test, and received a diagnosis of rectal chlamydia infection 16 days after their last sexual encounter; subsequent HIV test results for contact 15 are not available.

Patient A had non–work-related sexual contact with contact 16 six days before Patient's A's negative NAAT. Forty-seven days after his last sexual contact with patient A, contact 16 (hereafter referred to as patient D) received a diagnosis of pharyngeal chlamydia and previously unrecognized chronic HIV infection through laboratory methods.** Patient D identified a potential spread partner, a man who also was subsequently determined to have previously unrecognized chronic HIV infection; pretreatment plasma was not obtained from this patient for phylogenetic analysis of viral sequences. Patient A also had non–work-related sexual contact with another man (contact 17) approximately 1 month before symptom onset; Contact 17 had a negative NAAT but received a diagnosis of rectal gonorrhea >30 days after his last sexual contact with patient A.

Phylogenetic analysis of the *pol* and *gag* sequences revealed that patients A, B, C, and D all had subtype B sequences that clustered tightly together suggesting high genetic relatedness of their HIV sequences. Pairwise nucleotide identities (99.1% in *gag* and 99.6% in *pol*) were high. None of the *pol* sequences had any major drug resistance mutations. Patients A, B, C, and D were all linked to care within 18 days of receiving their diagnoses.

## Discussion

Since the 1990s, many adult film production companies have required performers to participate in periodic HIV testing. In 2004, work-related HIV transmission between heterosexual adult film performers (*2*) occurred despite the existence of one such testing program. Many adult film production companies continue to rely on HIV testing as the primary method to prevent HIV transmission. Performers obtain an HIV NAAT through a commercial laboratory, their test results are maintained in a database by a third party, and production companies check this database to ensure that performers have had a recent negative test before filming. To partially protect performer privacy, production companies are only informed of whether a performer is cleared to perform or not on the basis of test results. Some production companies have specialized in producing "bareback" films which involve condomless anal sex among male performers. Patient A had testing with NAAT <14 days before filming, as recommended by a leading industry trade group, with negative results. However, patient A's acute retroviral syndrome onset occurred 10 days after his NAAT and he engaged in condomless insertive and receptive oral, and insertive anal sex with patient B as directed by the production company.

The Federal Occupational Safety and Health Administration (OSHA) requires that all employers provide a place of employment free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to employees.†† The California state standard, equivalent to the OSHA Bloodborne Pathogens standard, requires that employers must include consistent use of appropriate engineering, administrative, and work practice controls, and personal protective equipment to prevent contact with blood and other potentially infectious materials, including semen and vaginal secretions.§§ Adult film performers are at risk for these work-related exposures (*3*).

In 2012, voters in Los Angeles County passed a local law requiring that adult film performers wear condoms during vaginal and anal sex and requiring adult film production companies to obtain a film permit from the Los Angeles County Department of Public Health. Permitting requirements include completion of a bloodborne pathogen training course by adult film directors, and submission of an exposure control plan by adult film producers.¶¶

¶ Positive HIV Ag/Ab chemiluminescent antigen/antibody test, negative HIV-1/2 immunoconcentrating assay, and viral load >10 million/mL.

** Positive HIV rapid immunoassay and HIV-1/2 enzyme immunoassay; CD4 count = 384 cells/mm3, HIV viral load = 127,000 copies/mL.

†† 29 U.S.C. Section 651. Furthermore, in California, adult film performers may be considered employees under the law. See Deupree v Workers' Comp. Appeals Bd., 2008 WL 4191236 (Cal. App. 2d Aug. 19, 2008); California Occupational Safety and Health Appeals Board, in the matter of the appeal of Cybernet Entertainment, LLC dba Kink.com, dockets 14-R6D1-0364 through 0367. April 10, 2015. http://www.dir.ca.gov/oshab/DECISIONS-ALJ/2015/Cybernet_Entert_2014-6-1-0364.pdf; and California Occupational Safety and Health Appeals Board, in the matter of reconsideration of the appeal of Treasure Island Media, Inc., dockets 14-R6D1-1093 through 1095. August 13, 2015. http://www.dir.ca.gov/oshab/decisions/Treasure-Island-Media.(10-1093).pdf.

§§ 29 CFR, Section 1910.1030, Bloodborne Pathogens. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051; and California Code of Regulations, Section 5193, Bloodborne Pathogens, http://www.dir.ca.gov/title8/5193.html.

¶¶ Los Angeles County Health and Safety Code, Title 11, Chapter 11.39, Safer Sex in the Adult Film Industry. https://www.municode.com/library/ca/los_angeles_county/codes/code_of_ordinances.

**Summary**

What is already known on this topic?

Work-related transmission of human immunodeficiency virus (HIV) and other sexually transmitted infections has been documented among adult film performers. HIV tests, including nucleic acid amplification, do not detect HIV very early after infection.

What is added by this report?

This is the first well-documented work-related HIV transmission among male adult film performers. A performer was infected by a non–work-related partner who was not aware of his HIV infection. The performer, having tested negative by nucleic acid amplification test within the preceding 14 days, and unaware of his very recent HIV infection, infected another performer and a non–work-related partner. Viruses in all four HIV infections were highly genetically related, indicating a transmission cluster.

What are the implications for public health practice?

Federal and state Occupational Safety and Health Administration regulations delineate rights of employees and responsibilities of employers to ensure safe working conditions. The adult film industry is well suited for implementation of combination HIV prevention strategies including biomedical (HIV testing, treatment, and preexposure prophylaxis), behavioral (consistent and correct use of condoms, facilitated by the use of a compatible lubricant), and regulatory interventions.

In May 2015, the California Occupational Safety and Health Standards Board held a public hearing on proposed new workplace standards to prevent STIs in the adult film industry, which included specific requirements for consistent and correct condom use (facilitated by the use of a compatible lubricant), and for confidential medical services provision at the employer's expense, including HIV and STI testing, and hepatitis A and human papillomavirus vaccinations, in addition to existing requirements for hepatitis B vaccination (*4*). The specific testing and examinations performed and their results would only be available to the performer, the health care provider, and anyone designated by the performer.

The wide geographic distribution of adult performers, filming locations, and production companies highlights the challenges of developing adult film worker protection regulations on a national and global scale, conducting contact investigations, and disseminating prevention information to employers and employees. Because the adult film industry recruits workers from numerous states and countries, documenting future disease transmission associated with filming sexual acts might, as this investigation did, require substantial resources and coordination between local, state, and federal agencies.

Because follow-up testing has not been reported for some sexual partners of patient A, and patient A did not reveal the names of all of his sexual contacts, this report might underestimate the extent of HIV transmission in this cluster. Among patient A's 17 named sexual contacts, six were chronically HIV-infected, one had last sexual contact with patient A before patient A was infected, and 10 were at risk for infection by patient A. Seven of these 10 engaged in condomless receptive anal sex with patient A, and two became infected. This 29% attack rate is comparable to the 23% attack rate of work-related HIV transmission among heterosexual performers in the 2004 report (*2*).

None of the interviewed persons in this sexual network used HIV PrEP, despite being at high risk for HIV infection. Coformulated emtricitabine/tenofovir (Truvada) has federal Food and Drug Administration approval to be taken orally once daily by HIV-negative persons for PrEP. Maximal intracellular concentrations of tenofovir are reached in rectal tissue at approximately 7 days, and in cervicovaginal tissues at approximately 20 days (*5*). Efficacy depends on adherence, but is >90% effective if taken daily. Unlike condoms, PrEP is not an HIV prevention modality with which employers can ensure compliance because of the requirement for daily use outside of the workplace, with no methods of tracking; PrEP also does not prevent other STIs. However, combined with condoms, PrEP remains an important approach for preventing HIV infection among persons at high risk for HIV infection, including adult film industry performers who might be at risk in both their professional and personal lives.

This investigation emphasizes the importance of public health prevention and regulatory strategies to prevent occupational HIV and other STI transmission. Persons at high risk for HIV infection should receive periodic HIV and STI testing.*** However, as demonstrated here and previously among heterosexual adult film performers (*2*), testing alone is not sufficient to prevent occupational HIV transmission. HIV can be transmitted during the 14-day period after a negative NAAT test, before a positive test is obtained. PrEP significantly reduces the risk for HIV acquisition among HIV-negative persons at high risk; however, PrEP is not an intervention with which employers can ensure compliance, and should be used with condoms to protect against both HIV and other STIs. The high prevalence of STIs within this network of sexual partners, including performers, emphasizes the importance of consistent condom use. In addition to complying with regulatory requirements under OSHA standards, the adult film industry should consider the implementation of combination HIV prevention strategies, including biomedical (HIV testing, treatment, and PrEP) and behavioral (consistent and correct use of condoms) interventions.

*** http://www.cdc.gov/hiv/pdf/prepguidelines2014.pdf; http://www.cdc.gov/std/tg2015/screening-recommendations.htm.

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# Progress Toward Strengthening National Blood Transfusion Services — 14 Countries, 2011–2014

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Blood transfusion is a life-saving medical intervention; however, challenges to the recruitment of voluntary, unpaid or otherwise nonremunerated whole blood donors and insufficient funding of national blood services and programs have created obstacles to collecting adequate supplies of safe blood in developing countries (*1*). Since 2004, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) has provided approximately $437 million in bilateral financial support to strengthen national blood transfusion services in 14 countries in sub-Saharan Africa and the Caribbean* that have high prevalence rates of human immunodeficiency virus (HIV) infections. CDC analyzed routinely collected surveillance data on annual blood collections and HIV prevalence among donated blood units for 2011–2014. This report updates previous CDC reports (*2*,*3*) on progress made by these 14 PEPFAR-supported countries in blood safety, summarizes challenges facing countries as they strive to meet World Health Organization (WHO) targets, and documents progress toward achieving the WHO target of 100% voluntary, nonremunerated blood donors by 2020 (*4*). During 2011–2014, overall blood collections among the 14 countries increased by 19%; countries with 100% voluntary, nonremunerated blood donations remained stable at eight, and, despite high national HIV prevalence rates, 12 of 14 countries reported an overall decrease in donated blood units that tested positive for HIV. Achieving safe and adequate national blood supplies remains a public health priority for WHO and countries worldwide. Continued success in improving blood safety and achieving WHO targets for blood quality and adequacy will depend on national government commitments to national blood transfusion services or blood programs through increased public financing and diversified funding mechanisms for transfusion-related activities.

During the last decade, PEPFAR has supported national blood transfusion services through the provision of technical and financial assistance to strengthen laboratory infrastructure, provide policy guidance, and promote the recruitment of voluntary, nonremunerated blood donors through donor selection strategies and expanded mobile collection campaigns. This support has contributed to reduced HIV prevalence among blood donors and increased blood collections. However, despite continued advances in HIV testing of donated blood and blood products, the estimated incidence of newly diagnosed HIV infections associated with blood transfusion in middle- and low-income countries still remains as high as 1% to 3% (*1*).

During the 4-year surveillance period (2011–2014), national blood transfusion services† in the 14 PEPFAR-supported countries included in this report used a standardized data collection tool to report on three indicators of blood safety and adequacy: 1) the total number of whole blood units collected; 2) the percentage of units collected from voluntary, nonremunerated blood donors, and; 3) the percentage of donated units reactive for HIV. The rate of whole blood units collected per 1,000 population per year was calculated using national census estimates or United Nations population projections. Data on the status of national blood policies and blood transfusion services in the 14 countries were provided by WHO. Aggregated country data were analyzed and used to track changes in these indicators.

During 2011–2014, total annual blood collections by national blood transfusion services in all 14 countries increased 19%, from 1,856,334 units in 2011 to 2,203,190 units in 2014 (Table 1). The overall median annual number of units collected increased 21.0% per year (range = 15.6%–32.7%), with a wide range of increases among countries. For example, during 2011–2014, annual collections increased by 147% (65,681 units) in Ethiopia and by 15% (15,772 units) in Mozambique (Table 1). The rate of collections remained below WHO's minimum target for adequacy of 10 units per 1,000 population per year in all but four countries: Botswana, Guyana, Namibia, and South Africa. South Africa reached this target before the initiation of PEPFAR funding. The rate of collections in Botswana reached the target in 2005 (11 units per 1,000 population) (*2*), but declined to <10 units during 2011–2013. Guyana's collection rate reached 10.2 units per 1,000 population in 2009 (*3*), and achieved a peak of 14.6 units per 1,000 population in 2013. Namibia's collection rate reached 10.5 units per 1,000 population in 2011, and increased to 12.7 units per 1,000 population by 2014. Despite the variation, all four of these countries maintained collections

* Botswana, Côte d'Ivoire, Ethiopia, Guyana, Haiti, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, and Zambia. Full list of countries receiving PEPFAR support (www.pepfar.gov).

† For the purposes of this report, "national blood transfusion services" refers to those government or non-governmental organizations with a legal mandate to collect, test, process, and distribute blood and blood components within a given country, and/or the legal authority to oversee or regulate the collection, testing, processing, and distribution of blood and blood components by other entities within that country.

**TABLE 1. Number of whole blood units collected by PEPFAR-supported blood transfusion services and units collected per 1,000 population, by country — 14 PEPFAR-supported countries, 2011–2014**

| | Whole blood units per year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 (baseline) | | 2011 | | 2012 | | 2013 | | 2014 | |
| Country | No. collected | No. per 1,000 population | No. collected | No. per 1,000 population | No. collected | No. per 1,000 population | No. collected | No. per 1,000 population | No. collected | No. per 1,000 population |
| Botswana | 11,583 | 6.5 | 16,562 | 8.2 | 19,279 | 9.4 | 19,197 | 9.2 | 25,510 | 12.1 |
| Côte d'Ivoire | 67,780 | 3.8 | 97,664 | 4.7 | 123,668 | 5.9 | 133,023 | 6.2 | 142,650 | 6.2 |
| Ethiopia | 17,208 | 0.2 | 49,296 | 0.5 | 55,855 | 0.6 | 75,801 | 0.8 | 110,367 | 1.1 |
| Guyana* | 4,008 | 5.4 | 7,930 | 10.5 | 7,712 | 10.3 | 11,148 | 14.6 | 10,260 | 13.4 |
| Haiti | 8,711 | 1.0 | 19,751 | 2.0 | 25,608 | 2.5 | 27,439 | 2.7 | 28,486 | 2.7 |
| Kenya | 40,857 | 1.2 | 126,123 | 3.1 | 156,891 | 3.8 | 169,369 | 3.9 | 182,187 | 4.1 |
| Mozambique | 67,105 | 3.4 | 115,033 | 5.0 | 121,561 | 5.1 | 119,003 | 4.9 | 121,091 | 4.8 |
| Namibia | 17,860 | 9.1 | 23,307 | 10.5 | 24,704 | 10.9 | 28,134 | 12.2 | 29,599 | 12.7 |
| Nigeria† | 1,266 | 0.0 | 39,106 | 0.2 | 42,577 | 0.3 | 55,288 | 0.3 | 49,328 | 0.3 |
| Rwanda | 30,786 | 3.7 | 37,881 | 3.7 | 40,520 | 3.9 | 43,000 | 4.0 | 48,665 | 4.4 |
| South Africa§ | 809,322 | 17.4 | 943,810 | 18.1 | 925,647 | 17.5 | 947,024 | 17.7 | 956,968 | 17.7 |
| Tanzania† | 12,597 | 0.3 | 98,176 | 2.2 | 114,464 | 2.5 | 169,443 | 3.7 | 171,661 | 3.6 |
| Uganda | 102,703 | 3.8 | 202,939 | 5.8 | 202,935 | 5.6 | 202,935 | 5.4 | 217,945 | 6.2 |
| Zambia | 40,616 | 3.7 | 78,756 | 5.8 | 108,296 | 7.7 | 113,386 | 7.8 | 108,473 | 7.2 |
| Total | 1,232,402 | 2.3 | 1,856,334 | 3.4 | 1,969,717 | 3.6 | 2,114,190 | 3.9 | 2,203,190 | 4.1 |

**Abbreviations:** AIDS = acquired immune deficiency syndrome; PEPFAR = President's Emergency Plan for AIDS Relief.
* Based on the 2013 United Nations Population Division census estimates. http://esa.un.org/unpd/wpp/DataQuery.
† Nigeria and Tanzania established a national blood transfusion service in 2004; the first year for which 12 complete months of data were available was 2005. Data from both countries only reflect blood collected by the National Blood Transfusion Service (NBTS) and do not include collections by private hospitals outside of the NBTS network. Private collections in both countries are believed to represent a substantial proportion of each country's national blood supply.
§ Includes data on collections from South African National Blood Service and Western Province Blood Transfusion Services.

above the WHO target in 2014 (Table 1). During 2011–2014, population-based whole blood unit collection rates increased by >1 unit per 1,000 population in six countries: Botswana (3.9 units), Guyana (2.9), Namibia (2.2), Côte d'Ivoire (1.5), Tanzania (1.4), and Zambia (1.4) (Table 1). However, during 2011–2014, only three countries (Ethiopia, Haiti, and Tanzania) reported >50% increases in collections, a decrease from the eight countries (Botswana, Guyana, Ethiopia, Haiti, Kenya, Mozambique, Uganda, and Zambia) that had reported >50% increases in collections during 2004–2010 (*2*,*3*).

Ten countries§ reported having national blood policies in place by 2012, and all 14 countries reported having a national blood transfusion service that met WHO organizational criteria. By 2012 seven countries¶ had published national standards for blood collection, testing, processing, and distribution. During 2011–2014, no change in the eight countries that previously reported collecting 100% of their national blood supply from voluntary, nonremunerated blood donors occurred (*3*) (Table 2). Ethiopia reported the largest increase in voluntary, nonremunerated blood donor donations, from 24% in 2011 to 88% in 2014. Guyana reported 99% voluntary, nonremunerated blood donor donations in 2014, an 11% increase from 89% in 2011. However, after reporting progress during 2004–2010 (*2*,*3*), Tanzania, Haiti, and Mozambique reported declines of 10%, 36%, and 37%, respectively, in the proportion of units collected from voluntary, nonremunerated blood donors during 2011–2014. The prevalence of HIV-reactive donated whole blood units continued to decline in seven countries during 2011–2014, and stabilized at low levels in Namibia and South Africa (Table 3). During 2011–2014, five countries reported increases in HIV prevalence among donated units (Table 3). By 2014, despite continued high HIV prevalence among adults aged 15–49 years, 12 of 14 countries reported declines in HIV prevalence among donated blood units compared to baseline prevalence estimates at the start of the PEPFAR initiative (Table 3).

## Discussion

Although increases in the percentage of voluntary, nonremunerated blood donors and in the number of blood units collected per 1,000 population since 2003 have been reported, whole blood collections largely remain insufficient to meet demand. Only four countries met the WHO-recommended minimum of 10 units per 1,000 population. The effect of the gap between supply and demand in many countries has been measured in pediatric and maternal mortality. As much as 65% of available blood in low-income countries in Africa has been estimated to be administered to children aged <5 years (*1*), and untreated postpartum hemorrhage is estimated to account for up to 46% of maternal deaths in some African settings (*5*). Unpublished 2012 data from the WHO Global Database on Blood Safety indicate that approximately 40 sub-Saharan African countries collect <10 units of blood per

§ Botswana, Côte d'Ivoire, Ethiopia, Kenya, Namibia, Nigeria, Rwanda, South Africa, Uganda, and Zambia.
¶ Côte d'Ivoire, Ethiopia, Namibia, Nigeria, Rwanda, South Africa, and Zambia.

**TABLE 2. Percentage of blood donations collected by PEPFAR-supported national blood transfusion services from voluntary, nonremunerated donors, by country — 14 PEPFAR-supported countries, 2003–2014**

| | % blood collections per year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| Botswana | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Côte d'Ivoire | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Ethiopia | 38.8 | 27.5 | 23.2 | 28.1 | 28.4 | 20.5 | 29.8 | 23.5 | 24.2 | 17.1 | 35.5 | 87.8 |
| Guyana | 21.7 | 18.9 | 26.1 | 31.2 | 61.1 | 54.6 | 84.0 | 78.5 | 89.0 | 86.0 | 96.0 | 99.0 |
| Haiti | 5.2 | 5.4 | 14.9 | 27.4 | 51.9 | 65.8 | 69.5 | 83.9 | 70.0 | 71.8 | 59.1 | 52.5 |
| Kenya | 99.0 | 95.3 | 97.6 | 98.9 | 99.5 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Mozambique | 58.0 | 58.3 | 59.6 | 52.0 | 72.3 | 59.7 | 63.3 | 61.0 | 54.8 | 49.1 | 43.8 | 39.0 |
| Namibia | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Nigeria* | — | — | 100.0 | 100.0 | 92.3 | 80.9 | 90.1 | 86.5 | 96.0 | 93.8 | 89.9 | 90.7 |
| Rwanda | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| South Africa† | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Tanzania* | — | — | 66.5 | 80.0 | 89.2 | 88.3 | 93.0 | 94.9 | 85.0 | 85.0 | 85.0 | 85.0 |
| Uganda | 95.5 | 96.3 | 99.0 | 99.9 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Zambia | 72.7 | 71.2 | 90.6 | 97.9 | 99.6 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Abbreviations:** — = not available; AIDS = acquired immune deficiency syndrome; PEPFAR = President's Emergency Plan for AIDS Relief.
* Nigeria did not have data on national blood policies available in the World Health Organization global database on blood safety in 2004. Nigeria and Tanzania established a national blood transfusion service in 2004; the first year for which 12 complete months of data were available was 2005.
† Includes data on collections from South African National Blood Service and Western Province Blood Transfusion Services.

**TABLE 3. Estimated population prevalence of human immunodeficiency virus (HIV) among persons aged 15–49 years, and percentage of collected whole blood units reactive for HIV, by country — 14 PEPFAR-supported countries, 2003–2014**

| | % HIV prevalence | | | % blood units reactive for HIV | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **2003** | **2008** | **2014** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| Botswana | 28.3 | 26.5 | 25.2 | 7.5 | 5.7 | 4.0 | 2.7 | 2.1 | 1.7 | 1.8 | 1.0 | 1.8 | 1.7 | 1.6 | 1.4 |
| Côte d'Ivoire | 5.2 | 4.2 | 3.5 | 1.6 | 1.4 | 1.5 | 1.4 | 1.2 | 0.9 | 0.7 | 0.5 | 0.6 | 0.5 | 0.4 | 0.3 |
| Ethiopia* | 2.6 | 1.6 | 1.2 | — | 3.6 | 3.4 | 2.5 | 3.0 | 2.9 | 1.8 | 1.9 | 3.7 | 2.0 | 1.6 | 0.8 |
| Guyana | 1 | 1.4 | 1.8 | 0.8 | 0.6 | 1.0 | 0.6 | 0.3 | 0.5 | 0.2 | 0.2 | 1.6 | 0.7 | 0.4 | 1.0 |
| Haiti | 2.8 | 2.2 | 1.9 | 1.7 | 1.8 | 1.6 | 1.9 | 1.4 | 1.7 | 1.4 | 1.2 | 1.1 | 0.9 | 1.1 | 1.1 |
| Kenya | 7.9 | 5.9 | 5.3 | 1.5 | 1.7 | 1.9 | 2.5 | 1.2 | 1.5 | 1.2 | 1.0 | 0.5 | 0.5 | 0.6 | 0.7 |
| Mozambique | 10.8 | 11.4 | 10.6 | 8.6 | 6.9 | 6.4 | 8.3 | 7.2 | 6.4 | 5.3 | 6.6 | 5.6 | 5.9 | 5.7 | 5.2 |
| Namibia | 16.1 | 14.4 | 16 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Nigeria† | 3.7 | 3.6 | 3.2 | — | — | 3.8 | 3.5 | 2.5 | 1.8 | 2.2 | 2.1 | 2.1 | 1.9 | 1.8 | 1.6 |
| Rwanda | 4.3 | 3.3 | 2.8 | 1.1 | 0.1 | 1.2 | 0.9 | 0.5 | 0.7 | 0.3 | 0.3 | 2.7 | 1.8 | 0.5 | 0.5 |
| South Africa§ | 17.5 | 18.3 | 18.9 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Tanzania† | 7.4 | 6.4 | 5.3 | — | — | 4.8 | 3.2 | 2.8 | 3.3 | 2.2 | 1.2 | 0.8 | 1.0 | 1.0 | 1.3 |
| Uganda | 6.4 | 6.6 | 7.3 | 2.0 | 1.9 | 1.6 | 1.5 | 1.3 | 1.2 | 0.8 | 1.0 | 0.9 | 0.5 | 0.6 | 1.1 |
| Zambia | 14 | 13.2 | 12.4 | 6.9 | 6.4 | 9.0 | 6.4 | 3.8 | 4.2 | 3.5 | 4.8 | 4.0 | 3.4 | 3.8 | 3.5 |

**Source:** 2003, 2008, and 2013 HIV prevalence data from UNAIDS estimates. http://aidsinfo.unaids.org.
**Abbreviations:** — = not available; AIDS = acquired immune deficiency syndrome; PEPFAR = President's Emergency Plan for AIDS Relief.
* In Ethiopia, reporting on HIV reactivity among collected units began in 2004.
† Nigeria and Tanzania established a national blood transfusion service in 2004; the first year for which 12 complete months of data were available was 2005.
§ Includes data on collections from South African National Blood Service and Western Province Blood Transfusion Services.

1,000 population, and 25 of these countries collect less than half the units needed to meet minimum estimated transfusion requirements. To fill this gap, many countries collect blood from other types of donors, including family members or replacement donors (friends of the recipient who donate blood to replace the transfused blood). Although formal systems of paid donation have largely been eliminated in sub-Saharan Africa, family and replacement donors might still be driven by informal financial incentives (*6*); in addition, replacement donors who only donate once have been shown to carry a higher risk for transfusion-transmissible infections (*7*). Reliance on donors at higher risk for HIV infection underscores the importance of quality-assured laboratory screening with highly sensitive assays to provide additional safety, a requirement that recent studies have found is not always met in low-resource settings (*8*).

Although the majority of the 14 countries reported decreases in the percentage of blood units testing positive for HIV collected since 2003, HIV prevalence among donated units in all 14 countries remains higher than the 0.002% reported in high-income countries (*1*). Six of the 14 countries have HIV prevalence rates ≥1% among donated units, and two have rates >3%. Sustaining progress made in reducing the risk for transfusion-transmitted HIV in sub-Saharan Africa

will depend in part on implementation of blood bank safety standards and quality management systems. However, to date, only two national blood transfusion services in sub-Saharan Africa (South Africa and Namibia) have achieved accreditation by an external accrediting body. To address this gap, the Africa Society for Blood Transfusion has developed the first regional standards and stepwise accreditation system for blood banks in sub-Saharan Africa.** Eleven countries have started the process and two have received certification.

The findings of this report are subject to at least three limitations. First, whole blood unit collections described in this report only reflect units collected by the national blood transfusion service in each country, and not units collected by individual hospitals. Although data are not available to quantify non-national blood transfusion service collections in all 14 countries, a recent CDC assessment of blood demand and use in Tanzania estimated that, in 2013, up to 38% of transfused units were collected by non-national blood transfusion service facilities (personal communication, B. Drammeh, CDC). As a result, total units collected per 1,000 population might be underestimated, and the proportion of blood supplied by voluntary, nonremunerated blood donors might be overestimated, because many of the countries in this report still rely on family and replacement donors to meet clinical demand. Second, variation in assays used for HIV screening, laboratory capacity, and testing proficiency among the countries might result in an over- or under- estimation of the HIV prevalence in collected units, which cannot be quantified. Finally, estimations of transfusion-associated HIV infections might underestimate the proportion of countries' overall annual HIV incidence attributable to unsafe blood, mainly because current incidence models do not account for test quality or rates of false negativity (*9*). Stronger donor selection criteria and improved screening technologies have reduced the number of HIV-positive donors being screened for donation and improved detection of HIV infections among donors, respectively (*10*). However, in countries with high HIV prevalence, blood donor recruitment and mobilization of uninfected persons is an ongoing challenge.

Since the initiation of PEPFAR support in 2004, national blood transfusion services in 14 countries have made substantial progress in increasing blood collections and decreasing HIV prevalence among donated units, gains that stabilized during 2011–2014. As PEPFAR support for blood safety declines,†† national governments need to continue to track key safety and adequacy indicators, and invest in sustainable quality management systems and studies to establish blood unit production costs. In addition, as countries make progress in controlling other factors of national HIV epidemics, expanded national HIV surveillance systems might aid in better understanding and tracking the contribution of blood transfusion to annual national HIV incidence.

**Summary**

What is already known on this topic?

Countries supported by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) have made substantial progress toward safer and more adequate national blood supplies by reducing the prevalence of human immunodeficiency virus (HIV) among donated blood units, which has likely contributed to fewer transfusion-associated HIV infections. However, the risk for HIV transmission via transfusion remains high in low- and middle-income countries.

What is added by this report?

The safety and availability of blood products has increased in 14 PEPFAR priority countries in sub-Saharan Africa and the Caribbean. During 2011–2014, blood collections increased by 19%, and despite high country prevalences of HIV infection, 12 of 14 countries reported an overall decrease in HIV prevalence among donated blood units. To reach World Health Organization 2020 goals for blood safety and adequacy, blood banking standards, accreditation, and quality management systems are still needed in low- and middle-income countries.

What are the implications for public health practice?

As countries control other modes of HIV transmission, continued prevention of transfusion-associated HIV infections through the adoption and implementation of international safety standards and quality management systems will become increasingly important. Sustained progress will also rely on the development of reliable country-based funding models as external donor funding for blood safety is reduced.

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** African Society for Blood Transfusion (AfSBT) system of step-wise accreditation (http://www.afsbt.org).

†† PEPFAR funding trends (https://data.pepfar.net/). Blood Safety programs are funded through the HMBL budget code.

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*Please note:* *Updated guidance has been published. To view the update, please click here.*



# Interim Guidelines for Prevention of Sexual Transmission of Zika Virus — United States, 2016

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Zika virus is a mosquito-borne flavivirus primarily transmitted by *Aedes aegypti* mosquitoes (*1*,*2*). Infection with Zika virus is asymptomatic in an estimated 80% of cases (*2*,*3*), and when Zika virus does cause illness, symptoms are generally mild and self-limited. Recent evidence suggests a possible association between maternal Zika virus infection and adverse fetal outcomes, such as congenital microcephaly (*4*,*5*), as well as a possible association with Guillain-Barré syndrome. Currently, no vaccine or medication exists to prevent or treat Zika virus infection. Persons residing in or traveling to areas of active Zika virus transmission should take steps to prevent Zika virus infection through prevention of mosquito bites (http://www.cdc.gov/zika/prevention/).

Sexual transmission of Zika virus is possible, and is of particular concern during pregnancy. Current information about possible sexual transmission of Zika is based on reports of three cases. The first was probable sexual transmission of Zika virus from a man to a woman (*6*), in which sexual contact occurred a few days before the man's symptom onset. The second is a case of sexual transmission currently under investigation (unpublished data, 2016, Dallas County Health and Human Services). The third is a single report of replication-competent Zika virus isolated from semen at least 2 weeks and possibly up to 10 weeks after illness onset; reverse transcriptase-polymerase chain reaction testing of blood plasma specimens collected at the same time as the semen specimens did not detect Zika virus (*7*). The man had no sexual contacts. Because no further testing was conducted, the duration of persistence of Zika virus in semen remains unknown.

In all three cases, the men developed symptomatic illness. Whether infected men who never develop symptoms can transmit Zika virus to their sex partners is unknown. Sexual transmission of Zika virus from infected women to their sex partners has not been reported. Sexual transmission of many infections, including those caused by other viruses, is reduced by consistent and correct use of latex condoms.

The following recommendations, which apply to men who reside in or have traveled to areas with active Zika virus transmission (http://wwwnc.cdc.gov/travel/notices/) and their sex partners, will be revised as more information becomes available.

## Recommendations for men and their pregnant partners

Men who reside in or have traveled to an area of active Zika virus transmission who have a pregnant partner should abstain from sexual activity or consistently and correctly use condoms during sex (i.e., vaginal intercourse, anal intercourse, or fellatio) for the duration of the pregnancy. Pregnant women should discuss their male partner's potential exposures to mosquitoes and history of Zika-like illness (http://www.cdc.gov/zika/symptoms) with their health care provider; providers can consult CDC's guidelines for evaluation and testing of pregnant women (*8*).

## Recommendations for men and their nonpregnant sex partners

Men who reside in or have traveled to an area of active Zika virus transmission who are concerned about sexual transmission of Zika virus might consider abstaining from sexual activity or using condoms consistently and correctly during sex. Couples considering this personal decision should take several factors into account. Most infections are asymptomatic, and when illness does occur, it is usually mild with symptoms lasting from several days to a week; severe disease requiring hospitalization is uncommon. The risk for acquiring vector-borne Zika virus in areas of active transmission depends on the duration and extent of exposure to infected mosquitoes and the steps taken to prevent mosquito bites (http://www.cdc.gov/zika/prevention). After infection, Zika virus might persist in semen when it is no longer detectable in blood.

Zika virus testing has been recommended to establish a diagnosis of infection in some groups, such as pregnant women (*8*). At present, Zika virus testing for the assessment of risk for sexual transmission is of uncertain value, because current understanding of the incidence and duration of shedding in the male genitourinary tract is limited to one case report in which Zika virus persisted longer than in blood (*7*). At this time, testing of men for the purpose of assessing risk for sexual transmission is not recommended. As we learn more about the incidence and duration of seminal shedding from infected men and the utility and availability of testing in this context, recommendations to prevent sexual transmission of Zika virus will be updated.

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*Please note:* *Updated guidance has been published. To view the update, please click here.*



# Update: Interim Guidelines for Health Care Providers Caring for Pregnant Women and Women of Reproductive Age with Possible Zika Virus Exposure — United States, 2016

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*On February 5, 2016 this report was posted as an MMWR Early Release on the MMWR website (http://www.cdc.gov/mmwr).*

CDC has updated its interim guidelines for U.S. health care providers caring for pregnant women during a Zika virus outbreak (*1*). Updated guidelines include a new recommendation to offer serologic testing to asymptomatic pregnant women (women who do not report clinical illness consistent with Zika virus disease) who have traveled to areas with ongoing Zika virus transmission. Testing can be offered 2–12 weeks after pregnant women return from travel. This update also expands guidance to women who reside in areas with ongoing Zika virus transmission, and includes recommendations for screening, testing, and management of pregnant women and recommendations for counseling women of reproductive age (15–44 years). Pregnant women who reside in areas with ongoing Zika virus transmission have an ongoing risk for infection throughout their pregnancy. For pregnant women with clinical illness consistent with Zika virus disease,* testing is recommended during the first week of illness. For asymptomatic pregnant women residing in areas with ongoing Zika virus transmission, testing is recommended at the initiation of prenatal care with follow-up testing mid-second trimester. Local health officials should determine when to implement testing of asymptomatic pregnant women based on information about levels of Zika virus transmission and laboratory capacity. Health care providers should discuss reproductive life plans, including pregnancy intention and timing, with women of reproductive age in the context of the potential risks associated with Zika virus infection.

Zika virus is primarily transmitted by *Aedes aegypti* mosquitoes, which are found throughout much of the region of the Americas, including parts of the United States (*2*,*3*). These mosquitoes can also transmit dengue and chikungunya viruses (*4*). The Zika virus outbreak continues to spread (http://www.cdc.gov/zika/geo/index.html), with ongoing Zika virus transmission recently reported in U.S. territories. Evidence suggesting an association of Zika virus infection with an increased risk for congenital microcephaly and other abnormalities of the brain and eye (*5*) prompted the World Health Organization to declare the Zika virus outbreak a Public Health Emergency of International Concern on February 1, 2016 (http://www.who.int/mediacentre/news/statements/2016/1st-emergency-committee-zika/en/).

There is currently no vaccine or medication to prevent Zika virus infection. All travelers to or residents of areas with ongoing Zika virus transmission should be advised to strictly follow steps to avoid mosquito bites because of the potential for exposure to Zika, dengue, and chikungunya viruses (*6*). *Aedes* vector mosquitoes bite mostly during daylight hours; thus, protection from mosquito bites is required throughout the day (*7*). Prevention of mosquito bites includes wearing long-sleeved shirts, pants, permethrin-treated clothing, and using United States Environmental Protection Agency (EPA)-registered insect repellents. Insect repellents containing ingredients such as DEET, picaridin, and IR3535 are safe for use during pregnancy when used in accordance with the product label (*6*). To prevent human-to-mosquito-to-human transmission, persons infected with Zika, dengue, or chikungunya virus should protect themselves from mosquito exposure during the first week of illness. The number of mosquitoes in and around homes can be reduced by emptying standing water from containers, installing or repairing screens on windows and doors, and using air conditioning if available. Further information on preventing mosquito bites is available online (http://www.cdc.gov/features/stopmosquitoes/).

Antiviral treatment is not currently available for Zika virus disease; treatment is supportive and includes rest, fluids, and analgesic and antipyretic medications. Aspirin and other nonsteroidal anti-inflammatory medications should be avoided until dengue virus infection can be ruled out (*8*). Dengue virus infection can cause serious complications, including hemorrhage and death, which might be substantially reduced by early recognition and supportive treatment (*4*,*8*). Pregnant women with fever should be treated with acetaminophen (*9*).

* Clinical illness consistent with Zika virus disease is defined as two or more of the following signs or symptoms: acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis.

## Updated Recommendations for Testing Pregnant Women with a History of Travel to Areas with Ongoing Zika Virus Transmission

Recommendations for Zika virus testing of pregnant women who have a clinical illness consistent with Zika virus disease during or within 2 weeks of travel to areas with ongoing Zika virus transmission are unchanged from CDC recommendations released January 19, 2016 (*1*). Zika virus testing of maternal serum includes reverse transcription-polymerase chain reaction (RT-PCR) testing for symptomatic patients with onset of symptoms during the previous week; immunoglobulin M (IgM) and plaque-reduction neutralizing antibody testing should be performed on specimens collected ≥4 days after onset of symptoms (Figure 1) (*1*,*10*).

Serologic testing for Zika virus can be offered to asymptomatic pregnant women who traveled to an area with ongoing Zika virus transmission (Figure 1); however, interpretation of results is complex. Because of cross-reactivity among related flaviviruses, such as dengue, yellow fever, and West Nile viruses, a positive IgM result can be difficult to interpret. Plaque-reduction neutralization testing (PRNT) can be performed to measure virus-specific neutralizing antibodies to Zika virus and other flaviviruses. The levels of neutralizing antibodies can then be compared between flaviviruses, but these tests might also be difficult to interpret in persons who were previously infected with or vaccinated against flaviviruses. However, a negative IgM result obtained 2–12 weeks after travel would suggest that a recent infection did not occur and could obviate the need for serial ultrasounds. Based on experience with other flaviviruses, IgM antibodies will be expected to be present at least 2 weeks after virus exposure and persist for up to 12 weeks (*11*–*14*). Information about the performance of serologic testing of asymptomatic persons is limited; a negative serologic test result obtained 2–12 weeks after travel cannot definitively rule out Zika virus infection. Given these challenges in interpreting serologic test results, health care providers should contact their state, local, or territorial health department for assistance with arranging testing and interpreting results. CDC is working with health departments and other organizations to rapidly increase the availability of testing for Zika virus.

## Guidelines for Pregnant Women Residing in Areas with Ongoing Zika Virus Transmission

Pregnant women who reside in areas with ongoing Zika virus transmission should be evaluated for symptoms of Zika virus disease. For women who report clinical illness consistent with Zika virus disease, testing by RT-PCR should be performed on serum collected within 7 days of symptom onset. Because viremia decreases over time, a negative RT-PCR result from serum collected 5–7 days after symptom onset does not exclude Zika virus infection, and serologic testing should be performed. (http://www.aphl.org/Materials/CDCMemo_Zika_Chik_Deng_Testing_011916.pdf).

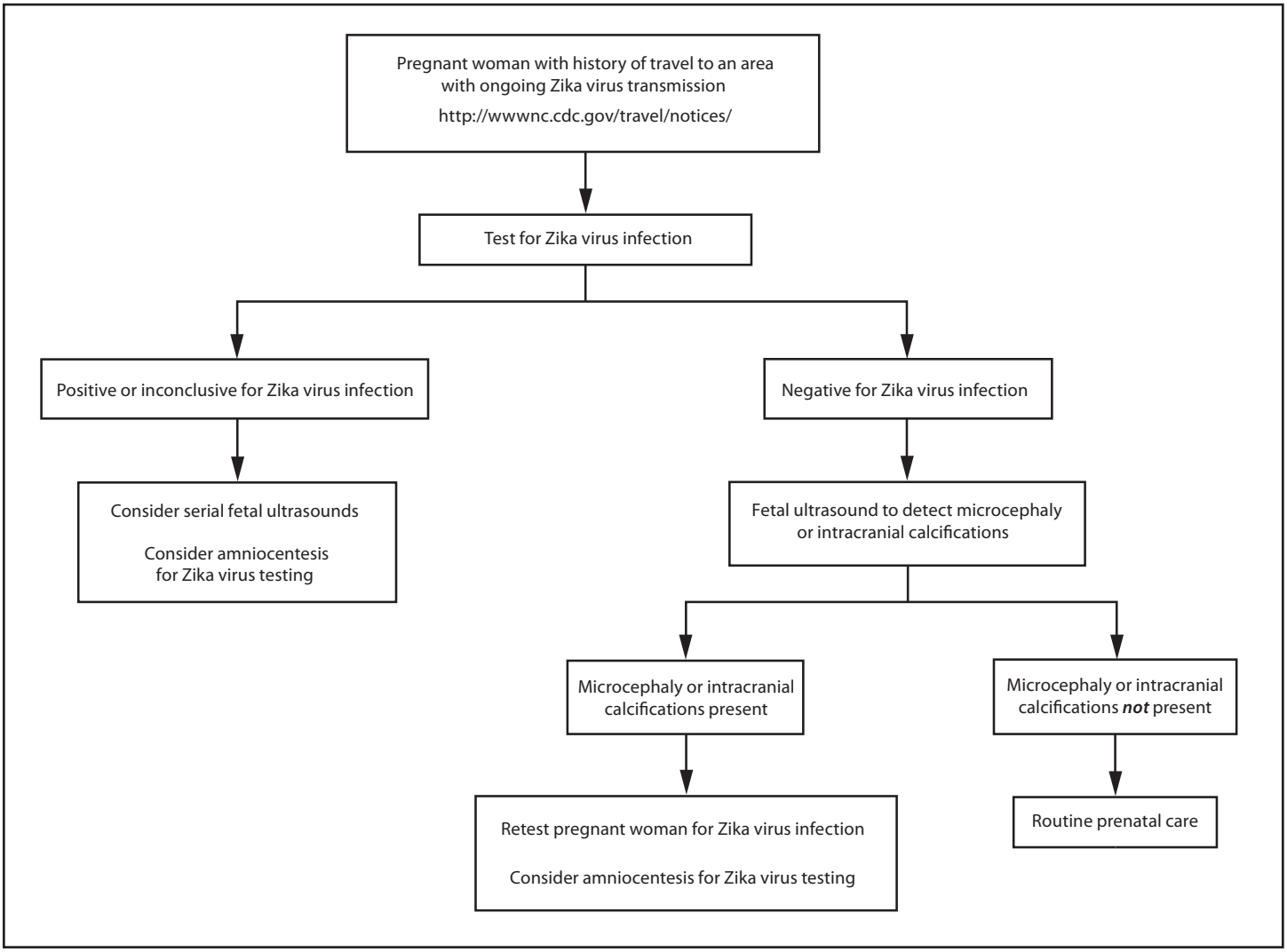
A false positive IgM result is more likely among women residing in areas with ongoing Zika virus transmission than among travelers because of a higher likelihood of previous exposure to a related flavivirus. Pregnant women who do not report clinical illness consistent with Zika virus disease can be offered IgM testing upon initiation of prenatal care; among women with negative IgM results, repeat testing can be considered in the mid-second trimester because of the ongoing risk for Zika virus exposure and infection throughout pregnancy (Figure 2).

Pregnant women with negative Zika virus IgM testing should receive routine prenatal care, including an assessment of pregnancy dating and an ultrasound at 18–20 weeks of gestation to assess fetal anatomy (*15*). The ultrasound should include careful evaluation of the fetus for brain anomalies, including microcephaly and intracranial calcifications. Because fetal microcephaly is most easily detected in the late second and early third trimesters of pregnancy (*16*), and because of ongoing potential exposure to Zika virus, health care providers might consider an additional fetal ultrasound later in pregnancy.

Findings of fetal microcephaly or intracranial calcifications on prenatal ultrasound should prompt health care providers to repeat maternal IgM testing and consider amniocentesis, depending on gestational age. Zika virus testing can be performed on amniotic fluid using RT-PCR to inform clinical management (*5*). Based on experience with other congenital infections and a small number of prenatally-diagnosed fetal Zika virus infections (*5*,*17*), amniocentesis can be used to diagnose intrauterine infections (*18*). However, the performance of RT-PCR testing of amniotic fluid for Zika virus infection has not been evaluated. Furthermore, the risk for microcephaly or other anomalies when Zika virus RNA is detected in amniotic fluid is not known.

Serial fetal ultrasounds should be considered to monitor fetal anatomy and growth every 3–4 weeks in pregnant women with positive or inconclusive Zika virus test results, and referral to a maternal-fetal medicine specialist is recommended. Testing is recommended at the time of delivery, including histopathologic examination of the placenta and umbilical cord, testing of frozen placental tissue and cord tissue for Zika virus RNA, and testing of cord serum (*1*,*19*). Guidelines for infants whose mothers have possible Zika virus infection are available (*19*). If a pregnant woman with Zika virus disease experiences a fetal loss, Zika virus RT-PCR and immunohistochemical staining should be performed on fetal tissues, including umbilical cord and placenta (*1*).

**FIGURE 1. Updated Interim guidance: testing algorithm*,†,§,¶,** for a pregnant woman with history of travel to an area with ongoing Zika virus transmission**




* Testing is recommended for pregnant women with clinical illness consistent with Zika virus disease, which includes two or more of the following signs or symptoms: acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis during or within 2 weeks of travel. Testing includes Zika virus reverse transcription-polymerase chain reaction (RT-PCR), and Zika virus immunoglobulin M (IgM) and neutralizing antibodies on serum specimens (http://www.aphl.org/Materials/CDCMemo_Zika_Chik_Deng_Testing_011916.pdf). Because of the overlap of symptoms and areas where other viral illnesses are endemic, evaluation for dengue or chikungunya virus infection is also recommended.

† Testing can be offered to pregnant women without clinical illness consistent with Zika virus disease. If performed, testing should include Zika virus IgM, and if IgM test result is positive or indeterminate, neutralizing antibodies on serum specimens. Testing should be performed 2–12 weeks after travel.

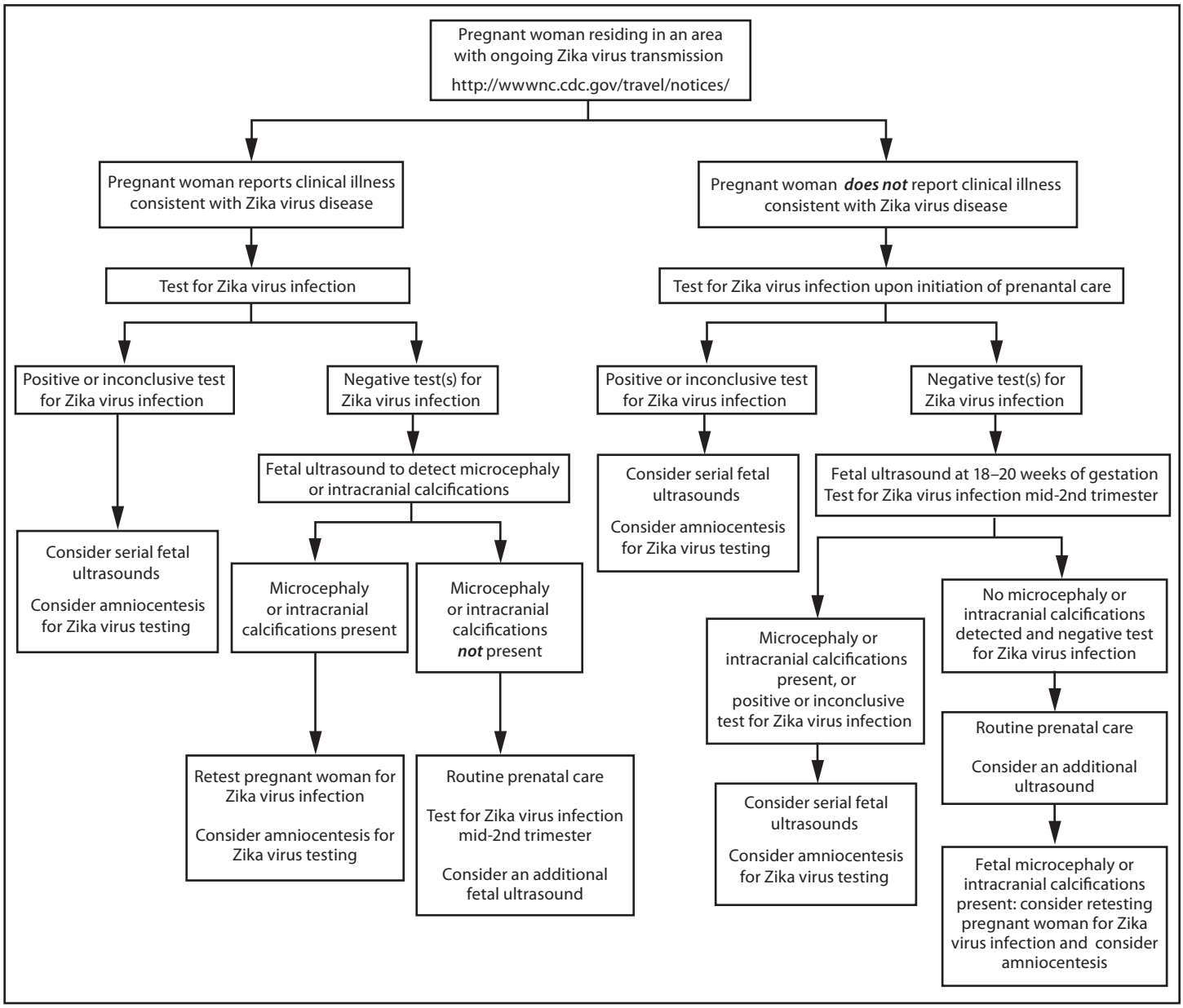
§ Laboratory evidence of maternal Zika virus infection: 1) Zika virus RNA detected by RT-PCR in any clinical specimen; or 2) positive Zika virus IgM with confirmatory neutralizing antibody titers that are ≥4-fold higher than dengue virus neutralizing antibody titers in serum. Testing is considered inconclusive if Zika virus neutralizing antibody titers are <4-fold higher than dengue virus neutralizing antibody titers.

¶ Fetal ultrasounds might not detect microcephaly or intracranial calcifications until the late second or early third trimester of pregnancy.

** Amniocentesis is not recommended until after 15 weeks of gestation. Amniotic fluid should be tested for Zika virus RNA by RT-PCR. The sensitivity and specificity of RT-PCR testing on amniotic fluid are not known.

Sexual transmission of Zika virus can occur, although there is limited data about the risk (*20*). The risk for sexual transmission of Zika virus can be eliminated by abstinence and reduced by correct and consistent use of condoms (*21*). Given the potential risks of maternal Zika virus infection, pregnant women whose male partners have or are at risk for Zika virus infection should consider using condoms or abstaining from sexual intercourse (*21*). Additional studies are needed to characterize the risk for sexual transmission of Zika virus; recommendations will be updated as more information becomes available.

**FIGURE 2. Interim guidance: testing algorithm*,†, §,¶,** for a pregnant woman residing in an area with ongoing Zika virus transmission,†† with or without clinical illness consistent with Zika virus disease§§**




* Tests for pregnant women with clinical illness consistent with Zika virus disease include Zika virus reverse transcription-polymerase chain reaction (RT-PCR), and Zika virus immunoglobulin M (IgM) and neutralizing antibodies on serum specimens (http://www.aphl.org/Materials/CDCMemo_Zika_Chik_Deng_Testing_011916.pdf). Because of the overlap of symptoms and areas where other viral illnesses are endemic, evaluation for dengue or chikungunya virus infection is also recommended. If chikungunya or dengue virus RNA is detected, treat in accordance with existing guidelines. Timely recognition and supportive treatment for dengue virus infections can substantially lower the risk of medical complications and death. Repeat Zika virus testing during pregnancy is warranted if clinical illness consistent with Zika virus disease develops later in pregnancy.

† Testing can be offered to pregnant women without clinical illness consistent with Zika virus disease. If performed, testing should include Zika virus IgM, and if IgM test result is positive or indeterminate, neutralizing antibodies on serum specimens. Results from serologic testing are challenging to interpret in areas where residents have had previous exposure to other flaviviruses (e.g., dengue, yellow fever).

§ Laboratory evidence of maternal Zika virus infection: 1) Zika virus RNA detected by RT-PCR in any clinical specimen; or 2) positive Zika virus IgM with confirmatory neutralizing antibody titers that are ≥4-fold higher than dengue virus neutralizing antibody titers in serum. Testing is considered inconclusive if Zika virus neutralizing antibody titers are <4-fold higher than dengue virus neutralizing antibody titer.

¶ Amniocentesis is not recommended until after 15 weeks gestation. Amniotic fluid should be tested for Zika virus RNA by RT-PCR. The sensitivity and specificity of RT-PCR testing on amniotic fluid are not known.

** Fetal ultrasounds might not detect microcephaly or intracranial calcifications until the late second or early third trimester of pregnancy.

†† Local health officials should determine when to implement testing of asymptomatic pregnant women based on information about levels of Zika virus transmission and laboratory capacity.

§§ Clinical illness consistent with Zika virus disease is defined as two or more of the following signs or symptoms: acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis.

## Special Considerations for Women of Reproductive Age Residing in Areas of Ongoing Zika Virus Transmission

CDC recommends that health care providers discuss pregnancy intention and reproductive options with women of reproductive age. Decisions regarding the timing of pregnancies are personal and complex; reproductive life plans can assist in making these decisions (*22*). Patient age, fertility, reproductive and medical history, as well as the values and preferences of the woman and her partner should be considered during discussions regarding pregnancy intentions and timing. In the context of the ongoing Zika virus transmission, preconception care should include a discussion of the signs and symptoms and the potential risks associated with Zika virus infection.

Health care providers should discuss strategies to prevent unintended pregnancy with women who do not want to become pregnant; these strategies should include counseling on family planning and use of contraceptive methods. Safety, effectiveness, availability, and acceptability should be considered when selecting a contraceptive method (*23*). Approximately half of U.S. pregnancies each year are unintended (*24*); patients should be counseled to use the most effective contraceptive method that can be used correctly and consistently. For women desiring highly effective contraception, long acting reversible contraception, including contraceptive implants and intrauterine devices, might be the best choice (http://www.cdc.gov/reproductivehealth/UnintendedPregnancy/PDF/Contraceptive_methods_508.pdf). When choosing a contraceptive method, the risk for sexually transmitted infections should also be considered; correct and consistent use of condoms reduces the risk for sexually transmitted infections.

Strategies to prevent mosquito bites should be emphasized for women living in areas with ongoing Zika virus transmission who want to become pregnant. These strategies, including wearing pants and long-sleeved shirts, using FDA-approved insect repellents, ensuring that windows and doors have screens, and staying inside air conditioned spaces when possible, can reduce the risk for Zika virus infection and other vector-borne diseases. During preconception counseling visits, the potential risks of Zika virus infection acquired during pregnancy should be discussed.

Women of reproductive age with current or previous laboratory-confirmed Zika virus infection should be counseled that there is no evidence that prior Zika virus infection poses a risk for birth defects in future pregnancies (*7*). This is because the viremia is expected to last approximately 1 week in patients with clinical illness (*2*,*25*). There is no current evidence to suggest that a fetus conceived after maternal viremia has resolved would be at risk for fetal infection (*7*).

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# Notes from the Field

## Circulating Vaccine-Derived Poliovirus Outbreaks — Five Countries, 2014–2015

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In 2015, wild poliovirus (WPV) transmission was identified in only Afghanistan and Pakistan (*1*). The widespread use of live, attenuated oral poliovirus vaccine (OPV) has been key in polio eradication efforts. However, OPV use, particularly in areas with low vaccination coverage, is associated with the low risk for emergence of vaccine-derived polioviruses (VDPV), which can cause paralysis (*2*). VDPVs vary genetically from vaccine viruses and can cause outbreaks in areas with low vaccination coverage. Circulating VDPVs (cVDPVs) are VDPVs in confirmed outbreaks. Single VDPVs for which the origin cannot be determined are classified as ambiguous (aVDPVs), which can also cause paralysis. Among the three types of WPV, type 2 has been declared to be eradicated. More than 90% of cVDPV cases have been caused by type 2 cVDPVs (cVDPV2). Therefore, in April 2016, all OPV-using countries of the world are discontinuing use of type 2 Sabin vaccine by simultaneously switching from trivalent OPV (types 1, 2, and 3) to bivalent OPV (types 1 and 3) for routine and supplementary immunization. The World Health Organization recently broadened the definition of cVDPVs to include any VDPV with genetic evidence of prolonged transmission (i.e., >1.5 years) and indicated that any single VDPV2 event (a case of paralysis caused by a VDPV or isolation of a VDPV from an environmental specimen) should elicit a detailed outbreak investigation and local immunization response. A confirmed cVDPV2 detection should elicit a full poliovirus outbreak response that includes multiple supplemental immunization activities (SIAs); an aVDPV designation should be made only after investigation and response (*3*). Since 2005, there have been 1–8 cVDPV outbreaks and 3–12 aVDPV events per year. There are currently five active cVDPV outbreaks in Guinea, Laos, Madagascar, Myanmar, and Ukraine, and four other active VDPV events.

The longest ongoing cVDPV outbreak, which began on September 29, 2014, is occurring in Madagascar, with a total of 11 cVDPV type 1 (cVDPV1) cases since the index patient developed symptoms in Sofia Region. The patient in the most recent case developed symptoms on August 22, 2015, in Sud-Ouest Province. Cases are widespread throughout the country; isolates have 20–27 nucleotide differences compared with the type 1 Sabin vaccine strain.* SIAs began in December 2014.

In Ukraine, two cVDPV1 cases in Zakarpattya Oblast have been identified. The first patient had symptom onset on June 30, 2015, and the second on July 07, 2015. The isolates from these patients had 20–26 nucleotide differences from the type 1 Sabin vaccine strain. Both patients fully recovered with no residual paralysis. SIAs began on October 21, 2015.

In Guinea, a child from Kankan Province developed symptoms on July 20, 2015. He traveled to Bamako, Mali, where cVDPV2 with 25 nucleotide differences from the type 2 Sabin vaccine strain was isolated from a stool specimen received on September 4, 2015. This was genetically linked to a cVDPV2 case in Guinea with onset in August, 2014. Subnational immunization days (SNIDs) began in Guinea on September 16, 2015. Mali has since conducted SNIDs and national immunization days (NIDs). Of note, most stool specimens from patients with acute flaccid paralysis collected during the peak of the Ebola epidemic in Guinea, Liberia, and Sierra Leone have not been tested. Testing of specimens from Guinea has resumed at the polio regional reference laboratory in Senegal, and three other cVDPV2 cases were subsequently identified, the latest with onset on October 2, 2015.

In Laos, nine cVDPV1 cases with up to 30 nucleotide differences from the type 1 Sabin vaccine strain have been identified. The patient in the first case, from Bolikhamxay Province, had symptom onset September 7, 2015. The last known case, from Vientiane Province, developed symptoms on January 11, 2016. SIAs began on October 9, 2015.

In Myanmar, a cVDPV2 with 15 nucleotide differences from the type 2 Sabin vaccine strain was isolated from a child who developed symptoms on October 5, 2015, in Rakhine Province. This case is genetically linked to a cVDPV2 case in the same province with symptom onset April 16, 2015. SIAs began on November 11, 2015.

Response to type 2 aVDPV events in the Democratic Republic of the Congo, Nigeria, Pakistan, and South Sudan has occurred or is ongoing. cVDPVs were also reported in Nigeria and Pakistan in the first half of 2015.

With eradication of WPV in sight, continued focus is needed to eliminate immunity gaps through high-quality SIAs and strong routine immunization programs (*4*). Additional cVDPV outbreaks might occur in areas with low routine OPV coverage. The risk for type 2 cVDPVs will change markedly after the global switch from trivalent OPV to bivalent OPV in April 2016; although the risk for cVDPV2 outbreaks will continue during the initial 12 months after the switch, the risk subsequently should fall to very low (*5*). CDC recommends that all international travelers ensure they are up to date on polio immunizations before traveling (*6*).

* When genomic sequencing of an isolate shows ≥1.5% (n≥14) nucleotide divergence in the VP1-coding region from Sabin poliovirus, this highlights prolonged undetected circulation and gaps in acute flaccid paralysis surveillance.

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# Announcement

## American Heart Month — February 2016

February is American Heart Month. The leading cause of death in the United States continues to be heart disease. Although the death rate for heart disease has been decreasing (*1*,*2*), too few U.S. adults get adequate physical activity, eat a healthy diet, avoid smoking, and control their blood pressure and cholesterol. More than one in three U.S. adults have at least one type of cardiovascular disease (CVD), which includes heart disease, stroke, and high blood pressure. Nearly one in three deaths are attributed to CVD each year (*1*). In the United States about 17% of health care dollars are spent on CVD each year, which amounts to more than $316 billion in medical expenses and lost productivity (*1*).

CVD and its risk factors are not distributed evenly across the U.S. population. Certain groups, defined by age, sex, race, ethnicity, or geography, have higher levels than others (*1*). Disproportionately high rates of avoidable CVD deaths are found among black men and among adults aged 30–74 years living in the Southeast, highlighting the need for targeted efforts to alleviate disparities and improve health (*3*). Black men experience a heart disease death rate twice that for white women, who have the lowest rate (*4*). CDC aims to reduce these disparities through increased use of clinical protocols (*5*), partnerships with national, state, and local organizations (including the Million Hearts initiative), and educational efforts targeting persons at risk for CVD.

In observance of American Heart Month 2016, CDC is focusing on increasing targeted consumer and health care provider messaging and providing resources specifically for black men and their health care providers. Additional information is online regarding American Heart Month (http://millionhearts.hhs.gov/news-media/events/heart-month.html) and prevention of heart disease (http://millionhearts.hhs.gov/learn-prevent/healthy-is-strong.html).

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# Erratum

## Vol. 64, No. 52

In the report, "Diagnosis of Tuberculosis in Three Zoo Elephants and a Human Contact — Oregon, 2013," on page 1398, the first sentence of the second paragraph should have read as follows: "In May 2013, a routine annual culture of a sample from a trunk washing on elephant A, an Asian elephant aged **30** years at a zoo in Oregon's Multnomah County, yielded *Mycobacterium tuberculosis,* indicating active, potentially infectious disease."

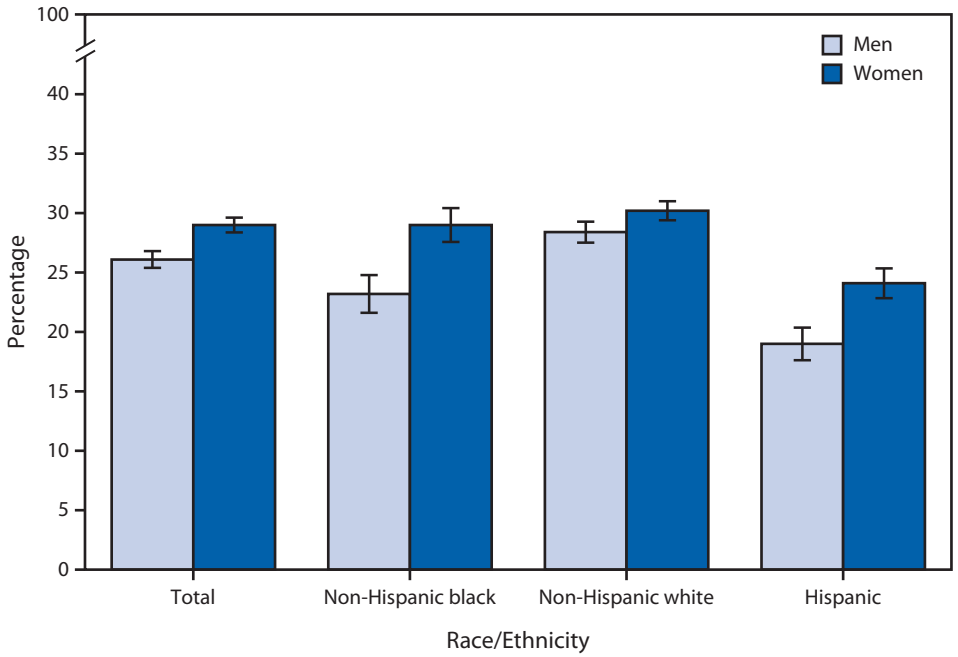
## Vol. 64, No. 25

In the report, "Monitoring of Persons with Risk for Exposure to Ebola Virus Disease — United States, November 3, 2014–March 8, 2015," on page 688, an error occurred in "**FIGURE 3. Number of persons with potential Ebola exposure monitored in 50 states, New York City, and the District of Columbia — November 3, 2014–March 8, 2015.**" The shading for the District of Columbia (DC) should have indicated that **200–499** persons were monitored in DC.

# QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

## Age-Adjusted Percentage* of Adults with Chronic Joint Symptoms,† by Sex and Race/Ethnicity — National Health Interview Survey, United States 2013–2014§




* With 95% confidence interval.

† Based on responses to a question that asked sample adults, "During the past 30 days, have you had any symptoms of pain, aching, or stiffness in or around a joint?" Respondents were asked to exclude the back or neck. Respondents who answered affirmatively were then asked a follow-up question, "Did your joint symptoms first begin more than 3 months ago?" Only respondents with affirmative answers to both questions were included in the analysis. Chronic pain is pain lasting >3 months.

§ Estimates are based on household interviews of a sample of the U.S. civilian, noninstitutionalized population aged ≥18 years. Persons for whom chronic pain was unknown were not included in the denominators when calculating percentages. Percentages were age-adjusted to the projected 2000 U.S. population as the standard population, using four age groups: 18–44, 45–64, 65–74, and ≥75 years.

During 2013–2014, women were more likely than men to have chronic symptoms of pain, aching, or stiffness in or around a joint for >3 months. This pattern was observed regardless of race/ethnicity. Among non-Hispanic black adults, 29.0% of women had chronic joint pain compared with 23.2% of men. Among non-Hispanic white adults, 30.2% of women had chronic joint pain compared with 28.4% of men. Among Hispanic adults, 24.1% of women had chronic joint pain compared with 19.0% of men. Hispanic men and women also were less likely than non-Hispanic black and non-Hispanic white men and women to have chronic joint pain.

**Source:** National Health Interview Survey, 2013–2014. http://www.cdc.gov/nchs/nhis.htm.

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