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Pain Awareness Month — September 2018

September is Pain Awareness Month, when organizations work to raise awareness of how pain affects persons, families, communities, and the nation and to support national action to address pain. A 2011 Institute of Medicine report (https://www.ncbi.nlm.nih.gov/pubmed/22553896) has prompted strategic planning efforts, such as the 2016 National Pain Strategy (https://iprcc.nih.gov/sites/default/files/HHSNational_Pain_Strategy_508C.pdf) and the 2017 Federal Pain Research Strategy (https://iprcc.nih.gov/Federal-Pain-Research-Strategy/Overview), and efforts for their implementation.

A report on chronic pain in this issue (*1*) estimates that chronic pain affects approximately 50 million U.S. adults, and high-impact chronic pain (i.e., interfering with work or life most days or every day) affects approximately 20 million U.S. adults. Findings in this report will help guide federal efforts to address high-impact chronic pain, such as *Healthy People 2020* objectives (https://www.healthypeople.gov/2020/topics-objectives) and the CDC Guideline for Prescribing Opioids for Chronic Pain (https://www.cdc.gov/mmwr/volumes/65/rr/rr6501e1.htm). Better public education regarding expectations, beliefs, and understanding about pain are all important. Additional measures include professional education and training for better, comprehensive, and integrated pain management.

Better pain management is also a major element in addressing the current opioid crisis. Persons living with pain need safer and more effective alternatives for pain management. Additional information is available at https://www.hhs.gov/opioids/about-the-epidemic/hhs-response/better-pain-management/index.html.

Reference

1. CDC. Prevalence of chronic pain and high-impact chronic pain among adults—United States, 2016. MMWR Morb Mortal Wkly Rep 2018;67:1001–6.

Prevalence of Chronic Pain and High-Impact Chronic Pain Among Adults — United States, 2016

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Chronic pain, one of the most common reasons adults seek medical care (*1*), has been linked to restrictions in mobility and daily activities (*2*,*3*), dependence on opioids (*4*), anxiety and depression (*2*), and poor perceived health or reduced quality of life (*2*,*3*). Population-based estimates of chronic pain among U.S. adults range from 11% to 40% (*5*), with considerable population subgroup variation. As a result, the 2016 National Pain Strategy called for more precise prevalence estimates of chronic pain and high-impact chronic pain (i.e., chronic pain that frequently limits life or work activities) to reliably establish the prevalence of chronic pain and aid in the development

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and implementation of population-wide pain interventions (*5*). National estimates of high-impact chronic pain can help differentiate persons with limitations in major life domains, including work, social, recreational, and self-care activities from those who maintain normal life activities despite chronic pain, providing a better understanding of the population in need of pain services. To estimate the prevalence of chronic pain and high-impact chronic pain in the United States, CDC analyzed 2016 National Health Interview Survey (NHIS) data. An estimated 20.4% (50.0 million) of U.S. adults had chronic pain and 8.0% of U.S. adults (19.6 million) had high-impact chronic pain, with higher prevalences of both chronic pain and high-impact chronic pain reported among women, older adults, previously but not currently employed adults, adults living in poverty, adults with public health insurance, and rural residents. These findings could be used to target pain management interventions.

NHIS is a cross-sectional, in-person, household health survey of the civilian noninstitutionalized U.S. population, conducted by the National Center for Health Statistics (NCHS).* Data from the 2016 Sample Adult Core for adults aged ≥18 years (33,028; response rate = 54.3%)† were analyzed. Information about pain was collected through responses to the following questions: "In the past six months, how often did you have pain? Would you say never, some days, most days, or every day?" and "Over the past six months, how often did pain limit your life or work activities? Would you say never, some days, most days, or every day?" Chronic pain was defined as pain on most days or every day in the past 6 months, as recommended by the International Association for the Study of Pain,§ modified to account for intermittent pain, and used in both the National Pain Strategy and National Institutes of Health Task Force on Chronic Back Pain (*6*). As suggested in the National Pain Strategy, high-impact chronic pain was defined as chronic pain that limited life or work activities on most days or every day during the past 6 months (*5*). The prevalence of chronic pain and high-impact chronic pain (both crude and

* https://www.cdc.gov/nchs/nhis/index.htm.

† The sample adult respondent is randomly selected from all adults aged ≥18 years in the family and answers for himself/herself (unless physically or mentally unable to do so, in which case a knowledgeable adult serves as a proxy respondent). Although interviews are conducted in respondents' homes, follow-ups by telephone to complete missing sections are permissible. For more information, see the 2016 National Health Interview Survey Public Use Data Release: Survey Description Document (ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2016/srvydesc.pdf).

§ The International Association for the Study of Pain's definitions of chronic pain can be found in the *Classification of Chronic Pain, Second Edition (Revised)*. https://www.iasp-pain.org/PublicationsNews/Content.aspx?ItemNumber=1673&navItemNumber=677.

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age-adjusted, with 95% confidence intervals) were estimated for the U.S. adult population overall and by various sociodemographic characteristics. These characteristics, collected with the Family Core questionnaire, included age, sex, race/ethnicity, education level, current employment status,¶ poverty status (calculated using NHIS imputed income files),** veteran status, health insurance coverage type (reported separately for adults aged <65 and ≥65 years), and urbanicity. All prevalence estimates met NCHS reliability standards.†† Because pain prevalence varies by age, age-adjusted estimates were used in comparisons of chronic pain and high-impact chronic pain between subgroups. Based on two-tailed Z-tests, all reported differences between subgroups are statistically significant (unless otherwise noted; p<0.05). Analyses were conducted using statistical software that accounts for the stratification and clustering of households in the NHIS sampling design. Estimates incorporated the final sample adult weights adjusted for nonresponse and calibrated to population control totals to enable generalization to the civilian noninstitutionalized population aged ≥18 years.

In 2016, an estimated 20.4% of U.S. adults (50.0 million) had chronic pain and 8.0% of U.S. adults (19.6 million) had high-impact chronic pain (Table), with higher prevalence associated with advancing age. Age-adjusted prevalences of both chronic pain and high-impact chronic pain were significantly higher among women, adults who had worked previously but were not currently employed, adults living in or near poverty, and rural residents. In addition, the age-adjusted prevalences of chronic pain and high-impact chronic pain were significantly lower among adults with at least a bachelor's degree compared with all other education levels.

Whereas non-Hispanic white adults had a significantly higher age-adjusted prevalence of chronic pain than did all other racial and ethnic subgroups, no significant differences in high-impact chronic pain prevalence by race/ethnicity were observed. Similarly, the age-adjusted prevalence of chronic pain was significantly higher among veterans than among nonveterans, but no significant difference was observed in the prevalence of high-impact chronic pain.

Among adults aged <65 years, the age-adjusted prevalences of chronic pain and high-impact chronic pain were higher among those with Medicaid and other public health care coverage or other insurance (e.g., Veteran's Administration, certain local and state government) than among adults with private insurance or those who were uninsured. Among adults aged ≥65 years, those with both Medicare and Medicaid had higher age-adjusted prevalences of chronic pain and high-impact chronic pain than did adults with all other types of coverage.

Summary

What is already known about this topic?

Chronic pain has been linked to numerous physical and mental conditions and contributes to high health care costs and lost productivity. A limited number of studies estimate that the prevalence of chronic pain ranges from 11% to 40%.

What is added by this report?

In 2016, an estimated 20.4% of U.S. adults had chronic pain and 8.0% of U.S. adults had high-impact chronic pain. Both were more prevalent among adults living in poverty, adults with less than a high school education, and adults with public health insurance.

What are the implications for public health practice?

This report helps fulfill a National Pain Strategy objective of producing more precise estimates of chronic pain and high-impact chronic pain.

Discussion

Pain is a component of many chronic conditions, and chronic pain is emerging as a health concern on its own, with negative consequences to individual persons, their families, and society as a whole (*4*,*5*). *Healthy People 2020* (https://www.healthypeople.gov/), the nation's science-based health objectives, has a developmental objective to "decrease the prevalence of adults having high-impact chronic pain." This analysis extends previous national studies of chronic pain prevalence by identifying adults with high-impact chronic pain. In 2016, approximately 20% of U.S. adults had chronic pain (approximately 50 million), and 8% of U.S. adults (approximately 20 million) had high-impact chronic pain. This estimate of high-impact chronic pain is similar to or slightly lower than estimates reported in the few studies that have looked at pain using a similar construct. For example, a recent study that used a measure of high-impact chronic pain similar to the one used in this study reported an estimate of

¶ Based on responses to the following questions: "What was [person]/were you doing last week?" and "Have you ever held a job or worked at a business?" Based on the first question, adults who were "working for pay at a job or business," "with a job or business but not at work" or "working, but not for pay, at a family-owned job or business" were classified as currently employed. Adults who were "looking for work" or "not working at a job or business and not looking for work" based on the first question and who subsequently answered "yes" to the second question were classified as "previously employed." Adults who were "looking for work" or "not working at a job or business and not looking for work" based on the first question and who subsequently answered "no" to the second question were classified as "never employed."

** Federal poverty levels are updated annually by the U.S. Census Bureau (https://aspe.hhs.gov/computations-2016-poverty-guidelines). Percentage of poverty relative to the federal poverty level is used to define poverty status, and is calculated, using NHIS imputed income files, as total family income divided by the family's corresponding federal poverty level, and multiplied by 100.

†† https://www.cdc.gov/nchs/data/series/sr_02/sr02_175.pdf.

TABLE. Prevalence of chronic pain* and high impact chronic pain† among U.S. adults aged ≥18 years, by sociodemographic characteristics—National Health Interview Survey, 2016

Characteristic	Chronic pain*			High-impact chronic pain†		
	Estimated no.§	Crude % (95% CI)	Age-adjusted¶ % (95% CI)	Estimated no.§	Crude % (95% CI)	Age-adjusted¶ % (95% CI)
Total	**50,009,000**	**20.4 (19.7–21.0)**	**19.4 (18.7–20.0)**	**19,611,000**	**8.0 (7.6–8.4)**	**7.5 (7.1–7.9)**
Age group (yrs)						
18–24	2,082,000	7.0 (5.8–8.5)	—**	446,000	1.5 (0.9–2.3)	—**
25–44	11,042,000	13.2 (12.3–14.1)	—**	3,681,000	4.4 (3.9–5.0)	—**
45–64	23,269,000	27.8 (26.6–29.0)	—**	10,044,000	12.0 (11.2–12.9)	—**
65–84	11,808,000	27.6 (26.4–29.0)	—**	4,578,000	10.7 (9.9–11.6)	—**
≥85	1,766,000	33.6 (30.1–37.3)	—**	830,000	15.8 (13.2–18.9)	—**
Sex						
Male	21,989,000	18.6 (17.7–19.5)	17.8 (17.0–18.7)	8,276,000	7.0 (6.5–7.6)	6.7 (6.2–7.3)
Female	28,049,000	22.1 (21.2–23.0)	20.8 (19.9–21.6)	11,296,000	8.9 (8.4–9.4)	8.2 (7.7–8.7)
Race/Ethnicity						
Hispanic	5,856,000	15.1 (13.6–16.7)	16.7 (15.2–18.4)	2,754,000	7.1 (6.0–8.3)	7.9 (6.9–9.2)
White, non-Hispanic	36,226,000	23.0 (22.2–23.8)	21.0 (20.3–21.8)	13,230,000	8.4 (7.9–8.9)	7.4 (7.0–7.9)
Black, non-Hispanic	5,148,000	17.9 (16.4–19.6)	17.8 (16.3–19.4)	2,387,000	8.3 (7.2–9.4)	8.1 (7.1–9.2)
Other, non-Hispanic††	2,774,000	13.8 (12.1–15.7)	14.4 (12.7–16.3)	1,326,000	6.6 (5.3–8.1)	7.0 (5.7–8.5)
Education						
Less than high school	7,809,000	26.1 (24.2–28.2)	23.7 (21.7–25.7)	4,069,000	13.6 (12.3–15.2)	12.1 (10.7–13.7)
High school/GED	14,441,000	23.7 (22.5–25.0)	22.6 (21.2–23.9)	5,910,000	9.7 (9.0–10.6)	9.1 (8.4–10.0)
Some college	17,129,000	22.6 (21.5–23.8)	22.9 (21.8–24.0)	6,518,000	8.6 (7.9–9.4)	8.7 (8.0–9.5)
Bachelor's degree or higher	10,383,000	13.4 (12.6–14.3)	12.4 (11.7–13.3)	2,944,000	3.8 (3.4–4.3)	3.5 (3.1–4.0)
Employment status						
Employed	22,085,000	14.7 (14.1–15.5)	14.5 (13.8–15.2)	5,108,000	3.4 (3.1–3.8)	3.2 (2.9–3.6)
Not employed; worked previously	25,737,000	31.5 (30.3–32.7)	29.2 (27.8–30.6)	13,318,000	16.3 (15.4–17.2)	16.1 (15.0–17.3)
Not employed; never worked	2,083,000	15.9 (13.8–18.2)	18.7 (16.1–21.6)	1,192,000	9.1 (7.6–10.9)	11.1 (9.1–13.4)
Poverty status						
<100% FPL	8,017,000	25.8 (24.2–27.6)	29.6 (27.9–31.3)	4,630,000	14.9 (13.6–16.4)	17.5 (16.1–19.0)
100% ≤FPL<200%	11,357,000	26.2 (24.5–27.9)	25.9 (24.2–27.7)	5,375,000	12.4 (11.3–13.6)	12.3 (11.2–13.5)
200% ≤FPL<400%	14,181,000	20.3 (19.2–21.4)	19.3 (18.3–20.4)	5,100,000	7.3 (6.7–8.1)	6.9 (6.2–7.6)
≥400% FPL	16,441,000	16.3 (15.4–17.2)	14.6 (13.8–15.5)	4,438,000	4.4 (4.0–4.9)	3.9 (3.5–4.4)
Veteran						
Yes	6,379,000	29.1 (27.1–31.2)	26.0 (23.5–28.7)	2,258,000	10.3 (9.1–11.8)	9.2 (7.7–11.1)
No	43,519,000	19.5 (18.9–20.2)	19.0 (18.4–19.7)	17,407,000	7.8 (7.4–8.2)	7.5 (7.1–7.9)

See table footnotes on the next page.

13.7% among a sample of U.S. adult health plan enrollees (*7*). Similarly, a 2001 study of adults from a region in Scotland found that 14.1% of survey participants reported significant chronic pain, and 6.3% reported severe chronic pain, and a 2001 study of Australian adults reported that 11.0% of men and 13.5% of women reported chronic pain that interfered, to some degree, with daily life activities (*3*,*8*). The results of subgroup analyses in the current study were consistent with findings in these studies (*3*,*8*) insofar as the prevalence of high-impact chronic pain was higher among women, adults who had achieved lower levels of education, and those who were not employed at the time of the survey, and was lower among adults with private health insurance compared with public and other types of coverage. In addition, high-impact chronic pain was also found to be higher among adults living in poverty and among rural residents.

Socioeconomic status appears to be a common factor in many of the subgroup differences in high-impact chronic pain prevalence reported here. Indicators of socioeconomic status such as education, poverty, and health insurance coverage have been determined to be associated with both general health status and the presence of specific health conditions (*9*) as well as with patients' success in navigating the health care system (*9*). Identifying populations at risk is necessary to inform efforts for developing and targeting quality pain services.

The findings in this report are subject to at least five limitations. First, data are self-reported and subject to recall bias. Second, data are cross-sectional, precluding drawing causal inferences. This might be particularly relevant for socioeconomic status, which can be both a risk factor for and a consequence of chronic pain or high-impact chronic pain, or both. Third, no information is available on treatment for chronic pain to assess the prevalence of chronic pain and high-impact

TABLE. (*Continued*) Prevalence of chronic pain* and high impact chronic pain† among U.S. adults aged ≥18 years, by sociodemographic characteristics—National Health Interview Survey, 2016

Characteristic	Chronic pain*			High-impact chronic pain†		
	Estimated no.§	Crude % (95% CI)	Age-adjusted¶ % (95% CI)	Estimated no.§	Crude % (95% CI)	Age-adjusted¶ % (95% CI)
Health insurance coverage§§						
Age <65 yrs						
Private	20,539,000	15.1 (14.3–15.8)	14.0 (13.3–14.8)	5,713,000	4.2 (3.8–4.7)	3.8 (3.4–4.2)
Medicaid and other public coverage	8,215,000	29.3 (27.3–31.5)	30.0 (28.0–32.2)	4,822,000	17.2 (15.6–19.0)	17.8 (16.2–19.6)
Other	3,860,000	43.5 (40.0–47.2)	34.8 (31.2–38.7)	2,263,000	25.5 (22.5–28.8)	19.3 (16.4–22.5)
Uninsured	3,683,000	16.2 (14.4–18.2)	17.0 (15.2–19.0)	1,319,000	5.8 (4.7–7.2)	6.2 (5.0–7.6)
Age ≥65 yrs						
Private	5,606,000	28.0 (26.3–29.9)	28.1 (26.3–30.0)	1,842,000	9.2 (8.1–10.5)	9.3 (8.2–10.6)
Medicare and Medicaid	1,428,000	42.5 (37.6–47.5)	42.5 (37.6–47.5)	816,000	24.3 (20.4–28.6)	24.3 (20.4–28.6)
Medicare Advantage	3,094,000	25.5 (23.1–28.1)	25.8 (23.4–28.4)	1,226,000	10.1 (8.5–11.8)	10.3 (8.7–12.1)
Medicare only, excluding Medicare Advantage	2,115,000	25.9 (23.1–28.9)	25.9 (23.1–28.9)	939,000	11.5 (9.5–13.7)	11.5 (9.5–13.7)
Other	1,229,000	31.6 (27.2–36.3)	31.8 (27.4–36.5)	545,000	14.0 (11.3–17.3)	14.3 (11.5–17.7)
Uninsured	106,000	—¶¶	—¶¶	59,000	—¶¶	—¶¶
Urbanicity* **						
Urban	38,401,000	19.0 (18.3–19.7)	18.4 (17.7–19.0)	14,754,000	7.3 (6.9–7.8)	7.0 (6.6–7.4)
Rural	11,575,000	26.9 (25.4–28.5)	24.0 (22.5–25.6)	4,776,000	11.1 (10.2–12.2)	9.8 (8.8–10.9)

Abbreviations: CI = confidence interval; FPL = federal poverty level; GED = General Educational Development certification.

* Pain on most days or every day in the past 6 months.

† Chronic pain limiting life or work activities on most days or every day in the past 6 months.

§ The estimated numbers, rounded to 1,000s, were annualized based on the 2016 data. Counts for adults of unknown status (responses coded as "refused," "don't know," or "not ascertained") with respect to chronic pain and high-impact chronic pain are not shown separately in the table, nor are they included in the calculation of percentages (as part of either the denominator or the numerator), to provide a more straightforward presentation of the data.

¶ Estimates are age-adjusted using the projected 2000 U.S. population as the standard population and five age groups: 18–29, 30–39, 40–49, 50–59, and ≥60 years.

** Not applicable.

†† Non-Hispanic other includes non-Hispanic American Indian and Alaska Native only, non-Hispanic Asian only, non-Hispanic Native Hawaiian and Pacific Islander only, and non-Hispanic multiple race.

§§ Based on a hierarchy of mutually exclusive categories. Adults reporting both private and Medicare Advantage coverage were assigned to the Medicare Advantage category. "Uninsured" includes adults who had no coverage as well as those who had only Indian Health Service coverage or had only a private plan that paid for one type of service such as accidents or dental care. "Other" comprises military health care including TRICARE, VA, and CHAMP-VA, and certain types of local and state governmental coverage, not including the Children's Health Insurance Program.

¶¶ Estimates are considered unreliable according to the National Center for Health Statistics' standards of reliability.

*** Based on U.S. Census Bureau definitions of urban and rural areas (https://www2.census.gov/geo/pdfs/reference/ua/Defining_Rural.pdf).

chronic pain among those with and without treatment. Fourth, NHIS excludes important populations, such as active duty military and residents of long-term care facilities or prisons. And finally, NHIS does not collect data on chronic pain or high-impact chronic pain in children. Despite these limitations, three strengths of this study are that it used a large, nationally representative data source to produce estimates of chronic pain and high-impact chronic pain across many demographic subgroups, it used standard broad definitions of pain that were not limited to one or more specific health conditions (e.g., headache or arthritis), and it used the standard case definition for high-impact chronic pain proposed by the National Pain Strategy.

Chronic pain contributes to an estimated $560 billion each year in direct medical costs, lost productivity, and disability programs (*4*). The National Pain Strategy, which is the first national effort to transform how the population burden of pain is perceived, assessed, and treated, recognizes the need for better data to inform action and calls for estimates of chronic pain and high-impact chronic pain in the general population (*5*). This report helps fulfill this objective and provides data to inform policymakers, clinicians, and researchers focused on pain care and prevention.

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Sexual Risk Behavior Differences Among Sexual Minority High School Students — United States, 2015 and 2017

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Sexual minority youths (i.e., those identifying as gay, lesbian, bisexual, or another nonheterosexual identity or reporting same-sex attraction or sexual partners) are at higher risk than youths who are not sexual minority youth (nonsexual minority youth) for negative health behaviors and outcomes, including human immunodeficiency virus (HIV) infection, other sexually transmitted diseases (STDs), pregnancy (*1*),* and related sexual risk behaviors (*2*). Less is known about sexual risk behavior differences between sexual minority youth subgroups. This is the first analysis of subgroup differences among sexual minority youths using nationally representative Youth Risk Behavior Survey (YRBS) data. CDC analyzed pooled data from the 2015 and 2017 cycles of the national YRBS, a cross-sectional, school-based survey assessing health behaviors among U.S. students in grades 9–12. Analyses examined differences in eight sexual risk behaviors between subgroups of sexual minority youths and nonsexual minority youths, as well as within sexual minority youths. Logistic regression models controlling for race/ethnicity and grade found that bisexual females and "not sure" males reported higher prevalences for many behaviors than did heterosexual students. For behavior-based subgroups, the largest number of differences were seen between students who had sexual contact with both sexes compared with students with only opposite-sex sexual contact. Findings highlight subgroup differences within sexual minority youths that could inform interventions to promote healthy behavior.

The national YRBS is a biennial, school-based survey of U.S. high school students. To achieve a sufficient sample size for sexual minority youth subgroup analysis, 2015 and 2017 national YRBS data were pooled. For each year, a nationally representative sample of students in grades 9–12 attending public and private schools was selected using a three-stage cluster sample design (*3*). In 2015, overall response rate and sample size were 60% and 15,624, respectively; in 2017, overall response rate and sample size were 60% and 14,765, respectively. Data were weighted to yield nationally representative estimates. The combined sample included 30,389 survey responses. Students completed the self-administered questionnaire during one class period, recording responses onto computer-scannable booklets/answer sheets. Survey procedures protected students' privacy through anonymous and voluntary participation. Local parental permission procedures were followed.

Sexual minority youths were defined by self-reported sexual identity and behavioral characteristics. Sexual identity was assessed by the question, "Which of the following best describes you?" (response options: heterosexual; gay or lesbian; bisexual; not sure). Sex of sexual contacts was assessed through two questions: "During your life, with whom have you had sexual contact?" (response options: I have never had sexual contact; females; males; females and males) and "What is your sex?" (response options: female; male). A 3-level categorical variable was created to describe sex of sexual contacts (same-sex only; both sexes; opposite-sex only). Eight questions assessed sexual risk behaviors. Multiple-choice responses were dichotomized to create behavioral measures: ever had sexual intercourse, had first sexual intercourse before age 13 years (early sexual debut), had sexual intercourse with four or more persons during their life (≥4 sex partners), had sexual intercourse during the 3 months preceding the survey (currently sexually active), did not use a condom during last sexual intercourse (no condom use), did not use any method to prevent pregnancy during last sexual intercourse (no pregnancy prevention method use), drank alcohol or used drugs before last sexual intercourse (alcohol/drug use before sex), and never been tested for HIV.

Analyses used statistical software to account for the complex sampling design. Unadjusted prevalence estimates with 95% confidence intervals (CIs) were calculated using Taylor series linearization. Sex-stratified logistic regression models produced adjusted prevalence ratios (APRs) comparing each sexual minority youth subgroup with heterosexual students or students with only opposite-sex sexual contact. Models controlled for race/ethnicity and grade, and except for the model predicting ever had sexual intercourse, were limited to students who had ever had sexual intercourse. Differences in risk behavior prevalence between sexual minority youth subgroups were tested using linear contrast t-tests. Statistical tests were considered significant if $p<0.05$ or 95% CIs did not include 1.0.

Across identity-based subgroups, unadjusted prevalence estimates for having ever had sexual intercourse ranged from 26.9% to 51.4% for females and from 33.9% to 47.8% for males (Table 1). Identity-based sexual minority youth

* https://www.cdc.gov/healthyyouth/disparities/smy.htm.

TABLE 1. Unadjusted weighted prevalence of sexual risk behaviors among sexual minority youths by identity- and behavior-based subgroups—National Youth Risk Behavior Survey, United States, 2015–2017

	Sexual identity % (95% CI)				Sex of sexual contacts % (95% CI)		
Sexual risk behavior	Gay or lesbian	Bisexual	Not sure	Heterosexual	Same sex only	Both sexes	Opposite sex only
Females							
Ever had sexual intercourse	48.4 (41.5–55.4)	51.4 (47.0–55.8)	26.9 (22.3–32.0)	37.3 (34.4–40.2)	66.2 (57.8–73.7)	72.6 (67.4–77.3)	77.7 (74.9–80.3)
Had first sexual intercourse before age 13 years*	11.1 (5.0–23.1)	11.2 (8.6–14.5)	12.0 (7.4–18.9)	3.8 (3.1–4.8)	15.2 (8.1–26.7)	13.2 (10.5–16.4)	3.7 (3.0–4.6)
Had sexual intercourse with ≥4 persons*,†	25.2 (15.6–37.9)	30.7 (26.5–35.2)	29.4 (18.7–43.0)	19.5 (18.0–21.1)	19.6 (11.9–30.6)	43.9 (38.0–50.0)	18.1 (16.5–19.8)
Currently sexually active*,§	69.3 (56.5–79.6)	71.4 (66.7–75.7)	68.4 (58.1–77.1)	77.7 (75.9–79.4)	65.7 (54.8–75.2)	77.5 (73.3–81.2)	76.3 (74.6–78.0)
Did not use condom during last sexual intercourse*,¶	82.5 (68.6–91.0)	51.7 (46.6–56.7)	42.5 (31.3–54.5)	44.6 (42.3–47.0)	—	56.5 (51.9–61.1)	43.6 (41.4–45.9)
Did not use any method to prevent pregnancy during last sexual intercourse*,**	68.5 (56.2–78.7)	21.3 (17.5–25.6)	15.4 (9.8–23.5)	13.3 (11.5–15.4)	—	21.4 (18.0–25.3)	13.3 (11.5–15.4)
Drank alcohol or used drugs before last sexual intercourse*	18.5 (9.6–32.4)	20.4 (17.4–23.9)	31.2 (21.1–43.4)	15.1 (13.6–16.7)	17.8 (10.0–29.6)	28.2 (23.9–32.9)	14.3 (12.9–15.9)
Never been tested for HIV*,††	80.3 (68.8–88.3)	73.3 (68.5–77.5)	84.1 (76.8–89.5)	79.8 (77.6–81.7)	77.6 (65.9–86.1)	69.1 (64.4–73.4)	80.5 (78.4–82.4)
Males							
Ever had sexual intercourse	47.8 (39.3–56.3)	42.7 (35.3–50.5)	33.9 (27.5–41.0)	42.5 (40.0–44.9)	83.3 (75.3–89.1)	77.3 (68.9–84.0)	78.9 (76.3–81.2)
Had first sexual intercourse before age 13 years*	21.4 (11.3–36.8)	18.1 (10.4–29.6)	29.7 (20.6–40.6)	11.3 (9.9–13.0)	26.1 (15.1–41.1)	28.1 (19.6–38.6)	11.1 (9.6–12.7)
Had sexual intercourse with ≥4 persons*,†	28.8 (20.2–39.2)	28.3 (19.0–39.8)	46.1 (33.1–59.7)	30.3 (27.9–32.8)	25.0 (17.3–34.7)	43.0 (33.6–52.9)	30.2 (27.9–32.7)
Currently sexually active*,§	67.1 (56.1–76.5)	60.6 (49.5–70.7)	72.4 (61.6–81.1)	70.4 (68.5–72.3)	66.2 (54.1–76.4)	66.1 (56.1–74.8)	70.5 (68.5–72.3)
Did not use condom during last sexual intercourse*,¶	54.4 (37.8–70.0)	43.7 (34.3–53.6)	45.1 (32.6–58.1)	35.1 (32.9–37.3)	58.4 (46.0–69.8)	46.1 (35.9–56.6)	35.1 (32.9–37.4)
Did not use any method to prevent pregnancy during last sexual intercourse*,**	48.8 (33.0–64.7)	18.3 (11.3–28.4)	25.1 (14.9–39.0)	10.8 (9.6–12.2)	—	21.6 (14.6–30.6)	10.8 (9.4–12.4)
Drank alcohol or used drugs before last sexual intercourse*	15.8 (8.4–27.9)	19.9 (11.9–31.3)	36.5 (25.2–49.5)	20.5 (18.7–22.4)	13.5 (7.1–24.2)	30.3 (22.2–39.9)	20.6 (18.8–22.5)
Never been tested for HIV*,††	69.7 (53.9–81.9)	84.4 (74.6–90.9)	82.1 (71.6–89.2)	87.0 (85.2–88.7)	78.0 (63.9–87.7)	82.4 (75.8–87.5)	87.0 (85.1–88.8)

Abbreviations: AIDS = acquired immunodeficiency virus; CI = confidence interval; HIV = human immunodeficiency virus.

* Analysis conducted among only students who ever had sexual intercourse. Analyses were not conducted for no condom use among female students with only same-sex sexual contact or for no pregnancy prevention use among male or female students with only same-sex sexual contact. In addition, students who had no sexual contact are excluded from the analyses by sex of sexual contact.

† During their life.

§ Had sexual intercourse with at least one person during the 3 months before the survey.

¶ Question asked about condom use by "you or your partner."

** Question asked about method used for pregnancy prevention by "you or your partner."

†† Question asked, "Have you ever been tested for HIV, the virus that causes AIDS? (Do not count tests done if you donated blood.)"

subgroups were more likely than were heterosexual students to engage in sexual risk behaviors (Table 2). Bisexual females were more likely than were heterosexual females to report having had sexual intercourse (APR = 1.41), early sexual debut (APR = 2.43), ≥4 sex partners (APR = 1.69), no condom use (APR = 1.17), no pregnancy prevention method use (APR = 1.49), and alcohol/drug use before sex (APR = 1.36). Males who were not sure about their sexual identity were more likely than were heterosexual males to report early sexual debut (APR = 2.33), ≥4 sex partners (APR = 1.47), no pregnancy prevention method use (APR = 2.03), and alcohol/drug use before sex (APR = 1.73). Lesbian or bisexual females were more likely than were females who were not sure about their sexual identity to report having had sexual intercourse, no condom use, and no pregnancy prevention method use. Gay or bisexual males were more likely than were males who were not sure to report having had sexual intercourse and not using pregnancy prevention. Gay/lesbian students were more likely than were bisexual students to report not using pregnancy prevention, and among females, not using condoms.

Across behavior-based subgroups, unadjusted prevalence estimates for having ever had sexual intercourse ranged from 66.2% to 77.7% for females and from 77.3% to 83.3% for males (Table 1). Students who had sexual contact with both sexes were more likely than were those with only opposite-sex sexual contact to report early sexual debut (females, APR = 3.05; males, APR = 2.64), ≥4 sex partners (females, APR = 2.49; males APR = 1.48), no condom use (females, APR = 1.30; males, APR = 1.34), no pregnancy prevention method use (females, APR = 1.52; males, APR = 2.12), and alcohol/drug use before sex (females, APR = 1.94; males, APR = 1.45); these students were more likely than were

TABLE 2. Adjusted prevalence ratios* for sexual risk behaviors among sexual minority youths by identity- and behavior-based subgroups (using heterosexual students and students with only opposite-sex partners as the referents)—National Youth Risk Behavior Survey, United States, 2015–2017

	Sexual identity APR (95% CI)			Sex of sexual contacts APR (95% CI)	
Sexual risk behavior	**Gay or lesbian**	**Bisexual**	**Not sure**	**Same sex only**	**Both sexes**
Females					
Ever had sexual intercourse	1.26§,¶ (1.09–1.47)	1.41§,¶ (1.29–1.55)	0.75§ (0.64–0.89)	0.86†† (0.75–0.98)	0.95 (0.90–1.01)
Had first sexual intercourse before age 13 years†	2.44§ (1.06–5.61)	2.43§ (1.66–3.57)	2.68§ (1.61–4.46)	2.97†† (1.42–6.19)	3.05†† (2.20–4.24)
Had sexual intercourse with ≥4 persons†	1.39 (0.89–2.16)	1.69§ (1.43–2.00)	1.62§ (1.08–2.43)	1.11¶¶ (0.65–1.92)	2.49†† (2.10–2.96)
Currently sexually active†	0.92 (0.77–1.08)	0.94§ (0.88–1.00)	0.90 (0.78–1.03)	0.89 (0.76–1.05)	1.03 (0.98–1.08)
Did not use condom during last sexual intercourse†	1.85§,¶,** (1.58–2.16)	1.17§ (1.05–1.30)	0.96 (0.72–1.30)	—	1.30†† (1.18–1.43)
Did not use any method to prevent pregnancy during last sexual intercourse†	4.88§,¶,** (3.77–6.32)	1.49§ (1.20–1.85)	1.07 (0.68–1.69)	—	1.52†† (1.27–1.81)
Drank alcohol or used drugs before last sexual intercourse†	1.27 (0.70–2.32)	1.36§ (1.13–1.63)	2.13§ (1.45–3.13)	1.09¶¶ (0.60–1.99)	1.94†† (1.58–2.38)
Never been tested for HIV†	1.03 (0.92–1.15)	0.92§,¶ (0.87–0.98)	1.06 (0.98–1.14)	0.98 (0.87–1.10)	0.86†† (0.81–0.91)
Males					
Ever had sexual intercourse	1.11¶ (0.92–1.33)	1.02 (0.84–1.23)	0.78§ (0.63–0.96)	1.05 (0.97–1.15)	0.99 (0.90–1.09)
Had first sexual intercourse before age 13 years†	1.86 (1.00–3.48)	1.58 (0.92–2.72)	2.33§ (1.55–3.51)	1.96†† (1.10–3.50)	2.64†† (1.86–3.75)
Had sexual intercourse with ≥4 persons†	0.93 (0.63–1.36)	1.00 (0.68–1.47)	1.47§ (1.06–2.04)	0.76¶¶ (0.53–1.10)	1.48†† (1.19–1.85)
Currently sexually active†	0.94 (0.80–1.09)	0.86 (0.71–1.03)	1.02 (0.88–1.18)	0.98 (0.84–1.15)	0.94 (0.81–1.08)
Did not use condom during last sexual intercourse†	1.54§ (1.13–2.11)	1.24 (0.99–1.56)	1.24 (0.90–1.72)	1.67†† (1.36–2.07)	1.34†† (1.02–1.77)
Did not use any method to prevent pregnancy during last sexual intercourse†	4.38§,¶,** (3.11–6.17)	1.72§ (1.07–2.76)	2.03§ (1.18–3.49)	—	2.12†† (1.45–3.11)
Drank alcohol or used drugs before last sexual intercourse†	0.73¶ (0.39–1.38)	0.94¶ (0.57–1.53)	1.73§ (1.15–2.61)	0.52††,¶¶ (0.28–0.99)	1.45†† (1.02–2.05)
Never been tested for HIV†	0.81§ (0.67–0.98)	0.96 (0.87–1.06)	0.92 (0.81–1.04)	0.89 (0.76–1.04)	0.93†† (0.86–1.00)

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

* Logistic regression adjusted for race/ethnicity and grade. Statistical significance is indicated when p<0.05 or 95% CI does not include 1.0. Analyses were not conducted for no condom use among females with only same-sex sexual contact or for no pregnancy prevention method use among male or female students with only same-sex sexual contact.

† Among students who ever had sexual intercourse.

§ Linear contrast t-tests reveal this sexual minority youth subgroup is significantly different from heterosexual students.

¶ Linear contrast t-tests reveal this sexual minority youth subgroup is significantly different from students who are not sure of their sexual identity.

** Linear contrast t-tests reveal this sexual minority youth subgroup is significantly different from bisexual students.

†† Linear contrast t-tests reveal this sexual minority youth subgroup is significantly different from students who had sexual contact with the opposite sex only.

¶¶ Linear contrast t-tests reveal this sexual minority youth subgroup is significantly different from students who had sexual contact with both sexes.

students with only same-sex sexual contact to report ≥4 sex partners and alcohol/drug use before sex (Table 2). Students with only same-sex sexual contact were more likely than were students with only opposite-sex sexual contact to report early sexual debut (females, APR = 2.97; males, APR = 1.96), and among males, no condom use (APR = 1.67).

Discussion

Consistent with 2017 YRBS data showing higher prevalence of sexual risk behaviors among sexual minority youths than among nonsexual minority youths (*2*), this analysis of pooled 2015 and 2017 YRBS data found that identity- and behavior-based sexual minority youth subgroups were more likely than were their nonsexual minority counterparts to report a range of sexual risk behaviors. Among identity-based groups, bisexual females and males who were not sure more frequently reported higher prevalences of risk behaviors than did heterosexual students, indicating students not identifying as gay/lesbian or heterosexual might exhibit higher levels of sexual risk behavior. For bisexual females, this aligns with previous research (*4*); however, interpretations of findings for males who reported that they were not sure of their sexual identity can be less clear. "Not sure" might reflect a respondent's uncertainty about his/her own sexual identity or uncertainty about the meaning of the question or response options. Findings reveal differences between "not sure" and heterosexual peers, as previously documented (*2*), but also between "not sure" and both gay/lesbian and bisexual subgroups for several behaviors. Higher risk behavior prevalence in sexual minority youths reporting sexual contact with both sexes compared with students with only opposite-sex sexual contact was consistent with previously reported findings (*5*,*6*).

The prevalences of no pregnancy prevention method use and, for females, no condom use were higher among gay/lesbian

Summary

What is already known about this topic?

Sexual minority youths are at higher risk than are nonsexual minority youths for human immunodeficiency virus infection, sexually transmitted diseases, pregnancy, and related risk behaviors. Less is known about risk differences among sexual minority youth subgroups.

What is added by this report?

Among sexual minority youths, risk behaviors were more prevalent among bisexual females and males who were not sure than among their heterosexual peers as well as among students who had sexual contact with both sexes than among those with only same-sex sexual contact.

What are the implications for public health practice?

Better understanding differential risk within sexual minority youths might help public health practitioners tailor sexual risk reduction interventions for sexual minority youths.

than among bisexual students. Lesbian females with only same-sex sexual contact might perceive reduced need for condoms to prevent pregnancy. However, researchers have documented both increased pregnancy risk among lesbians (*1*) and identity-behavior discordance among adolescents, indicating that sexual identity might not reflect behavior (*7*).

Risk behavior differences based on behavior-based subgroups revealed that females and males who had sexual contact with both sexes were at higher risk than were their peers with only same-sex sexual contact for having had ≥4 sex partners and alcohol/drug use before sex. These findings align with previously published studies documenting that students who had sexual contact with both sexes were at higher risk than were students with only same-sex sexual contact for multiple sexual risk behaviors (*5*,*6*). In addition, higher risk of no condom use among males with only same-sex sexual contact compared with those with only opposite-sex sexual contact is particularly concerning because of the higher HIV/STD risk among this group.[†]

The findings in this report are subject to at least three limitations. First, these findings represent students in public or private schools and not all youths of similar ages, including those not in school. Nationwide, in 2013, approximately 5% of persons aged 16–17 years were not enrolled in high school and lacked a high school credential[§]; however, sexual minority youths might represent a disproportionate percentage of high school dropouts and other youths absent from or not attending school (*8*). Second, although questions exhibited good reliability in a test-retest study (*9*), over- or underreporting of behaviors cannot be estimated. Finally, because sexual contact was not defined, students might have considered various sexual activities when responding to this question, including involuntary sexual contact.

These findings support the importance of considering both sexual identity and behavior in assessment of risk among sexual minority youths, as other researchers have encouraged (*7*,*10*). Sexual minority youth subgroups report differential risk levels within sexual minority youths and between sexual minority youths and nonsexual minority youths. Understanding these differences within sexual minority youths might help public health practitioners tailor sexual risk reduction and health promotion interventions to meet subgroup prevention needs by aligning intervention focus to the specific profiles of each subgroup and ensuring content is relevant to their experiences and needs.

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Sentinel Surveillance for Congenital Rubella Syndrome — India, 2016–2017

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Rubella infection during pregnancy can result in miscarriage, fetal death, stillbirth, or a constellation of congenital malformations known as congenital rubella syndrome (CRS). The 11 countries in the World Health Organization (WHO) South-East Asia Region are committed to the elimination of measles and control of rubella and CRS by 2020. Until 2016, when the Government of India's Ministry of Health and Family Welfare and the Indian Council of Medical Research initiated surveillance for CRS in five sentinel sites, India did not conduct systematic surveillance for CRS. During the first 8 months of surveillance, 207 patients with suspected CRS were identified. Based on clinical details and serologic investigations, 72 (34.8%) cases were classified as laboratory-confirmed CRS, four (1.9%) as congenital rubella infection, 11 (5.3%) as clinically compatible cases, and 120 (58.0%) were excluded as noncases. The experience gained during the first phase of surveillance will be useful in expanding the surveillance network, and data from the surveillance network will be used to help monitor progress toward control of rubella and CRS in India.

Rubella is a common cause of childhood febrile rash illness in India, typically associated with mild illness; however, infection during the first trimester of pregnancy can severely affect the fetus, resulting in spontaneous abortion, stillbirth, or CRS (*1*,*2*). In 2010, among an estimated 103,000 infants with CRS born globally, 46% were born in the South-East Asia Region (*3*). The Government of India is committed to eliminating measles and controlling rubella and CRS by 2020. Maintaining high population immunity to rubella, creating a network of laboratories, and developing and sustaining a case-based surveillance system are the principal strategies for elimination of measles and control of rubella and CRS (*3*).

In 2017, India introduced measles-rubella vaccine nationwide and launched a mass vaccination campaign targeting children aged 9 months to 14 years in five states or union territories (*4*), with plans for phased expansion to the remaining states. Outbreak-based and laboratory-supported measles and rubella surveillance was established in the country in 2005 (*5*,*6*). Although several published studies in India have examined the prevalence of CRS among different population groups, including patients with cataracts and other ocular abnormalities, hearing loss, mental retardation, cardiac defects, and other congenital anomalies, there was no systematic CRS surveillance system (*7*). To address this gap, the Indian Council of Medical Research and the Ministry of Health and Family Welfare initiated laboratory-supported surveillance for CRS in five sentinel sites in five Indian states in December 2016.

CRS surveillance is focused on identifying suspected CRS cases among infants aged 0–11 months who are patients in pediatrics; ear, nose, and throat (ENT); ophthalmology; and cardiology outpatient departments of the sentinel hospitals. Suspected CRS cases also are identified during the routine clinical examination of newborn babies born at the sentinel sites.

According to the case definitions adapted from WHO-recommended standards for CRS surveillance (Box) (*3*), all infants with suspected CRS are referred to the site surveillance coordinator (a pediatrician) for a complete physical examination. After obtaining written informed consent from the parents to enroll the infant into the surveillance system, demographic, epidemiologic, and clinical information is obtained, and a 1mL blood specimen is collected from the infant. Among infants aged 6–11 months at the time of enrollment, additional blood specimens are collected one month after the first specimen and measured quantitatively to document a sustained rise in immunoglobulin G (IgG) antibodies against rubella. Serum is tested for immunoglobulin M (IgM) and IgG antibodies against rubella using a commercial enzyme-linked immunosorbent assay. In addition, all infants aged <6 months at the time of enrollment have oropharyngeal swabs collected and transported to the National Institute of Virology in Pune for reverse transcription–polymerase chain reaction (RT-PCR) testing and genotyping conducted according to WHO guidelines (*8*).

During December 2016–July 2017, the surveillance system identified 207 patients with suspected CRS (Table 1). Forty-one (19.8%) suspected CRS patients were detected on routine newborn examination; the remaining 166 were identified through pediatrics, ophthalmology, cardiology, or ENT outpatient departments at sentinel sites. Overall, 145 (70%) patients with suspected CRS were aged ≤5 months

*These authors contributed equally to this report.

BOX. Case definitions* for congenital rubella syndrome (CRS) surveillance — Congenital Rubella Syndrome Sentinel Surveillance, India, December 2016–July 2017

Suspected CRS. The presence of any of the following conditions in an infant:

- Structural heart defect (excluding PDA† or PFO† in infants <37 weeks gestational age).
- Hearing impairment.§
- One or more of the following eye signs: cataract, microphthalmos, microcornea, congenital glaucoma, and pigmentary retinopathy.
- Maternal history of suspected or confirmed rubella infection during pregnancy.
- Strong clinical suspicion.

Clinically confirmed CRS. The detection by a physician of two clinical signs from group A or one from group A and one from group B in an infant:

- **Group A:** Cataract(s), congenital glaucoma, pigmentary retinopathy, congenital heart defect, or hearing loss.
- **Group B:** Microcephaly, developmental delay, meningoencephalitis, splenomegaly, purpura, radiolucent bone disease, or jaundice with onset within 24 hours after birth.

Laboratory-confirmed CRS. The presence in an infant of one condition from Group A (above) and one of the following laboratory criteria:

- Detection of rubella IgM antibody; or
- Sustained detectable rubella IgG antibody level, as determined on at least two occasions at age 6–12 months, in the absence of receipt of rubella vaccine.

Congenital rubella infection. Absence of any clinical signs from group A in an infant with a positive rubella-specific IgM test.

Clinically compatible case. Signs or symptoms of CRS in a patient from whom a blood specimen could not collected.

Excluded noncase. A negative serologic result for rubella, irrespective of clinical signs present in an infant.

Abbreviations: IgG = immunoglobulin G; IgM = immunoglobulin M; PDA = patent ductus arteriosus; PFO = patent foramen ovale.

* Adapted from World Health Organization. Strategic plan for measles elimination and rubella and congenital rubella syndrome control in the South-East Asia Region. New Delhi, India: World Health Organization Regional Office for South-East Asia; 2015. (http://www.searo.who.int/entity/immunization/documents/sear_mr_strategic_plan_2014_2020.pdf).

† Confirmed by echocardiography.

§ Confirmed by auditory brainstem response or auditory steady-state response audiometry.

(median age = 3 months; interquartile range = 0–7 months) at the time of diagnosis; infants with CRS were from 11 states.

Structural heart defects (135; 65.2% of patients with suspected CRS) and eye abnormalities (94; 45.4%) were the most common findings leading to a diagnosis of suspected CRS; 37 (17.9%) children had hearing impairment. Mothers of 41 (19.8%) infants had a history of febrile rash illness during pregnancy (Table 1).

Blood specimens were obtained from 205 (99.0%) of the 207 patients with suspected CRS. IgM antibodies against rubella were identified in 71 (34.6%) patients, and a sustained rise in rubella IgG antibody titers was detected in an additional five (2.4%) patients. Among these 76 patients, 72 (34.8% of 207 with suspected CRS, all of whom met clinical criteria) were classified as laboratory-confirmed CRS, and four were categorized as having congenital rubella infection (positive rubella IgM in the absence of cataracts, congenital glaucoma, pigmentary retinopathy, congenital heart defects, or hearing loss (Box). Eleven (5.3%) patients were considered to have clinically compatible cases; the remaining 120 (58.0%) were excluded as noncases. Most laboratory-confirmed CRS cases were detected at the Chandigarh (33; 45.8%), Jodhpur (17; 23.6%), and Bengaluru (13; 18.1%) sites. The proportion of laboratory-confirmed cases detected among children aged

TABLE 1. Characteristics of suspected cases of congenital rubella syndrome (CRS) (N = 207) — Congenital Rubella Sentinel Surveillance System, India, December 2016–July 2017

Characteristic of patients	No. of cases (%)
Sentinel site (state)	
Postgraduate Institute of Medical Education and Research, Chandigarh (Punjab/Haryana)	60 (29.0)
All India Institute of Medical Sciences, Jodhpur (Rajasthan)	49 (23.7)
KEM Hospital, Pune (Maharashtra)	36 (17.4)
Indira Gandhi Institute for Child Health, Bengaluru (Karnataka)	35 (16.9)
Christian Medical College, Vellore (Tamil Nadu)	27 (13.0)
Department first consulted	
Pediatrics	85 (41.1)
Neonatology	41 (19.8)
Ophthalmology	44 (21.3)
Cardiology	22 (10.6)
Ear, nose, and throat	7 (3.4)
Other	8 (3.9)
Criteria for suspecting CRS	
Structural heart defect	135 (65.2)
Eye signs	94 (45.4)
Maternal history of fever with rash during pregnancy	41 (19.8)
Hearing impairment	37 (17.9)
Clinically suspected	11 (5.3)
Age at diagnosis	
<1 month	56 (27.1)
1–5 months	89 (43.0)
6–11 months	62 (30.0)
Sex	
Male	114 (55.1)
Female	93 (44.9)
Place where suspected CRS patient was delivered	
Private facility	105 (50.7)
Public facility	91 (44.0)
Home	10 (4.8)
Other	1 (0.5)
Age of mother (yrs)	
18–25	126 (60.9)
26–30	64 (30.9)
31–35	9 (4.3)
>35	4 (1.9)
Not available	4 (1.9)

TABLE 2. Pertinent clinical findings among 207 suspected, 72 laboratory-confirmed, and 120 excluded congenital rubella syndrome (CRS) patients — Congenital Rubella Syndrome Sentinel Surveillance, India, December 2016–July 2017

Clinical finding	All suspected CRS (N = 207), no. (%)	Laboratory-confirmed CRS (N = 72), no. (%)	Excluded noncases (N = 120), no. (%)
General examination			
Jaundice	28 (13.5)	5 (6.9)	18 (15.0)
Rash	19 (9.2)	12 (16.7)	4 (3.3)
Lymphadenopathy	7 (3.4)	1 (1.4)	5 (4.2)
Purpura	6 (2.9)	4 (5.6)	0 (—)
Cardiorespiratory			
Structural heart defect	135 (65.2)	60 (83.3)	66 (55.0)
Retractions	43 (20.8)	14 (19.4)	23 (19.2)
Gastrointestinal			
Hepatomegaly	63 (30.4)	29 (40.3)	28 (23.3)
Splenomegaly	33 (15.9)	17 (23.6)	12 (10.0)
Central nervous system			
Microcephaly	91 (44.0)	41 (56.9)	41 (34.2)
Developmental delay	55 (26.6)	19 (26.4)	32 (26.7)
Hypertonia	25 (12.1)	11 (15.3)	10 (8.3)
History of seizures	17 (8.2)	2 (2.8)	10 (8.3)
Hypotonia	14 (6.8)	3 (4.2)	9 (7.5)
Bulging anterior fontanelle	4 (1.9)	0 (—)	2 (1.7)
Meningoencephalitis	4 (1.9)	0 (—)	2 (1.7)
Ophthalmologic			
Cataract	78 (37.7)	45 (62.5)	28 (23.3)
Microphthalmos	17 (8.2)	10 (13.9)	6 (5.0)
Pigmentary retinopathy	11 (5.3)	7 (9.7)	3 (2.5)
Congenital glaucoma	7 (3.4)	5 (6.9)	2 (1.7)
Microcornea	8 (3.9)	4 (5.6)	4 (3.3)
Ear, nose, and throat			
Hearing impairment	54 (26.1)	25 (34.7)	25 (20.8)
No. of CRS diagnostic criteria met			
1	115 (55.5)	21 (29.2)	87 (72.5)
2	61 (29.5)	26 (36.1)	30 (25.0)
≥3	31 (15.0)	25 (34.7)	3 (2.5)

≤3 months (48 of 115; 41.7%) was significantly higher than that among older children (24 of 92; 26.1%) (p = 0.02).

Among the 72 laboratory-confirmed cases, structural heart defects were present in 60 (83.3%) patients, congenital cataracts in 45 (62.5%), and hearing impairment in 25 (34.7%) (Table 2). Among the 60 laboratory-confirmed CRS patients with structural heart defects, patent ductus arteriosus (PDA) and complex congenital defects with PDA were the most common structural abnormalities detected, accounting for 51 (85%) of all congenital heart defects (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/58461).

Oropharyngeal swabs were collected from 133 (91.7%) patients aged ≤5 months and shipped to the National Institute of Virology in Pune. Twenty-five (21%) of 119 swabs tested by RT-PCR were positive for rubella. Genotyping of seven representative specimens from northern, western, and southern Indian states revealed all viruses to be the 2B genotype.

During the first 8 months of CRS surveillance in India, adequate data were collected from 207 patients with suspected CRS, and adequate blood specimens (including collection of an additional specimen from infants aged 6–11 months if the first specimen was IgM-negative) were collected from 196 (95%) (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/58462). Although blood specimens were transported to the laboratories within 5 days of collection, only 96 (46.8%) of the 205 results were reported within 4 days of collection. Patients with laboratory-confirmed CRS were not monitored for virus excretion.

Discussion

This is the first report of long-term CRS surveillance data in India. During the first 8 months of surveillance, 72 laboratory-confirmed cases of CRS were detected at five sentinel sites,

which is a substantial increase over the two to three cases that had been passively detected each year in the past by the sentinel sites (Sanjay Verma, Post Graduate Institute of Medical Education and Research, Chandigarh, India, unpublished data, 2018), confirming that CRS is an important public health problem in India. The sentinel surveillance system also generated important epidemiologic data about CRS at these sentinel sites, including information on circulating rubella virus genotypes. An expansion of the surveillance network is planned, and the experience gained during the first phase will help guide this expansion.

Approximately one third of the suspected CRS cases were laboratory-confirmed; this rate of laboratory confirmation was likely related to the use of specific case definitions for suspected CRS, which included infants with confirmed cardiac defects, hearing impairment, or eye abnormalities. This high rate of laboratory confirmation also reflects a substantial risk for rubella in the population.

WHO has proposed eight indicators for assessing the quality of CRS surveillance: 1) reporting rates of suspected CRS cases (as a measure of sensitivity of surveillance); 2) percentage of suspected CRS cases with essential data points recorded (as a measure of adequacy of investigation); 3) proportion of cases that are laboratory-confirmed; 4) proportion of laboratory-confirmed cases with virus detected; 5) proportion of laboratory-confirmed cases monitored for virus excretion; 6) timeliness of detection (after birth); 7) timeliness of specimen transport; and 8) timeliness of laboratory reporting (*9*,*10*). During the first 8 months of CRS surveillance in India, indicator targets were met or surpassed for data adequacy, specimen collection, and timeliness of specimen transport; however, improvement is needed in detection of cases within 3 months of birth, and fewer than half of laboratory results were reported within 4 days. Laboratory diagnosis of CRS in this surveillance was based on serologic tests; oropharyngeal swabs were only collected from children aged ≤5 months for the primary purpose of generating baseline data about circulating genotypes.

The findings in this report are subject to at least two limitations. First, it was not possible to estimate the incidence of CRS. All sentinel sites are tertiary care hospitals and serve large populations, not only from the city where they are located but also from neighboring districts and states. Second, among patients with laboratory-confirmed CRS, heart defects and eye abnormalities were the most common defects, whereas published studies report hearing loss as the most common defect (*2*). This finding points toward a bias in ascertainment of patients with suspected CRS because many of them were recruited from cardiology and ophthalmology clinics and very few from ENT clinics.

Summary

What is already known about this topic?

India is committed to eliminating measles and controlling rubella and congenital rubella syndrome (CRS) by 2020. Before 2016, India did not have a systematic CRS surveillance system.

What is added by this report?

CRS surveillance in five sentinel sites from 2016 identified 207 suspected CRS cases; 72 (34.8%) were laboratory-confirmed. CRS surveillance met or surpassed indicators for data adequacy, specimen collection, and timeliness of specimen transport. However, timeliness of detection of cases within 3 months of birth and of reporting laboratory results needs improvement.

What are the implications for public health practice?

Expansion of the sentinel CRS surveillance network to other states can be guided by experiences during the first 8 months.

The newly initiated sentinel CRS surveillance system is generating quality epidemiologic data about CRS in India. Further expansion of the network and long-term surveillance will be useful to monitor progress made toward control of rubella and CRS in India.

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Notes from the Field

Enterovirus A71 Neurologic Disease in Children — Colorado, 2018

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On May 10, 2018, the Colorado Department of Public Health and Environment (CDPHE) was notified by Children's Hospital Colorado (CHCO) of an increase in pediatric cases of meningitis and encephalitis in which patients tested positive for enterovirus (EV). CDPHE surveillance data for May 2018 showed a 2.75-fold increase in encephalitis of unknown etiology compared with the 5-year (May 2013–2017) average; this coincided with a threefold rise in enterovirus/rhinovirus (EV/RV) detections from clinical testing at CHCO during the same period. Specimens from children with neurologic disease were tested by EV reverse transcription–polymerase chain reaction (RT-PCR) at CHCO and VP1 sequencing at CDC (*1*). As of August 26, 2018, EV-A71 was identified in 34 children with neurologic disease. This report describes the clinical, laboratory, and radiologic findings for the first 13 children identified with EV-A71 neurologic disease for whom complete information is available.

Patients with EV-A71 central nervous system (CNS) infection had symptom onset during March 10–June 5, 2018; median age was 13 months (range = 10 days–35 months); 11 were male. Twelve had meningitis, nine had encephalitis, and three had acute flaccid myelitis (AFM). All 13 children had fever and irritability; three developed lesions typical of hand, foot, and mouth disease. Neurologic signs included encephalopathy (seven), ataxia (seven), myoclonus (six), limb weakness (four), cranial nerve deficits (two), and seizures (one). Nine of 10 children with a cerebrospinal fluid (CSF) specimen analyzed had a pleocytosis (median white blood cell count = 106 cells/μL, range = 17–698 [normal = 0–5]). Six of eight children who had brain imaging results had abnormalities; five were in the brainstem, three in the cerebellum, and three in the spinal cord. All 13 children had EV-A71 identified in nasopharyngeal, pharyngeal, or rectal specimens. However, only two of 11 children whose CSF was tested had a specimen positive for enterovirus by pan-EV RT-PCR; one of two was available for typing and was identified as EV-A71. All 13 children were hospitalized (median = 5 days; range = 1–23 days), and four required intensive care. The three children who received an AFM diagnosis had residual limb weakness at discharge. All children survived.

EV-A71 can cause hand, foot, and mouth disease and neurologic disease, primarily among children aged <5 years (*2*,*3*). Common manifestations include a febrile illness with lesions on the palms, soles, oral mucous membranes, or perineum; and aseptic meningitis. Severe CNS EV-A71 infection can cause brainstem encephalitis leading to cardiopulmonary collapse and polio-like AFM (*4*). EV-A71 epidemics have occurred in the Asian-Pacific region since the late 1990s (*5*). Since the 1980s, the National Enterovirus Surveillance System has detected seasonal endemic EV-A71 activity in the United States; EV-A71 accounts for <1% of typed EVs (*3*). Limited, regional U.S. outbreaks have occurred sporadically in an unpredictable pattern; factors causing year-to-year circulation have not been identified (*3*,*6*). Peak U.S. circulation of EVs, including EV-A71, usually occurs during June–October (*3*,*6*). Although associated with neurologic disease, EV-A71 is uncommonly detected in CSF and is more frequently identified in respiratory and fecal specimens (*7*). In similar EV-A71 outbreaks in Colorado during 2003 and 2005, EV-A71 CNS infection was identified in 16 children (eight in each cluster); 11 children recovered fully, four had residual limb paralysis, and one child died (*7*). At this time, no other clusters of EV-A71 neurologic disease have been reported to CDC in 2018.

This investigation highlights the importance of testing nonsterile sites when CNS disease associated with EV is suspected and CSF is negative. Furthermore, health care providers should consider EV-A71 as an etiology when febrile patients display myoclonus, ataxia, or limb weakness. CDPHE has alerted Colorado health care providers to the EV-A71 outbreak and requested reports of EV meningitis and encephalitis, in addition to routine AFM surveillance.

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All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. M.S. Oberste has been issued the following patents: U.S. patent no. 7,435,539 for typing of human enteroviruses and U.S. patent no. 6,846,621 for typing of human enteroviruses. W.A. Nix and M.S. Oberste have been issued the following US patents: U.S. patent no. 7,714,122 for kits including VP1 and VP3 nucleic acid molecules for detecting and identifying enteroviruses; U.S. patent no. 7,247,457 for detection

and identification of enteroviruses by seminested amplification of the enterovirus VP1 protein; U.S. patent no. 8,048,630; and U.S. patent no. 2,651,123 for methods and agents for detecting parechovirus. K. Messacar reports grants from National Institutes of Health NIAID grant 1K23AI128069-01, during the conduct of the study. No other potential conflicts of interest were disclosed.

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Notes from the Field

Mumps Outbreak Associated with Cheerleading Competitions — North Texas, December 2016–February 2017

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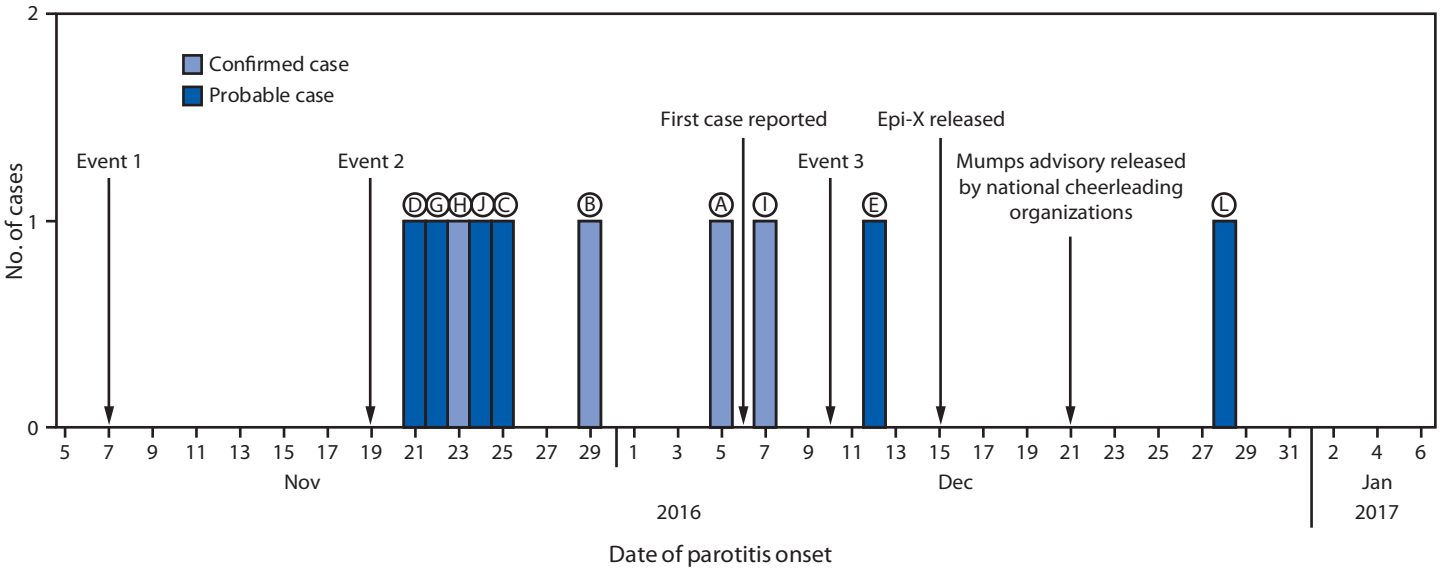
On December 6, 2016, Collin County (Texas) Health Care Services (CCHCS) was notified of a suspected mumps case in a woman aged 41 years (patient A), who developed parotitis on December 5. Patient A had attended a cheerleading competition (event 2) 16 days before parotitis onset (Figure). On December 7, CCHCS was notified of a second suspected mumps case in a woman aged 24 years (patient B), with parotitis onset on November 29. Patient B had attended a different cheerleading competition (event 1) 23 days before parotitis onset and worked as a gymnastics instructor at a cheerleading facility (facility A) 2 days before parotitis onset. On December 9, real-time reverse transcription–polymerase chain reaction of buccal swabs performed by the Texas Department of State Health Services (Texas DSHS) confirmed mumps in both patients. After more cases were reported, a call for cases was issued by Texas DSHS. In all, 12 mumps cases (five confirmed and seven probable) in five counties were identified in persons who were nonathlete participants or attendees at three cheerleading competitions or were household contacts of mumps patients.

Two suspected mumps cases (in patients C and D) were reported to CCHCS on December 9. Patient C, a female aged 15 years and a student of patient B at facility A, reported parotitis onset on November 25 and attendance 19 days earlier at event 1. Patient D, aged 45 years, the parent of another student of patient B's at facility A, reported parotitis onset on November 21 and attendance at event 1, 15 days before parotitis onset. CCHCS instituted an outbreak investigation focused on contact tracing using CDC guidelines (*1*) and implemented prevention and control measures in collaboration with Texas DSHS, other local health departments, cheerleading facilities, and national cheerleading organizations. Eight additional mumps cases from three other counties were identified (in patients E–L), and all reported attending either event 1 or event 2 during their exposure window (12–25 days before parotitis onset), with the exception of patient F. Patients E and F reported attending another cheerleading competition on December 10, 2016, (event 3) during their infectious period (Figure). However, neither patient F, a household contact of patient G, nor patient K, a household contact of patient H, attended any cheerleading events before parotitis onset.

FIGURE. Mumps cases* in persons attending three cheerleading competition events (N = 10), by parotitis onset date† — Texas, 2016–2017



Abbreviation: Epi-X = CDC's Epidemic Information Exchange.

* Patients indicated by circled letters. Patients F and K are not shown. Both were household contacts of patients and did not attend any cheerleading events before parotitis onset.

† 12–25 days after each event.

On December 14, a mumps advisory was issued to staff members and students at facility A. The possibility of multistate exposures at the cheerleading competitions prompted release via CDC's Epidemic Information Exchange (Epi-X) of a call for cases on December 16. During December 21–22, Texas DSHS partnered with three national cheerleading organizations to release a mumps advisory to the 4,228 registered participants at all three events.

This outbreak resulted in five confirmed and seven probable mumps cases in residents of five counties. Ten cases occurred in females; the median age was 40 years. Among the 10 cheerleading event–associated cases, seven occurred in event staff members and nonathlete, adult attendees. All 12 patients reported having received at least 1 dose of measles-mumps-rubella (MMR) vaccine. Among the eight patients who could provide immunization documentation, five had received 2 MMR doses. CDC performed genotyping on one specimen, identifying mumps virus genotype G.

Although six patients reported attending facility A regularly, it was excluded as an outbreak setting because of inadequate epidemiologic evidence linking cases (i.e., different attendance times and coaches and patients' parotitis onsets <12 days from one another). Among all 12 patients, six (B, C, D, G, H, and J) attended event 1 and reported symptom onset within the following 12–25 days, implicating event 1 as their likely exposure setting. Three patients (A, E, and I) were likely exposed while attending event 2. One patient (L) attended event 3, but was a household contact of patient E; therefore, the source of exposure could not be established.

Although mumps outbreaks associated with athletic events have been reported (*2*–*4*), this outbreak is the first documented report of mumps transmission during a sporting event with the majority of cases occurring in nonathlete participants or attendees. Receipt of 2 appropriately spaced MMR vaccine doses offers the best protection against mumps; however, transmission can occur at athletic events among athletes, parents, guardians, coaches, and staff members, including appropriately vaccinated persons, underscoring the importance of receiving recommended vaccines to reduce transmission risk or disease severity. Because mumps outbreaks can occur in persons who have received mumps-containing vaccine, contact tracing should include vaccinated persons, and in some outbreak settings, a third dose of MMR vaccine is recommended (*5*).

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Erratum

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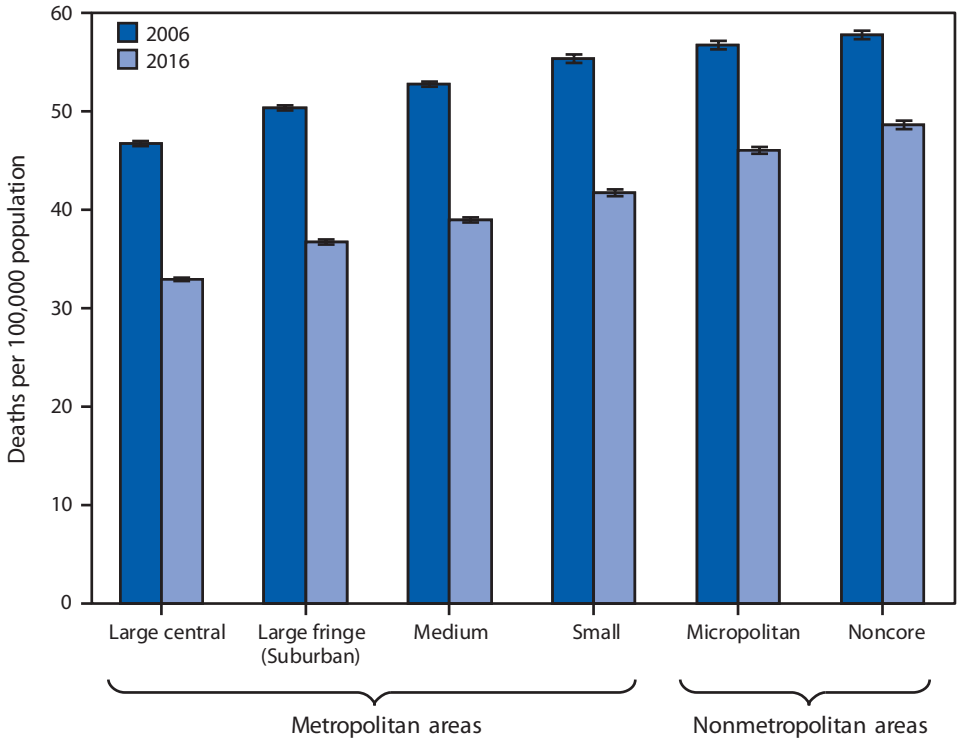
In the report "Notes from the Field: Respiratory Symptoms and Skin Irritation Among Hospital Workers Using a New Disinfection Product — Pennsylvania, 2015," in the fourth paragraph, the fourth sentence should have read "Full-shift air sample results for hydrogen peroxide ranged from **<11** parts per billion (ppb) to 511 ppb; for acetic acid, from **<8.8 ppb to 319.4 ppb**; and for peroxyacetic acid, from **<2.2** ppb to 48 ppb."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Death Rates* for Lung Cancer,† by Urbanization of County of Residence§ — National Vital Statistics System, United States, 2006 and 2016



* Deaths per 100,000 population age-adjusted to the 2000 U.S. standard population with 95% confidence intervals.
† Lung cancer deaths were identified with the *International Classification of Diseases, Tenth Revision* underlying cause of death code C34.
§ Counties were classified into six urbanization levels based on a classification scheme developed by the National Center for Health Statistics that considers metropolitan/nonmetropolitan status, population, and other factors.

From 2006 to 2016, the age-adjusted death rate for lung cancer decreased in each of the six urbanization levels, with the largest decrease (29%) in large central metropolitan counties and the smallest decrease (16%) in noncore counties. In both years, the rate of lung cancer death was higher in nonmetropolitan areas than in metropolitan areas. In 2016, the lung cancer death rate in noncore counties was 48.6 per 100,000 compared with 33.0 in large central metropolitan counties.

Sources: National Center for Health Statistics, National Vital Statistics System, Mortality data. https://www.cdc.gov/nchs/nvss/deaths.htm; 2013 National Center for Health Statistics urban-rural classification scheme for counties. https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf.

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