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Drug Overdose Deaths Among Women Aged 30–64 Years — United States, 1999–2017

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The drug epidemic in the United States continues to evolve. The drug overdose death rate has rapidly increased among women (*1*,*2*), although within this demographic group, the increase in overdose death risk is not uniform. From 1999 to 2010, the largest percentage changes in the rates of overall drug overdose deaths were among women in the age groups 45–54 years and 55–64 years (*1*); however, this finding does not take into account trends in specific drugs or consider changes in age group distributions in drug-specific overdose death rates. To target prevention strategies to address the epidemic among women in these age groups, CDC examined overdose death rates among women aged 30–64 years during 1999–2017, overall and by drug subcategories (antidepressants, benzodiazepines, cocaine, heroin, prescription opioids, and synthetic opioids, excluding methadone). Age distribution changes in drug-specific overdose death rates were calculated. Among women aged 30–64 years, the unadjusted drug overdose death rate increased 260%, from 6.7 deaths per 100,000 population (4,314 total drug overdose deaths) in 1999 to 24.3 (18,110) in 2017. The number and rate of deaths involving antidepressants, benzodiazepines, cocaine, heroin, and synthetic opioids each increased during this period. Prescription opioid–related deaths increased between 1999 and 2017 among women aged 30–64 years, with the largest increases among those aged 55–64 years. Interventions to address the rise in drug overdose deaths include implementing the CDC *Guideline for Prescribing Opioids for Chronic Pain* (*3*), reviewing records of controlled substance prescribing (e.g., prescription drug monitoring programs, health insurance programs), and developing capacity of drug use disorder treatments and linkage to care, especially for middle-aged women with drug use disorders.

Mortality data for U.S. residents were obtained from the 1999–2017 National Vital Statistics System,* which is based on information from all death certificates filed in the 50 states and the District of Columbia. Deaths of nonresidents (e.g., nonresident aliens, nationals living abroad) were excluded. Mortality data were provided to CDC's National Center for Health Statistics through the Vital Statistics Cooperative Program and coded according to the *International Classification of Diseases, Tenth Revision* (ICD-10). Analyses were restricted to deaths with an underlying cause of death based on the following ICD-10 codes for drug overdoses: X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), and Y10–Y14 (undetermined intent). Among deaths with drug overdose as the underlying cause, the type of drug involved was based on ICD-10 codes for antidepressants (T43.0–T43.2), benzodiazepines (T42.4), cocaine (T40.5), and opioids (all T40.0–T40.4 and T40.6, including those for heroin [T40.1],

* https://www.cdc.gov/nchs/nvss/deaths.htm.

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prescription opioids [T40.2–40.3], and synthetic opioids, excluding methadone [T40.4]). Deaths involving more than one type of drug were counted in multiple categories. Crude rates are reported as deaths per 100,000 population. Percent change was calculated on unrounded rates. Joinpoint regression† was used to test the significance of overdose trends from 1999 to 2017. Annual percentage change estimates that were statistically significant ($p<0.05$) are presented to indicate the magnitude and direction of significant trends. Age distribution changes in drug-specific overdose deaths were calculated by 5-year age groupings, with average age of death analyzed for drug type for the years 1999 and 2017.

Among women aged 30–64 years, the crude drug overdose death rate increased 260%, from 6.7 deaths per 100,000 population (4,314 total drug overdose deaths) in 1999 to 24.3 (18,110) in 2017 (Figure 1). The rate of drug overdose deaths involving any opioid increased 492%, from 2.6 per 100,000 population in 1999 to 15.5 in 2017 (data not shown). During this time, rates of drug overdose deaths increased for those involving synthetic opioids (1,643%), heroin (915%), benzodiazepines (830%), prescription opioids (485%), cocaine (280%), and antidepressants (176%). Significant inflection points in trends of crude death rates of drug overdoses by drug indicate an increasing annual percentage change for all drugs except cocaine, for which crude death rates significantly decreased from 2006 to 2009.

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

From 1999 to 2017, drug overdose death rates increased by approximately 200% among women aged 35–39 and 45–49 years, 350% among those aged 30–34 and 50–54 years, and nearly 500% among those aged 55–64 years (Figure 2). During 1999, overdose death rates were highest among women aged 40–44 years (9.6 deaths per 100,000 population), whereas during 2017, rates were highest among women aged 50–54 years (28.2).

The crude rate of overdose deaths involving antidepressants doubled from 1999 to 2017 among women aged 30–34 years and 40–49 years and increased approximately 300% among those aged 55–59 years, and nearly 400% among those aged 60–64 years. In 2017, rates were lowest among women aged 30–34 years (2.0) and highest among women aged 50–54 years (4.6). Rates of overdose deaths involving benzodiazepines increased in every age group examined (30–34 years, 1,225%; 40–44 years, 534%), with similar rates in 2017 among the 5-year age categories of those aged 35–49 years (range = 4.9–5.3). Similarly, the rate of overdose deaths involving cocaine in 2017 varied little by age category among women aged 30–54 years (range = 4.5–5.0). The crude rate of heroin-related overdose deaths among women aged 30–49 years ranged from 0.4 to 0.6 per 100,000 in 1999; in 2017, rates ranged from 1.3 among women aged 60–64 years to 5.6 among those aged 30–34 years. The crude rate for deaths involving prescription opioids increased from 1999 to 2017 for every age group, with the largest increases (>1,000%) among women aged 55–64 years. The crude rate also increased for every age group

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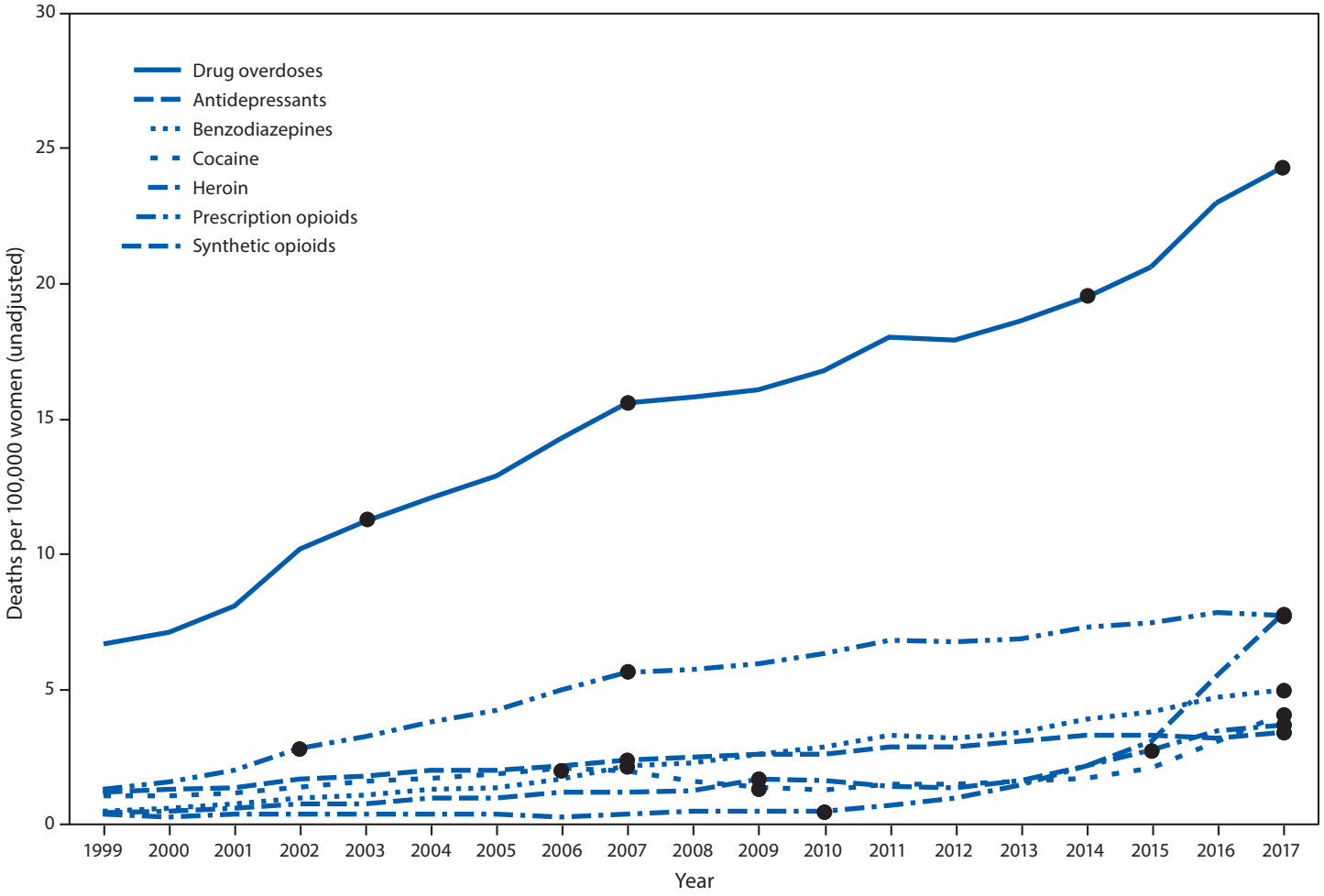
FIGURE 1. Drug overdose deaths* (unadjusted) per 100,000 women aged 30–64 years, by involved drug or drug class — National Vital Statistics System (NVSS), 1999–2017†,§



* Drug overdose deaths were identified using *International Classification of Diseases, Tenth Revision* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. The multiple cause-of-death code or codes for each drug were *heroin*: T40.1; *prescription opioids*: T40.2 for natural and semisynthetic opioids (e.g., oxycodone and hydrocodone) and T40.3 for methadone; *synthetic opioids, excluding methadone* (e.g., fentanyl and tramadol): T40.4; *cocaine*: T40.5; *benzodiazepines*: T42.4; and *antidepressants*: T43.0–43.2. Deaths might involve more than one drug; thus categories are not exclusive.

† NVSS mortality data.

§ Significant annual percent change indicated by dots. *Antidepressants*: 1999–2007 = 8.82; 2007–2017 = 3.63; *benzodiazepines*: 1999–2007 = 18.94; 2007–2017 = 8.91; *cocaine*: 1999–2006 = 11.59; 2006–2009 = -14.95; 2014–2017 = 36.71; *drug overdoses*: 1999–2003 = 14.68; 2003–2007 = 8.28; 2007–2014 = 3.31; 2014–2017 = 8.16; *heroin*: 1999–2010 = 4.17; 2010–2015 = 42.16; 2015–2017 = 12.79; *prescription opioids*: 1999–2002 = 30.97; 2002–2007 = 15.03; 2007–2017 = 3.47; *synthetic opioids*: 1999–2009 = 12.64; 2013–2017 = 52.81.

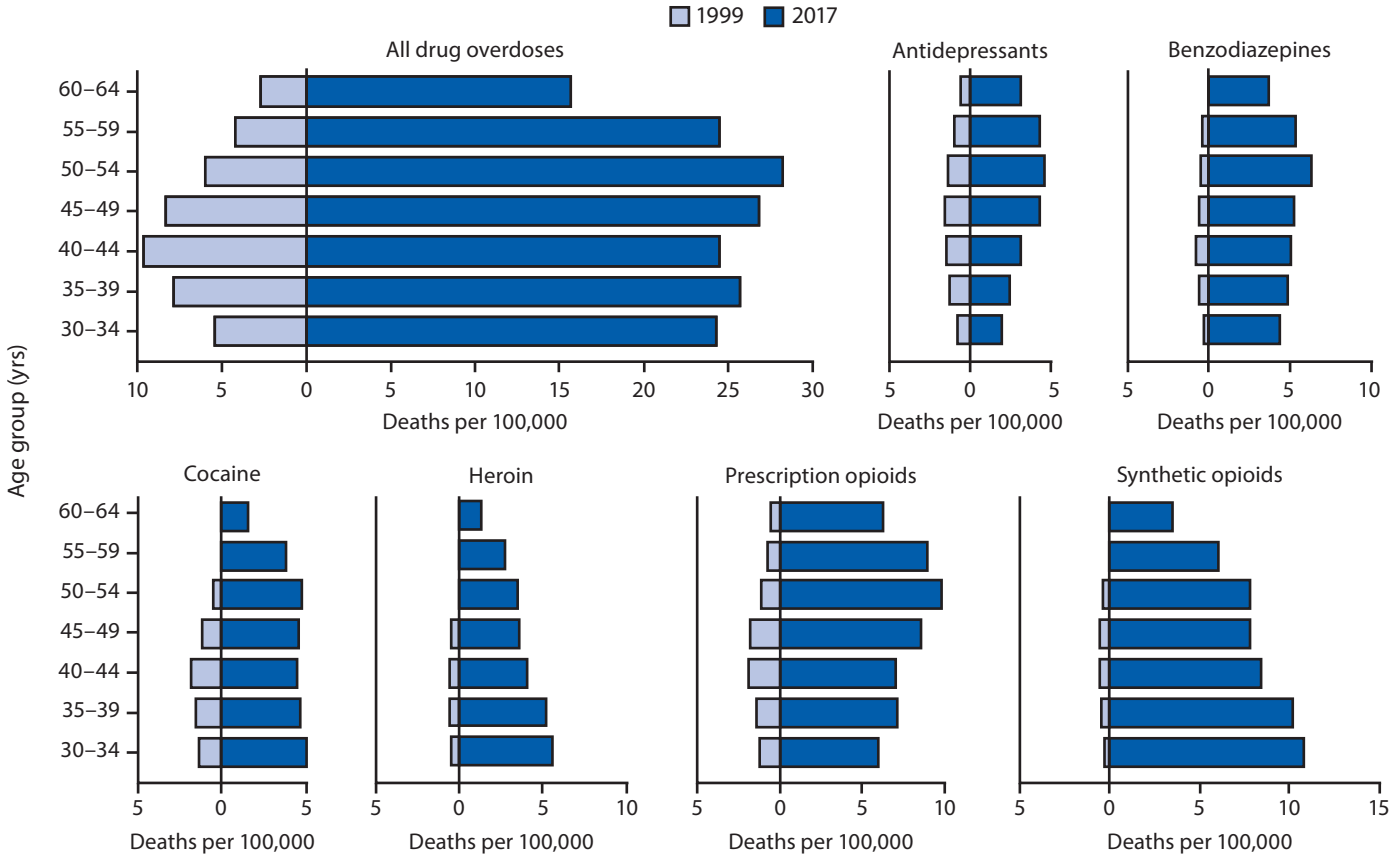
for deaths involving synthetic opioids excluding methadone, with the largest increase among women aged 30–34 years (3,500%).

The average age at death from overall drug overdoses among women aged 30–64 years increased by 2.8 years, from 43.5 years in 1999 to 46.3 years in 2017 (Table). The largest increase in average age of death was among cocaine-related deaths (4.7 years), followed by prescription opioid–related deaths (4.5 years). The average age of death among synthetic opioid–related deaths did not change.

Discussion

From 1999 to 2017, the crude rate of drug overdose deaths among women aged 30–64 years in the United States increased by 260%. The rates of overdose deaths increased for all drug categories examined, with a notable increase in rates of deaths involving synthetic opioids (1,643%), heroin (915%), and benzodiazepines (830%). These findings are consistent with recent reports highlighting an overall increasing trend in deaths involving drugs, especially with shifts in the type of drugs involved (e.g., heroin) (*4*).

FIGURE 2. Drug overdose deaths (unadjusted) per 100,000 women aged 30–64 years, by age group and involved drug or drug class — National Vital Statistics System (NVSS), 1999* and 2017†,§



* Rates in 1999 for certain age groups are not displayed because counts were <20 deaths.
† NVSS mortality data.
§ Drug overdose deaths were identified using *International Classification of Diseases, Tenth Revision* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. The multiple cause-of-death code or codes for each drug were *heroin*: T40.1; *prescription opioids*: T40.2 for natural and semisynthetic opioids (e.g., oxycodone and hydrocodone) and T40.3 for methadone; *synthetic opioids, excluding methadone* (e.g., fentanyl and tramadol): T40.4; *cocaine*: T40.5; *benzodiazepines*: T42.4; *and antidepressants*: T43.0–43.2. Deaths might involve more than one drug; thus categories are not exclusive.

Other reports have highlighted the overall increase in overdose deaths and emergency department visits related to drug use, especially among women aged 45–64 years (*1*). In addition to demonstrating the varying drug overdose rate increases by age group, this study determined that the age distribution of decedents shifted from 1999 to 2017, and the average age of women aged 30–64 years dying from drug overdoses increased for every drug class analyzed except synthetic opioids. Prevention programs might need to shift response options as the overdose epidemic experiences demographic shifts. Further, as women progress through life, individual experiences can change in the type of substance used or misused and in the experiences of pain that might result in an opioid prescription (*5–8*).

The findings in this report are subject to at least three limitations. First, rate estimates of specific drugs involved with deaths might be affected by factors related to death investigation, such as the substances tested for or the circumstances under which

TABLE. Average age at death among women aged 30–64 years who died of a drug overdose,* by involved drug or drug class — National Vital Statistics System (NVSS), 1999 and 2017†

Drug/Drug class involved	Average age at death (yrs)		
	1999	2017	Increase 1999 to 2017
All drug overdoses	**43.5**	**46.3**	**2.8**
Antidepressant	44.8	48.9	4.1
Benzodiazepine	44.1	47.1	3.0
Cocaine	40.4	45.1	4.7
Heroin	40.8	43.5	2.7
Prescription opioid	43.3	47.8	4.5
Synthetic opioid	44.2	44.2	0.0

* Drug overdose deaths were identified using *International Classification of Diseases, Tenth Revision* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. The multiple cause-of-death code or codes for each drug were *heroin:* T40.1; *prescription opioids:* T40.2 for natural and semisynthetic opioids (e.g., oxycodone and hydrocodone) and T40.3 for methadone; *synthetic opioids, excluding methadone* (e.g., fentanyl and tramadol): T40.4; *cocaine:* T40.5; *benzodiazepines:* T42.4; and *antidepressants:* T43.0–43.2. Deaths might involve more than one drug; thus categories are not exclusive.
† NVSS mortality data.

Summary

What is already known about this topic?

The U.S. drug epidemic is evolving, including among women. Studies have highlighted rising rates of drug overdose deaths among women aged 45–64 years.

What is added by this report?

From 1999 to 2017, the death rate from drug overdose among women aged 30–64 years increased by 260%. Drug overdose deaths involving antidepressants, benzodiazepines, cocaine, heroin, prescription opioids, and synthetic opioids all increased. Among women aged 30–64 years, the average age at death for drug overdose deaths increased by nearly 3 years.

What are the implications for public health practice?

Overdose deaths continue to be unacceptably high, and targeted efforts are needed to reduce the number of deaths in this evolving epidemic, including those among middle-aged women.

tests are performed. For example, toxicology testing cannot distinguish between pharmaceutical fentanyl and illicitly manufactured fentanyl. Second, drug categories presented are not mutually exclusive, and deaths might have involved more than one substance. Increases in deaths involving certain drugs might be the result of increases in certain drug combinations. Finally, the percentage of deaths with specific drugs identified on the death certificate varies over time. Changes in testing and reporting of drugs might have led to observed increases in some drug entities involved in drug overdose deaths.

Substantial work has focused on informing women of childbearing age about the risk and benefit of the use of certain drugs, particularly for the risk posed by neonatal abstinence syndrome as a result of opioid use during pregnancy (*9*,*10*). The current analysis demonstrates the remaining need to consider middle-aged women who remain vulnerable to death by drug overdose. A multifaceted approach involving the full spectrum of care services is likely necessary. For example, health care providers who treat women for pain, depression, or anxiety can discuss treatment options that consider the unique biopsychosocial needs of women (*2*). Providers can consider implementing the CDC *Guideline for Prescribing Opioids for Chronic Pain* (*3*), and Medicaid programs can also examine whether prescribing of controlled substances to their clients meets established guidelines. Access to gender-responsive substance use disorder treatment services, especially for pregnant women and women with drug use disorders, can reduce harmful outcomes. Overdose deaths continue to be unacceptably high, and targeted efforts are needed to reduce the number of deaths in this evolving epidemic among middle-aged women.

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Evaluation of State-Mandated Reporting of Neonatal Abstinence Syndrome — Six States, 2013–2017

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From 2004 to 2014, the incidence of neonatal abstinence syndrome (NAS) in the United States increased 433%, from 1.5 to 8.0 per 1,000 hospital births. The latest national data from 2014 indicate that one baby was born with signs of NAS every 15 minutes in the United States (*1*). NAS is a drug withdrawal syndrome that most commonly occurs among infants after in utero exposure to opioids, although other substances have also been associated with NAS. Prenatal opioid exposure has also been associated with poor fetal growth, preterm birth, stillbirth, and possible specific birth defects (*2*–*5*). NAS surveillance has often depended on hospital discharge data, which historically underestimate the incidence of NAS and are not available in real time, thus limiting states' ability to quickly direct public health resources (*6*,*7*). This evaluation focused on six states with state laws implementing required NAS case reporting for public health surveillance during 2013–2017 and reviews implementation of the laws, state officials' reports of data quality before and after laws were passed, and advantages and challenges of legally mandating NAS reporting for public health surveillance in the absence of a national case definition. Using standardized search terms in an online legal research database, laws in six states mandating reporting of NAS from medical facilities to state health departments (SHDs) or from SHDs to a state legislative body were identified. SHD officials in these six states completed a questionnaire followed by a semistructured telephone interview to clarify open-text responses from the questionnaire. Variability was found in the type and number of surveillance data elements reported and in how states used NAS surveillance data. Following implementation, five states with identified laws reported receiving NAS case reports within 30 days of diagnosis. Mandated NAS case reporting allowed SHDs to quantify the incidence of NAS in their states and to inform programs and services. This information might be useful to states considering implementing mandatory NAS surveillance.

To identify states with laws mandating reporting of NAS for public health surveillance, relevant laws (statutes and regulations) were identified using Westlaw,* an online legal research database, on January 3, 2018. Search terms were limited to identify statutes and regulations that explicitly named "neonatal abstinence syndrome" in states' disease and conditions reporting laws. The search string was applied to all 50 states and the District of Columbia. Laws were cross-referenced with states' disease reporting lists on SHD websites. Six states (Arizona, Florida, Georgia, Kentucky, Tennessee, and Virginia) were identified as having laws requiring reporting of NAS from medical facilities to the SHD, from the SHD to a state legislative body, or both. SHD officials in these six states completed a 28-item questionnaire, and a semistructured telephone interview (focusing on development of statute, implementation, data collection and quality) was conducted with one interviewee per state. Interviewees were identified via outreach to SHD officials requesting SHD points of contact for, or designated experts on, NAS surveillance. Questionnaire and interview data were analyzed for similarities and differences in NAS reporting criteria, data elements and utilization, reporting system, required resources, and barriers to case reporting.

A review of the six states' laws indicated variation in states' reporting frameworks (Table 1). Laws in Arizona, Florida, Georgia, Kentucky, and Virginia require medical providers and medical facilities to report cases of NAS to their respective SHDs. In Tennessee, the health commissioner has the authority to add new diseases to the reportable disease list without a new statute or regulation. Using this authority, NAS was made reportable from medical facilities to the Tennessee SHD without a new law in 2013; therefore, the 2013 implementation is not included in this review of NAS laws. However, Tennessee's 2017 law, which explicitly names "neonatal abstinence syndrome," was captured in the Westlaw search; therefore, the 2017 law requiring the SHD to report NAS cases to the Tennessee state legislature was included in this analysis. Georgia's 2017 law also requires any medical provider who has diagnosed an infant with NAS to report the case to the SHD and the SHD to report cases to the state legislature. Georgia's and Virginia's laws define NAS, whereas the other four states' laws do not. Arizona's law specifies data elements to be collected. State laws vary in the required time frame for case reporting from "at the time of diagnosis" to within 6 months after diagnosis.

The questionnaire and telephone interviews were completed during March–May 2018. All six states identify reportable NAS cases based on a clinical diagnosis of NAS by a medical

* https://next.westlaw.com.

TABLE 1. Legislation mandating neonatal abstinence syndrome (NAS) case reporting — six states, 2013–2017

State	Citation	Effective year	Is there a definition of NAS used in the law?	Who must report NAS?		To whom must NAS be reported?		Time frame for reporting to	
				Provider/ Facility*	Dept. of Health	Dept. of Health	Legislative body	Dept. of Health	Legislative body
Arizona	AZ. Admin. code § R9–4-602	2017	No	Yes	—	Yes	—	5 business days	N/A
Florida	FL. Admin. Code Ann. r. 64D-3.029	2014	No	Yes	—	Yes	—	6 months†	N/A
Georgia	GA. Code Ann. § 31–12–2	2017	Yes§	Yes	Yes¶	Yes	Yes	N/A**	annually
Kentucky	KY. Rev. Stat. Ann. § 211.676 KY. Rev. Stat. Ann. § 211.678	2013 2014	No	Yes	—	Yes	—	at time of diagnosis	N/A
Tennessee††	TN. Code Ann. § 68–1-805	2017	No	—	Yes	—	Yes	N/A	annually
Virginia§§	12 VA. Admin. Code § 5–90–80¶¶	2017	Yes***	Yes	—	Yes	—	1 month	N/A

Abbreviations: AZ = Arizona; FL = Florida; GA = Georgia; KY = Kentucky; N/A = not applicable; TN = Tennessee; VA = Virginia.

* Defines providers broadly to include coroners and medical examiners. Facilities are also defined broadly to include hospitals, birthing centers, and various healthcare facilities. Individual states might have laws with additional mandatory reporters. For example, see GA. Code Ann. § 31–12–2, in which "any other person or entity the department determines has knowledge of diagnosis or health outcomes related, directly or indirectly" must also report NAS.

† FL. Admin. Code Ann. r. 64D-3.029(3), FN 18. Within 6 months, hospitals must "report each case of neonatal abstinence syndrome occurring in an infant admitted to the hospital." However, "[i]f a hospital reports a case of neonatal abstinence syndrome to the Agency for Health Care Administration in its inpatient discharge data report, pursuant to Chapter 59E-7, F.A.C., then it need not comply with the reporting requirements of subsection 64D-3.029(1), F.A.C."

§ GA. Code Ann. § 31–12–2. "'[N]eonatal abstinence syndrome' means a group of physical problems that occur in a newborn infant who was exposed to addictive illegal or prescription drugs while in the mother's womb."

¶ The Georgia Department of Health must report NAS case load and NAS incidence to the state legislature on a yearly basis.

** GA. Code Ann. § 31–12–2 indicates that reporting shall take place "in a manner and at such times as may be prescribed." The health department has used this authority to require a 30-day time frame for reporting.

†† See also Tenn. Comp. R. and Regs. 1200–14–01-.02 (2010). This law does not use the terminology "neonatal abstinence syndrome" but does authorize the health commissioner to add diseases to the reportable disease list, which requires providers to report to the state health department. Tennessee added NAS to its reportable disease list in 2013.

§§ See also VA Code Ann. § 32.1–35 (West 2018). This law does not use the terminology "neonatal abstinence syndrome" but does authorize the board to add diseases to the reportable disease list. NAS is on the reportable disease list in Virginia.

¶¶ Virginia's legislature enacted an uncodified act (SB1323/HB1467) Acts 2017, mL. 185 and 280, requiring the Board of Health to adopt regulation to include NAS as a reportable disease.

*** 12 VA Admin Code § 5–90–80. "[A] condition characterized by clinical signs of withdrawal from exposure to prescribed or illicit drugs."

provider (Table 2). Georgia's SHD also requires that infants with positive toxicology results be reported to the SHD as a NAS case even in the absence of a clinical diagnosis of NAS by a medical provider. Including positive infant toxicology results in Georgia's NAS case definition allows the state to determine the types of substances infants are exposed to prenatally that might cause signs of withdrawal postnatally. Documented maternal opioid use is not a criterion for case reporting in any of the six states. None of these states reported administration of specific care or pharmacologic treatment to an infant as a criterion for case reporting. Health officials in Kentucky commented that they do not define cases based on an abstinence scoring tool (*8*,*9*) because of potential subjective differences in how providers quantify symptoms as part of the scoring method. During interviews, state officials consistently noted that mandated reporting of NAS was enacted to 1) gain a more precise understanding of the incidence of NAS in their state, 2) better characterize the impact of the opioid crisis in their state, 3) identify specific communities or geographic areas more severely affected by opioids and NAS, and 4) inform programs and services.

Although specific approaches varied, most of the surveyed states implemented electronic reporting of NAS, which was reported as an advantage by state officials. Another resource advantage noted by state officials in Arizona and Georgia was adding NAS case reporting to existing electronic disease surveillance systems. The Tennessee and Virginia SHDs established new electronic NAS case reporting systems, and the Kentucky SHD used paper-based case report forms with plans to transition to an electronic reporting system. Florida's passive electronic case reporting via administrative data sets did not require any changes.

Georgia, Kentucky, Tennessee, and Virginia reported that education of providers and hospital staff members on NAS case reporting requirements is one of the more resource-intensive activities related to NAS case reporting (Table 2). Arizona reported collecting missing data and training staff members on data entry and record review as challenges that require additional staffing resources. Other challenges reported by state officials include staff member turnover at hospitals and birthing centers, which could result in gaps in reporting, and the requirement that all facilities that provide care to an infant with NAS have to report the case, which poses the potential for duplicate reporting if an infant is transferred to another facility.

The numbers and types of data elements required for case reporting differed by state (Table 2). All six states collect infant demographics; Florida, Georgia, Kentucky, and Tennessee also collect maternal demographics. In addition, surveillance

TABLE 2. Advantages and challenges of surveillance features reported by health officials among states with mandated reporting of neonatal abstinence syndrome (NAS) — six states, 2013–2017

Surveillance feature reported in 28-item questionnaire	States endorsing surveillance feature in questionnaire	Advantages (+) and challenges (-) reported by health officials in open-text fields in questionnaire and during semistructured interviews
Criteria for reporting NAS		
Clinical diagnoses by medical provider*	AZ, FL, GA, KY, TN, VA	– Requires additional review to identify duplicate NAS cases (i.e., if infant is treated at multiple facilities or at delivery and at another encounter postdischarge) – Providers might look to state health departments for a case definition – Will not identify asymptomatic infants with prenatal substance exposure – Transition from *International Classification of Diseases Clinical Modification* (ICD)-9 to ICD-10 codes might affect the number and trends of cases identified in administrative data sets and require additional educational resources
Positive toxicology result for infant	GA†	+ Toxicology results allow state to determine whether substance exposure was from a prescribed medication or an illicit substance§
Data elements collected in case reports		
Maternal demographics	FL, GA, KY, TN	+ Allows for characterizations of populations at higher risk and areas of higher risk
Infant demographics	AZ, FL, GA, KY, TN, VA	+ Opportunity to identify patterns in specific geographic areas
Maternal source of exposure(s)	AZ, GA, KY, TN, VA	+ Can identify prenatal exposures + Allows for comparison between clinical symptoms of withdrawal and substance exposure in the absence of clinical symptoms of withdrawal + Provides information on polysubstance exposures
Heath care service utilization by infant	GA	+ Ability to estimate costs associated with treatment + Can capture characteristics of treatment (e.g., length of stay)
Other Clinical signs and symptoms Substances for which mother/infant tested positive Maternal use of medication-assisted treatment Maternal history of substance misuse	AZ, GA, KY, TN	+ Some variables (e.g., medical record number) allows for linkage with other data sources
Reporting system		
State had an existing notifiable disease surveillance system	AZ, GA, VA	+ Existing in-house system allows for more rapid changes to reporting system to be implemented + More timely reporting – Obstetric and neonatal providers might not be familiar with case reporting because many notifiable conditions are for infectious diseases
State has hospital discharge data linked to vital records	FL	+ Ability to link to other vital records and public health surveillance systems + Feasible in the absence of funding resources – Coding errors – Might not capture infants delivered or treated outside of a hospital setting – Does not consistently capture specific substance exposures – Duplications in reported cases if infant is transferred – Deidentified data does not allow for referrals to services
State has NAS-specific reporting system	KY, TN, VA	+ Might allow for online case reporting + Case report form can be easily modified + Reduces need for additional resources required by paper-based system (e.g., data entry) – Online reporting system might require system maintenance
Data quality		
Data completeness	FL, GA, KY	+ Required reporting elements can reduce number of missing values – Delays in laboratory reports can lead to missing toxicology data – Lack of clinical case definition can lead to differences in variables reported by provider
Required resources		
Educating providers/hospitals about reporting requirements	GA, KY, TN, VA	– Added responsibility for medical provider and hospital staff members
Collecting missing data	AZ, GA	– Requires fiscal and human resources to collect missing data and to train staff members to input data and review records
Other Data cleaning Data reporting	FL, KY	– Requires fiscal and human resources

See table footnotes on next page.

TABLE 2. (*Continued*) Advantages and challenges of surveillance features reported by health officials among states with mandated reporting of neonatal abstinence syndrome (NAS) — six states, 2013–2017

Surveillance feature reported in 28-item questionnaire	States endorsing surveillance feature in questionnaire	Advantages (+) and challenges (-) reported by health officials in open-text fields in questionnaire and during semistructured interviews
Data utilization		
Identification of women with substance use disorder	AZ	+ Opportunity to link women to treatment
Identification of mothers with multiple pregnancies affected by opioid exposure	FL	+ Opportunity for prevention of future NAS cases
Shared with other state and local agencies	GA, FL, KY, TN	+ Informs community assessments, planning, and program development + Opportunity to evaluate the incidence of NAS within the state + Informs interventions
Public reporting (as of March 2018)	AZ, GA, KY, TN	+ Opportunity to inform partners
Barriers to case reporting		
Limited awareness of mandate	GA	– Underreporting from providers might underestimate incidence of NAS
Limitations at the hospital/provider level	AZ, GA, KY, TN, VA	– Hospital staff member turnover can create reporting gaps/underreporting – Training new staff members in reporting process – Providers might have limited knowledge of reporting criteria – Complexity of reporting form

Abbreviations: AZ = Arizona; FL = Florida; GA = Georgia; KY = Kentucky; TN = Tennessee; VA = Virginia.
* During interviews the benefits of having a clinical diagnosis by a medical provider as part of the case definition were not specifically discussed.
† In Georgia, infants with a clinical diagnosis of NAS or a positive toxicology result should be reported to the state health department.
§ Toxicology results do not provide information on whether a prescribed substance was used as prescribed or diverted.

data were used differently by the states. Arizona, Georgia, Kentucky, and Tennessee publicly report deidentified data to inform partners and stakeholders of NAS incidence. These four states also share data with other state and local agencies to inform community assessments, planning, program development, and to provide opportunities for intervention. Arizona reported that NAS surveillance improves the state's understanding of the proportion of NAS cases attributable to medically supervised opioid treatment during pregnancy, including pain management and medication-assisted treatment for opioid use disorder, and provides an opportunity to improve treatment strategies for pregnant women with opioid use disorder. Florida links infant and maternal hospital discharge data to connect women who have had two or more opioid-exposed pregnancies to treatment services; other states use data to promote and develop supportive care and integrated services for families.

Discussion

This review of the six identified states' NAS reporting laws, data collection, state officials' reports of data quality, and data utilization identified important considerations for implementing state-based NAS surveillance. Among the six identified states that legislatively mandated reporting of NAS to SHD for public health surveillance during 2013–2017, differences in case definition and specificity of required data elements might affect the data available for monitoring and public health response.

Since this analysis, the Council of State and Territorial Epidemiologists has convened a workgroup to develop a position statement on a standardized surveillance case definition for NAS surveillance that will be presented to the council in the summer of 2019. This will be helpful because surveyed state officials noted that the absence of a standardized NAS case definition introduces substantial variability in the type and number of cases reported to SHDs. For example, only Georgia's NAS case definition includes asymptomatic infants with positive toxicology tests to be reported to the SHD. All surveyed states favored an electronic system for case reporting. Both benefits and limitations were noted when adapting existing electronic reporting systems or when a NAS-specific system was created de novo.

The findings in this report are subject to at least four limitations. First, narrow search terms were applied to identify laws (codified statutes and regulations) mandating NAS case reporting, which might have failed to identify states that used different terminology, mechanisms, or laws enacted since January 3, 2018. Second, four of the six laws reviewed were enacted in 2017, limiting states' abilities to report on advantages and challenges and limiting opportunities to evaluate changes in NAS case reporting before and after laws were implemented. Third, the semistructured interview asked state informants to share areas for improvement in their case reporting systems but did not ask states to discuss perceived benefits of using a clinical diagnosis of NAS as a surveillance case definition. Finally, this report relied on qualitative data and cannot quantify the impact of these laws in states' responses to increasing rates of NAS.

Mandated NAS case reporting might improve states' ability to calculate more timely estimates of the incidence of NAS in their jurisdictions, identify opportunities for prevention, and facilitate linkages to care for infants and mothers. With more accurate and timely estimates of disease incidence, health systems and health care providers might be better prepared to

Summary

What is already known about this topic?

In 2014, in the United States, an infant with neonatal abstinence syndrome (NAS) was born every 15 minutes. Historically, NAS surveillance has depended on hospital discharge data, frequently with a time lag, limiting ability to rapidly direct public health resources.

What is added by this report?

Among six identified states with mandated NAS reporting laws during 2013–2017, NAS incidence could be quantified to inform programs and services. However, differences in reporting methods and case definitions might influence states' abilities to monitor NAS incidence.

What are the implications for public health practice?

States considering requiring NAS case reporting for public health surveillance can benefit from understanding advantages and challenges of approaches used by states with mandated NAS reporting.

ensure that adequate resources exist to address the immediate and potential long-term needs of children born with NAS and mothers. A standardized case definition for NAS and consistent reporting approaches will improve the ability to make meaningful comparisons between states and target prevention efforts to areas of greatest need.

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Emergence of Extensively Drug-Resistant *Salmonella* Typhi Infections Among Travelers to or from Pakistan — United States, 2016–2018

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In February 2018, a typhoid fever outbreak caused by *Salmonella enterica* serotype Typhi (Typhi), resistant to chloramphenicol, ampicillin, trimethoprim-sulfamethoxazole, fluoroquinolones, and third-generation cephalosporins, was reported in Pakistan. During November 2016–September 2017, 339 cases of this extensively drug-resistant (XDR) Typhi strain were reported in Pakistan, mostly in Karachi and Hyderabad; one travel-associated case was also reported from the United Kingdom (*1*). More cases have been detected in Karachi and Hyderabad as surveillance efforts have been strengthened, with recent reports increasing the number of cases to 5,372 (*2*). In the United States, in response to the reports from Pakistan, enhanced surveillance identified 29 patients with typhoid fever who had traveled to or from Pakistan during 2016–2018, including five with XDR Typhi. Travelers to areas with endemic disease, such as South Asia, should be vaccinated against typhoid fever before traveling and follow safe food and water practices. Clinicians should be aware that most typhoid fever infections in the United States are fluoroquinolone nonsusceptible and that the XDR Typhi outbreak strain associated with travel to Pakistan is only susceptible to azithromycin and carbapenems.

Typhoid fever is a systemic febrile illness that requires prompt antibiotic treatment.* Worldwide, approximately 12–27 million cases of typhoid fever occur annually (*3*). In the United States, approximately 350 culture-confirmed cases are reported to CDC each year. Most U.S. patients report having traveled internationally within the preceding 30 days. Over the past several decades, the emergence of Typhi that is multidrug resistant (MDR) to historically used first-line antibiotics, such as chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole, led to the use of fluoroquinolones (e.g., ciprofloxacin) as the first-line treatment (*4*). However, since the early 2000s, increasing fluoroquinolone nonsusceptibility (intermediate or full resistance to ciprofloxacin), especially in South Asia, has led to the use of third-generation cephalosporins (e.g., ceftriaxone) as a recommended first-line treatment.

Local and state health departments report culture-confirmed Typhi to CDC's National Typhoid and Paratyphoid Fever Surveillance (NTPFS) system (*5*). Information is collected on travel history in the 30 days preceding illness. Public health laboratories in 54 state and local health departments forward all Typhi isolates to CDC's National Antimicrobial Resistance Monitoring System (NARMS) in batched shipments for antimicrobial susceptibility testing (*6*). The NARMS laboratory uses broth microdilution to determine the minimum inhibitory concentration (MIC) for 14 antimicrobial agents. Resistance is defined by MIC breakpoints established by the Clinical and Laboratory Standards Institute (CLSI) where available (*7*). Typhi isolates are categorized as fluoroquinolone nonsusceptible if their MICs are classified as intermediate (MIC ≥0.12–0.5 μg/mL) or resistant (MIC ≥1.0 μg/mL) to ciprofloxacin. Typhi isolates are defined as MDR if they are resistant to chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole, and as XDR if they are MDR, nonsusceptible to fluoroquinolones, and resistant to third-generation cephalosporins. In March 2018, CDC enhanced surveillance for typhoid fever by asking state and local health departments to interview every patient with typhoid fever about travel to or from Pakistan and to expedite submission of Typhi isolates from these patients to CDC. Surveillance data from NARMS and NTPFS from 2006–2015 were compared with data from 2016–2018 and reviewed for XDR cases among persons who traveled to Pakistan.

During 2006–2015, a total of 3,538 patients with culture-confirmed typhoid fever were reported to NTPFS (median = 338 patients annually), including 244 (7%) who traveled to only Pakistan in the 30 days before onset (median = 23 patients annually) (Table 1). During 2006–2015, NARMS tested 3,598 Typhi isolates. Among these, 2,350 (65%) were fluoroquinolone nonsusceptible, 418 (12%) were MDR, and none had resistance to ceftriaxone. Fluoroquinolone nonsusceptibility increased from 55% (177 of 323 isolates) in 2006 to 66% (221 of 336) in 2015. Information on international travel was available for 2,242 (62%) patients with isolates tested by NARMS; 169 (8%) traveled to only Pakistan. Of 169 isolates from travelers to Pakistan, 133 (79%) were fluoroquinolone nonsusceptible and 85 (50%) were MDR (Table 1). During 2016–2018, 29 patients with typhoid fever reported travel to or from Pakistan and had isolates tested for antimicrobial susceptibility; among these, five patients had XDR Typhi (Table 2). All patients with XDR Typhi who had traveled to

* https://www.cdc.gov/typhoid-fever/symptoms.html.

TABLE 1. Number of patients with laboratory-confirmed typhoid fever reported to CDC's National Typhoid and Paratyphoid Fever Surveillance System, number of isolates tested by the National Antimicrobial Resistance Monitoring System (NARMS), and antibiotic susceptibility — United States, 2006–2015

Characteristic	No.	No. of patients with travel to Pakistan only
Patients with laboratory-confirmed typhoid fever	3,538	244
Typhi isolates tested by NARMS*	3,598	169
Fluoroquinolone nonsusceptible (% of isolates tested)†	2,350 (65)	133 (79)
MDR (% of isolates tested)†	418 (12)	85 (50)
Ceftriaxone-resistant	0	0

Abbreviation: MDR = multidrug resistant (resistant to chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole).
* Representing 2,242 patients with confirmed typhoid fever for whom travel information was available.
† Not mutually exclusive.

TABLE 2. Characteristics of 29 patients with culture-confirmed typhoid fever who traveled to or from Pakistan — National Typhoid and Paratyphoid Fever Surveillance System, United States, 2016–2018*

Characteristic	No. (%)
Sex	
Male	14 (48)
Female	15 (52)
Age group (yrs)	
0–5	5 (17)
6–11	9 (31)
12–17	8 (28)
18–44	6 (21)
45–63	1 (3)
Traveled to visit friends or relatives	
Yes	24 (83)
No	1 (3)
Unknown	4 (14)
Antibiotic resistance†	
Pansusceptible	2 (7)
Fluoroquinolone nonsusceptible	9 (31)
Fluoroquinolone nonsusceptible and MDR	13 (45)
XDR§	5 (17)

Abbreviations: MDR = multidrug resistant; XDR = extensively drug-resistant.
* Includes patients reported to CDC through October 12, 2018.
† Based on the following four mutually exclusive categories: 1) pansusceptible; 2) fluoroquinolone nonsusceptible; 3) fluoroquinolone nonsusceptible and MDR (resistant to chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole); and 4) XDR (fluoroquinolone nonsusceptible, MDR, and resistant to third-generation cephalosporins).
§ Patients with XDR Typhi were aged 4–12 years.

or from Pakistan were children aged 4–12 years and traveled to or from Pakistan during late 2017 through mid-2018.

Discussion

A large typhoid fever outbreak in Pakistan has resulted in 5,372 XDR Typhi cases reported during 2016–2018, and five travel-related cases in the United States. Approximately 250,000 trips to Pakistan were taken from the United States in 2017 (modeled data from OAG, Inc., https://www.oag.com); travelers to Pakistan might be at risk for acquiring XDR Typhi and having limited treatment options. Spread of the XDR Typhi strain to neighboring countries, such as India, might occur; approximately 2.4 million trips from the United States to India were taken in 2017 (modeled data from OAG, Inc.), and returning travelers from India typically account for 57%–69% of typhoid fever cases reported to CDC (*5*,*8*).

Providers caring for patients with suspected typhoid fever should obtain a travel history, blood and stool cultures, and antimicrobial susceptibility testing. Serologic tests have several limitations and do not yield a bacterial isolate that can be used for antimicrobial susceptibility testing; they should not be used to diagnose typhoid fever. Patients with confirmed typhoid fever should be reported to the local health department. Health departments should notify CDC of typhoid fever cases and send all Typhi isolates to NARMS for antimicrobial susceptibility testing.

Most typhoid fever infections diagnosed in the United States are fluoroquinolone nonsusceptible; therefore, health care providers should not use fluoroquinolones as empiric therapy, especially in returning travelers from South Asia (*8*). Fluoroquinolone nonsusceptibility has been associated with treatment failure or delayed clinical response (*4*). Typhoid fever relapses involving a similar, but often less severe, illness can occur even with appropriate treatment, typically 1–3 weeks after initial clinical improvement (*4*).

The emergence of fluoroquinolone nonsusceptible strains that are resistant to third-generation cephalosporins, such as ceftriaxone, in Pakistan and other countries complicates typhoid fever treatment.† The XDR Typhi strain is only susceptible to azithromycin and carbapenems. Azithromycin should be used to treat patients with suspected uncomplicated typhoid fever who have traveled to or from Pakistan. Azithromycin dosing for typhoid fever is higher than the dosage for more routine indications (*9*). Patients with suspected severe or complicated typhoid fever (which includes encephalopathy, intestinal perforation, peritonitis, intestinal hemorrhage, or bacteremia with sepsis or shock) and who have traveled to or from Pakistan might need to be treated with a carbapenem (*9*). Treatment regimens can be adjusted when culture and sensitivity results are available.

Effective strategies to promote pretravel typhoid vaccination, surveillance with rapid reporting of XDR Typhi cases, and use of alternative empiric treatments when clinical suspicion is high are critical to preventing and treating further travel-associated cases. Two typhoid fever vaccines are available in the United States for travelers: an oral live, attenuated vaccine

† https://doi.org/10.1128/mBio.02112-18.

Summary

What is already known about this topic?

Extensively drug-resistant (XDR) *Salmonella* Typhi causing a typhoid fever outbreak in Pakistan is susceptible only to azithromycin and carbapenems.

What is added by this report?

During 2006–2015, 79% of U.S. isolates from typhoid fever patients who traveled to Pakistan were fluoroquinolone nonsusceptible. During 2016–2018, typhoid fever was diagnosed in 29 U.S. patients with recent Pakistan travel; five had XDR Typhi.

What are the implications for public health practice?

Vaccination can help prevent typhoid fever. Fluoroquinolones should not be used for empiric treatment of typhoid fever patients who traveled to South Asia. Patients with travel to Pakistan should be treated with azithromycin for uncomplicated typhoid fever and with carbapenems for complicated disease.

(Vivotif) and an intramuscular Vi capsular polysaccharide vaccine (Typhim Vi). Both vaccines are moderately effective, protecting 50%–80% of recipients. The oral vaccine can be given to persons aged ≥6 years at least 1 week before travel, and the intramuscular vaccine can be given to persons aged ≥2 years at least 2 weeks before travel (*10*).

The findings in this report are subject to at least two limitations. First, surveillance data from NTPFS and NARMS identify only culture-confirmed infections, which represent a fraction of all infections. Second, some Typhi isolates were from patients for whom a case report form with travel information was not sent to NTPFS; thus travel history and resistance data were not available for all confirmed cases of typhoid fever.

Vaccination and safe food and water practices (only drinking water that is disinfected or bottled and washing hands before eating) while traveling provide the best protection from typhoid fever (*10*). Travelers should seek medical care if they become ill while traveling abroad or after returning home. Early clinical suspicion for typhoid fever can ensure that cultures are sent to the laboratory and that appropriate antibiotic treatment is started quickly, thereby reducing morbidity and mortality. In the United States, collaboration among health care providers, local and state health departments, and CDC is essential to ensuring that emerging resistance patterns are identified quickly and that patients receive appropriate treatment. Globally, public health partners should work to improve prevention efforts that include vaccination in the face of diminishing therapeutic options.

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Establishing Baseline Cervical Cancer Screening Coverage — India, 2015–2016

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Cervical cancer is the second leading cause of new cancer cases and cancer-related deaths among women in India, with an estimated 96,922 new cases and 60,078 deaths each year.* Despite the availability of effective low-cost screening options in India, limited access to screening and treatment services, diagnosis at a later stage, and low investment in health care infrastructure all contribute to the high number of deaths (*1*). In 2016 the Ministry of Health and Family Welfare of India recommended cervical cancer screening using visual inspection with acetic acid every 5 years for women aged 30–65 years (per World Health Organization [WHO] guidelines) (*2*,*3*). To establish a baseline for cervical cancer screening coverage, survey data were analyzed to estimate the percentage of women aged 30–49 years who had ever been screened for cervical cancer (defined as ever having had a cervix examination). Cervical cancer screening was estimated using data from the Fourth National Family Health Survey† (NFHS-4), a nationally representative survey conducted at the district level during 2015–2016, which included 699,686 Indian women aged 15–49 years. Lifetime cervical cancer screening prevalence was low (29.8%) and varied by geographic region, ranging from 10.0% in the Northeast Region to 45.2% in the Western Region. Prevalence of screening was higher among women with higher levels of education and household wealth, those who had ever been married, and urban residents. This screening prevalence can be used as a baseline indicator for cervical cancer screening in India in accordance with the WHO Noncommunicable Diseases Global Monitoring Framework during state-based programmatic rollout and program evaluation (*4*).

The 2015–2016 NFHS-4, a cross-sectional, nationally representative survey, was conducted in all 29 states and seven union territories in India; it included a sample of 699,686 women aged 15–49 years in both urban and rural areas, with a 97.6% response rate. The survey questionnaire underwent pretesting and was translated into 18 regional languages and back-translated to ensure consistency. To ascertain cervical cancer screening, women aged 30–49 years were asked "Have you ever undergone a cervix examination?" Weighted prevalence estimates of women who reported screening and 95% confidence intervals (CIs) were calculated. Chi-squared tests were used to assess statistical significance of differences, defined as a p-value <0.05. Data were stratified by age, rural/urban residence, level of education, marital status, household wealth index,§ religion, work status, caste/tribe status,¶ partner's education, and geographic region.** Maps were created to display weighted prevalence estimates.

Overall, among 336,777 women aged 30–49 years, 29.8% (95% CI = 29.4%–30.2%) reported ever having been screened for cervical cancer (Table). Screening prevalence increased with women's educational level and that of their partners, ranging from 24.7% among women with no formal education to 37.1% among women who had completed grade 12 or higher, and from 26.3% among those whose partners had no formal education to 36.9% among those whose partners had at least a grade 12 level education.

Cervical cancer screening prevalence varied by women's marital status, from a low of 6.2% among those who were never married to 30.5% among those who were currently married. When assessed by household wealth, prevalence was lowest among women from the poorest households (17.1%) and highest among those from the wealthiest households (40.4%). Screening prevalences were lower among Hindu (29.4%) and Muslim (26.8%) women than among Sikh (50.2%), Buddhist (48.2%), and Christian (39.1%) women,

* International Agency for Research on Cancer Global Cancer Observatory. http://gco.iarc.fr/today/data/factsheets/populations/356-india-fact-sheets.pdf.

† National Family Health Survey-4, India, 2015–2016, data version 73. http://rchiips.org/NFHS/nfhs4.shtml and https://dhsprogram.com/.

§ The household wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using data on a household's ownership of selected assets, such as televisions and bicycles, materials used for housing construction, and types of water access and sanitation facilities.

¶ Scheduled Classes, Scheduled Tribes, and "Other Backward Classes" are constitutionally recognized categories describing historically, socially, educationally, and/or economically disadvantaged groups that are officially recognized in India. "General" is a group that has a higher status in the caste hierarchy. Scheduled Castes are castes that the Government of India identifies as in need of special protection from social injustice and exploitation. They are explicitly recognized by the Constitution of India, were previously called the "depressed classes" by the British; other past names were untouchables or dalits. Scheduled Tribes consist of approximately 700 tribes that tend to be geographically isolated and have limited economic and social interaction with the rest of the population. Although there is a substantial degree of heterogeneity within each category, these categories are routinely used for population-based monitoring in India.

** *North:* Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, and Rajasthan. *Central:* Chhattisgarh, Madhya Pradesh, Uttarakhand, and Uttar Pradesh. *East:* Bihar, Jharkhand, Odisha, and West Bengal. *Northeast:* Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. *Western:* Goa, Gujarat, and Maharashtra. *South:* Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, and Telangana. *Union territories:* Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Delhi, Lakshadweep, and Puducherry.

TABLE. Prevalence of cervical cancer screening among women aged 30–49 years, by demographic and socioeconomic characteristics — Fourth National Family Health Survey, India, 2015–2016

Characteristic	No. in sample	Weighted screening prevalence, % (95% CI)	p-value (chi-squared)*
Overall	**336,777**	**29.8 (29.4–30.2)**	—
Age group (yrs)			
30–34	97,048	29.0 (28.4–29.6)	<0.0001
35–39	90,433	29.5 (29.0–30.0)	
40–44	76,627	30.4 (29.9–31.0)	
45–49	72,669	30.7 (30.1–31.3)	
Education			
No education	143,607	24.7 (24.2–25.2)	<0.0001
Grades 1–8	96,582	29.9 (29.4–30.4)	
Grades 9–11	51,753	36.9 (36.1–37.8)	
Grades ≥12	44,835	37.1 (36.1–38.1)	
Partners' education†			
No education	13,470	26.3 (25.1–27.5)	<0.0001
Grades 1–8	18,214	31.4 (30.3–32.6)	
Grades 9–11	13,735	35.9 (34.4–37.3)	
Grades ≥12	12,524	36.9 (35.2–38.5)	
Marital status			
Never married	7,165	6.2 (5.0–7.3)	<0.0001
Currently married	305,662	30.5 (30.1–30.9)	
Widowed	18,838	25.9 (24.9–27.0)	
Divorced/Separated/Deserted	5,112	24.9 (23.0–26.9)	
No. of children			
0	17,562	27.6 (26.4–28.8)	<0.0001
1	31,029	33.0 (32.0–34.0)	
2	98,185	34.0 (33.4–34.6)	
≥3	190,001	26.8 (26.5–27.2)	
Household wealth index§			
Poorest	63,723	17.1 (16.6–17.5)	<0.0001
Poor	69,441	23.1 (22.5–23.6)	
Middle	68,525	30.2 (29.5–30.8)	
Rich	67,191	34.7 (33.9–35.4)	
Richest	67,897	40.4 (39.5–41.3)	
Working status†			
Currently working	17,732	31.9 (30.7–33.1)	0.6000
Not currently working	41,489	32.1 (31.3–33.0)	
Religion¶			
Hindu	252,410	29.4 (29.0–29.9)	<0.0001
Muslim	40,686	26.8 (25.9–27.8)	
Christian	26,378	39.1 (37.0–41.1)	
Sikh	7,953	50.2 (47.3–53.0)	
Buddhist	4,587	48.2 (43.4–52.9)	
Jain	597	38.6 (32.3–44.8)	
Other	4,166	9.1 (7.3–11.0)	
Caste/Tribe status**			
Scheduled Caste	57,860	28.2 (27.3–29.1)	<0.0001
Scheduled Tribe	61,013	25.1 (24.2–26.1)	
"Other Backward Class"	130,332	30.8 (30.3–31.4)	
General	85,963	31.2 (30.5–31.9)	
Do not know	1,609	17.3 (14.4–20.2)	
Place of residence			
Urban	102,300	34.0 (33.2–34.8)	<0.0001
Rural	234,477	27.5 (27.1–27.9)	
Geographic regions††			
North	56,018	37.0 (36.2–37.9)	<0.0001
Central	91,087	22.7 (22.1–23.3)	
East	59,048	15.7 (15.2–16.2)	
Northeast	49,292	10.0 (9.5–10.5)	
Western	27,537	45.2 (43.8–46.6)	
South	45,070	38.1 (37.2–39.0)	
Union Territories	8,725	41.2 (35.3–47.0)	

See table footnotes on next page.

TABLE. (*Continued*) Prevalence of cervical cancer screening among women aged 30–49 years, by demographic and socioeconomic characteristics — Fourth National Family Health Survey, India, 2015–2016

Characteristic	No. in sample	Weighted screening prevalence, % (95% CI)	p-value (chi-squared)*
State/Union territory by region			
North			<0.0001
Haryana	10,097	42.0 (39.8–44.1)	
Himachal Pradesh	5,604	30.8 (28.5–33.0)	
Jammu and Kashmir	11,107	50.7 (48.7–52.8)	
Punjab	10,210	51.3 (48.3–54.2)	
Rajasthan	19,000	26.0 (24.7–27.3)	
Central			
Chhattisgarh	11,551	23.7 (21.9–25.4)	
Madhya Pradesh	29,475	30.1 (29.0–31.1)	
Uttarakhand	8,103	23.0 (21.2–24.8)	
Uttar Pradesh	41,958	19.2 (18.4–19.9)	
East			
Bihar	20,215	18.1 (17.2–19.0)	
Jharkhand	13,282	15.3 (14.3–16.4)	
Odisha	16,837	34.4 (32.8–36.0)	
West Bengal	8,714	5.2 (4.6–5.9)	
Northeast			
Arunachal Pradesh	7,291	10.5 (9.3–11.6)	
Assam	13,942	6.3 (5.6–7.0)	
Manipur	7,156	25.5 (24.1–27.0)	
Meghalaya	4,087	27.0 (24.6–29.5)	
Mizoram	6,314	30.9 (28.6–33.2)	
Nagaland	5,518	20.9 (19.3–22.5)	
Sikkim	2,559	15.9 (13.7–18.2)	
Tripura	2,425	7.6 (6.0–9.2)	
Western			
Goa	989	64.6 (59.3–69.8)	
Gujarat	11,788	33.2 (31.2–35.2)	
Maharashtra	14,760	51.0 (49.2–52.8)	
South			
Andhra Pradesh	5,618	42.6 (40.4–44.8)	
Karnataka	13,567	18.4 (16.9–20.0)	
Kerala	6,399	78.1 (76.3–80.0)	
Tamil Nadu	15,724	31.0 (29.7–32.4)	
Telangana	3,762	41.2 (38.2–44.3)	
Union territories			
Andaman and Nicobar Islands	1,563	28.8 (23.4–34.3)	
Chandigarh	385	73.6 (66.1–81.0)	
Dadra and Nagar Haveli	361	23.4 (16.8–30.1)	
Daman and Diu	677	52.6 (44.3–60.9)	
Delhi	2,899	40.7 (33.7–47.8)	
Lakshadweep	596	71.8 (66.7–76.8)	
Puducherry	2,244	28.9 (22.2–35.6)	

* Chi-square test, significantly different if p<0.05 among groups; p-values were calculated using prevalence to the hundredth decimal place.
† Partners' education and work status were collected in only a random subset of households selected for state-modules and limited to married women so do not sum to total.
§ The household wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using data on a household's ownership of selected assets such as televisions and bicycles, materials used for housing construction, and types of water access and sanitation facilities.
¶ Other included Jewish, Parsi/Zoroastrian, no religion, and other religion.
** Scheduled Caste, Scheduled Tribe, and "Other Backward Class" are constitutionally recognized categories describing historically, socially, educationally, and/or economically disadvantaged groups that are officially recognized in India. "General" is a category that does not belong to any of the prior three categories. Although there is a substantial degree of heterogeneity within each category, these categories are routinely used for population-based monitoring in India.
†† *North*: Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, and Rajasthan. *Central*: Chhattisgarh, Madhya Pradesh, Uttarakhand, and Uttar Pradesh. *East:* Bihar, Jharkhand, Odisha, and West Bengal. *Northeast*: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. *Western*: Goa, Gujarat, and Maharashtra. *South:* Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, and Telangana. *Union territories:* Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Delhi, Lakshadweep, and Puducherry.

and lower among women who belonged to a Scheduled Tribe (25.1%) or Scheduled Caste (28.2%) than among women in "Other Backward Classes" (30.8%) or the general category.

Geographically, screening prevalence was higher among women in urban (34.0%) than among those in rural (27.5%) areas, and higher in the Western Region (45.2%), union territories (41.2%), South Region (38.1%), and North Region (37.0%) than in the Northeast (10.0%), East (15.7%), and Central (22.7%) regions (Figure). Across states, screening prevalence ranged from 5.2% (West Bengal) to 78.1% (Kerala) (Table).

Discussion

Nationally, fewer than one in three Indian women reported having been screened for cervical cancer, although screening prevalence was highly variable across states and within districts, and was higher in urban areas. Higher screening prevalence was associated with education of women and their partners, wealth, and marriage.

The operational framework in India recommends a screen-and-treat approach using visual inspection with acetic acid, consistent with WHO guidelines for countries that do not have cervical cancer screening programs in place or resources for Papanicolaou (Pap) or human papillomavirus testing[††] (*2*,*3*). Visual inspection with acetic acid screening programs in India have been found through randomized controlled trials to effectively reduce cervical cancer mortality by approximately 30% (*5*,*6*).

The historical focus of the health system in India has been on maternal and child health and communicable diseases. However, it is also important to take into account the epidemiologic transition and demographic shift in the Indian population to more disability-adjusted life years from noncommunicable, chronic diseases than from communicable, maternal, neonatal, and nutritional diseases (*7*). The decision of India's Ministry of Health and Family Welfare to provide guidance in 2016 on universal population-based cervical cancer screening among women aged 30–65 years is a response to this epidemiologic transition. Screening of women in the target population will be recommended every 5 years; surveillance during the initial rollout and each 5-year interval will be evaluated, and strategies will be modified to improve screening rates (*2*).

The national and state cervical cancer screening baseline estimates in this study can be used for programmatic rollout, implementation benchmarks, and program evaluation in accordance with the WHO cervical cancer indicator[§§] for women aged 30–49 years screened for cervical cancer (*4*). Cervical cancer screening can also be monitored in age groups outside the recommended guidelines to evaluate effective implementation of screening recommendations.

The findings of this study are subject to at least three limitations. First, despite the intention that the survey question serve as an indicator for cervical cancer screening, women might have reported cervical examinations that were not related to cervical cancer screening. This could lead to an overestimation of screening prevalence. There is a concern that women might have confused a pelvic exam with a cervical cancer screening test; however, as in the United States, self-reported questions have proved to be a consistent way of measuring screening prevalence in countries with no organized screening program or screening registries (*8*,*9*). Second, it is possible that women might have responded in a manner they viewed as more socially acceptable. Finally, with dialect differences, survey questions might not have been fully understood. The next version of the survey (NFHS-5) will specifically ask women whether they have undergone a screening test for cervical cancer. A study to determine accuracy of self-reported screening of the survey question compared with that of clinical records might be beneficial.

The main strength of this study is the large sample size of the nationally representative survey. These are the first reported data on cervical cancer screening in India that allow examination across all states and union territories down to the district level. Previous national estimates were based on smaller sample sizes in older data sources; for example, the 2003 World Health Survey, a household survey of 3,954 women found that 5.3% of Indian women aged 25–64 years reported having been screened with a Pap test in the past 3 years (*10*).

Moving forward with the state-level screening program rollouts in India, it is important to consider how socioeconomic factors might be associated with acceptance of screening at the district, state, and national levels. In the future, these baseline data can be used to plan and evaluate cervical cancer screening programs, perform cost-effectiveness analyses, and evaluate facility readiness. Prioritizing geographic areas and groups with lower screening prevalences might be needed to progress to India's national goal of universal cervical cancer screening (*3*).[¶¶]

At the May 2018 World Health Assembly, the WHO Director-General issued a call to action to eliminate cervical cancer globally as a public health problem, including comprehensive strategies such as vaccination, screening, and treatment.[***] Strong surveillance systems that include cancer

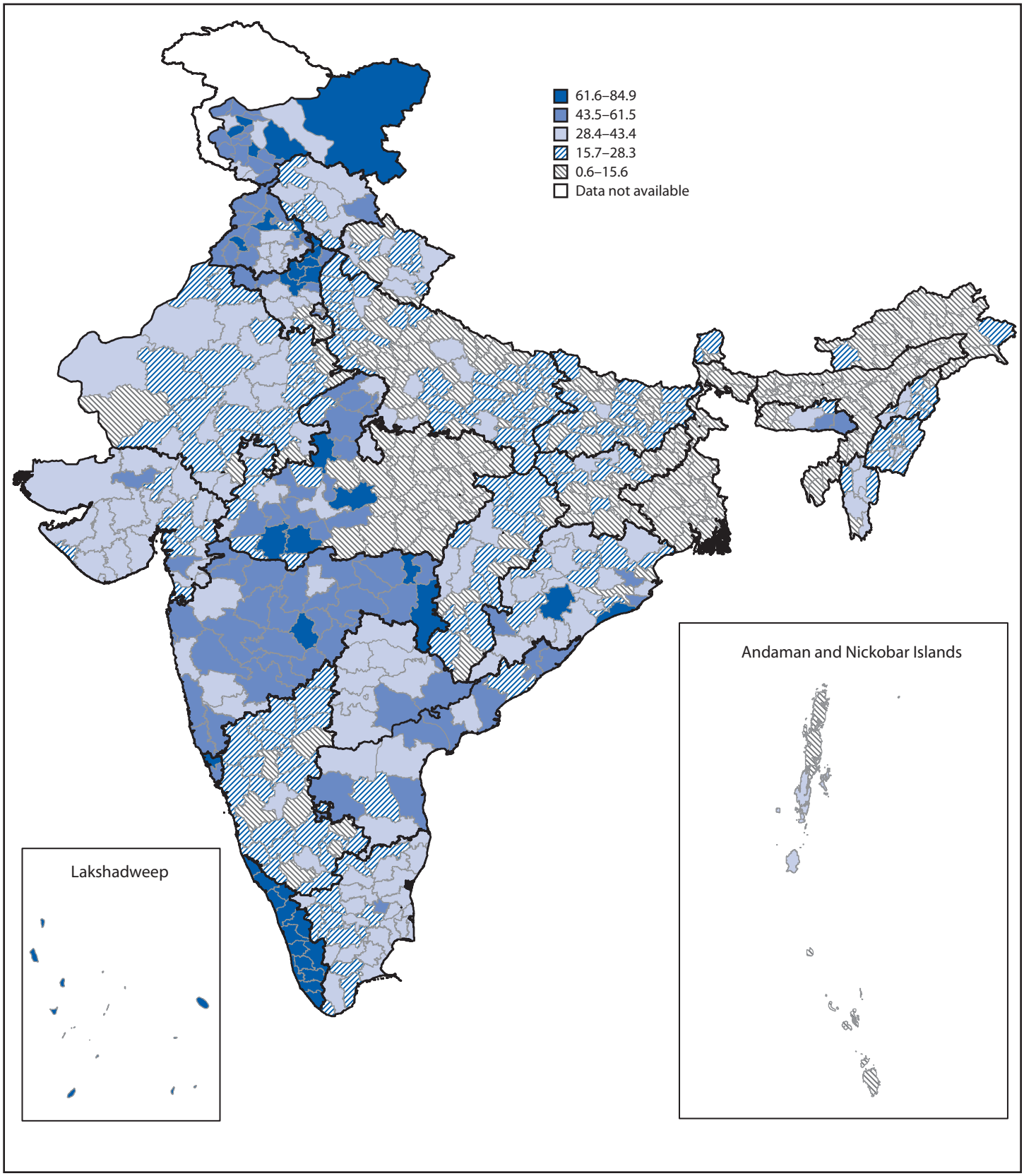
[††] http://nicpr.res.in/images/PDF/guidelines_for_population_level_screening_of_common_NCDs.pdf.

[§§] Proportion of women aged 30–49 years screened for cervical cancer at least once, or more often, and for lower or higher age groups according to national programs or policies.

[¶¶] https://www.bmj.com/content/bmj/355/bmj.i5574.full.pdf.

[***] https://www.who.int/reproductivehealth/call-to-action-elimination-cervical-cancer/en.

FIGURE. Prevalence of cervical cancer screening among women aged 30–49 years, by district — National Family Health Survey-4, India, 2015–2016



Summary

What is already known about this topic?

Cervical cancer is the second leading cause of cancer mortality among women in India; in 2016 the Ministry of Health and Family Welfare of India recommended population-based cervical cancer screening in women aged ≥30 years.

What is added by this report?

Among women in India aged 30–49 years, less than one third (29.8%) reported ever having been screened for cervical cancer. There was substantial geographic variation, and screening prevalence was associated with education of women and their partners, wealth, and marriage.

What are the implications for public health practice?

These estimates can be used as baseline data to plan cervical cancer screening targeted interventions, programmatic rollouts, and evaluation to help India meet the goal of universal cervical cancer screening.

registries, national surveys, or registries that can measure screening or vaccination coupled with modeling will all play an important role in ensuring that cervical cancer can be eliminated as a public health problem in women.

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Notes from the Field

Respiratory Syncytial Virus Infections in a Neonatal Intensive Care Unit — Louisiana, December 2017

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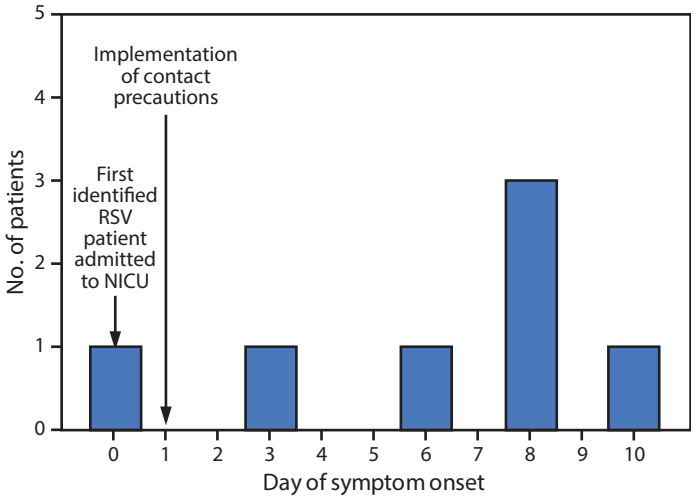
In December 2017, the Louisiana Department of Health was notified of seven cases of respiratory syncytial virus (RSV) infection in a five-unit (units A–E), 84-bed neonatal intensive care unit (NICU) that included 66 individual infant rooms. The first case occurred in an infant who had been discharged postpartum from the NICU 30 days earlier and was readmitted for respiratory distress (day 0), approximately 2 weeks after the peak in reported RSV cases in Louisiana (mid-November) (*1*). The other six infants had at least one respiratory symptom while in the NICU postpartum. Upon identification of the first case, the facility implemented contact precautions for symptomatic infants, and NICU staff members were asked to report any respiratory symptoms. Nasopharyngeal specimens were obtained from infants who had rhinorrhea, cough, or nasal congestion. Nasopharyngeal swabs were also obtained from asymptomatic infants in two of the three units where the seven identified patients resided. A case was defined as laboratory-confirmed RSV infection in an NICU patient during December 2017. After consultation with CDC, a team of Louisiana Department of Health epidemiologists visited the facility 3 days after notification to review medical charts, observe infection control procedures, interview NICU staff members, and determine measures to prevent further transmission.

All seven patients were born at the facility. The first identified RSV case occurred in the only patient who had been discharged. Symptom onsets occurred over an 11-day period (Figure). Six of the seven patients were born at 25–36 weeks' gestational age. One patient was housed in unit A, one in unit B, and five in unit C. The median age of patients from birth to symptom onset was 15 days (range = 7–147 days). The most commonly observed signs and symptoms among patients with RSV included cough (four patients), nasal congestion (seven), tachypnea (four), tachycardia (four), and poor feeding (four). One patient required bilevel positive airway pressure, another required continuous positive airway pressure, and a third required endotracheal intubation and mechanical ventilation. Hospital staff members reported that two of the patients were visited by ill family members despite a policy prohibiting ill visitors. No staff members reported symptoms.

FIGURE. Day of symptom onset among seven patients with respiratory syncytial virus (RSV) infection in a neonatal intensive care unit (NICU) — Louisiana, December 2017*



* Infection presentation by location: day 0 (unit A), days 3–8 (unit C), and day 10 (unit B).

Respiratory specimens from the seven patients were tested at the hospital laboratory by real-time reverse transcription-polymerase chain reaction; all were positive for RSV and negative for influenza, coronavirus, parainfluenza, and human metapneumovirus. Nasal swabs were sent to CDC for subtype-specific testing by real-time reverse transcription-polymerase chain reaction. All seven specimens were identified as RSV type B. Enterovirus or rhinovirus was also detected in one patient's specimen. No additional patients had RSV detected in any specimens.

During the facility visit, epidemiologists reviewed infection control policies, availability and use of personal protective equipment, infection control signage, visitor education, and environmental cleaning. Louisiana Department of Health recommended that the facility, in addition to the standard and contact precautions already in place, implement droplet precautions; restrict visitation from sick persons and children aged <12 years; that visitors, including family members, wear facemasks when entering patient rooms; and that the facility increase hand hygiene stations, enhance environmental cleaning, and designate certain staff members to care for RSV patients. No additional cases were identified during the 14 days following the last observed symptom onset, and all seven patients recovered.

RSV is a leading cause of lower respiratory tract infections in young children worldwide. In the United States, infants aged ≤2 months have an estimated hospitalization rate of 17.9 per 1,000 each year (*2*). During the RSV season (typically fall through spring), health care facilities are at increased risk for nosocomial transmission of RSV, although such transmission is rarely identified and reported to public health officials. Transmission within NICUs is of particular concern because of the presence of infants at high risk, including preterm infants and infants with underlying medical conditions (*3*). To prevent RSV transmission in health care facilities, standard and contact precautions (*4*), cohorting of symptomatic patients and staff members, excluding symptomatic visitors and young siblings, and emphasizing hand hygiene practices are recommended (*3*).

Acknowledgments

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All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

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Effective January 11, 2019, the *MMWR* Series will no longer offer new continuing education (CE) activities through CDC's Training and Continuing Education Online (TCEO) system. TCEO CE activities posted before January 11, 2019, will remain available until their expiration date (https://www.cdc.gov/mmwr/cme/weekly_conted.html).

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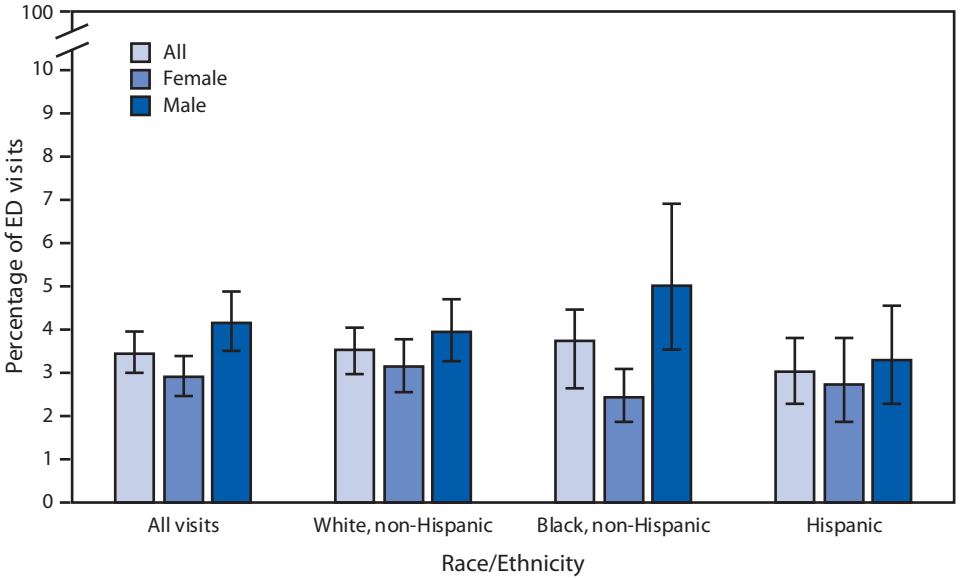
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Emergency Department (ED) Visits† Made by Patients with Chronic Kidney Disease§ Among Persons Aged ≥18 Years, by Race/Ethnicity and Sex — National Hospital Ambulatory Medical Care Survey, 2015–2016



* With 95% confidence intervals indicated with error bars.
† Based on a sample of visits to EDs in noninstitutional general and short-stay hospitals, exclusive of federal, military, and Veterans Administration hospitals, located in the 50 states and District of Columbia. The "All visits" group includes all racial/ethnic groups, not just non-Hispanic White, non-Hispanic Black, and Hispanic.
§ Defined as ED visits made by patients with documentation in the medical record of a diagnosis of chronic kidney disease, regardless of the diagnosis for the current visit.

During 2015–2016, 3.5% of adult visits to the ED were made by those with chronic kidney disease. A higher percentage of visits were made by men with chronic kidney disease than women (4.1% compared with 2.7%). The same pattern was observed for non-Hispanic black men (5.0%) and women (2.4%). Although the pattern was similar, there was no statistically significant difference in ED visits by sex for Hispanic and non-Hispanic white adults.

Source: National Center for Health Statistics, National Hospital Ambulatory Medical Care Survey, 2015–2016.

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