

Silicosis Mortality Trends and New Exposures to Respirable Crystalline Silica — United States, 2001–2010

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Silicosis is a preventable occupational lung disease caused by the inhalation of respirable crystalline silica dust and can progress to respiratory failure and death (1). No effective specific treatment for silicosis is available; patients are provided supportive care, and some patients may be considered for lung transplantation. Chronic silicosis can develop or progress even after occupational exposure has ceased (1). The number of deaths from silicosis declined from 1,065 in 1968 to 165 in 2004 (2). Hazardous occupational exposures to silica dust have long been known to occur in a variety of industrial operations, including mining, quarrying, sandblasting, rock drilling, road construction, pottery making, stone masonry, and tunneling operations (1). Recently, hazardous silica exposures have been newly documented during hydraulic fracturing of gas and oil wells and during fabrication and installation of engineered stone countertops (3,4). To describe temporal trends in silicosis mortality in the United States, CDC analyzed annual multiple cause-of-death data for 2001–2010 for decedents aged ≥15 years.* During 2001–2010, a total of 1,437 decedents had silicosis coded as an underlying or contributing cause of death. The annual number of silicosis deaths declined from 164 (death rate[†] = 0.74 per 1 million population) in 2001 to 101 (0.39 per 1 million) in 2010 (p = 0.002). Because of new operations and tasks placing workers at risk for silicosis, efforts to limit workplace exposure to crystalline silica need to be maintained.

For this analysis, decedents for whom the *International Classification of Diseases, 10th Revision* code J62 (pneumocoinosis due to dust containing silica [silicosis][§]) was assigned

* Additional information available at <http://webappa.cdc.gov/ords/norms.html>.

[†] Death rates were age-adjusted to the 2000 standard U.S. population. The age intervals used were 15–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥85 years.

[§] Classic (chronic) silicosis results from exposure to respirable crystalline silica for >10 years; exposure to higher concentrations of silica for 5–10 years can cause accelerated silicosis, and symptoms of acute silicosis can sometimes develop within weeks of initial exposure to extremely high concentrations of silica.

as either the underlying[¶] or contributing cause of death were identified from 2001–2010 mortality data. Deaths of persons aged ≥15 years were analyzed. Trends in annual age-adjusted death rates per 1 million population were examined using a first-order autoregressive linear regression model. Differences in death rates were considered to be statistically significant if 95% confidence intervals did not overlap.

During 2001–2010, 1,437 decedents had silicosis coded as the underlying or contributing cause of death. Of these, 28 (1.9%) were aged 15–44 years, 1,370 (95.3%) were males, and 1,236 (86.0%) were whites (Table). The overall age-adjusted

[¶] Underlying cause of death is defined as “the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury.”

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TABLE. Number and rate* of silicosis deaths, by selected characteristics and year — United States, 2001–2010

Characteristic	Age group (yrs)						Overall		
	15–44			≥45			No.	Rate	(95% CI)
	No.	Rate	(95% CI)	No.	Rate	(95% CI)	No.	Rate	(95% CI)
Total	28	0.01	(0.01–0.01)	1,409	0.58	(0.55–0.61)	1,437	0.59	(0.56–0.62)
Sex									
Male	23	0.02	(0.01–0.03)	1,347	1.37	(1.30–1.44)	1,370	1.39	(1.32–1.46)
Female	5	0.00	—	62	0.04	(0.03–0.05)	67	0.05	(0.04–0.06)
Race									
White	22	0.01	(0.01–0.02)	1,214	0.57	(0.54–0.60)	1,236	0.59	(0.56–0.62)
Black	5	0.01	(0.01–0.05)	181	0.85	(0.72–0.98)	186	0.87	(0.74–1.00)
Other	1	0.01	(0.00–0.06)	14	0.15	(0.08–0.25)	15	0.16	(0.09–0.26)
Year									
2001	1	0.00	—	163	0.74	(0.63–0.85)	164	0.74	(0.63–0.85)
2002	5	0.02	(0.01–0.05)	143	0.64	(0.54–0.74)	148	0.66	(0.55–0.77)
2003	6	0.02	(0.01–0.07)	173	0.76	(0.65–0.87)	179	0.78	(0.67–0.89)
2004	3	0.01	(0.00–0.03)	163	0.70	(0.59–0.81)	166	0.71	(0.60–0.82)
2005	2	0.01	(0.00–0.04)	159	0.67	(0.57–0.77)	161	0.68	(0.57–0.79)
2006	6	0.02	(0.01–0.07)	120	0.49	(0.40–0.58)	126	0.52	(0.43–0.61)
2007	1	0.00	—	122	0.49	(0.40–0.58)	123	0.50	(0.41–0.59)
2008	2	0.01	(0.00–0.04)	146	0.58	(0.49–0.67)	148	0.58	(0.49–0.67)
2009	1	0.00	—	120	0.47	(0.39–0.55)	121	0.48	(0.39–0.57)
2010	1	0.01	(0.00–0.06)	100	0.38	(0.30–0.46)	101	0.39	(0.31–0.47)
p-value [†]	— [§]	— [§]		0.012	0.002		0.010	0.002	

Abbreviation: CI = confidence interval.

* Rate per 1 million persons, age-adjusted to the 2000 U.S. standard population.

† For 2001–2010 trend.

§ Trend test not performed because of small number of deaths.

silicosis death rate for blacks (0.87 per 1 million) was significantly higher than the rate for whites (0.59) and other races (0.16). The age-adjusted silicosis death rate for males (1.39 per 1 million) was significantly higher than the rate

for females. The annual number of silicosis deaths declined from 164 (0.74 per 1 million) in 2001 to 101 (0.39) in 2010 (p for trend = 0.002).

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Discussion

A statistically significant decline in silicosis death rates was observed during 2001–2010. However, silicosis deaths still occurred among persons aged 15–44 years. Of 28 decedents aged 15–44 years, the youngest was aged 19 years. This would be consistent with the decedent developing acute silicosis after an extremely high exposure to respirable crystalline silica. Such findings indicate the importance of educating at-risk workers and their employers regarding the dangers of exposure to respirable crystalline silica in the workplace. The disparities by sex and by race reflect differences in the composition of the workforces in the industries and occupations placing workers at risk for exposure to crystalline silica dust.**

Approximately 2 million U.S. workers remain potentially exposed to respirable crystalline silica (5). Occupational exposures to dust containing crystalline silica have long been known to occur in mining, quarrying, sandblasting, pottery making, rock drilling, road construction, stone masonry, and tunneling operations (1,5). Despite enforceable limits†† on worker exposure to respirable crystalline silica, substantial overexposures continue to occur in the United States (3). Moreover, new job tasks that place workers at risk for silicosis continue to emerge.

In 2004, occupational disease surveillance programs in Michigan, New Jersey, Massachusetts, New York, and Ohio reported nine confirmed cases of silicosis among technicians who performed sandblasting in dental laboratories (6); in 2013, there were approximately 37,000 dental laboratory technicians in the United States.§§ In a 2012 report from Israel, a 2014 report from Spain, and a 2015 report from the United States, silicosis has been documented among workers exposed to respirable crystalline silica dust during the fabrication and installation of quartz-containing engineered stone products used primarily for kitchen and bathroom countertops (4,7,8). A 2013 report documented high levels of exposure to respirable crystalline silica during hydraulic fracturing of gas and oil wells (3). Moreover, a 2010 study reported an excess risk for silicosis in coal miners that was associated with silica as a component of coal mine dust formed during drilling, crushing, and loading of mine material (9). In 2013, there were approximately 204,000 oil and gas extraction industry workers and approximately 80,000 coal mining industry workers in the United States.¶¶

** Additional information available at <http://www.bls.gov/cps/wlf-databook-2013.pdf>.

†† Additional information available in “Lowering Miners’ Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors; Final Rule” (<http://www.gpo.gov/fdsys/pkg/FR-2014-05-01/pdf/2014-09084.pdf>) and “Criteria for a Recommended Standard: Occupational Exposure to Respirable Coal Mine Dust” (<http://www.cdc.gov/niosh/docs/95-106/pdfs/95-106.pdf>).

§§ Additional information available at http://www.bls.gov/oes/current/oes_nat.htm.

¶¶ Additional information available at http://www.bls.gov/opus/ee/2014/ces/table1a_201401.pdf.

What is already known on this topic?

Silicosis is an occupational lung disease caused by inhalation of respirable crystalline silica in a variety of industrial operations, including mining, quarrying, road construction, masonry, and tunneling. From 1968 to 2004, silicosis deaths in the United States declined from 1,065 per year to 165.

What is added by this report?

Although silicosis deaths decreased significantly from 164 in 2001 to 101 in 2010, they continued to occur among young persons, with 28 deaths reported among persons aged 15–44 years during 2001–2010. New work tasks, including hydraulic fracturing, sandblasting denim, and engineered stone counter-top fabrication and installation, can lead to overexposure to respirable crystalline silica.

What are the implications for public health practice?

Because of the serious health and socioeconomic consequences of silicosis, new operations and tasks placing workers at risk for silicosis, and the continuing occurrence of silicosis deaths, efforts to limit workplace exposure to crystalline silica need to be maintained. In addition, the long latency of silicosis warrants continuing surveillance. The Occupational Safety and Health Administration and CDC recommend best practices for protecting workers, including the use of engineering controls and respiratory protection.

Finally, although not in the United States, silicosis cases have been reported in other occupational settings, including among denim sandblasters (10).

In 1999, the Council of State and Territorial Epidemiologists made silicosis a nationally notifiable condition.*** In addition, because current permissible exposure limits for respirable crystalline silica do not adequately protect workers, the Occupational Safety and Health Administration (OSHA) has proposed amending the current standards. One of the proposed changes is a lower permissible exposure limit (5).

The findings in this report are subject to at least three limitations. First, silicosis deaths were not validated by medical records or follow-up with health care providers, thus findings might be subject to misclassification. Second, no individual work history is reported on death certificates. Therefore, it was not possible to identify those industries and occupations where the decedents’ exposures to crystalline silica occurred. Finally, inhalation of respirable crystalline silica can cause diseases other than silicosis, such as lung cancer and chronic obstructive pulmonary disease (1,5), which are not considered in this analysis.

*** Available at <http://c.yimcdn.com/sites/www.cste.org/resource/resmgr/ps/09-oh-01.pdf>.

Effective silicosis prevention strategies for employers recommended by OSHA^{†††} and CDC's National Institute for Occupational Safety and Health^{§§§} are available. Comprehensive silicosis prevention programs include substituting less hazardous noncrystalline silica alternatives when possible, implementing engineering controls (e.g., blasting cabinets, local exhaust ventilation, not using compressed air for cleaning surfaces, using water sprays to control airborne dust, and using surface wetting to prevent dust from becoming airborne when cutting, drilling, grinding, etc.), administrative and work practice controls, personal respiratory protective equipment, medical monitoring of exposed workers, and worker training. Because of the serious health and socioeconomic consequences of silicosis, new operations and tasks placing workers at risk for silicosis, and the continuing occurrence of silicosis deaths among young workers, effective primary prevention through elimination of exposure to respirable crystalline silica is critical. At the same time, because of the sometimes long latency of silicosis, with cases diagnosed years after exposure and often in retirement, ongoing silicosis surveillance is needed to track its prevalence in the United States.

^{†††} Available at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=12716.

^{§§§} Available at <http://www.cdc.gov/niosh/topics/silica>.

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Addressing Needs of Contacts of Ebola Patients During an Investigation of an Ebola Cluster in the United States — Dallas, Texas, 2014

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The first imported case of Ebola virus disease (Ebola) diagnosed in the United States was confirmed on September 30, 2014; two health care workers who cared for this patient subsequently developed Ebola (*1*). Since then, local, state, and federal health officials have continued to prepare for future imported cases, including developing strategies to identify and monitor persons who have had contact with an Ebola patient. This report describes some of the needs of persons who were contacts of Ebola patients in Texas. It is based on requests received from contacts in the course of daily contact tracing interactions and on how those needs were met through community partnerships. Meeting the needs of contacts of the Ebola patients was essential to successful contact tracing, which is critical to interrupting transmission. Although a formal needs assessment of contacts was not conducted, this report provides important information for preparing for an importation of Ebola. Anticipating the nonclinical needs of persons under public health surveillance includes addressing potential concerns about housing, transportation, education, employment, food, and other household needs. Ensuring necessary supports are in place for persons who are asked to refrain from entering public venues can impact their willingness to comply with voluntary and mandated quarantine orders. Engagement with a wide range of community partners, including businesses, schools, charitable foundations, community and faith-based organizations, and mental health resources would enhance public health emergency preparedness for Ebola by readying resources to meet these potential needs.

A total of 179 contacts (including the two health care workers who became infected and whose illnesses subsequently were counted as cases) of the three patients with Ebola diagnosed in Texas were identified, including 149 health care workers, 20 community contacts, and 10 persons who had been transported in the same ambulance that transported the first patient with Ebola before it was completely cleaned and disinfected (*1*). The 20 community and 10 ambulance contacts included the following at-risk or vulnerable populations (*2*): school-aged children (eight), non-English speakers (Spanish, Armenian, and Nepali) (three), persons with complex chronic medical conditions (two), and persons experiencing homelessness

(one). The person experiencing homelessness was initially difficult to locate. This person was given temporary quarters and quarantined to facilitate compliance with monitoring. Contact tracers from local and state health departments and CDC actively monitored contacts through twice-daily symptom and temperature checks at least 6 hours apart, once by telephone and once in-person (*3*). Five of the community contacts and two ambulance contacts were isolated under legal control orders, and at least 20 health care worker contacts voluntarily self-quarantined. A total of 68 health care worker contacts were eventually placed under controlled movement restrictions directing avoidance of public congregate settings, such as grocery stores and restaurants, as well as avoidance of long distance travel by commercial conveyances (*2*). Contacts often reported their needs and experiences to contact tracers on an ad hoc basis, including their feelings of social isolation. Specific needs were often related to the degree of social isolation experienced by the contacts. Some contacts reported difficulty obtaining basic necessities such as food, diapers, medical supplies, and refills of prescription medications. The 20 community contacts were part of seven households and included eight working adults, all of whom were excluded from work by employers. Six out of seven households required either financial support for rent and utilities and/or other assistance in procuring basic necessities such as food. Two households of the community contacts stated that they felt unsafe leaving their homes because of stigmatization by others in their community after their photos, names, and addresses had been published in the media.

All eight contacts who were children were excluded from school or daycare during the duration of the 21-day monitoring period. Procurement of childcare was a challenge encountered by families who were requested by schools or daycares to keep children home because of concerns that their children posed a risk to others in the school. Continuity of children's education was especially challenging in families without access to technology for home study. Witnessing the first Ebola patient's health deteriorate, and subsequently learning that two health care workers were ill, further heightened anxiety among health care contacts. More than three quarters of community and

health care worker contacts reported stress, social isolation, or stigma. A common report among health care worker contacts was that caring for the index patient was emotionally taxing. The majority of the health care worker contacts experienced some degree of anxiety about possibly becoming ill or infecting their family members.

Discussion

By working with local and charitable organizations, the contact tracing team was able to link contacts to sources of financial aid. Even among those who did not require financial assistance, seven (3.9%) requested help changing pre-existing reservations for airline flights scheduled for their monitoring period so that they could comply with their movement restrictions. Contact tracers also found that recognizing unique cultural, linguistic, and socioeconomic differences helped ensure contacts' compliance with monitoring, particularly among the community contacts (4). For example, the first Ebola patient was Liberian, and many of his contacts were part of the local Liberian community. Relationships between the contacts and the contact tracing team were strengthened when the team worked with aid organizations to provide familiar food and clothing in a culturally sensitive manner. The contact tracing team worked with local school districts and charitable foundations to provide laptops, textbooks, and school supplies to ensure students could access course materials. Teachers designed lesson plans and assignments that could be completed at home. Physicians from the Dallas County Medical Society also volunteered to present current information about Ebola to school administrators, teachers, and parents to help minimize stigma and ensure that all students would be welcomed back into their schools. Contact tracers also served as an important source of emotional support. In addition, social workers volunteered their time to provide counseling services to contacts, although only one contact used these services.

The findings in this report are subject to at least one limitation. This assessment did not include a formal, structured survey to quantify needs and thus was limited to ad hoc contact tracing data collected over the course of the public health response. Preparedness for similar responses in the future would benefit from developing a simple database to quantify and track contact needs and align them with community partner resources, including social workers in order to better address these issues.

Contact tracing in this challenging setting involved more than monitoring temperatures and checking for symptoms. Meeting the needs of contacts was essential to effective contact tracing and therefore was critical to interrupting Ebola

What is already known on this topic?

Little has been reported on the implications of being identified as an Ebola contact or on the nonclinical needs that might arise for this population.

What is added by this report?

Contact tracers from Dallas County Health and Human Services, the Texas Department of State Health Services, and CDC actively monitored 179 contacts of three Ebola patients in Texas, including 149 health care workers, 20 community contacts, and 10 persons who had been transported in the ambulance that transported the first patient with Ebola. Contacts were monitored daily with symptom and temperature checks. All contacts experienced some type of movement restriction. Meeting the needs of contacts of Ebola patients, including basic needs for food, financial assistance, and education, was essential to successful contact tracing, which is critical to interrupting transmission.

What are the implications for public health practice?

Engagement with a wide range of community partners, including businesses, schools, charitable foundations, community and faith-based organizations, and mental health resources would enhance public health emergency preparedness for Ebola. When this is done before the identification of an Ebola case, it can provide a useful basis for addressing the needs of persons identified as contacts of an Ebola case, and facilitates successful contact tracing during an Ebola investigation.

transmission in Dallas. Although this report focuses on preparing for possible future cases in the United States, lessons learned from this contact tracing experience might be useful in other sites where there are cases of Ebola. Unless preparations are made to address the needs of Ebola contacts, responders might have difficulty following all possible contacts and as a result, contact tracing might be incomplete. Partnering with businesses, schools, charitable foundations, community and faith-based organizations, and mental health resources before an Ebola case is identified is an important part of public health emergency preparedness and will be useful for responding to possible future cases of Ebola.

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Use of Group Quarantine in Ebola Control — Nigeria, 2014

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On July 20, 2014, the first known case of Ebola virus disease (Ebola) in Nigeria, in a traveler from Liberia (1), led to an outbreak that was successfully curtailed with infection control, contact tracing, isolation, and quarantine measures coordinated through an incident management system (2). During this outbreak, most contacts underwent home monitoring, which included instructions to stay home or to avoid crowded areas if staying home was not possible. However, for five contacts with high-risk exposures, group quarantine in an observation unit was preferred because the five had crowded home environments or occupations that could have resulted in a large number of community exposures if they developed Ebola.

On August 26, 2014, Nigerian authorities opened an observation unit in Lagos to function in conjunction with the Ebola isolation ward there. The observation unit housed the five quarantined asymptomatic contacts. The observation unit had eight beds in one large room, with four shared bathrooms. Additional living areas included a living room with a television and a kitchen with a microwave and refrigerator. Protocols developed for the unit required evaluation of each contact for clinical signs and symptoms of Ebola three times daily by the medical team. Quarantined contacts received instructions to avoid direct contact with each other and to avoid sharing items. Each contact was provided a pack of disinfecting wipes for use on common surfaces including door handles.

Visitors were restricted to the front porch of the unit, and food was delivered individually packaged with disposable utensils. An environmental health officer was stationed at the facility to disinfect the bathrooms after each use to minimize the potential for transmission between residents if one were to become infectious. Environmental health officers wore gloves, face masks, boots, scrubs, and aprons. Contacts housed in the unit were permitted to bring in personal items, including mobile telephones, with the understanding that if they developed symptoms of Ebola, their personal items would not be allowed to leave the facility.

Bringing exposed contacts together in group quarantine in an observation unit during an Ebola outbreak is not standard practice because the virus is only transmitted by exposure to body fluid when an infected person is symptomatic and because it is often not feasible to quarantine large populations of exposed persons in such facilities. Also, if one person in the observation unit becomes symptomatic, the 21-day observation period starts anew for each of the others based on their exposure to the newly symptomatic person. Alternatively,

home monitoring of exposed, asymptomatic persons typically includes self-quarantine practices in conjunction with social distancing (i.e., avoiding crowded areas). Home monitoring of this sort minimizes both individual and public risk when effectively implemented.

In this instance, the five exposed persons could not be relied on to consistently adhere to social distancing nor to reliably report symptoms during home monitoring; thus, leaving them at home could have resulted in their coming into contact with large numbers of persons at their residence or workplace. Some resided in student dormitories, whereas others had public professions that required close contact with large numbers of persons. The observation unit allowed the contacts to be supervised to ensure that they did not come into contact with the general public, and that their health status was closely monitored.

Allowing the five identified contacts to stay in contact with the general public would have risked undermining containment efforts and spread of the virus to a third generation of patients. Before the observation unit opened, the contact tracing team had consistently maintained daily, in-person monitoring of >93% of all contacts, all of whom were traceable back to the person with the first recognized case of Ebola. The decision to use group quarantine versus home monitoring was made by balancing the practicalities of managing the observation unit effectively while simultaneously administering protocols within the observation unit to minimize risk to the persons housed there. Ultimately, none of the contacts quarantined in the observation unit developed signs of Ebola, and each of the persons were released at the conclusion of their individual, 21-day postexposure monitoring periods.

Lagos state had the resources to establish the observation unit and ensure that those observed were properly cared for. However, group quarantine of contacts in a central location might not be workable on a large scale.

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Implementation of a Statewide Surveillance System for Neonatal Abstinence Syndrome — Tennessee, 2013

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Over the last decade, rates of opioid pain reliever prescribing grew substantially in the United States, affecting many segments of the population, including pregnant women (1). Nationally, Tennessee ranks second in the rate of prescriptions written for opioid pain relievers, with 1.4 per person in 2012 (2). The rising prevalence of opioid pain reliever use and misuse in Tennessee led to an increase in adverse outcomes in the state, including neonatal abstinence syndrome (NAS). NAS is a withdrawal syndrome experienced by infants shortly after birth. The syndrome most commonly occurs after antenatal exposure to opioids, although other medications have also been implicated (3). From 2000 to 2009, the incidence rate of NAS in Tennessee increased from 0.7 to 5.1 per 1,000 births, exceeding the national average, which increased from 1.2 to 3.4 per 1,000 births (4). NAS is associated with numerous morbidities for the infant, including low birth weight, poor feeding, and respiratory problems (5). Previous population-based analyses of NAS relied on hospital discharge data, which typically become available for analysis only after substantial delay (4,5). In Tennessee, the rising incidence of NAS and its associated public health burden created an urgent need for timelier incidence figures to drive policy and prevention efforts. Beginning January 1, 2013, the Tennessee Department of Health (TDH) made NAS reporting mandatory. A total of 921 cases were reported in 2013 (among 79,954 births), with the most cases clustered in eastern Tennessee; 63% of cases occurred to mothers who were reported to be using at least one substance prescribed by a health care provider (e.g., opioid pain relievers or maintenance medications for opioid dependency), and 33% of cases occurred among women using illicit or diverted substances (e.g., heroin or medications prescribed for someone else). The first year's surveillance results highlight the need for primary prevention activities focused on reducing dependence/addiction among women of childbearing age and preventing unintended pregnancy among female opioid users.

Beginning in 2012, TDH staff worked with neonatal, obstetrical, and public health stakeholders throughout the state to define the data elements for NAS reporting, with a goal of gathering sufficient data to inform program and policy efforts while minimizing the additional reporting burden on hospitals. Hospitals were advised that typically the diagnosis of NAS involves clinical signs of withdrawal, a history of exposure (prenatal substance use), and evidence of exposure

(positive maternal or neonatal drug tests), although not all these elements are absolutely required for reporting the diagnosis. TDH advised hospitals to report cases in which a diagnosis of NAS was assigned to an infant based on a clinical withdrawal syndrome, with symptoms such as feeding difficulty, sleep disturbance, hyperirritability, or seizures. Hospitals were also asked to report data on history of exposure as well as evidence of exposure to support the diagnosis based on clinical signs. An online reporting system allowed for rapid and secure collection of protected health information. Hospitals were asked to report within 30 days of the infant's diagnosis using a standard set of data fields (Box). Hospitals were introduced to the reporting requirement in many ways, including notification through health care provider organizations, an introductory webinar, and online availability of a reference guide and an FAQ document. On a weekly basis, TDH staff extracted the surveillance data from SurveyGizmo (Widgix, LLC; Boulder, Colorado). Weekly surveillance reports were published online at http://health.tn.gov/mch/nas/nas_summary_archive.shtml.

In 2013, a total of 1,101 cases of NAS were reported through Tennessee's surveillance system. TDH epidemiologists reviewed the reports and resolved any suspected duplicates with reporting hospital staff. After excluding 39 duplicates and 141 cases without clinical signs consistent with NAS, a total of 921 cases (among 79,954 births) were reported in calendar year 2013 (Table). A provisional comparison of the total number of cases reported during the first 6 months through this surveillance system (N = 426) with counts from hospital discharge data during the same period (N = 488) showed that the surveillance system captured 88.4% of NAS cases identified through administrative claims. In addition to clinical signs of NAS, 98.3% of the cases also had a positive maternal or neonatal drug screen and/or a history of maternal substance use. The highest incidence rate was noted to be in eastern Tennessee, consistent with previous analyses of hospital discharge data. Rates varied across the state health department regions, ranging from 1.6 to 54.2 per 1,000 live births (Figure). More cases of NAS were reported among males compared with females (58.0% versus 41.9%) ($p < 0.001$). The most commonly reported sources of exposure were supervised replacement therapy (such as methadone or buprenorphine, 46.4% of cases), followed by prescription substance obtained without a prescription (40.2%), and nonprescription substance (27.4%).

BOX. Reporting elements included in a statewide surveillance system for neonatal abstinence syndrome (NAS) — Tennessee, 2013

- Type of hospitalization
 - Initial (birth) hospitalization
 - Transfer from birth facility
 - Readmission
 - Diagnosed in outpatient setting
- Name of birth hospital
- Name of reporting hospital
- Last four digits of infant's hospital chart number
- Infant's date of birth
- Sex of infant
 - Male
 - Female
 - Unknown at time of report
- Mother's county of residence
- Confirmatory drug tests ordered for infant
 - Hair, pending
 - Hair, completed
 - Urine, pending
 - Urine, completed
 - Meconium, pending
 - Meconium, completed
 - Umbilical cord, pending
 - Umbilical cord, completed
 - Other (please specify)
- Clinical signs of NAS in infant
 - Yes
 - No
- Other supportive elements for diagnosis
 - Maternal history of using substance known to cause NAS
 - Positive maternal screening test for substances known to cause NAS
 - Positive neonatal screening test for substances known to cause NAS
- Source of substance causing NAS, if known
 - Maternal, supervised replacement therapy (prescription drug obtained with a prescription)
 - Maternal, supervised pain therapy (prescription drug obtained with a prescription)
 - Maternal, therapy for psychiatric or neurologic condition (prescription drug obtained with a prescription)
 - Maternal, prescription substance obtained without a prescription
 - Maternal, nonprescription substance
 - No known exposure but clinical signs consistent with NAS
 - Other (please specify)

TABLE. Findings of a statewide surveillance system for neonatal abstinence syndrome (NAS) — Tennessee, 2013

No. of NAS cases reported	921
Type of hospital reporting (%)	
Birth	84.2
Transfer	15.4
Outpatient	0.2
Readmission	0.2
Sex of infant (%)	
Male	58.0
Female	41.9
Source of substance causing NAS (%)	
Supervised replacement therapy	46.4
Supervised pain therapy	19.0
Therapy for psychiatric or neurologic condition	7.4
Prescription substance obtained without a prescription	40.2
Nonprescription substance	27.4
No known exposure but clinical signs consistent with NAS	1.4
No response (left blank)	2.1
Elements of case reporting (%)	
One: clinical signs of NAS only	1.7
Two: clinical signs plus history of exposure only	27.8
Two: clinical signs plus evidence of exposure only	7.7
Three: clinical signs plus history of exposure and evidence of exposure	62.8

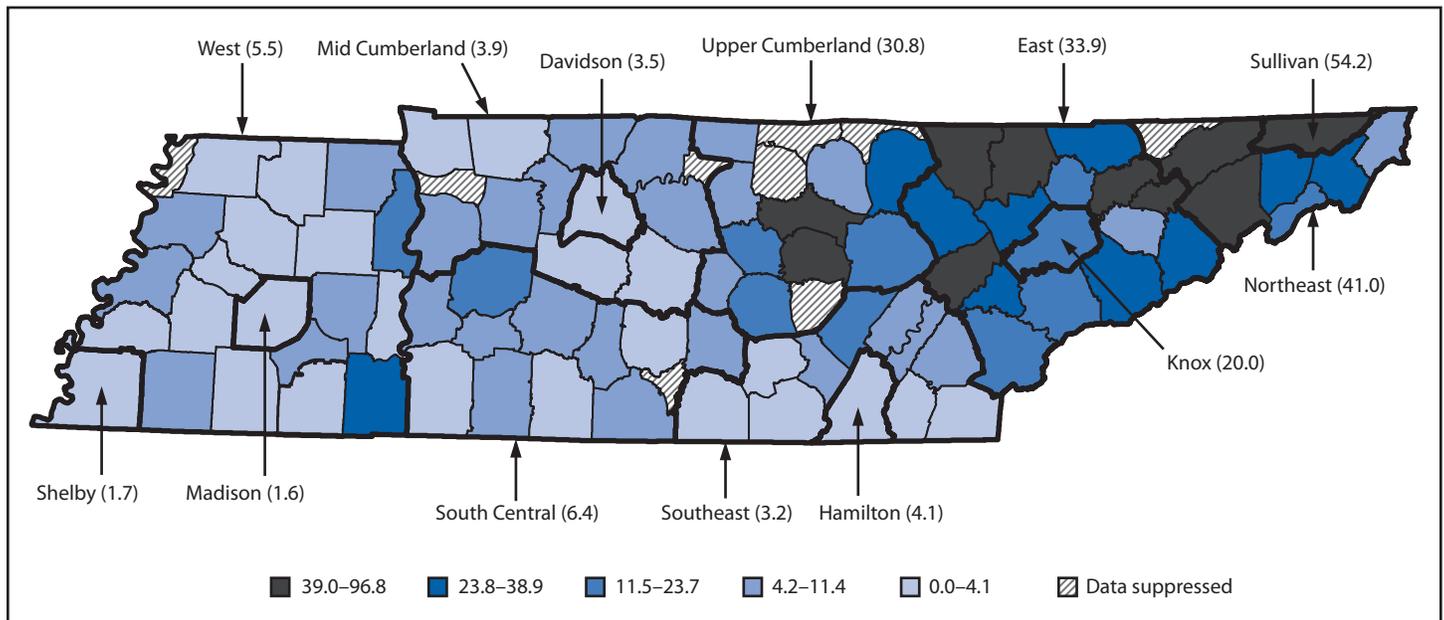
When cases were analyzed using mutually exclusive categories of exposure source, 41.7% of cases involved maternal use of prescription drugs only; another 21.6% involved exposure to at least one drug prescribed by a health care provider and an illicit/diverted drug, and 33.2% involved exposure to illicit/diverted drugs only. A relatively small proportion of cases were reported in which the source of exposure was marked as “no known exposure” (1.4%) or was left blank by the reporting hospital (2.1%) (Table).

Each week surveillance data were compiled, posted online, and distributed via e-mail to various public health stakeholders across the state, including cabinet-level officials, public health staff, health care providers, reporting hospitals, insurance payers, and community nonprofit agencies. Public health partners (both public and private sector) are using these data to inform local prevention activities. For example, a local health department in one region with high NAS incidence is co-locating family planning services in a methadone clinic, and a large third-party payer is piloting the co-location of substance abuse services in a rural primary care clinic. In addition, TDH is developing automated notifications that will be sent electronically from the state's prescription drug monitoring program to providers whose patients might be at risk of overdose or other adverse outcomes.

Discussion

The new Tennessee NAS surveillance system identified a high rate of NAS cases throughout the state (11.6 per 1,000 live births), demonstrating a 16-fold increase in the syndrome

FIGURE. Rate of neonatal abstinence syndrome per 1,000 live births, by mother's county of residence and state health department region* — Tennessee, 2013



*Thin border lines indicate counties. Thick border lines indicate state health department regions.

since the year 2000. Geographic distribution of cases was skewed with a higher case rate in Tennessee's eastern, more mountainous counties, consistent with prior analyses showing higher opioid use in those areas compared with other regions of the country (7). Further, the high incidence of NAS in eastern Tennessee counties is consistent with other indicators of opioid use/misuse in Tennessee, including opioid prescriptions and overdose deaths (2,8). Similar to previous population-based analyses (4), the findings in this report indicate that male infants were more likely to be diagnosed with NAS than female infants, suggesting a heightened susceptibility to the syndrome.

The findings in this report are subject to at least three limitations. First, a passive surveillance system might not capture all cases of NAS. However, provisional comparison of counts from this surveillance system with hospital discharge data suggests that Tennessee's surveillance system captured a majority of cases in real-time and with the advantage of greater detail (e.g., maternal exposure source) compared with administrative claims during its first year of operation. Second, because the system does not gather identifying information, there is a potential for duplicates in reporting. To address this, staff routinely monitor key fields (date of birth, county, sex, and hospital name) to identify possible duplicates; suspected duplicates are then reviewed with the reporting hospital for confirmation. In 2013, a total of 39 cases (3.5%) were found to be duplicates. Finally, the count of NAS depends on accurate diagnosis of the clinical syndrome. There is known variability

What is already known on this topic?

The incidence of neonatal abstinence syndrome (NAS) has increased substantially across the United States over the past decade, concomitant with an increase in maternal opioid use. Infants with antenatal opioid exposure are more likely to suffer other perinatal morbidities. The high rate of NAS also places a burden on public health and social service systems.

What is added by this report?

In 2013, Tennessee became the first state to establish a public health surveillance system for NAS. In its first year of operation, 921 affected infants were identified, of whom nearly two thirds were born to mothers who used at least one opioid medication prescribed to them by a health care provider during pregnancy. Cases were more common among the Appalachian counties of eastern Tennessee.

What are the implications for public health practice?

Availability of near real-time surveillance data for NAS gives Tennessee actionable data on which to allocate programmatic resources and develop sound public health policy aimed at primary prevention. Inclusion of information on maternal county of residence and source of exposure allows for targeted interventions that best address local needs.

in the approach to diagnosing NAS, creating the possibility of misclassification (9).

In 63% of NAS cases reported in Tennessee in 2013, the infant was born to a mother who had used at least one substance prescribed to her by a health care provider. This finding

is particularly important because health care providers have multiple opportunities to intervene with patients at risk for using substances that could cause NAS. Health care providers can, and in some states, such as Tennessee, are required to use state prescription drug monitoring programs to identify patients with use patterns that increase their risk for dependence/addiction and make appropriate referrals to treatment resources (10).

Targeting prevention of opioid dependence/addiction to women of childbearing age is a primary strategy for preventing NAS and should be considered by states with high rates of the syndrome. Prevention of unintended pregnancy in this population is another primary prevention strategy for NAS. The Tennessee experience of public reporting of NAS suggests that real-time, location-specific data can lead to primary prevention strategies aimed at the most affected populations and also provide a potential mechanism for intervention through health care providers responsible for prescribing substances associated with NAS.

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The staff of birthing hospitals across Tennessee.

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Notes from the Field

Silicosis in a Countertop Fabricator — Texas, 2014

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In May 2014, the Texas Department of State Health Services was notified of a case of silicosis with progressive massive fibrosis in a Hispanic male aged 37 years who worked for an engineered stone countertop company as a polisher, laminator, and fabricator. He was exposed to dust for 10 years from working with conglomerate or quartz surfacing materials containing 70%–90% crystalline silica.* This is the first reported case of silicosis associated with exposure to quartz surfacing materials in North America.

In 2010, the patient presented to a primary care provider with a 2-year history of persistent cough and dyspnea on exertion. He had no history of tobacco use or pulmonary disease. On physical examination, he had diminished bibasilar breath sounds and a right-sided inspiratory wheeze. Pulmonary function studies showed a combined obstructive and restrictive defect with no change post bronchodilator and reduced diffusion capacity. An electrocardiogram showed right ventricular hypertrophy, and cardiac catheterization confirmed the presence of pulmonary hypertension. A B Reader[†] classified the patient's chest radiograph as large opacity Category "C" with 3/2 profusion, q/r bilateral upper and middle lobe rounded opacities. Computed tomography scan of the chest showed bilateral upper and middle lobe small rounded and large opacities, with hilar and mediastinal adenopathy. The worker was reassigned to a different job to minimize silica dust exposure. He is oxygen-dependent, and his medical condition is being monitored for possible lung transplantation.

Clusters of silicosis cases, some requiring lung transplantation, have occurred among fabrication workers exposed to silica dust from quartz surfacing materials in Israel, Italy, and Spain (1–4). In the last year, imports of quartz surfacing

materials to the United States have risen 49%,[§] and these materials are among the most popular countertop materials. The increased use of this silica-containing material poses a new risk for silica exposure (<http://blogs.cdc.gov/niosh-science-blog/2014/03/11/countertops>). An investigation by CDC's National Institute for Occupational Safety and Health of the patient's work site is ongoing to identify work hazards and assess silica exposures and the health of the other employees.

Health care providers need to be aware of quartz surfacing materials as a source of silica exposure, advise reassignment of patients with silicosis to jobs without silica dust exposure, and report cases to their state public health agency; in 2010, silicosis was reportable in 25 states.[¶] Employers are responsible for maintaining a safe workplace by measuring silica exposure, limiting access to areas where silica exposures are high, using effective methods to reduce exposure (e.g., wet methods,** local exhaust ventilation, and use of personal protective equipment), providing medical examinations to workers with high exposures, and training workers about silica hazards and how to limit exposures.^{††}

[§] Information available at http://www.stoneupdate.com/us-stone-imports/statwatch-monthly-report/805-granite-quartz-imports-continue-2014-boom?utm_source=mailinglist&utm_medium=email&utm_campaign=edge+16+december+2014.

[¶] In 2010, silicosis was a reportable condition in 25 states (Arkansas, California, Connecticut, Delaware, Florida, Illinois, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Rhode Island, Texas, Virginia, and Wisconsin); however, only two states (Michigan and New Jersey) currently submit case data to CDC's National Institute for Occupational Safety and Health. Additional information available at <http://www.cste.org/group/srcaqueryres>.

** Suppression of dust using water stream or spray.

^{††} Additional information available at <https://www.osha.gov/dsg/topics/silicacrystalline/index.html>, https://www.osha.gov/OshDoc/data_General_Facts/crystalline-factsheet.pdf.

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*Additional information available at http://www.4willis.com/pdf/zodiaq/msds-zodiaqlab_aug2010.pdf, <http://www.caesarstoneus.com/en/pages/tech%20-%20info.aspx>, and <http://www.silestoneusa.com/distributors/for-the-trade>.

[†]Additional information available at <http://www.cdc.gov/niosh/topics/chestradiography/breader.html> and <http://www.cdc.gov/niosh/topics/chestradiography/ilo.html>.

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Notes from the Field

Prevalence of Risk Factors for Suicide Among Veterinarians — United States, 2014

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Veterinarians are believed to be at increased risk for suicide compared with the general population (1). Few data on the occurrence of suicidal behavior and suicide risk factors among U.S. veterinarians are available. Veterinarians participating in two wellness summits held during September 2013 concluded that more research is needed on veterinarians and their mental health (2).

During July 1–October 20, 2014, an anonymous, Web-based questionnaire was made available through the Veterinary Information Network (VIN), an online community for veterinarians; VIN News Service; *JAVMA News*; and monthly e-mail messages to veterinarians in 49 states (Maine was excluded) and Puerto Rico sent through the state's veterinary medical association, agriculture or livestock department, or health department. The questionnaire asked respondents about their experiences with depression and suicidal behavior, and included standardized questions from the Kessler-6 psychological distress scale that assesses for the presence of serious mental illness (3). Respondents with nonresponses were included in the denominators when calculating prevalence estimates.

Responses were received from 10,254 currently employed veterinarians (10.3% of all employed U.S. veterinarians). The most commonly reported age category was 30–39 years (28.8%), and 31.3% were male. Thirty-four percent reported practicing veterinary medicine for <10 years, 24.6% for 10–19 years, 21.6% for 20–29 years, and 19.8% for ≥30 years. Most (68.6%) respondents practiced small animal medicine, and 37.8% were practice owners. In comparison, 44.4% of U.S. veterinarians are male, and 66.6% practice small animal medicine exclusively (4).

Approximately 6.8% (95% confidence interval [CI] = 5.9%–7.7%) of male and 10.9% (CI = 10.2%–11.6%) of female respondents were characterized as having serious psychological distress based on the Kessler-6 psychological distress scale, compared with 3.5% of male and 4.4% of female U.S. adults, respectively (5). Since graduating from veterinary school, 24.5% and 36.7% (CIs = 23.0%–26.0%, 35.6%–37.8%) of

male and female respondents reported experiencing depressive episodes, respectively, 14.4% and 19.1% (CIs = 13.2%–15.7%, 18.2%–20.0%) suicidal ideation, and 1.1% and 1.4% (CIs = 0.7%–1.5%, 1.2%–1.7%) suicide attempts. In comparison, male and female U.S. adults had a lower lifetime prevalence of depressive episodes (15.1% and 22.9%, respectively) and suicidal ideation (5.1% and 7.1%) but a higher prevalence of suicide attempts (1.6% and 3.0%) (6,7).

The findings in this report are subject to at least two limitations. First, the small number of veterinarians who responded compared with the number of those potentially eligible increases the likelihood of nonresponse bias. Second, the possibility exists for social desirability bias. Both of these factors could lead to overestimation or underestimation of the actual prevalence of risk factors for suicide among U.S. veterinarians. Nevertheless, these data suggest that nearly one in 10 U.S. veterinarians might suffer from serious psychological distress and more than one in six might have experienced suicidal ideation since graduation. Additional data, particularly data from representative samples, are needed to further characterize the underlying risk factors for suicidal behavior among veterinarians and identify effective prevention methods.

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Veterinarians who participated in the survey. Veterinarians and Mental Health Investigation Team. State veterinary medical associations. State agriculture and livestock departments. State health departments. National Association of State Public Health Veterinarians. Veterinary Information Network (VIN). American Veterinary Medical Association. Paul D. Pion, DVM, VIN. Mark Rishniw, PhD, University of California, Davis. Joni Scheftel, DVM, Minnesota Department of Health. Melinda Larkin, *JAVMA News*. Phyllis DeGioia, VIN News Service. Lori Kogan, PhD, Colorado State University. Bryan Buss, DVM, Division of State and Local Readiness, Office of Public Health Preparedness and Response, CDC.

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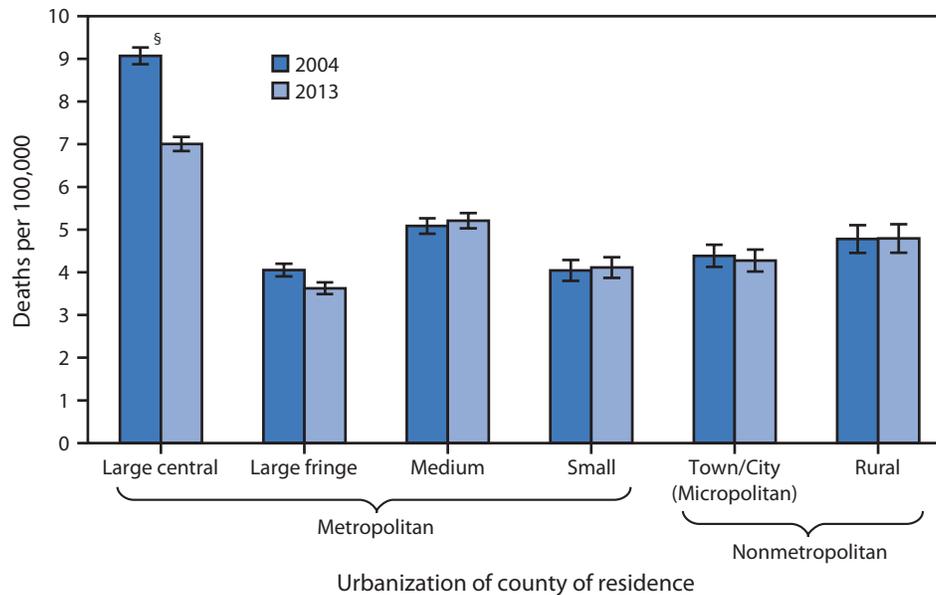
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QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Homicide Rates,* by Urbanization of County of Residence† — United States, 2004 and 2013



* Age-adjusted rates per 100,000, based on the 2000 U.S. standard population. Deaths from homicide are coded *U01–*U02, X85–Y09, and Y87.1 in the *International Classification of Diseases, 10th Revision*.

† Counties were classified into urbanization levels based on a classification scheme that considers metropolitan/nonmetropolitan status, population, and other factors.

§ 95% confidence interval.

From 2004 to 2013 in the United States, the age-adjusted homicide rate in large central metropolitan counties decreased 23% (from 9.1 to 7.0 deaths per 100,000 population), and the rate in large fringe metropolitan counties (suburbs of large cities) decreased by 10% (from 4.1 to 3.6). For four other county urbanization types (medium and small metropolitan and town/city [micropolitan] and rural nonmetropolitan), rates in 2004 and 2013 were similar. For both years, the homicide rates in large central metropolitan counties were higher than the rates for all other county types, and the rates for medium metropolitan counties were higher than the rates for large fringe and small metropolitan counties, and town/city (micropolitan) nonmetropolitan counties. Overall, in the United States, the 2004 age-adjusted homicide rate was 5.9 deaths per 100,000 population, and the 2013 rate was 5.2.

Source: National Vital Statistics System. Available at <http://wonder.cdc.gov>.

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