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Characteristics of Alcohol, Marijuana, and Other Drug Use Among Persons Aged 13–18 Years Being Assessed for Substance Use Disorder Treatment — United States, 2014–2022

Sarah Connolly, PhD[1,2]; Taryn Dailey Govoni, MPH[3]; Xinyi Jiang, PhD[2]; Andrew Terranella, MD[2]; Gery P. Guy Jr., PhD[2]; Jody L. Green, PhD[3]; Christina Mikosz, MD[2]

Abstract

Substance use often begins during adolescence, placing youths at risk for fatal overdose and substance use disorders (SUD) in adulthood. Understanding the motivations reported by adolescents for using alcohol, marijuana, and other drugs and the persons with whom they use these substances could guide strategies to prevent or reduce substance use and its related consequences among adolescents. A cross-sectional study was conducted among adolescents being assessed for SUD treatment in the United States during 2014–2022, to examine self-reported motivations for using substances and the persons with whom substances were used. The most commonly reported motivation for substance use was "to feel mellow, calm, or relaxed" (73%), with other stress-related motivations among the top reasons, including "to stop worrying about a problem or to forget bad memories" (44%) and "to help with depression or anxiety" (40%); one half (50%) reported using substances "to have fun or experiment." The majority of adolescents reported using substances with friends (81%) or using alone (50%). These findings suggest that interventions related to reducing stress and addressing mental health concerns might reduce these leading motivations for substance use among adolescents. Education for adolescents about harm reduction strategies, including the danger of using drugs while alone and how to recognize and respond to an overdose, can reduce the risk for fatal overdose.

Introduction

Initiation of substance use often occurs during adolescence (*1*), and adolescents commonly report using substances to feel good or get high and to relieve pain or aid with sleep problems (*2*,*3*). Adverse consequences of adolescent substance use include overdose, risk for development of substance use disorder (SUD), negative impact on brain development, and death. Prescription opioid misuse during adolescence is associated with SUD in adulthood (*4*). In the event of an overdose, immediate medical attention is necessary; bystanders can respond by calling emergency medical personnel and administering naloxone, which reverses overdoses caused by opioids. To guide the development and implementation of prevention strategies and help reduce substance use and fatal overdoses among youths, the motivations for substance use and the persons with whom adolescents report using substances were studied.

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Methods

Data Source

Data were obtained from the National Addictions Vigilance Intervention and Prevention Program's Comprehensive Health Assessment for Teens (CHAT) (*5*). CHAT is a self-reported, online assessment for persons aged 13–18 years who are being evaluated for SUD treatment. Assessments conducted during January 1, 2014–September 28, 2022, were analyzed. Because the assessment may be completed more than once, assessments completed by the same person within 60 days of a previous assessment were removed. The data set was restricted to assessments reporting past–30-day use of alcohol, marijuana, or other drugs* and with at least one option selected for motivation or persons with whom substances were used.

Respondents were asked to report specific substances used within six categories: 1) alcohol, 2) marijuana, hashish, or tetrahydrocannabinol (THC), 3) drugs other than alcohol or marijuana,† and misuse§ of 4) prescription pain medications,¶ 5) prescription stimulants,** or 6) prescription sedatives or tranquilizers.†† Motivation for use was asked for each of the six categories; each motivation question had 15 response options§§ and respondents were asked to select all options that applied. Respondents were also asked to select the persons with whom they used substances from four categories of substances: 1) alcohol, 2) marijuana, hashish, or THC, 3) drugs other than alcohol or marijuana, and 4) prescription drugs (which included prescription pain medications, prescription stimulants, and prescription sedatives or tranquilizers). Ten options describing the persons with whom substances were used were presented,¶¶ and respondents were asked to select all that applied.

* Two assessments that reported using only methadone were excluded.

† The category "drugs, other than alcohol or marijuana" included the following nonprescription drugs: inhalants, cocaine, methamphetamines, hallucinogens, phenylcyclidine or ketamine, heroin, ecstasy or 3,4-methylenedioxymethamphetamine, gamma hydroxybutyrate or rohypnol, cough syrup, illegally made fentanyl (added to assessment in 2017), and xylazine (added to assessment in 2022), methadone, "other drug," and "any drug."

§ Misuse is described as prescription medication use "not as prescribed," "without a prescription from a doctor," "to get high," or "to change how you feel."

¶ A description of prescription pain medications provided in the assessment states, "Examples of painkillers include Oxycontin, Vicodin, and Percocet. Pain medications help people feel less pain after surgery, and help manage intense chronic pain."

** A description of prescription stimulants provided in the assessment states, "Examples of stimulants include Ritalin, Adderall, and Dexedrine. Stimulants help people concentrate or focus better."

†† A description of prescription sedatives or tranquilizers provided in the assessment states, "Examples of sedatives include Valium, Xanax, and Klonopin. Sedatives or tranquilizers help people sleep or feel less anxious."

§§ 1) To feel mellow, calm, or relaxed, 2) to sleep better or fall asleep, 3) to stay awake, 4) to feel less shy or more social, 5) to stop worrying about a problem or forget bad memories, 6) to have fun or experiment, 7) to be sexier or make sex more fun, 8) to lose weight, 9) to make something less boring, 10) to improve or get rid of the effects of other drugs, 11) to concentrate better, 12) to deal with chronic pain, 13) to help with depression or anxiety, 14) to fit in, or 15) other reasons.

¶¶ 1) Friend or friends, 2) brother or sister, 3) parent or parents, 4) adult relative or other adult, 5) relative near adolescent's own age, 6) boyfriend or girlfriend, 7) coworker, 8) someone else, 9) anyone who has drugs, or 10) used alone.

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Data Analysis

The percentages of each motivation and the persons with whom substances were used were calculated.*** Responses were not mutually exclusive: a respondent could report more than one motivation or person with whom substances were used; therefore, the percentages sum to >100. R software (version 4.2.2; R Foundation) was used to conduct all analyses. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.†††

Results

Substance Use

Among 15,963 CHAT assessments conducted during the study period, 9,557 (60%) indicated past–30-day use of alcohol, marijuana, or other drugs. Of those, 9,543 reported at least one motivation or person with whom substances were used and were included in further analyses. Marijuana was most commonly reported (84% of assessments), followed by alcohol (49%) (Figure) (Table). Nonprescription drug use was indicated on 2,032 (21%) assessments; those most commonly reported were methamphetamine (8%), cough syrup (7%), and hallucinogens (6%). Prescription drug misuse was indicated on 1,812 (19%) assessments, with prescription pain medication reported most commonly (13%), followed by prescription sedatives or tranquilizers (11%), and prescription stimulants (9%).

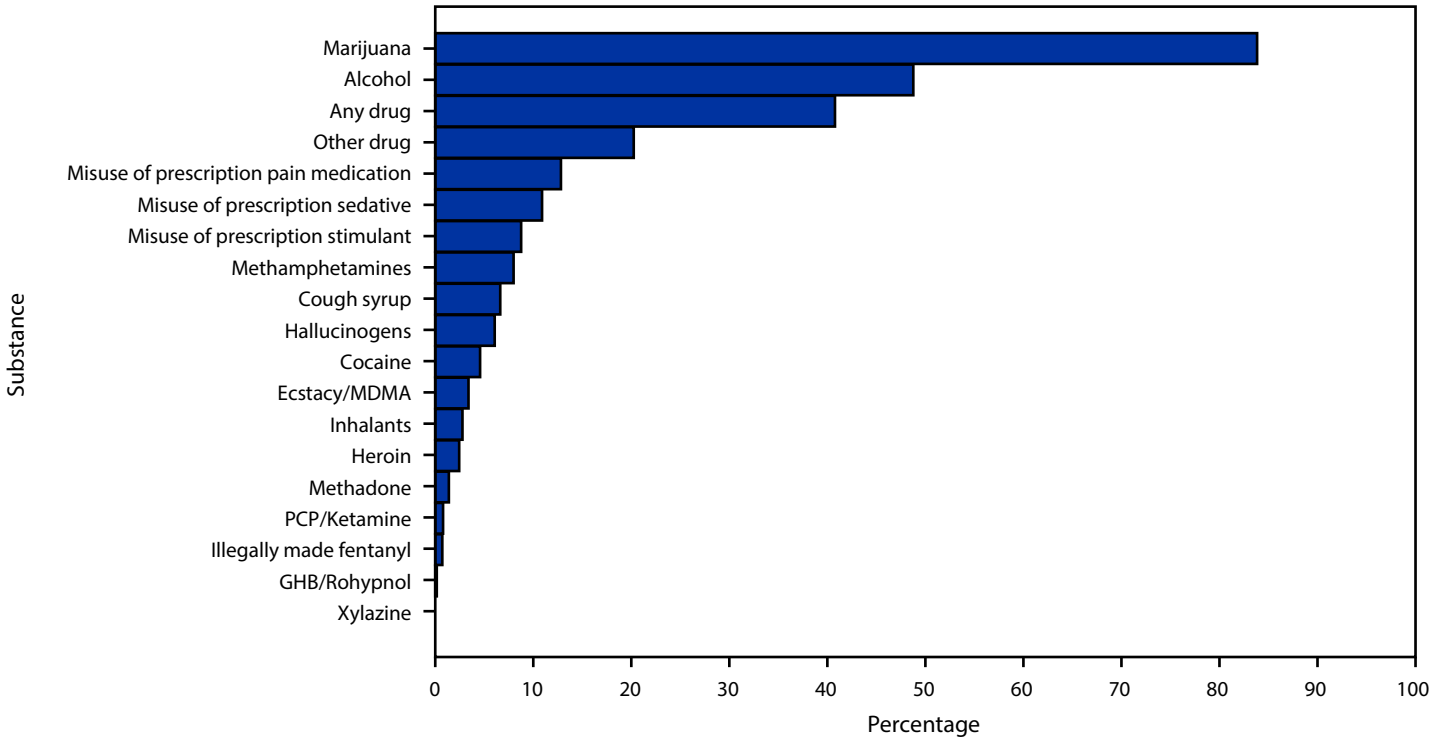
Reasons Reported for Using Substances

Overall, the most common reasons adolescents reported for using substances were to feel mellow, calm, or relaxed (73%), to have fun or experiment (50%), to sleep better or to fall asleep (44%), to stop worrying about a problem or to forget bad memories (44%), to make something less boring (41%), and to help with depression or anxiety (40%). By category, the most frequently reported motivation for alcohol use and nonprescription drug misuse was to have fun or experiment (51% and 55%, respectively), whereas use to feel mellow, calm, or relaxed was the most reported motivation for use of marijuana (76%), and misuse of prescription pain medications (61%) and prescription sedatives or tranquilizers (55%). The most common motivation for prescription stimulant misuse was to stay awake (31%).

*** The number of assessments for which an option was selected was divided by the total number of assessments in that substance type category.

††† 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE. Percentage of persons aged 13–18 years being assessed for substance use disorder treatment reporting specific substances used during the previous 30 days* — National Addictions Vigilance Intervention and Prevention Program Comprehensive Health Assessment for Teens, United States, 2014–2022



Abbreviations: GHB = gamma hydroxybutyrate; MDMA = 3,4-methylenedioxy-methamphetamine; PCP = phenylcyclidine.

* Among those reporting previous 30-day use of any alcohol, marijuana, or other drugs, and at least one motivation or person with whom substances were used.

TABLE. Motivations for drug use among persons aged 13–18 years being assessed for substance use disorder treatment who reported use of alcohol, marijuana, or other drugs during the previous 30 days and persons with whom they used substances — National Addictions Vigilance Intervention and Prevention Program Comprehensive Health Assessment for Teens, United States, 2014–2022

	No. (%)							
					Prescription medication			
Measure	Overall* 9,543 (100)	Alcohol† 4,648 (49)	Marijuana§,¶ 7,994 (84)	Nonprescription drug¶ 2,032 (21)	Pain medication** 1,222 (13)	Stimulant†† 834 (9)	Sedative/ Tranquilizer§§ 1,037 (11)	Any¶¶
Motivation* **								
To feel mellow, calm, or relaxed	**6,968 (73)**	1,862 (40)	6,090 (76)	1,085 (53)	745 (61)	243 (29)	569 (55)	—
To sleep better or fall asleep	**4,216 (44)**	620 (13)	3,644 (46)	560 (28)	425 (35)	94 (11)	364 (35)	—
To stay awake	**1,212 (13)**	133 (3)	309 (4)	618 (30)	128 (10)	262 (31)	66 (6)	—
To feel less shy or more social	**2,056 (22)**	926 (20)	1,183 (15)	456 (22)	152 (12)	111 (13)	116 (11)	—
To stop worrying about a problem or forget bad memories	**4,169 (44)**	1,514 (33)	3,148 (39)	869 (43)	382 (31)	165 (20)	276 (27)	—
To have fun or experiment	**4,771 (50)**	2,372 (51)	3,157 (39)	1,124 (55)	431 (35)	248 (30)	330 (32)	—
To be sexier or make sex more fun	**1,033 (11)**	441 (10)	664 (8)	320 (16)	107 (9)	51 (6)	52 (5)	—
To lose weight	**400 (4)**	46 (1)	104 (1)	199 (10)	40 (3)	54 (7)	20 (2)	—
To make something less boring	**3,893 (41)**	1,634 (35)	2,846 (36)	895 (44)	361 (30)	221 (26)	259 (25)	—
To improve or get rid of the effects of other drugs	**1,008 (11)**	356 (8)	640 (8)	393 (19)	183 (15)	101 (12)	132 (13)	—
To concentrate better	**2,126 (22)**	84 (2)	1,637 (20)	412 (20)	121 (10)	230 (28)	74 (7)	—
To deal with chronic pain	**1,326 (14)**	121 (3)	1,055 (13)	227 (11)	231 (19)	44 (5)	80 (8)	—
To help with depression or anxiety	**3,787 (40)**	1,087 (23)	3,068 (38)	840 (41)	398 (33)	191 (23)	328 (32)	—
To fit in	**1,144 (12)**	487 (10)	641 (8)	226 (11)	87 (7)	49 (6)	49 (5)	—
Other reason	**2,149 (23)**	704 (15)	1,074 (13)	318 (16)	176 (14)	120 (14)	133 (13)	—
Median no. of motivations selected*** (IQR)	**3 (2–6)**	2 (1–4)	3 (2–5)	3 (1–6)	2 (1–5)	2 (1–4)	2 (1–4)	—
Persons with whom substances were used¶¶,* **								
Friend or friends	**7,751 (81)**	3,906 (84)	6,419 (80)	1,581 (78)	—	—	—	1,168 (64)
Brother or sister	**1,273 (13)**	427 (9)	1,018 (13)	128 (6)	—	—	—	55 (3)
Parent or parents	**389 (4)**	187 (4)	195 (2)	52 (3)	—	—	—	29 (2)
Adult relative or other adult	**881 (9)**	375 (8)	591 (7)	156 (8)	—	—	—	78 (4)
Relative near your own age	**865 (9)**	288 (6)	662 (8)	98 (5)	—	—	—	45 (3)
Boyfriend or girlfriend	**2,288 (24)**	1,066 (23)	1,771 (22)	449 (22)	—	—	—	256 (14)
Coworker	**302 (3)**	88 (2)	252 (3)	45 (2)	—	—	—	20 (1)
Someone else	**1,610 (17)**	507 (11)	1,135 (14)	368 (18)	—	—	—	173 (10)
Anyone who has drugs	**2,189 (23)**	767 (17)	1,762 (22)	472 (23)	—	—	—	284 (16)
Alone	**4,757 (50)**	1,200 (26)	3,526 (44)	798 (39)	—	—	—	931 (51)
Median no. of persons with whom substances were used*** (IQR)	**2 (1–3)**	1 (1–2)	2 (1–3)	2 (1–3)	—	—	—	1 (1–2)

Abbreviation: THC = tetrahydrocannabinol.

* Includes motivations or persons with whom adolescents used substances reported for any of the following: alcohol, marijuana, nonprescription drugs, prescription drug misuse, methadone, "other drug," and "any drug."

† The alcohol motivation question is phrased, "People use alcohol for many reasons. Why have you used alcohol? Select all that apply." The question asking with whom alcohol is used is phrased, "When you drink, who do you drink with? Select all that apply."

§ The marijuana motivation question is phrased, "People use marijuana, hashish, or THC for many reasons. Why have you used marijuana, hashish, or THC? Select all that apply." The question asking with whom marijuana is used is phrased, "When you use marijuana, hashish, or THC, who do you use it with? Select all that apply."

¶ Inhalants, cocaine, methamphetamines, hallucinogens, phenylcyclidine or ketamine, heroin, ecstasy or 3,4-methylenedioxy-methamphetamine, gamma hydroxybutyrate or rohypnol, cough syrup, illegally made fentanyl (added to assessment in 2017), and xylazine (added to assessment in 2022). The motivation question is phrased, "People use drugs for many reasons. Why have you used drugs, other than alcohol or marijuana? Select all that apply." The question asking with whom these substances are used is phrased, "When you use drugs, other than alcohol or marijuana, who do you use them with? Select all that apply." This assessment section also included methadone, "other drug," and "any drug," which are captured by the same motivation question and the question asking with whom persons use. If a person reported methadone, "other drug," or "any drug" in addition to one or more nonprescription drugs, the motivations and with whom they use (for methadone, "other drug," or "any drug") cannot be differentiated and are counted in this table.

** Includes persons who responded affirmatively to assessment questions asking about prescription pain medication use "not as prescribed," "without a prescription from a doctor," "to get high," or "to change how you feel." The motivation question is phrased, "People use drugs for many reasons. Why have you used prescription pain medications on your own? Select all that apply."

†† Includes persons who responded affirmatively to assessment questions asking about prescription stimulant use "not as prescribed," "without a prescription from a doctor," "to get high," or "to change how you feel." The motivation question is phrased, "People use drugs for many reasons. Why have you used prescription stimulants on your own? Select all that apply."

§§ Includes persons who responded affirmatively to assessment questions asking about prescription sedative and tranquilizer use "not as prescribed," "without a prescription from a doctor," "to get high," or "to change how you feel." The motivation question is phrased, "People use drugs for many reasons. Why have you used prescription sedatives or tranquilizers on your own? Select all that apply."

¶¶ The question asking with whom substances are used is asked once for all prescription drugs and is phrased, "When you use prescription drugs, who do you use them with? Select all that apply." The denominator for the number of assessments indicating past–30-day misuse of at least one prescription drug is 1,812.

*** Motivation and persons with whom substances are used questions are in a "select all that apply" format; therefore, percentages sum to >100. Median and IQR summarize the number of motivations and the number of persons with whom they use substances that respondents selected for each question.

Summary

What is already known about this topic?

Substance use, including drugs and alcohol, often begins during adolescence.

What is added by this report?

Among adolescents being assessed for substance use disorder treatment, the most commonly reported reasons for substance use included seeking to feel mellow or calm, experimentation, and other stress-related motivations. Most reported using substances with friends; however, approximately one half of respondents who reported past–30-day prescription drug misuse reported using alone.

What are the implications for public health practice?

Reducing stress and promoting mental health among adolescents might lessen motivations for substance use. Educating adolescents on harm reduction practices, including the risks of using drugs alone and ensuring they are able to recognize and respond to overdose (e.g., administering naloxone), could prevent fatal overdoses.

Persons with Whom Substances Were Used

Adolescents most commonly used substances with friends (81%), a boyfriend or girlfriend (24%), anyone who has drugs (23%), and someone else (17%); however, one half (50%) reported using alone. Although using with friends and using alone were reported most often for all substances, the prevalence varied by substance type. Approximately 80% of adolescents who reported using alcohol, marijuana, or nonprescription drugs reported using these substances with friends; however, 64% of those who reported misusing prescription drugs used them with friends. Among adolescents reporting prescription drug misuse, more than one half (51%) reported using these drugs alone, whereas using alone was reported by 44% of those who used marijuana, 39% of those who used nonprescription drugs, and 26% of those who used alcohol.

Discussion

This analysis summarizing self-reported motivations for use of various substances among adolescents being assessed for SUD treatment who used alcohol, marijuana, or other drugs during the previous 30 days, and the persons with whom adolescents used these substances, found that many adolescents use substances to have fun or experiment or to seek relief mentally, emotionally, or physically. These findings are consistent with those reported in a 2020 study that examined motivations for the nonmedical use of prescription drugs in a sample of young adults, which identified recreational and self-treatment motivations among young adults over time and across drug classes (*2*). Anxiety and experiencing traumatic life events have been associated with substance use in adolescents (*6*). Specific reporting of motivations, including "to stop worrying about a problem or to forget bad memories" and "to help with depression or anxiety," underscores the potential direct impact that improving mental health could have on substance use.

One half of adolescents reported using substances while alone. Of particular concern, more than one half of respondents who reported past–30-day prescription drug misuse reported using the drugs alone. Prescription drug misuse while alone presents a significant risk for fatal overdose, especially given the proliferation of counterfeit pills resembling prescription drugs and containing illegal drugs (e.g., illegally manufactured fentanyl) (*7*). Education about harm reduction behaviors, such as using in the presence of others and expanding access to naloxone to all persons who use drugs, could reduce this risk.

Adolescents most commonly reported using substances with friends, which presents the opportunity for bystander intervention in the event of an overdose. Nearly 70% of fatal adolescent overdoses occurred with a potential bystander present, yet in most cases no bystander response was documented (*8*). Overdose deaths can be prevented through education tailored to adolescents to improve recognition of signs of overdose and teach bystanders how to respond, including the administration of naloxone (*9*) and increasing awareness of local Good Samaritan laws, which protect persons against liability when they provide emergency care to others (*10*). In addition, ensuring access to effective, evidence-based treatment for SUD and mental health conditions might decrease overdose risk.

Limitations

The findings in this report are subject to at least three limitations. First, the population represents a convenience sample of adolescents being assessed for SUD treatment and is not generalizable to all adolescents in the United States. Second, the assessment is self-reported and subject to potential reporting and recall biases as well as social desirability bias. Finally, several questions on motivations and persons with whom respondents use substances refer to categories of substances; thus, it was not possible to ascertain to which specific drug a person might be referring in their response if use of more than one substance within a drug category was reported.

Implications for Public Health Practice

Harm reduction education specifically tailored to adolescents has the potential to discourage using substances while alone and teach how to recognize and respond to an overdose in others, which could thereby prevent overdoses that occur when adolescents use drugs with friends from becoming fatal. Public health action ensuring that youths have access to treatment and support for mental health concerns and stress could reduce some of the reported motivations for substance use. These interventions could be implemented on a broad or local scale to improve adolescent well-being and reduce harms related to substance use.

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Akadia Kacha-Ochana, CDC.

Corresponding author: Sarah Connolly, SConnolly@cdc.gov.

[1]Epidemic Intelligence Service, CDC; [2]Division of Overdose Prevention, National Center for Injury Prevention and Control, CDC; [3]Inflexxion, Irvine, California.

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Selection of Antibiotics as Prophylaxis for Close Contacts of Patients with Meningococcal Disease in Areas with Ciprofloxacin Resistance — United States, 2024

Isha Berry, PhD[1,2]; Amy B. Rubis, MPH[1]; Rebecca L. Howie, PhD[1]; Shalabh Sharma, MS[1]; Daya Marasini, PhD[1]; Henju Marjuki, PhD[1]; Samuel Crowe, PhD[1]; Lucy A. McNamara, PhD[1]

Abstract

Meningococcal disease, caused by the bacterium *Neisseria meningitidis*, is a rare but life-threatening illness that requires prompt antibiotic treatment for patients and antibiotic prophylaxis for their close contacts. Historically, *N. meningitidis* isolates in the United States have been largely susceptible to the antibiotics recommended for prophylaxis, including ciprofloxacin. Since 2019, however, the number of meningococcal disease cases caused by ciprofloxacin-resistant strains has increased. Antibiotic prophylaxis with ciprofloxacin in areas with ciprofloxacin resistance might result in prophylaxis failure. Health departments should preferentially consider using antibiotics other than ciprofloxacin as prophylaxis for close contacts when both of the following criteria have been met in a local catchment area during a rolling 12-month period: 1) the reporting of two or more invasive meningococcal disease cases caused by ciprofloxacin-resistant strains, and 2) ≥20% of all reported invasive meningococcal disease cases are caused by ciprofloxacin-resistant strains. Other than ciprofloxacin, alternative recommended antibiotic options include rifampin, ceftriaxone, or azithromycin. Ongoing monitoring for antibiotic resistance of meningococcal isolates through surveillance and health care providers' reporting of prophylaxis failures will guide future updates to prophylaxis considerations and recommendations.

Introduction

Neisseria meningitidis causes invasive meningococcal disease, a severe and life-threatening illness. Close contacts of patients with invasive meningococcal disease are at increased risk for acquiring the disease, and antibiotic prophylaxis is recommended for these persons. First-line options for prophylaxis are rifampin, ciprofloxacin, and ceftriaxone; azithromycin can also be used in areas with ciprofloxacin-resistant strains (*1*). Historically, antibiotic resistance in *N. meningitidis* has been uncommon in the United States (*2*). However, in 2020, CDC identified 11 ciprofloxacin- and penicillin-resistant *N. meningitidis* serogroup Y (NmY) isolates from cases occurring in 2019 and 2020 (*3*,*4*).

More recent data show that 29 cases caused by ciprofloxacin-resistant strains were reported during 2019–2021: 24 NmY (also resistant to penicillin), four NmB, and one nongroupable strain. No direct epidemiologic linkages among cases were identified. The median patient age was 24 years (range = 2 months–88 years) and 20 (69%) cases occurred among Hispanic or Latino persons; one case (3%) was fatal.

Although no instances of prophylaxis failure associated with ciprofloxacin resistance in the United States have been reported to date, use of ciprofloxacin as prophylaxis in areas with ciprofloxacin resistance might increase the likelihood of failure. Based on emerging evidence, CDC is providing updated guidance for health departments to aid in making decisions about when and where recommended antibiotic options other than ciprofloxacin should be preferentially considered for use as prophylaxis for close contacts of patients with invasive meningococcal disease.

Methods

CDC considered four main criteria in developing the guidance for preferentially considering options other than ciprofloxacin for meningococcal disease prophylaxis. These include 1) a threshold for action (i.e., the number and percentage of cases caused by ciprofloxacin-resistant strains in a specified area and period, after which alternatives to ciprofloxacin should be preferentially considered), 2) the alternative antibiotics that should be used, 3) the duration of the guidance, and 4) the catchment area (i.e., the area in which cases are counted for determining the threshold and that will follow the changes in prophylaxis prescribing practices).

During October 2022–April 2023, these four criteria, as well as five contextual considerations (acceptability to public health partners, feasibility in implementation, effect on health equity, potential indirect outcomes, and anticipated opposition), were evaluated using an iterative process. CDC began by soliciting feedback on the criteria and contextual considerations from governmental and nongovernmental subject matter experts, including experts from within the agency, jurisdictional health departments, and academic institutions, to gain information on the need for updated guidance and to discuss the practical considerations that could affect guidance implementation. CDC experts developed draft implementation guidance, after which additional feedback was solicited from state and local public health professionals who would potentially implement this guidance. This feedback was considered by CDC when formulating the final guidance.

Rationale and Evidence

Invasive Meningococcal Disease Cases and Resistance Patterns

An annual average of 1.25 cases of invasive meningococcal disease caused by ciprofloxacin-resistant strains were reported in the United States during 2011–2018; however, the number of such cases has increased sharply since 2019. An annual average of 9.7 cases of invasive meningococcal disease caused by ciprofloxacin-resistant strains were reported in 2019, 2020, and 2021, despite an overall 75% decline in disease incidence from 0.24 cases per 100,000 population (2011) to 0.06 (2021) (Figure 1). Recent cases were predominantly caused by ciprofloxacin- and penicillin-resistant NmY strains and were distributed across the United States, but clusters were identified in some geographic areas (Figure 2).

Considerations in Determining Resistance Thresholds

Resistance thresholds for recommending changing antibiotics are inconsistent across pathogens and contexts (*5*). CDC experts agreed that, because of the severity of invasive meningococcal disease and high mortality risk in potential instances of prophylaxis failure, the threshold should be low. In determining the threshold for action, both a specific number of resistant cases (e.g., one or two) and a percentage (e.g., 20%) of all cases were needed to allow sufficient flexibility for jurisdictions with high invasive meningococcal disease incidence to act while ensuring areas with low incidence were not changing recommendations based on a single, potentially sporadic, resistant case.

Existing guidance states that rifampin (4 oral doses in 48 hours), ciprofloxacin (single oral dose), or ceftriaxone (single injection) are first-line antibiotics for meningococcal prophylaxis; a single oral dose of azithromycin has also been used in areas with ciprofloxacin-resistant strains (*1*). A published systematic review and meta-analysis determining effectiveness, adverse events, and development of drug resistance for different meningococcal prophylaxis regimens was used as supporting evidence for determining when to favor the use of recommended prophylaxis options other than ciprofloxacin (*6*). Six studies presented data on rifampin compared with placebo and found that rifampin was effective at eradicating *N. meningitidis* 1 week after prophylaxis (meta-analysis pooled risk ratio [RR] = 0.17; 95% CI = 0.13–0.24) (*6*). No trials evaluated ceftriaxone or azithromycin against placebo, but two studies comparing rifampin with ceftriaxone found no statistically significant difference in eradication (RR = 3.71; 95% CI = 0.73–18.86) (*6*), and one study comparing azithromycin to rifampin reported no statistically significant difference in eradication (RR = 0.30; 95% CI = 0.30–5.54) (*6,7*). Across nine studies examining side effects and adverse events for at least one of the alternative antibiotics, reported adverse events were mild and included nausea, diarrhea, abdominal pain, headaches, dizziness, and skin rashes. Compared with rifampin, one study found a higher adverse event rate with ceftriaxone (RR = 1.39; 95% CI = 1.10–1.75); however, this difference was primarily driven by reports of pain at the injection site. Six studies reported on the antibiotic susceptibility of

FIGURE 1. Meningococcal disease incidence and number of invasive meningococcal disease cases caused by ciprofloxacin-resistant or ciprofloxacin- and penicillin-resistant strains of *Neisseria meningitidis* — United States, 2011–2021

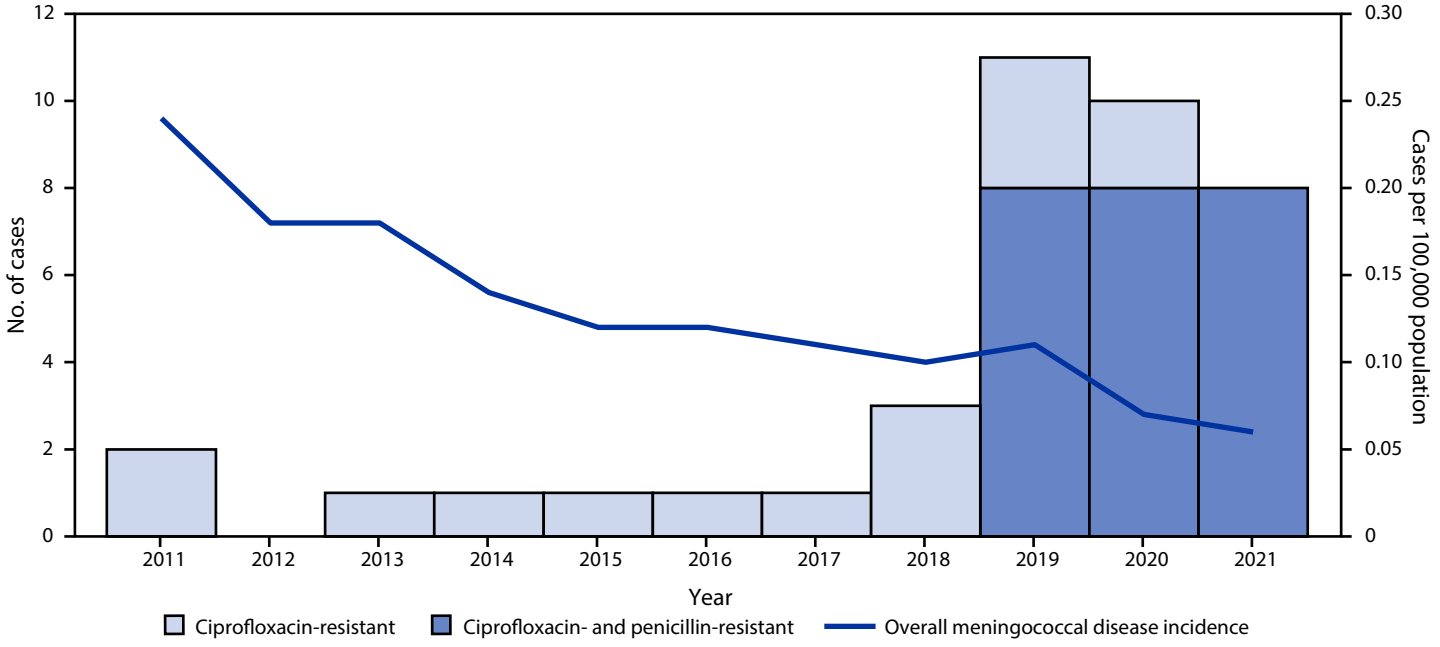
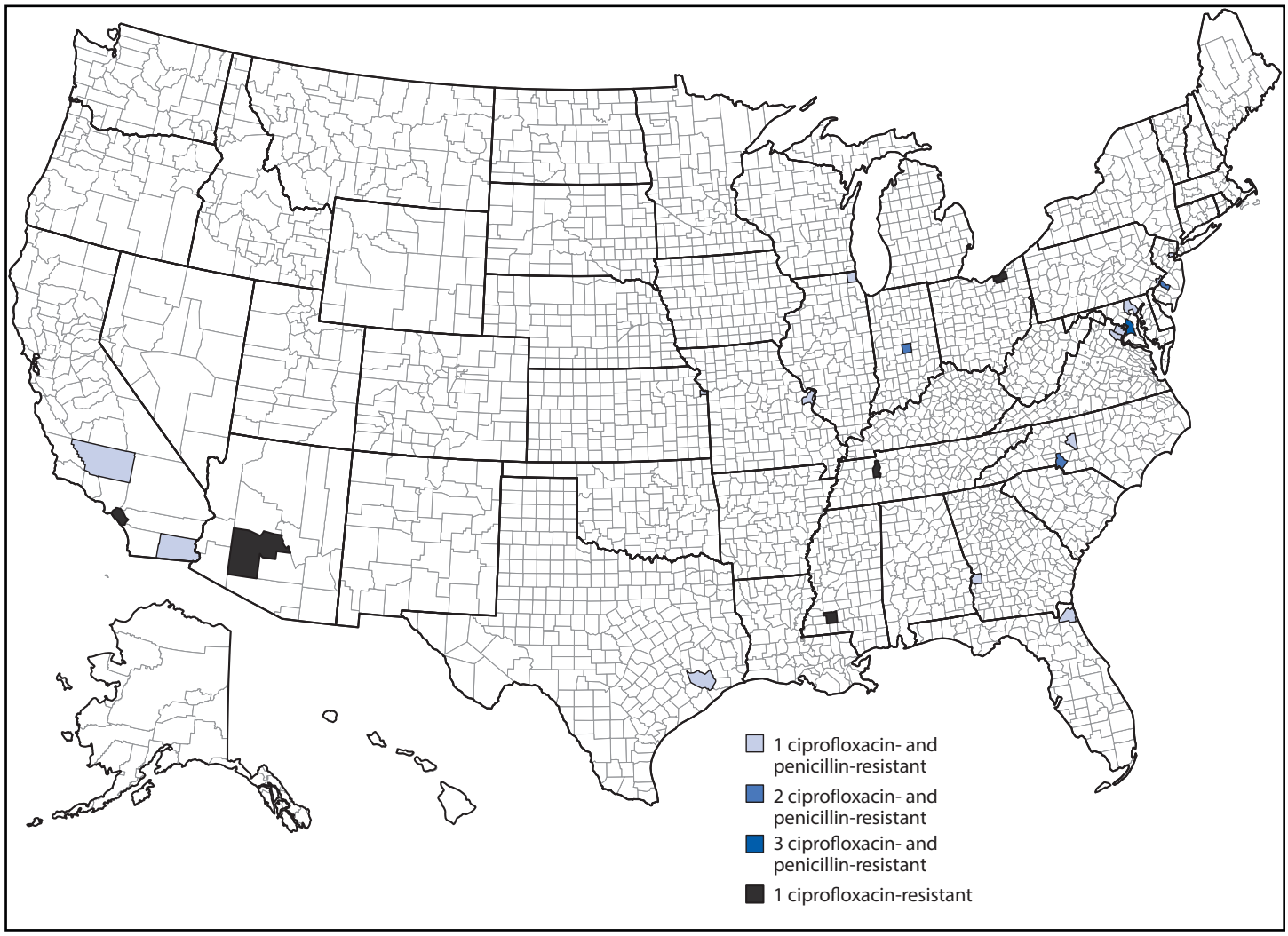


FIGURE 2. Number of invasive meningococcal disease cases caused by ciprofloxacin-resistant or ciprofloxacin- and penicillin-resistant *Neisseria meningitidis* strains, by county — United States, 2019–2021



persistent isolates to at least one of the alternative antibiotics; development of resistance following prophylaxis was detected only for rifampin (*6*). Resistance to rifampin has also been reported in mass chemoprophylaxis settings, but because there is a fitness cost to the mutations associated with resistance, resistant strains have not become widespread (*8*); occasional rifampin prophylaxis failures have also been reported (*9*). CDC experts reviewed the literature since 2013 for updated data on the effectiveness of alternative prophylaxis regimens; no new data were identified.

The CDC expert group also considered adherence, acceptability, contraindications, and dosing regimens for the alternative antibiotics and noted that despite limited evidence of effectiveness, azithromycin would likely be the logistically simplest replacement for ciprofloxacin among the existing recommended prophylaxis options. In determining the duration of guidance, feasibility and communication challenges were considered, recognizing that frequent changes in recommended prophylaxis antibiotics within a local area might cause confusion among providers and public health staff members and might lead to lack of adherence. Flexibility in guidance criteria to allow for unique jurisdictional and cross-jurisdictional considerations during implementation, particularly when defining a catchment area, was emphasized in feedback discussions.

Presentation of Guidance

Implementation Guidance for Health Departments

Based on the currently recommended prophylaxis options (*1*), the 2013 systematic review (*6*), and expert feedback using the stated criteria and contextual considerations, the implementation guidance for health departments includes the circumstances under which ciprofloxacin prophylaxis should be discontinued and alternative antibiotic prophylaxis options

Summary

What is already known about this topic?

Meningococcal disease cases caused by ciprofloxacin-resistant strains of *Neisseria meningitidis* have increased in the United States. Use of ciprofloxacin for antibiotic prophylaxis in areas with ciprofloxacin resistance might result in prophylaxis failure.

What is added by this report?

CDC provides implementation guidance for health departments for the preferential use of other recommended prophylaxis options (i.e., rifampin, ceftriaxone, or azithromycin) in place of ciprofloxacin when two or more ciprofloxacin-resistant meningococcal disease cases that account for ≥20% of all cases are reported in a local catchment area during a 12-month period.

What are the implications for public health practice?

Monitoring for prophylaxis failures and antimicrobial resistance among meningococcal isolates is essential to support the need for additional updates to recommendations.

should be preferentially considered, alternative prophylaxis regimens, and the extent and duration of implementation of the updated guidance (Box).

Health departments have flexibility in guidance implementation. Updated prophylaxis guidance can be implemented at a lower threshold or extended across a broader area, such as across a metropolitan statistical area or health department catchment area. Other health department considerations in determining guidance implementation include local epidemiology; feasibility (e.g., logistical simplicity of having a particular geographic area follow uniform guidance); epidemiologic linkages among patients; travel history, including college and other students' travel to or from school*; and patterns in population movement, including movement across jurisdictional borders.

Benefits and Harms

The primary anticipated public health benefit of this guidance is a reduced likelihood of ciprofloxacin prophylaxis failure. However, potential prophylaxis failures with alternative antibiotics might occur, and the potential for reduced adherence or slower administration of less convenient alternative prophylaxis options remains.

Discussion

CDC's implementation guidance for choosing antibiotics for invasive meningococcal disease prophylaxis is based on observed increases in the number of cases of invasive meningococcal disease caused by ciprofloxacin-resistant strains since 2019 and concerns about potential prophylaxis failures in areas with ciprofloxacin resistance. These data, combined with evidence that alternative recommended prophylaxis options are effective and are associated with minimal adverse events, support preferentially considering the use of antibiotics other than ciprofloxacin in areas reaching a minimum threshold for action.

Antimicrobial susceptibility testing for *N. meningitidis* is typically conducted at CDC rather than locally and is not routinely conducted in support of patient care. Therefore, results to guide prophylaxis options for close contacts of individual cases are often not available. However, if antimicrobial susceptibility testing results demonstrating resistance in an index patient are promptly available by local testing, adjustments in prophylaxis can also be made, regardless of whether a local area has reached the recommended threshold.

Effective guidance implementation will depend on rapid communication of antimicrobial susceptibility testing results between CDC and jurisdictions to guide local threshold calculations, strong cross-jurisdictional communication regarding catchment area borders, availability of alternative antibiotics, and monitoring for potential prophylaxis failures. A need remains to generate more data on azithromycin's effectiveness

BOX. Implementation guidance for health departments for preferentially considering antibiotics other than ciprofloxacin for invasive meningococcal disease prophylaxis

Discontinue use of ciprofloxacin as prophylaxis for close contacts when both of the following threshold criteria have been met in the catchment area* during a rolling 12-month period:

- Two or more invasive meningococcal disease cases caused by ciprofloxacin-resistant strains have been reported, and
- Cases caused by ciprofloxacin-resistant strains account for ≥20% of all reported invasive meningococcal disease cases.

Prescribe rifampin, ceftriaxone, or azithromycin instead of ciprofloxacin as prophylaxis when the threshold criteria have been reached.†

Implement updated prophylaxis guidance in all counties within the catchment area.

Maintain updated prophylaxis guidance until a full 24 months have passed without any invasive meningococcal disease cases caused by ciprofloxacin-resistant strains having been reported in the catchment area.

* The catchment area should be a single contiguous area that contains all counties reporting ciprofloxacin-resistant cases. Jurisdictions should include surrounding counties, if warranted, based on population mixing patterns.
† https://www.cdc.gov/vaccines/pubs/surv-manual/chpt08-mening.html

* https://learn.cste.org/images/dH42Qhmof6nEbdvwIIL6F4zvNjU1NzA0MjAxMTUy/Course_Content/Case_based_Surveillance_for_Syphilis/CSTE_Revised_Guidelines_for_Determining_Residency_for_Disease_Reporting_Purposes.pdf

because it is likely the most convenient and readily available alternative antibiotic for meningococcal prophylaxis.

CDC staff members are available to provide technical assistance if questions about guidance implementation arise. To support monitoring and evaluation of guidance implementation, health departments are requested to notify CDC about any changes made to prophylaxis guidance at meningnet@cdc.gov. CDC will continue to monitor for prophylaxis failures and antimicrobial resistance among meningococcal isolates to determine whether adjustments are needed and will update the guidance as new data become available.

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Corresponding author: Isha Berry, tqx3@cdc.gov.

[1]Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, CDC; [2]Epidemic Intelligence Service, CDC.

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Severe Work-Related Injuries in the Oil and Gas Extraction Industry — 32 Federal Occupational Safety and Health Administration Jurisdictions, United States, January 2015–July 2022

Vidisha Parasram, DrPH[1,2]; Christina Socias-Morales, DrPH[2]; Audrey Reichard, MPH[2]

Abstract

The Occupational Safety and Health Administration (OSHA) severe injuries reports include work-related injuries from establishments under federal OSHA jurisdiction that result in an amputation, loss of an eye, or inpatient hospitalization. Data from 32 jurisdictions were examined to determine oil and gas extraction industry-specific severe industry trends during January 2015–July 2022, using the 2012 North American Industry Classification System (NAICS) codes for oil and gas extraction. During this period, a total of 2,101 severe work-related injuries were reported in this sector. Among these severe work-related injuries, well service contract workers' injuries included the highest number of amputations (417) and hospitalizations (1,194), accounting for 20% and 57%, respectively, of all severe injuries reported. Overall, 895 (43%) of all severe injuries reported involved upper extremities. Contract workers in the service and drilling subindustries (NAICS codes 213112 and 213111, respectively) experienced disproportionately more work-related injuries compared with those in the operation subindustry (NAICS code 211). These injuries could be preventable by including contractors in worksite safety plans that administer the hierarchy of controls, are within an effective safety management system, and provide consistent safety training on work equipment, personal protective equipment, and daily site safety meetings that increase safety culture.

Introduction

The oil and gas extraction (OGE) industry sector operates and develops oil and gas field properties. Although OGE industry sector workers represent a small portion of the U.S. workforce,* this sector is expected to grow more rapidly than other sectors.† Workers in this industry are consistently overrepresented in numbers of work-related injuries, illnesses, and fatalities (*1*), possibly related to the precarious nature of their work and to their status as contract workers or self-employed.§

The OGE industry sector is divided into two subsectors: 1) extraction and 2) well drilling and service. The extraction subsector (North American Industry Classification System [NAICS] code 211) includes oil and gas operators, and consists primarily of companies that lease, drill, and extract fossil fuels. In contrast, the well drilling (NAICS code 213111), and service (NAICS code 213112) subsector workers are paid as contractors¶ who operate, construct, drill, pump, and transport oil and gas (*2*). OGE contract workers are often exposed to more hazardous work conditions (*2*) and longer shifts (*3*), and they experience more work-related fatalities (*1*,*4*). Temporary or nonstandard work arrangements have been linked to adverse health and safety outcomes, because in contrast to permanent workers, contract workers often have less information about their work environment, less job-specific training, less access to safety equipment, and no union representation (*5*,*6*). Differences have been identified within subindustries; drilling contractors experience more fatal occupational injuries and fatal falls compared with servicing employees (*4*). These risks are even higher for offshore OGE workers because of the remote, dynamic nature of platforms, and because workers live in close proximity to process units with flammable hydrocarbons (*7*).

Current data on nonfatal occupational injuries in the OGE industry sector (*8*) are limited. CDC identified risk factors for severe injuries in the OGE industry using Occupational Safety and Health Administration (OSHA) severe injury reports collected during January 2015–July 2022 to increase understanding that could guide implementation of strategies to improve OGE worker safety.

Methods

The OSHA severe injury reports contain employer accounts of amputations, loss of an eye, or inpatient hospitalizations from 32 of 54 (59.3%) states and territories (jurisdictions) under federal OSHA authority. Severe injuries from the 22 (40.7%) jurisdictions implementing their own state-plan labor requirements are not included in the dataset. OSHA releases data from severe injury reports every 6 months.

Public OSHA severe injury reports data** collected during January 2015–July 2022 were used to examine OGE industry specific trends. Severe injury reports were aggregated by type of injury (amputation, loss of an eye, or hospitalization) and

* https://www.bls.gov/iag/tgs/iag21.htm
† https://www.eia.gov/outlooks/aeo/
§ The OGE industry largely consists of a contract or self-employed workforce.
¶ https://www.cdc.gov/niosh/docs/2017-193/2017-193.pdf
** https://www.osha.gov/severeinjury

stratified by NAICS 2012[††] and the Occupational Injury and Illness Classification System (OIICS).[§§] Some reports included more than one injury, hospitalization, or amputation; thus, the sum of hospitalizations, amputations, and eye injuries might exceed the total number of severe injury reports. Multiple severe injures from a single report were summed to create a total number of injuries. Descriptive analyses were conducted by one- and two-digit OIICS codes for nature of injury, primary source, event or exposure, and body part affected. Descriptive analyses were stratified by time and subindustry to understand injury characteristics. Analyses were limited to cases with NAICS codes in the following subindustries: 211 (Crude Petroleum and Natural Gas Extraction), 213111 (Drilling Oil and Gas Wells), and 213112 (Support Activities for Oil and Gas Operations). Analyses were performed using SAS software (version 9.4; SAS Institute). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[¶¶]

[††] https://www.census.gov/naics/?58967?yearbck=2012
[§§] Version 2.01. https://wwwn.cdc.gov/wisards/oiics
[¶¶] 45 C.F.R. part 46; 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d), 5 U.S.C. Sect. 552a, 44 U.S.C. Sect. 3501 et seq.

Results

A total of 82,366 work-related severe injuries were reported to OSHA during January 2015–July 2022; among these, 2,101 (2.6%) were reported by the OGE industry. The highest number of severe injury reports was reported by contract OGE employers. Oil and gas operations support activities personnel in well-servicing companies accounted for 1,473 (70.1%) of these 2,101 injuries, followed by oil and gas well drillers (491; 23.4%) (Table 1). Among oil and gas operators, 137 (6.5%) severe injuries were reported, including 110 (5.2%) among Crude Petroleum and Natural Gas Extraction subindustry operators and 27 (1.3%) by the Natural Gas Liquid Extraction subindustry.

Temporal and Geographic Distribution of Severe Injuries

OGE severe injury reports for all subindustries fluctuated during the study period; the highest number was reported in 2018 (395), and the lowest (excluding 2022, which includes data only through July) occurred in 2020 (144). Among all severe injury reports, the highest number of amputations (417, accounting for 19.8% of reports) and hospitalizations (1,194; 56.8%) were reported among oil and gas subindustry support activities personnel in the well-servicing companies sector

TABLE 1. Severe injury reports* submitted to the Occupational Safety and Health Administration by oil and gas extraction industry employers, by subindustry and year (N = 2,101) — United States, January 2015–July 2022

Employer/Subindustry	Year								Total (%)
	2015	2016	2017	2018	2019	2020	2021	2022[†]	
Contractors[§]									
Oil and gas subindustry support activities personnel[¶]									
Total severe injury reports	**224**	**162**	**248**	**276**	**267**	**106**	**110**	**80**	**1,473 (70.1)**
Hospitalization	180	134	196	226	213	90	91	64	**1,194 (56.8)**
Amputation	59	43	72	73	81	28	36	25	**417 (19.8)**
Eye injury	2	3	3	3	2	2	3	1	**19 (0.9)**
Oil and gas well drillers**									
Total severe injury reports	**71**	**54**	**102**	**95**	**68**	**29**	**37**	**35**	**491 (23.4)**
Hospitalization	50	46	83	71	52	23	26	24	**375 (17.8)**
Amputation	28	10	30	40	21	7	15	12	**163 (7.8)**
Eye injury	1	0	0	0	1	0	0	0	**2 (0.1)**
Operators[††] in crude petroleum and natural gas extraction[§§] and natural gas extraction[¶¶]									
Total severe injury reports	**30**	**13**	**25**	**24**	**23**	**9**	**6**	**7**	**137 (6.5)**
Hospitalization	22	9	23	18	17	8	6	7	**110 (5.2)**
Amputation	10	5	6	9	8	1	1	1	**41 (2.0)**
Eye injury	0	0	0	0	1	0	0	0	**1 (0.1)**
Total	**325**	**67**	**375**	**395**	**358**	**144**	**153**	**122**	**2,101 (100.0)**

Abbreviations: NAICS = North American Industry Classification System; OSHA = Occupational Safety and Health Administration.
* Some OSHA severe injury reports included more than one injury, hospitalization, or amputation; thus, the sum of hospitalizations, amputations, and eye injuries might exceed the total number of severe injury reports. Multiple severe injures from a single report were summed to create a total number of injuries.
[†] During January–July 2022.
[§] NAICS code 213.
[¶] NAICS code 213112.
** NAICS code 213111.
[††] NAICS code 211.
[§§] NAICS code 211111.
[¶¶] NAICS code 211112.

(163; 7.7%), followed by drilling contractors (375; 17.8%). Only 22 (1.0%) severe injury reports in OGE involved an eye injury, with oil and gas subindustry support activities personnel reporting 19 (86.4%) of these.

Among reporting jurisdictions, Texas recorded the highest number of severe injuries within OGE (1,134; 54%), followed by North Dakota (221; 10.5%) and Oklahoma (171; 8.1%). Severe injury reports occurred most frequently in July (228; 10.8%) and January (224; 10.7%).

Body Part Involved and Nature of Severe Injuries

Analysis of injuries by involved body part found that 895 (42.6%) of all severe injury reports involved an upper extremity, 771 (86.1%) of which involved the hands; 376 (17.9%) severe injury reports involved a lower extremity, including 254 (67.6%) involving the legs (Table 2). Approximately 10% of injuries among OGE contract workers involved multiple body parts (200) or the trunk (216). In addition, contract workers in well-servicing companies recorded the highest number of hand injuries (520, accounting for 24.8% of all severe injuries) and leg injuries (183; 8.7%). Most injuries were classified as traumatic injuries and disorders (2,090; 99.5%) with open wounds (740; 35.2%), traumatic injuries to bones, nerves, and spinal cord (589; 28.0%), and other traumatic injuries and disorders (307; 14.6%) accounting for the three leading injury types. Most incidents were caused by contact with objects and equipment (1,280; 60.9%), followed by slips, trips, and falls (370; 17.6%) (Figure).

TABLE 2. Severe work-related injuries among oil and gas extraction workers by involved body part, nature of injury, and subindustry (N = 2,101) — United States, January 2015–July 2022

Characteristic	OIICS, no. (%)			
	Contractors			
	Support activities for oil and gas operations*	Drilling oil and gas wells†	Operators§	Total (%)¶
Body part involved				
Upper extremity**	610 (29.0)	227 (10.8)	58 (2.8)	**895 (42.6)**
Lower extremity††	263 (12.5)	89 (4.2)	24 (1.1)	**376 (17.9)**
Multiple body parts§§	156 (7.4)	44 (2.1)	16 (0.8)	**216 (10.3)**
Trunk¶¶	156 (7.4)	47 (2.2)	8 (0.4)	**211 (10.0)**
Head***	114 (5.4)	40 (1.9)	11 (0.5)	**165 (7.9)**
Nonclassifiable†††	85 (4.0)	19 (0.9)	12 (0.6)	**116 (5.5)**
Body systems§§§	81 (3.9)	23 (1.1)	7 (0.3)	**111 (5.3)**
Neck, including throat¶¶¶	6 (0.3)	2 (0.1)	0 (—)	**8 (0.4)**
Total	**1,471 (70.0)**	**491 (23.4)**	**136 (6.5)**	**2,098 (99.9)******
Nature of injury				
Open wound	508 (24.2)	186 (8.9)	46 (2.2)	**740 (35.2)**
Traumatic injury to bones, nerves, or spinal cord	425 (20.2)	133 (6.3)	31 (1.5)	**589 (28.0)**
Other traumatic injury or disorder	205 (9.6)	78 (3.7)	24 (1.1)	**307 (14.6)**
Burn or corrosion	148 (7.0)	29 (1.4)	21 (1.0)	**198 (9.4)**
Multiple traumatic injuries or disorders	57 (2.7)	20 (1.0)	0 (—)	**77 (3.7)**
Effect of environmental conditions	37 (1.8)	13 (0.6)	2 (0.1)	**52 (2.5)**
Traumatic injury or disorder, unspecified	29 (1.4)	7 (0.3)	4 (0.2)	**40 (1.9)**
Intracranial injury	27 (1.3)	12 (0.6)	3 (0.1)	**42 (2.0)**
Traumatic injury to muscles, tendons, ligaments, or joints	18 (0.9)	7 (0.3)	2 (0.1)	**27 (1.3)**
Surface wound or bruise	11 (0.5)	4 (0.2)	2 (0.1)	**17 (0.8)**
Total	**1,465 (69.7)**	**489 (23.3)**	**135 (6.4)**	**2,089 (99.4)†††**

Source: OIICS Code Trees. https://wwwn.cdc.gov/wisards/oiics/Trees/MultiTree.aspx?TreeType

Abbreviations: NAICS = North American Industry Classification System; OIICS = Occupational Injury and Illness Classification System.

* NAICS code 213112.

† NAICS code 213111.

§ NAICS code 211.

¶ Total percentage row totals might not equal the sum of all percentage values in a row because of rounding.

** Includes the extremities that are bounded by the trunk at the top with the fingers as the lowermost part (e.g., bones, cartilage, muscles, skin, subcutaneous tissue, veins, and arteries of upper extremities).

†† Includes the appendages that are bounded by the hip to the top with the toes as the lowermost part (e.g., bones, cartilage, muscles, skin, subcutaneous tissue, veins, and arteries of lower extremities).

§§ Multiple body parts from two or more areas of the body.

¶¶ The main part of the body where the head and limbs are attached. The area is bounded by the neck, shoulders, and legs.

*** The uppermost parts of the body (e.g., the skull, its contents, and related external structures; excludes amputations).

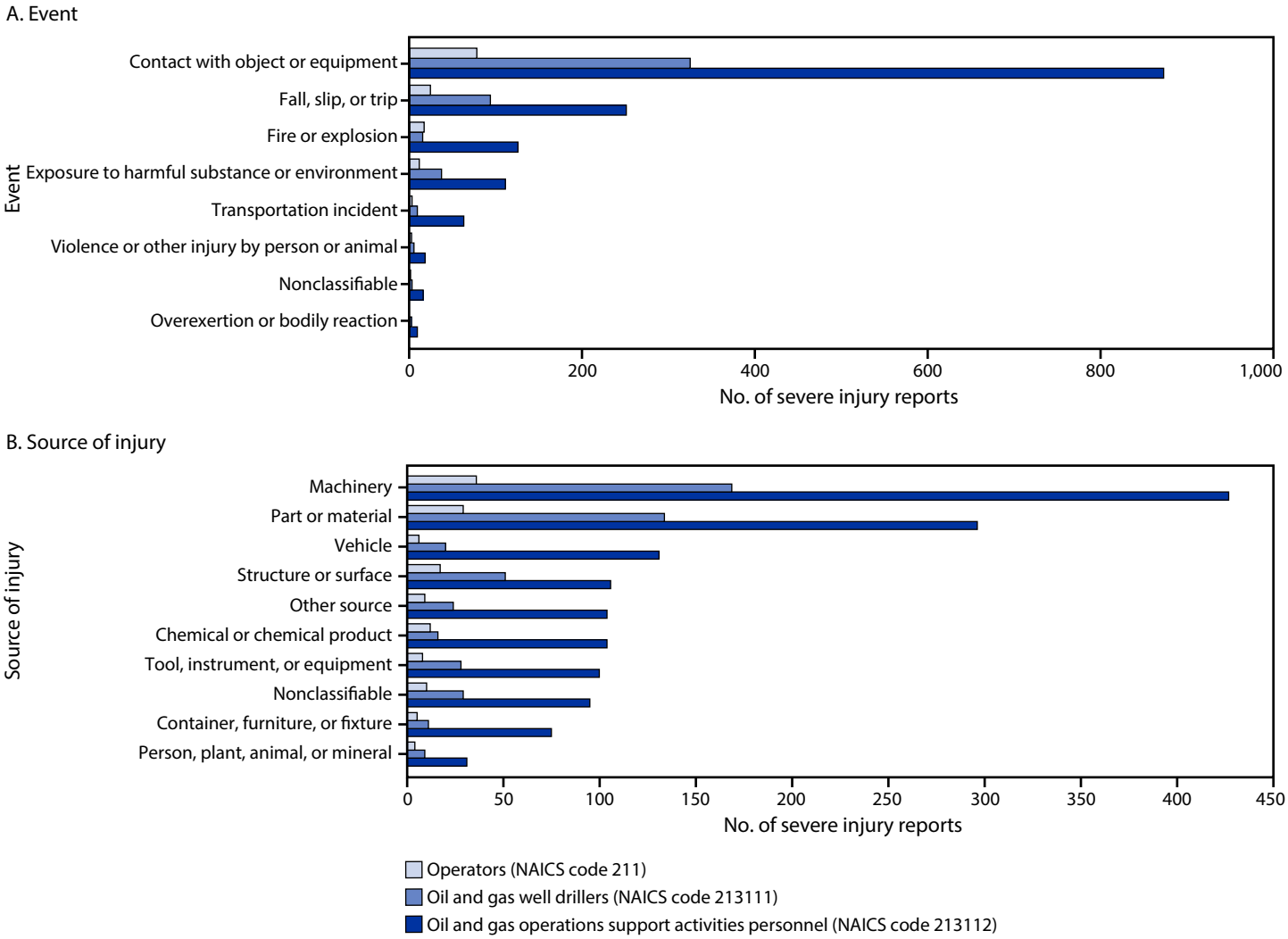
††† Source not known.

§§§ The functioning of an entire body system is affected without specific injury (e.g., hypothermia or asthma).

¶¶¶ The portion of the body that connects the head to the torso or trunk (e.g., the jaw, chin, and cranial region to the top and the shoulder below; excludes amputations).

**** Data were missing for three severe work-related injury records.

FIGURE. Severe work-related injuries* among oil and gas extraction workers, by event (A) and source of injury (B) (N = 2,101) — United States, January 2015–July 2022



Abbreviation: NAICS = North American Industry Classification System.
* Injuries that result in an amputation, loss of an eye, or inpatient hospitalization.

Sources of Severe Injuries

Machinery was the leading source of injury (633; 30.1%) among OGE contractors and operators, with construction, logging, and mining machinery accounting for 483 of these injuries (23.0% of all injuries). The second most common cause of injury involved parts and materials (460; 21.9%), followed by structures and surfaces (174; 8.3%). Among these, building materials-solid elements (187; 8.9%) was the leading source of injury. Vehicles*** were involved in 157 (7.5%) severe injuries and were the third highest source of injury among contractors in well-servicing companies, accounting for 131 (6.2%) injuries among these groups. Highway motorized vehicles††† (e.g., passenger vehicles, trucks, and multipurpose vehicles) accounted for 101 (4.8%) severe injuries. Overall, 430 (20.5%) injuries involved oil drilling rigs and machinery, and several involved other equipment, including pipes, ducts, and tubing (101; 4.8%), machine and appliance parts (67; 3.2%), heat-environmental equipment (52; 2.5%), and hoses (37; 1.8%).

Discussion

Although OGE workers represent a small proportion of the U.S. workforce, these workers are consistently overrepresented

*** Total number of vehicles involved is determined from the OIICS code under source of injury or illness and defined as vehicles that generally move on wheels, runners, water, or air.

††† Motorized vehicles are vehicles which are operated primarily on highways and other public roadways and used for transportation, hauling, delivering, and emergencies.

Summary

What is already known about this topic?

Oil and gas extraction (OGE) industry contract workers incur more work-related severe injuries compared with workers in other industries, based on data from the Occupational Safety and Health Administration.

What is added by this report?

During January 2015–July 2022, 32 jurisdictions reported 2,101 severe injuries (those resulting in amputation, loss of an eye, or inpatient hospitalization) among OGE industry workers. Overall, 895 (42.6%) reports of severe injuries involved upper extremities. Contract workers in the service and drilling subindustries experienced disproportionately more work-related injuries compared with those in the operation subindustry.

What are the implications for public health practice?

OGE operators could prevent contractor injuries and improve worksite safety by including contract workers in site safety management plans, improving job and equipment hazards training, and reinforcing safety practices.

in reports of work-related injuries, illnesses, and fatalities (*1*). Among OGE workers, contract workers in oil and gas subindustry support activities personnel in the well-servicing subindustry experience a greater number of severe work-related injuries than do those in the drilling contractor and operator subindustries. This finding might be attributed to the temporary nature of most work in this subindustry, which is largely without a social safety net, and consists of high-hazard jobs for which workers do not receive consistent training (*6*). Most of these severe injuries affect the upper and lower extremities, involve machinery or parts and materials, and vehicles, and are caused by contact with objects or trips, slips, and falls. These severe injuries might be associated with work stress, exposures to hazardous chemicals and other comorbid conditions, and vulnerabilities that are not available in the severe injury report data for analysis but warrant further research.

Under OSHA's General Duty Clause,[§§§] an employer must ensure a safe workplace for employees. This responsibility is allocated to OGE operators, who hire site contractors with their own safety programs that might not address all the site and equipment hazards present at a worksite. One potential strategy to address this would be for OGE operators to involve workers and contractors with a thorough understanding of work conditions in creating a job hazard analysis or daily safety plan within an effective safety management system. Using a safety management system that employs stringent and consistent safety training on job equipment, including personal protective equipment, and incorporates daily site safety meetings to discuss and address the changing work hazards can foster an inclusive safety culture. Further, severe injuries could be prevented by employing a hierarchy of controls, a process for identifying and controlling hazards[¶¶¶] whereby the most effective controls involve eliminating or substituting the hazard or condition through engineering controls, followed by safe work practices, administrative controls, and use of personal protective equipment when feasible.[****]

Limitations

The findings in this report are subject to at least five limitations. First, severe injury reports are administrative records collected for enforcement rather than a census or sample of work-related injuries for public health research; these data lack information on individual workers and are only available at the facility level, thereby limiting analysis. Second, only those severe injury reports from federal jurisdictions are publicly available. States implementing their own state plans are subject to the same reporting requirements, however, these data are not publicly available; thus, data from states with a large oil and gas sector (e.g., California, New Mexico, Utah, and Wyoming) are not available for analysis, limiting understanding of severe injury trends nationally in the OGE sector. Third, despite the reporting requirement, injuries are significantly underreported to OSHA.[††††] Fourth, the data do not contain worker demographic and work arrangement information that would permit identification of high-risk worker populations or health and safety inequities. Finally, the data do not contain information on injury severity or length of hospital stay, thereby limiting analysis of risk.

Implications for Public Health Practice

OSHA severe injury reports data provide timely, transparent, publicly available injury information at no cost to users, which can be used to examine trends over time, by geographic region, and by injury characteristics. These data have previously been analyzed to examine kidney injuries among indoor and outdoor workers (*9*) and seasonality and trends (*10*). The current severe injury report is the first of its kind to record nonfatal severe occupational injuries among federally covered states. These data can increase awareness of nonfatal injuries in the OGE sector on a national level by describing (through the use of NAICS and OIICS codes) the industry, nature, primary source, event of the injury, and affected body part or parts when severe occupational injuries occur. OSHA severe injury reports are submitted by employers but are confirmed and coded by OSHA. Despite significant underreporting, they provide additional insight into the occurrence of severe

[§§§] https://www.osha.gov/laws-regs/oshact/section5-duties

[¶¶¶] https://www.cdc.gov/niosh/topics/hierarchy/default.html
[****] https://www.osha.gov/safety-management/hazard-prevention
[††††] https://www.osha.gov/sites/default/files/severe-injury-report-2015to2021.pdf

occupational injuries and can therefore guide the development of strategic interventions for severe injury prevention in the OGE industry. The data also provide an opportunity to monitor changes in occupational injury trends in 6-month increments instead of annual data releases available from other occupational injury surveys. These findings also underscore the necessity for OGE operators to work with contracting companies to review their health and safety programs, interventions, and company safety procedures and address specific worksite hazards to prevent the occurrence of severe injuries leading to hospitalizations and amputations specifically affecting upper and lower body extremities.

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Dave Schmidt, Mark Zak, Occupational Safety and Health Administration, Office of Statistical Analysis.

Corresponding author: Vidisha Parasram, vparasram@cdc.gov.

[1]Epidemic Intelligence Service, CDC; [2]Division of Safety Research, National Institute for Occupational Safety and Health, CDC.

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Comparison of Administration of 8-Milligram and 4-Milligram Intranasal Naloxone by Law Enforcement During Response to Suspected Opioid Overdose — New York, March 2022–August 2023

Emily R. Payne, MSPH[1]; Sharon Stancliff, MD[1]; Kirsten Rowe, MS[1]; Jason A. Christie[2]; Michael W. Dailey, MD[3]

Abstract

In 2021, an 8-mg intranasal naloxone product was approved by the Food and Drug Administration; however, no studies have examined outcomes among persons who receive the 8-mg naloxone product and those who receive the usual 4-mg product. During March 2022–August 2023, New York State Department of Health (NYSDOH) supplied some New York State Police (NYSP) troops with 8-mg intranasal naloxone; other troops continued to receive 4-mg intranasal naloxone to treat suspected opioid overdose. NYSP submitted detailed reports to NYSDOH when naloxone was administered. No significant differences were observed in survival, mean number of naloxone doses administered, prevalence of most postnaloxone signs and symptoms, postnaloxone anger or combativeness, or hospital transport refusal among 4-mg and 8-mg intranasal naloxone recipients; however, persons who received the 8-mg intranasal naloxone product had 2.51 times the risk for opioid withdrawal signs and symptoms, including vomiting, than did those who received the 4-mg intranasal naloxone product (95% CI = 1.51–4.18). This initial study suggests no benefits to law enforcement administration of higher-dose naloxone were identified; more research is needed to guide public health agencies in considering whether 8-mg intranasal naloxone confers additional benefits for community organizations.

Introduction

An 8-mg intranasal naloxone formulation, a higher-concentration product than had previously been available, was approved by the Food and Drug Administration (FDA) in 2021 for emergency treatment of known or suspected opioid overdose (*1*); however, no real-world data on use of the 8-mg product are available. The approval of the higher-concentration formulation was based on the 505(b)(2) approval pathway under the Federal Food, Drug, and Cosmetic Act, relying on data from the original FDA approval of naloxone (*1*) and supported by reports from both the FDA Advisory Committee (*2*) and the National Institutes of Health (*3*), which both suggested that higher-dose initial opioid reversal agents were needed to effectively respond to overdoses from synthetic opioids, including fentanyl. For example, one retrospective study of community members noted that the majority administered ≥2 doses in responding to suspected overdoses (*4*). However, no real-world quantitative data suggest that 4-mg intranasal naloxone is ineffective at reversing such overdoses.*

In 2014, New York began a law enforcement naloxone initiative, which includes developing and delivering training, and supplying naloxone to law enforcement, providing implementation guidance, and having a system for collecting data on naloxone administrations† (*5*). The New York State Police (NYSP), a statewide law enforcement organization, reports the highest number of annual law enforcement naloxone administrations among New York law enforcement agencies, with approximately 360 reports per year (New York State Department of Health [NYSDOH], unpublished data, 2022). In New York, 4-mg intranasal naloxone is currently the product most commonly used by community responders, including law enforcement. For each person to whom naloxone is administered, law enforcement agencies submit a naloxone administration report to NYSDOH; reports include the following information: 1) date and time of administration, 2) age and perceived gender of the aided person, 3) county and zip code where the overdose occurred, 4) naloxone formulation used, 5) number of naloxone doses administered, 6) response to naloxone, 7) postnaloxone signs and symptoms, 8) emergency medical services disposition, and 9) survival.

Harm reduction advocates and medical professionals have noted potential harms of higher-dose naloxone, including severe withdrawal signs and symptoms, which can result in refusal of medical care, rapid reuse of opioids, reluctance to use naloxone if witnessing an overdose, and respiratory complications, including pulmonary edema and consequences of aspiration of vomitus (*6,7*). To evaluate this potential risk, in 2022, NYSDOH partnered with NYSP to field test 8-mg intranasal naloxone use by some NYSP troops. The aims of the study were to conduct real-world comparisons of survival, the average number of doses administered, presence of postnaloxone signs and symptoms, and hospital transport refusal among persons receiving the 8-mg or the 4-mg intranasal naloxone products.

* At the time of this writing, FDA has not approved intranasal naloxone doses >4 mg/0.1 mL for over-the-counter sales and has approved a lower dose (3 mg/0.1 mL) for such sales. https://www.fda.gov/news-events/press-announcements/fda-approves-second-over-counter-naloxone-nasal-spray-product

† New York training materials for law enforcement naloxone administration include nausea, vomiting, and withdrawal (sick feeling) as the key components of opioid withdrawal signs and symptoms for which to monitor after naloxone administration.

Methods

Field Test: 8-mg versus 4-mg Intranasal Naloxone

In March 2022, NYSDOH partnered with NYSP to field test 8-mg intranasal naloxone by three of their 11 troops for use at the scene of a suspected opioid overdose. The three troops, located in eastern New York, received only 8-mg naloxone during this period. The other eight state police troops continued to receive the 4-mg intranasal product. All NYSP sworn members (state troopers) undergo standardized annual training on response to possible overdose events including patient assessment, naloxone use, and provision of rescue breathing. In addition, troopers receive biennial training in cardiopulmonary resuscitation, including chest compressions and automated external defibrillator usage. In 2022, the annual training included explanation of the field test and the change made to the reporting form to include dosage of intranasal naloxone administered. This study was reviewed and approved by the NYSDOH Institutional Review Board as non-research.[§]

The field test included a review of naloxone administration reports at regular team meetings, including by two physicians. When indicated, review of body-worn camera footage was conducted by study authors in collaboration with NYSP. Exclusion criteria included 1) absence of opioid toxidrome (i.e., respiratory depression or decreased consciousness), 2) more than one naloxone formulation (i.e., both 4-mg and 8-mg products) used by law enforcement responders, and 3) likely death before naloxone administration. Likely death before naloxone administration was ascertained by review of body-worn camera footage, responder reports, and defibrillator demonstration of asystole with no bystander cardiopulmonary resuscitation.

[§] 45 C.F.R. part 46.101(c); 21 C.F.R. part 56.

Data Analysis

Average number of naloxone doses administered per patient by formulation were compared using a t-test. Rates of survival and postnaloxone signs, symptoms, and behaviors (opioid withdrawal signs and symptoms including vomiting [reported as "dope sick" or "vomiting" by responders], lethargy, disorientation, perceived anger or combativeness, and hospital transport refusal) were compared using bivariate log-binomial regression for relative risk with associated p-values. Vomiting was also examined as an isolated postnaloxone sign separate from the grouped opioid withdrawal signs and symptoms variable. Persons who received the 4-mg intranasal naloxone product served as the referent group for all comparisons. P-values <0.05 were considered statistically significant. Analyses were conducted using SAS software (version 9.4; SAS Institute).

Results

Naloxone Administration Reports

During March 26, 2022–August 16, 2023, NYSP troopers submitted 436 naloxone administration reports. After review, 354 (81.2%) forms met inclusion criteria, including 101 (29%) 8-mg and 253 (71%) 4-mg intranasal naloxone forms (Table). Overall, 99.0% of persons who received 8 mg and 99.2% of those who received 4-mg intranasal naloxone survived (relative risk [RR] = 0.81; p = 0.86). Recipients of 8-mg intranasal naloxone received an average of 1.58 doses (95% CI = 1.45–1.72), corresponding to a mean of 12.6 mg of naloxone. Recipients of 4-mg intranasal naloxone received an average of 1.67 doses (95% CI = 1.59–1.75), corresponding to a mean of 6.7 mg of naloxone. The mean number of doses administered per patient did not differ significantly by formulation (p = 0.27). Postnaloxone anger or combativeness as perceived by the responding law enforcement officer was reported in 11 of 101

TABLE. Reported outcomes and postnaloxone signs and symptoms among persons who received naloxone for suspected opioid overdose, by intranasal naloxone formulation as reported by New York State Police personnel (N = 354) — New York, March 2022–August 2023

Characteristic	Naloxone doses administered, no. (%)		RR (95% CI)	p-value for RR
	8 mg (n = 101)	4 mg* (n = 253)		
Reported outcome				
Survived	100 (99.0)	248 (99.2)	0.81 (0.07–8.99)	0.86
Perceived anger or combativeness	11 (10.9)	20 (7.9)	1.42 (0.66–3.09)	0.37
Refused transport to hospital	19 (19.0)	66 (26.6)	0.65 (0.36–1.15)	0.14
Postnaloxone sign or symptom				
Opioid withdrawal sign or symptom, including vomiting[†]	38 (37.6)	49 (19.4)	2.51 (1.51–4.18)	<0.001
Vomiting only	21 (20.8)	35 (13.8)	1.64 (0.90–2.98)	0.11
Disorientation	67 (66.3)	148 (58.5)	1.40 (0.86–2.27)	0.17
Lethargy	53 (52.5)	110 (43.5)	1.44 (0.90–2.28)	0.13

Abbreviation: RR = relative risk.
* Referent group.
[†] New York training materials for law enforcement naloxone administration include nausea, vomiting, and withdrawal (sick feeling) as the key components of opioid withdrawal signs and symptoms for which to monitor after naloxone administration.

Summary

What is already known about this topic?

In 2021, the Food and Drug Administration approved an 8-mg intranasal naloxone product, with twice the amount in the usual 4-mg dose; no data on use of this product in probable opioid overdoses are available.

What is added by this report?

Among recipients of 4-mg or 8-mg intranasal naloxone administered by law enforcement, no differences were observed in survival, the number of doses received, prevalence of most postnaloxone signs and symptoms, combativeness, or hospital transport refusal; 8-mg product recipients had a significantly higher prevalence of opioid withdrawal signs and symptoms than did 4-mg product recipients.

What are the implications for public health practice?

No benefits to administration of 8-mg intranasal naloxone compared with 4-mg product were found. More data are needed to determine whether higher-dose intranasal naloxone would provide added benefits.

(10.9%) 8-mg recipients and 20 of 253 (7.9%) 4-mg recipients and did not differ by formulation (RR = 1.42; p = 0.37). Most aided persons who were not deceased were transported to the hospital (75.6%; NYSDOH, unpublished data, 2022–2023), and hospital transport refusal did not differ significantly by formulation (RR = 0.65; p = 0.14).

Postnaloxone Signs and Symptoms

The most common postnaloxone signs and symptoms experienced among both groups were disorientation (8-mg recipients: 66.3%; 4-mg recipients: 58.5%) and lethargy (8-mg recipients: 52.5%; 4-mg recipients: 43.5%). RR for postnaloxone disorientation and lethargy did not differ significantly by formulation (p = 0.17 and 0.13, respectively).

Opioid withdrawal signs and symptoms including vomiting were significantly more prevalent among 8-mg naloxone recipients (37.6%) than among 4-mg recipients (19.4%), (RR = 2.51; p<0.001). Vomiting, one sign of withdrawal, was observed in 20.8% and 13.8% of 8-mg and 4-mg intranasal naloxone recipients, respectively; this was not significantly different by formulation (RR = 1.64; 95% CI = 0.90–2.98) (p = 0.11).

Discussion

Despite the increased naloxone concentration in the 8-mg intranasal product, no significant differences were found in the survival of aided persons, or the number of doses administered by law enforcement by formulation, suggesting that, in this field test, the increased dosage did not provide added benefit, even in light of the increased prevalence of synthetic opioids, including fentanyl, in the drug supply.

Other studies have also found that number of naloxone doses administered in response to overdose has not changed over time, even with 4-mg and other lower-potency formulations (*8,9*). In this study, persons who received the 8-mg product were more than twice as likely to experience postnaloxone opioid withdrawal signs and symptoms including vomiting, compared with those who received the 4-mg intranasal naloxone product. When vomiting was analyzed as an isolated sign, no significant differences between formulations were found. However, the high prevalence of vomiting as an isolated sign in both groups is concerning because of the risk of aspiration in sedated persons.

Limitations

The findings in this report are subject to at least four limitations. First, responding law enforcement personnel are not medical providers, and inconsistencies in their classification of postnaloxone symptoms or behaviors might have occurred. However, NYSP personnel have been reporting using a similar form for several years and are experienced in assessing symptoms and behaviors. Second, the number of 8-mg intranasal naloxone administration reports included was limited because only three of 11 NYSP troops received this formulation. With an increased sample size, additional differences in outcomes between groups might have been observed. Third, no information could be compared about differences between groups on the type or dose of substance used before suspected overdose, vital signs, or demographics. Finally, because the data were gathered from New York State only, the opioid potency might not reflect that in other areas.

Implications for Public Health Practice

As reported in a 2022 review article (*7*), this study found no evidence supporting a benefit associated with administration of stronger opioid antagonists. In addition, the findings in this report align with data reported in a recent systematic review (*10*), which found that higher doses of naloxone administered in the emergency department were associated with a higher frequency of adverse events. This study is the first to provide real-world data comparing postnaloxone signs and symptoms and survival among persons administered 8-mg and 4-mg intranasal naloxone by community responders in response to a probable opioid overdose. This study suggests that there are no benefits to law enforcement administration of higher-dose naloxone. Additional data are needed to guide public health agencies in considering whether the 8-mg intranasal naloxone product provides benefits compared with the usual 4-mg intranasal naloxone product among community organizations, including law enforcement, given the lack of difference in survival rates or number of naloxone doses administered and the

increased prevalence of opioid withdrawal signs and symptoms, including vomiting, in 8-mg recipients, when compared with recipients of 4-mg intranasal naloxone.

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Corresponding author: Sharon Stancliff, Sharon.Stancliff@health.ny.gov.

[1]AIDS Institute, New York State Department of Health; [2]New York State Police, Albany, New York; [3]Albany Medical College, Albany, New York.

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Notes from the Field

Rapidly Linking an Outbreak of *Salmonella* Typhimurium Infections to Domestically Grown Cantaloupes Through Early Collaboration — United States, 2022

Colin Schwensohn, MPH[1]; Benjamin Schneider, MPH[1,2]; Erin Jenkins, MPH[3]; Allison Wellman, MPH[3]; Sharon Seelman Federman, MS, MBA[3]; Oluwakemi Oni, MPH[4]; Nicole Stone, MPH[5]; Jennifer Adams[1,6]; Laura Gieraltowski, PhD[1]

In 2020, federal and state regulators conducted environmental testing at a midwestern melon farm in response to a multistate outbreak of *Salmonella* infections that was associated with melon consumption (*1*). *Salmonella* was detected in the environmental samples, and whole genome sequencing (WGS) was performed. PulseNet, CDC's molecular subtyping network for foodborne disease surveillance, was used to assess genetic relationships between environmental *Salmonella* isolates and those from ill persons. *Salmonella* Typhimurium identified in environmental testing was related to illnesses in previous years that exhibited a seasonal pattern (Figure). Although this environmental strain was not linked to illnesses in the 2020 outbreak, the pattern of increased incidence during previous summers raised concern about the possibility of a persistent *Salmonella* reservoir with potential to cause future outbreaks. Investigations identified the short melon growing season as a challenge: by the time an outbreak is detected, epidemiologic and traceback evidence collected, and a farm identified, the growing season is over, and melons are no longer on the market. To overcome this challenge, CDC collaborated with the Food and Drug Administration (FDA) and state and local health and agricultural agencies in 2022 to identify all cases of *Salmonella* infection genetically related to the 2020 environmental strain for immediate follow-up. Ill persons were interviewed using a standardized questionnaire to identify the source of melon exposure as quickly as possible and before the end of the melon growing season. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.*

Investigation and Outcomes

On August 4, 2022, PulseNet identified 12 *S.* Typhimurium infections that were genetically related within seven allele differences by WGS to the 2020 environmental strain. Cases were defined as infections with isolates that were related to the 2020 strain within 10 allele differences and that occurred during July 7–September 11, 2022. In total, 87 outbreak cases from 11 states were identified in 2022.† The median patient age was 65 years (range = 1–93 years); 67% of patients were female. Thirty-two (37%) patients were hospitalized; none died.

Upon outbreak detection, investigators worked with state and local agencies to assess cantaloupe and watermelon exposure, which were vehicles of interest based on previous outbreak investigations. In 2022, cantaloupe consumption was reported significantly more frequently by ill persons (36 of 47; 77%) than during a 2018–2019 survey of healthy persons conducted on FoodNet sites (29%, p<0.001) (*2*). FDA traced the source of cantaloupes purchased by ill persons to a common geographic region close to where the 2020 *Salmonella* environmental strain was identified. By August 25, 2022, the combination of epidemiologic and traceback data and relationship to the 2020 environmental strain indicated that cantaloupes grown in the Midwest were the likely outbreak source. At the time cantaloupes were identified as the source, the 2022 cantaloupe growing season (May–July) had already ended (*3*). As a result, contaminated melons were unlikely to be on the market; therefore, a recall was not initiated because ongoing foodborne illness risk had ceased. In 2022, the time from outbreak detection to determining melons were the likely source was 14 days shorter compared to the 2020 outbreak investigation, which ranged from September 18, 2020–October 23, 2020.

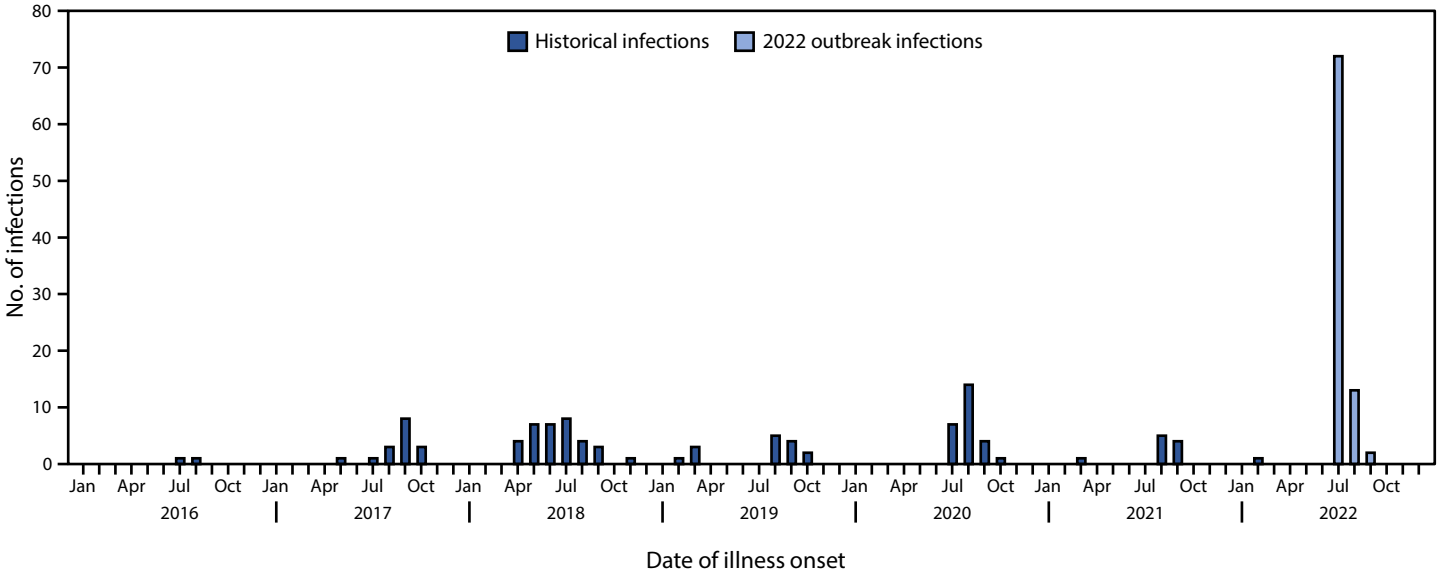
Preliminary Conclusions and Actions

Although the risk for foodborne illness from contaminated melons had ended before definitive public health action could be taken, this investigation highlights how WGS-based surveillance combined with rapid epidemiologic data collection by state and local agencies can be used to reduce the time to outbreak detection and response. The time from outbreak detection to source identification was 2 weeks shorter in 2022 compared with that during the 2020 outbreak. This shortened time frame is attributable to collaboration with partners to prepare to rapidly assess food exposures after illnesses with the 2020 environmental strain were identified. In the future, these activities, paired with prospective melon sampling and *Salmonella* testing might identify melon-associated outbreak strains earlier, further speeding outbreak investigations by quickly narrowing to a likely source. The strategies detailed in this report might increase the likelihood of public health action during future outbreaks.

* 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

† Georgia (one case), Illinois (five), Indiana (17), Iowa (38), Kentucky (three), Michigan (three), Minnesota (four), Missouri (two), Ohio (three), South Carolina (one), and Wisconsin (10).

FIGURE. Number of persons infected with *Salmonella* Typhimurium, by case status and date of illness onset — United States, July 23, 2016–September 11, 2022



Summary

What is already known about this topic?

A 2020 outbreak of *Salmonella* infections was found to be associated with melons after conclusion of harvesting, when melons were no longer likely to be on the market.

What is added by this report?

In 2022, whole genome sequencing (WGS)–based *Salmonella* surveillance, historical melon farm environmental sampling results, and patient interviews were used to rapidly link a *Salmonella* Typhimurium outbreak to contaminated cantaloupes.

What are the implications for public health practice?

WGS-based surveillance, combined with rapid collection of epidemiologic data by state and local agencies, can be used to reduce the time to outbreak detection and response.

Corresponding author: Colin Schwensohn, hvq4@cdc.gov.

[1]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [2]Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee; [3]Food and Drug Administration, Silver Spring, Maryland; [4]Iowa Department of Health and Human Services; [5]Indiana Department of Health; [6]Association of Public Health Laboratories, Silver Spring, Maryland.

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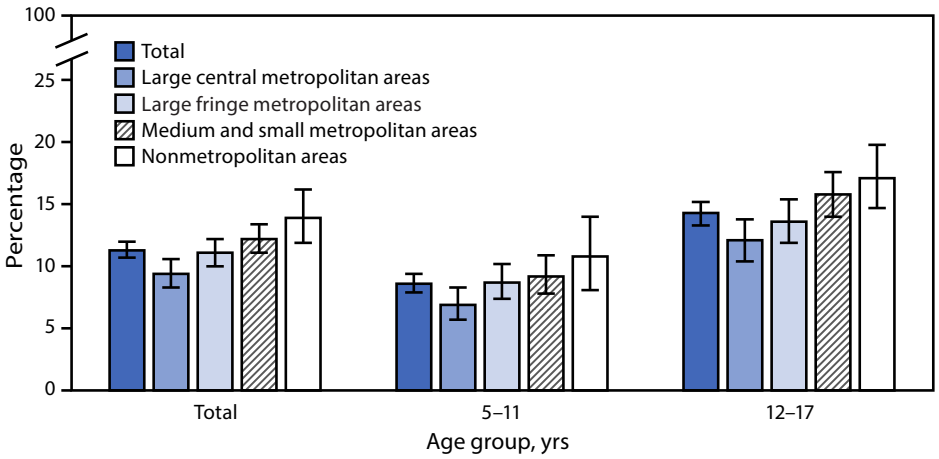
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Children and Adolescents Aged 5–17 Years Who Had Ever Received a Diagnosis of Attention-Deficit/Hyperactivity Disorder,† by Urbanization Level§ and Age Group — National Health Interview Survey, United States, 2020–2022¶



Abbreviations: ADD = attention-deficit disorder; ADHD = attention-deficit/hyperactivity disorder.
* With 95% CIs indicated by error bars.
† Based on an affirmative response to the survey question, "Has a doctor or health professional ever told you that [child] had attention-deficit/hyperactivity disorder or ADHD or attention-deficit disorder or ADD?"
§ Urbanization level is based on county of residence using the National Center for Health Statistics Urban-Rural Classification Scheme for Counties. https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf
¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population.

During 2020–2022, 11.3% of children and adolescents aged 5–17 years had ever received a diagnosis of ADHD. The percentage of children and adolescents who had ever received a diagnosis of ADHD increased with decreasing level of urbanization from 9.4% among those living in large central metropolitan areas to 13.9% among those living in nonmetropolitan areas. A similar pattern was seen among children aged 5–11 years (6.9% in large central metropolitan areas compared with 10.8% in nonmetropolitan areas) and children and adolescents aged 12–17 years (12.1% to 17.1%). Children and adolescents aged 12–17 years were more likely than were children aged 5–11 years to receive an ADHD diagnosis across all levels of urbanicity.

Source: National Center for Health Statistics, National Health Interview Survey, 2020–2022. https://www.cdc.gov/nchs/nhis.htm

Reported by: Nazik Elgaddal, MS, nelgaddal@cdc.gov; Cynthia Reuben, MA.

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