Carbon Monoxide Epidemic Among Immigrant Populations: King County, Washington, 2006

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Objectives. We investigated an outbreak of carbon monoxide (CO) poisoning after a power outage to determine its extent, identify risk factors, and develop prevention measures.

Methods. We reviewed medical records and medical examiner reports of patients with CO poisoning or related symptoms during December 15 to 24, 2006. We grouped patients into households exposed concurrently to a single source of CO.

Results. Among 259 patients with CO poisoning, 204 cases were laboratory confirmed, 37 were probable, 10 were suspected, and 8 were fatal. Of 86 households studied, 58% (n=50) were immigrant households from Africa (n=21), Asia (n=15), Latin America (n=10), and the Middle East (n=4); 34% (n=29) were US-born households. One percent of households was European (n=1), and the origin for 7% (n=6) was unknown. Charcoal was the most common fuel source used among immigrant households (82%), whereas liquid fuel was predominant among US-born households (34%).

Conclusions. Educational campaigns to prevent CO poisoning should consider immigrants' cultural practices and languages and specifically warn against burning charcoal indoors and incorrect ventilation of gasoline- or propane-powered electric generators. (*Am J Public Health.* 2009;99:1687–1692. doi: 10.2105/AJPH.2008.143222)

Outbreaks of acute unintentional carbon monoxide (CO) poisoning have been reported after winter storms and other natural disasters secondary to loss of electrical power and subsequent use of alternate sources of energy.[1–3]

On December 14, 2006, from approximately 4:00 PM until the early morning hours of December 15, a severe windstorm affected western and central Washington State, with wind speeds of over 135 mph in certain areas.[4] An estimated 4 million persons in 15 counties were without electrical power by early morning on December 15.[4] During the next 5 to 6 days, temperatures decreased into the low 30s (degrees Farenheit), and by December 21, approximately 184 000 persons were estimated to be without power.[4] Within 24 hours of the storm's onset, local health care facilities experienced a surge in persons with CO poisoning, ultimately exceeding 250 reported cases.[5]

In response to the outbreak, we initiated an epidemiologic investigation across King County, Washington, to determine the extent of CO poisoning caused by the windstorm, describe the demographic and clinical features of affected patients, and identify prevention measures to reduce future cases.

METHODS

On December 18, 2006, Public Health—Seattle and King County requested that all King County acute-care hospitals enhance surveillance for CO poisoning and report all cases encountered. We obtained records of all patients examined in health care facilities and the regional hyperbaric oxygen treatment center during December 15 to 24, 2006, with a discharge diagnosis of CO poisoning or related symptoms. Accepted criteria for hyperbaric oxygen therapy of CO poisoning were transient or prolonged unconsciousness, abnormal neurologic findings on physical examination, evidence of cardiac ischemia, a carboxyhemoglobin (COHb) concentration greater than 25% to 30%, and in some instances, pregnancy. We also reviewed all King County medical examiner cases during December 15 to 24 to identify deaths attributed to CO poisoning. In addition, hospitals and the public health physicians on our team reviewed laboratory data regarding patients who had a COHb-concentration test during these dates and obtained all corresponding records for these patients. Our public health physicians performed chart abstractions with a standard tool developed for this investigation.

We defined a case of CO poisoning as a diagnosis of or symptoms consistent with CO poisoning in any patient evaluated at a King County health care facility or by the King County medical examiner during December 15 to 24, 2006. We categorized cases into 4 mutually exclusive classifications: confirmed, probable, suspected, and fatal. Among nonfatal cases, we defined a laboratory-confirmed case as one with a COHb concentration greater than 2% for nonsmokers and greater than 9% for smokers[6]; a probable case as a physician's diagnosis of CO poisoning that did not meet laboratory criteria for a confirmed case; and a suspected case as self-reported signs and symptoms of CO poisoning with a history of exposure to a source of CO or an epidemiologic link to a confirmed or probable case. Fatal cases were defined as deaths from exposures that occurred during December 15 to 24, 2006, in which the King County medical examiner had classified the cause of death as CO poisoning. We excluded CO poisoning cases that were clearly related to occupational, intentional, or residential fire exposures.

Radford and Drizd studied COHb concentrations of nearly 10 000 US residents aged 3 to 74 years and of all smoking statuses to define normal COHb concentrations for different groups.[6] They reported the 98th percentile for COHb among smokers as 10%. Therefore, a concentration of 10% or greater is 50 times more likely to have a contribution from an exogenous source than from cigarettes alone. The selection of this concentration as a cutoff for smokers is also consistent with the Centers for Disease Control and Prevention's definition of CO poisoning.[7]

We grouped cases together into households, which we defined as multiple cases exposed to a single source of CO with concurrent time and location, even if no familial relationship existed. Team members attempted to interview an adult from each household or an adult proxy who was familiar with the CO-exposure incident. The team made a minimum of 3 attempts to contact each household and used interpreters as needed. We defined an immigrant household as having at least 1 member born outside the United States who had been exposed to CO; if at least 1 household member who was exposed to CO spoke a primary language other than English, we classified the household as foreign-language speaking. For households in which the medical record and personal interview indicated a different primary language, we chose the language indicated by the interview. We categorized cases by race/ethnicity when this information was documented in the medical record per categories used by the US Census Bureau to optimize comparisons with the known racial/ethnic composition of the region.[16]

RESULTS

Hospital surveillance identified 279 patients for medical record review. Of these, 20 were excluded because of house fires, intentional exposures, or other causes. A total of 259 met 1 of our case classifications: 204 were laboratory confirmed, 37 were probable, 10 were suspected, and 8 cases were fatal. These 259 cases represented 116 different households. Interviews were conducted for 84 (72%) households, representing 201 (78%) cases; additional information was obtained from medical examiner reports for 2 of the households in which fatalities occurred for whom interviews were not conducted, representing 6 additional cases. The remaining 30 households were lost to follow-up.

Of the 259 cases, 63% (n=164) were among girls and women, with ages ranging from 3 weeks to 83 years (median=26 years; Table 1). Race/ethnicity data had been recorded in 66% (n=172) of case records: 25% (n=43) were Asian, 44% (n=76) Black, 16% (n=28) Hispanic, and 15% (n=25) White. Primary language spoken was recorded in 74% (n=192) of patient records. Among these, 39% (n=75) spoke a language other than English: at least 12 other languages were identified in medical records, and at least 13 other languages were identified on the basis of interview data. Medical records indicated that 18 patients were smokers and 149 were nonsmokers; smoking status was not documented for 92 cases, and for purposes of laboratory interpretation for case classification, the patients were assumed to be nonsmokers. Pregnancy status, a potential indication for hyperbaric oxygen treatment, was noted in the records of 44 of the 82 women of childbearing age (i.e., ages 15–44 years), of whom 8 were documented as being pregnant.

Date of medical care was available for 250 nonfatal cases and for the 1 fatality who had been hospitalized before death. Of these 251 patients, 65% (n=164) had sought care at a health care facility within 2 days of the storm. Of the total 259 persons, 1 patient was directly admitted to the hospital, 2 presented to an outpatient clinic, 7 were reported deceased by the medical examiner, and the remaining 249 were first examined at an emergency department. Of the 249 persons who presented to an emergency department, 5 were admitted to either an inpatient ward or an intensive care unit. One of these hospitalized patients later died. Arrival time was available for 78% (n=196) of the 251 patients with a date of medical care noted. Of the 63 patients for whom arrival time was unavailable, 76% (n=48) were examined during the first 2 days of the storm when health care facilities were often at mass capacity. Thirteen percent (n=8) were medical examiner cases, including 7 persons who were dead on arrival and 1 who was transferred to an intensive care unit and later died. Among the 196 patients for whom arrival time was recorded, regardless of which day they arrived, 48% (n=95) had been examined during 6:00 PM to 12:00 AM, the period associated with CO exposure during winter windstorms, when temperatures dropped after sundown and alternate cooking and heating sources were used.[7]

Among the 259 patients, the most common symptoms at examination were headache, 71% (n=184); nausea, 54% (n=141); vomiting, 32% (n=84); and dizziness, 30% (n=77). Three percent of patients (n=7) were dead on arrival; loss of consciousness occurred among 17% (n=44), including 1 patient who initially

TABLE 1—Patients Evaluated by Health Care Facilities, a Hyperbaric Oxygen Treatment Center, and King County Medical Examiner With Symptoms and Signs of Carbon Monoxide Poisoning, by Selected Characteristics: King County, WA, December 15–24, 2006

	Amount
Charts abstracted, no.	279
Cases meeting definition, no.	259
Households identified, no.	116
Female, no. (%)	164 (63.3)
Age	
Range	3 wk–83 y
Median	26 y
Age group, no. (%)	
≤3 y	29 (11.2)
4–12 y	53 (20.5)
13–18 y	25 (9.7)
19–64 y	141 (54.4)
≥65 y	11 (4.2)
Race/ethnicity, no. (%)	
Asian	43 (16.6)
Black	76 (29.3)
White	25 (9.7)
Hispanic	28 (10.8)
Unknown	87 (33.6)
Pregnant, no. (%)	
Yes	8 (3.1)
No	90 (34.7)
Unknown	68 (41.5)
Smoker, no. (%)	
Yes	18 (6.9)
No	149 (57.5)
Unknown	92 (35.5)
Clinical outcome, no. (%)	
Hyperbaric oxygen treatment	70 (27)
Hospitalized	6 (2.3)
Died	8 (3.1)

Note. Totals may not add up to 100% because of rounding.

presented with loss of consciousness but eventually died during hospitalization. Of 4 patients noted to be asymptomatic in the medical charts, 2 were children younger than 2 years; 1 was aged 10 years and was brought in as part of a household; and 1 was a woman aged 29 years who was evaluated after bringing in her daughter for medical attention. Documented preexisting comorbidities included cardiovascular disease among 34 patients, pulmonary disease among 8 patients, and neurologic disorder among 8 patients.

TABLE 2—Patients (N = 259) Evaluated by Health Care Facilities, a Hyperbaric Oxygen Treatment Center, and King County Medical Examiner With Symptoms and Signs of Carbon Monoxide Poisoning, by Selected Clinical Characteristics: King County, WA, December 15–24, 2006

	Amount
Symptoms and signs at presentation,[a] no. (%)	
Headache	184 (71)
Nausea	141 (54.4)
Vomiting	84 (32.4)
Dizziness	77 (29.7)
Loss of consciousness	43 (16.6)
Shortness of breath	32 (12.4)
Dead on arrival	7 (2.7)
Asymptomatic	6 (2.3)
Comorbidities, no. (%)	
Cardiovascular disease risk factors[b]	34 (13.1)
Pulmonary disease	8 (3.1)
Neurologic disease	8 (3.1)
None	162 (62.5)
Unspecified	44 (16.9)
Initial carboxyhemoglobin concentrations, %	
Range	0.4–32.3
Median	12.5

[a]Patients might have had more than 1 symptom or sign at examination.
[b]Cardiac risk factors included coronary artery disease, hypertension, hyperlipidemia, septal defect, diabetes mellitus, status post cardiac procedure not otherwise specified, congestive heart failure, and atypical chest pain.

COHb concentrations ranged from 0.4% to 32.3% (median=12.5%; Table 2).

Of the 259 patients, 68% (n=175) were discharged to home from the health care facility, 27% (n=70) were transferred to the hyperbaric oxygen treatment center, 2% (n=6) were hospitalized, and 3% (n=8) died. Five of these deaths occurred among family members of a Vietnamese household, 2 parents and their 3 sons aged 14, 21, and 24 years, who had purchased a generator the day after the storm and had it running in their garage with both doors closed. Four of these family members were found dead; the son aged 24 years was found unconscious, was admitted to an intensive care unit, and later died of toxic asphyxia secondary to his CO exposure. The other 3 deaths occurred among 3 persons in separate households: a Mexican man aged 31 years was found dead next to a charcoal grill, a Mexican man aged 26 years was found dead with a generator in the living room, and an Afghan man aged 73 years was found dead next to a charcoal grill.

Of the 70 patients who received hyperbaric oxygen treatment, 99% (n=69) had confirmed illness, and 1% (n=1) had probable illness. Thirty percent (n=21) were Asian, 29% (n=20) Black, 14% (n=10) Hispanic, 7% (n=5) White, and for 20% of cases (n=14), race/ethnicity was unknown.

Among 116 households, the median number of cases per household was 2 (range=1–11 cases); 53% (n=62) of households had only a single case of poisoning. Of the 86 households for whom such information was available, 58% (n=50) were immigrant households from the following areas: Africa (n=21), Asia (n=15), Latin America (n=10), and the Middle East (n=4). For 34% (n=29) of households, all members were US born. Immigrant status was unavailable for 7% of households interviewed (Table 3). Primary spoken language data were available for 88% (n=76) of interviewed households; of these, English was the primary spoken language by at least 1 household member for 45% (n=34), and 55% (n=42) had at least 1 household member who spoke a primary language other than English; at least 13 different languages were spoken in affected households, most commonly Somali (n=10), Spanish (n=9), and Vietnamese (n=8).

Fifty-three percent (n=46) of the 86 interviewed households had used charcoal-burning grills, hibachis, or buckets as the CO-producing fuel source. A gasoline- or propane-powered electric generator was the source of CO exposure for 16% (n=14) of these households.

TABLE 3—Households (N = 86) Evaluated by Health Care Facilities, a Hyperbaric Oxygen Treatment Center, and King County Medical Examiner With Carbon Monoxide Poisoning, by Selected Characteristics: King County, WA, December 15–24, 2006

Place	No. (%)
Place of birth	
Africa	21 (24.4)
Asia	15 (17.4)
Europe	1 (1.2)
Latin America	10 (11.6)
Middle East	4 (4.7)
United States	29 (33.7)
Unknown	6 (7)
Source of carbon monoxide	
Charcoal[a]	46 (53.5)
Gasoline- or propane-powered electric generator	14 (16.3)
Liquid fuel[b]	14 (16.3)
Other[c]	10 (11.6)
Not documented	2 (2.3)
Primary language spoken	
English	34 (39.5)
Somali	10 (11.6)
Spanish	9 (10.5)
Vietnamese	8 (9.3)
Amharic	3 (3.5)
Cambodian	2 (2.3)
Tagalog	2 (2.3)
Armenian	1 (1.2)
Chinese	1 (1.2)
French	1 (1.2)
Korean	1 (1.2)
Oriya	1 (1.2)
Russian	1 (1.2)
Tigrigna	1 (1.2)
Unknown	11 (12.8)

[a]Used, for example, in a grill, hibachi, or bucket.
[b]This can be kerosene-, propane-, or other petroleum-fueled lantern; space heater; grill; or fireplace.
[c]Other included, for example, a wood stove, wood fireplace, or vehicle.

Liquid fuels (e.g., gasoline, propane, or kerosene) powered such devices as lanterns, space heaters, grills, and fireplaces, and were the source of CO exposure for 16% (n=14) of interviewed households. Another 12% (n=10) of these households used other CO-producing sources (e.g., wood stoves, wood fireplaces, and vehicles; Table 3). Forty-four percent (n=38) of households reported purchasing their fuel and devices only after the storm hit. Exposure source information was unavailable for 2% (n=2) of interviewed households.

The percentages of immigrant households that used each of the top 3 fuel sources were: 82% (n=42), charcoal; 12% (n=6), a gasoline- or propane-powered electric generator; and 2% (n=1), liquid fuel. Conversely, among US-born households, 7% (n=2) used charcoal; 28% (n=8), a generator; and 34% (n=10), liquid fuel (Table 4). Among immigrant households, more than 95% of African households were exposed to charcoal, as were 67% of Asian households, 70% of Latin American households, and 100% of Middle Eastern households. Of note, all 8 fatalities occurred among 4 immigrant households: 1 fatality occurred in each of 3 separate households, 2 of whom had used charcoal, and 1 of whom had used a generator in a living area; 5 deaths occurred in a fourth household that had used a generator in an unventilated garage.

DISCUSSION

This epidemic of CO poisoning represents the most significant storm-related outbreak in US history.[8] One other outbreak associated with an ice storm in Maine in 1998 might have had as many or more cases, but it did not have as many deaths.[9] Because CO poisoning causes nonspecific symptoms and is underrecognized,[9–11] the true magnitude of this outbreak was likely substantially larger than reported. Underdiagnosis of CO poisoning is well described; 30% to 50% of patients seeking care at emergency departments because of CO poisoning might not receive a CO poisoning diagnosis.[12–15] Because this study was limited to persons who presented to King County facilities, 1 of 15 counties that suffered widespread power outages, it likely accounts for only a fraction of persons affected; it also only captures those who sought medical care or were reported to the King County medical examiner's office. Thus, non–King County residents, persons with milder symptoms, and those with limited access to medical care, including the uninsured and racial/ethnic minorities, were likely underestimated by this investigation.

Despite these potential underestimates, our investigation revealed that racial/ethnic minorities were disproportionately affected, consistent with previously reported CO outbreaks after winter storms.[1,3] The majority of patients identified in this outbreak were from households that were defined as immigrant or as having at least 1 foreign-born member. The majority of these immigrant households were from African, Asian, Latin American, and Middle Eastern countries, where climates are typically warmer than in the Pacific Northwest. In Washington State, the last major CO poisoning epidemic occurred in January 1993, after a severe windstorm. At that time, the racial/ethnic composition of the affected population was primarily Asian.[1,3]

In this outbreak, the race/ethnicity data obtained from medical charts revealed that 17% of those affected were Asian, 29% were Black, 11% were Hispanic, and 10% were White. Of the 76 cases reported among Blacks, interview data revealed that 71% (n=54) were from African households. Interview data also revealed that in 55% of affected households, a language other than English was the primary language spoken by at least 1 household member. By comparison, according to the 2006 American Community Survey Data for King County, 13% of the population of King County is Asian, 6% Black, 7% Hispanic, and 73% White; 24% speak a language other than English at home.[16] Twenty-four percent of immigrants in the outbreak we investigated were African in origin (from Ethiopia, Guinea, Kenya, Liberia, Sierra Leone, Somalia, Sudan, and

TABLE 4—Households Evaluated by Health Care Facilities, a Hyperbaric Oxygen Treatment Center, and King County Medical Examiner With Symptoms and Signs of Carbon Monoxide Poisoning, by Geographical Area of Birth and Fuel Source: King County, WA, December 15–24, 2006

	Africa,[a] No. (%)	Asia,[b] No. (%)	Europe,[c] No. (%)	Latin America,[d] No. (%)	Middle East,[e] No. (%)	United States,[f] No. (%)	Unknown or not documented,[g] No. (%)
Charcoal[h]	20 (95.2)	10 (66.7)	1 (100.0)	7 (70.0)	4 (100.0)	2 (6.9)	2 (33.3)
Liquid fuel[i]	1 (4.8)	...	...	...	...	10 (34.5)	3 (50.0)
Gasoline- or propane-powered electric generator	...	4 (26.7)	...	2 (20.0)	...	8 (27.6)	...
Other[j]	...	1 (6.7)	...	1 (10.0)	...	2 (6.90)	...
Not documented	...	...	...	...	...	7 (24.1)	1 (16.7)

[a]Sample size, n = 21. Africa included Ethiopia, Guinea, Kenya, Liberia, Sierra Leone, Somalia, Sudan, and Tanzania.
[b]Sample size, n = 15. Asia included Cambodia, China, India, Laos, Philippines, and Vietnam.
[c]Sample size, n = 1. Europe only included Russia.
[d]Sample size, n = 10. Latin America included Argentina, El Salvador, Honduras, and Mexico.
[e]Sample size, n = 4. The Middle East included Iran and Afghanistan.
[f]Sample size, n = 29.
[g]Sample size, n = 6.
[h]Used, for example, in a grill, hibachi, or bucket.
[i]This can be kerosene-, propane-, or other petroleum-fueled lantern; space heater; grill; or fireplace.
[j]Other included, for example, a wood stove, wood fireplace, or vehicle.

Tanzania), compared with estimates from the American Community Survey, which reported that the proportion of foreign-born persons in King County from African countries was approximately 5% in 2000 and approximately 8% in 2006.[16] Awareness of immigrant communities' country of origin and primary language spoken, particularly as the immigrant composition of a community changes with time, can assist public health practitioners in designing more appropriate and effective education campaigns.

Similar to the previous Washington State outbreak,[1,3] a majority of persons were affected by charcoal exposure, particularly those in immigrant households. Certain countries from which affected immigrants come are those in which solid fuels are regularly used for indoor cooking and heat.[17] Recent immigrants, particularly those from warmer climates and places in which indoor cooking with charcoal or fire is practiced, might be more likely than the general population to engage in practices that put them at risk for CO exposure after a winter storm, and in particular, from incorrect use of charcoal-burning devices. In addition to knowing immigrants' countries of origin, knowledge of cultural practices having public health relevance is helpful in targeting specific prevention measures to particular communities—in this case, informing members of certain communities regarding the dangers of indoor charcoal use and CO poisoning. Notably, charcoal was the fuel source used in 2 of 4 households with fatalities, although 6 of 8 fatalities resulted from generator use in enclosed and unventilated living areas.

As noted previously,[8] epidemics of CO poisoning after severe winter storms are predictable and potentially preventable. Windstorms, similar to the severe storm in western Washington State in 1993 that caused the last major CO-poisoning epidemic, often damage electrical lines and cause widespread power outages, thus causing the public to search for alternate sources of energy.[1,3] In Washington State, the majority of western counties can expect to experience at least 1 substantial windstorm per calendar year, usually in winter when temperatures are low. This storm pattern makes fall and wintertime excellent opportunities to routinely remind the public about the dangers of CO poisoning from alternate fuel sources in the event of weather-related power outages. Moreover, critical hours exist between the time the storm is predicted to hit and its onset when warnings to the public should be intensified.[11]

Although data are limited regarding the efficacy of public education campaigns, they are recommended for preventing CO exposures and poisoning.[18] These campaigns should reach vulnerable populations through messages in multiple languages based on the region's ethnic composition and warning of the dangers of indoor charcoal and gasoline- or propane-powered electric generator use.[19] Messages should be provided before a storm hits in foreign-language newspapers, on radio and television broadcasts, in shopping markets, and in neighborhoods throughout the city. Warnings might also be effective when posted at the point of fuel purchase even after power outages.[19]

This outbreak resulted in considerable stress on the regional emergency medical systems and local health care facilities.[5] Because affected households comprised 11 or fewer persons and the majority of people presented within the first 2 days after the storm, emergency medical providers were treating substantial numbers of patients simultaneously, many of whom did not speak English as their primary language. Knowledge of the community's ethnic composition and languages spoken can help health care professionals prepare for future CO outbreaks. Availability of translators can facilitate medical evaluation and management.[20]

Limitations

This study had certain limitations. First, major data-collection sources were medical charts and interviews. Approximately two thirds of all patients sought care at local health care facilities within a 2-day period, resulting in overwhelmed facilities and suboptimal record keeping. Thus, certain key elements (e.g., smoking status) upon which the confirmed case classification was based were missing for more than one third of all patients. By assuming these patients were nonsmokers, we might have overestimated the number of confirmed cases.

Similarly, language spoken was unavailable by medical chart for more than one quarter of patients, and a similar percentage of households were lost to follow-up. Thus, households with a primary language other than English and with immigrant status might be underestimated in our study. Second, our use of a COHb concentration at more than 9% as the classification of a confirmed case among smokers might have underestimated confirmed cases by assuming all COHb concentrations less than 9% among smokers were attributed solely to cigarettes.

Third, interviews by proxy were completed for only 2 of the 8 fatalities, and for the remaining 6 cases, information was obtained from medical examiner reports, which were limited. Thus, our data were lacking on the most severe cases of this outbreak. Fourth, because no reference population was surveyed as a comparison with this group, we were unable to assess the risk for this study population compared with the general population.

Fifth, because this outbreak involved more hyperbaric chamber–treated patients than did other published outbreaks of CO poisoning, characterizing the criteria used for determining the need for hyperbaric oxygen treatment might have been beneficial. However, such investigation was beyond the scope of this study. Finally, we do not present information on duration of CO exposure, time of removal from CO source, and time that COHb concentration was determined and are therefore unable to comment on uptake or release kinetics of CO from the body, which might explain why certain groups (i.e., women) were more affected than others.

Conclusions

CO poisoning attributed to outbreaks after severe weather and power outages, as well as to inadvertent exposures, remains a substantial public health problem in the United States and results in approximately 50 000 excess emergency department visits annually.[21] Use of standardized, structured medical-encounter systems or forms (e.g., that would be filled out by the provider) for patients with CO poisoning can help ensure more-complete ascertainment of both medical and epidemiologic risk factors (e.g., language spoken, ethnicity, pregnancy status, exposure source, and smoking history). Such data are often incompletely ascertained during outbreaks but are key to understanding the changing epidemiology of CO poisoning and for targeting public health interventions as well as clinical case management. Such systems can also be useful in conducting public health surveillance for CO poisoning.[22] ■

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Note.*The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.*

Contributors

R.K. Gulati assisted in the concept and design of the study, data acquisition and management, data cleaning, analysis and interpretation, and led the writing of the article. T. Kwan-Gett assisted in the concept and design of the study, data analysis and interpretation, and acquisition of data. N.B. Hampson assisted in the concept and design of the study, data acquisition, data interpretation, and writing of the article. A. Baer assisted in the concept and design of the study, data collection, data management, data cleaning, and data analysis and interpretation. D. Shusterman assisted in the concept and design of the study, interpretation of data, and helped acquire data. J.R. Shandro and J.S. Duchin assisted in the concept and design of the study, interpretation of data, drafting of the article, and supervised all aspects of the study's implementation. All authors helped review drafts of the article.

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