2013
Annual Report on
Carbon Monoxide Poisoning
In Michigan

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2013 ANNUAL REPORT ON CARBON MONOXIDE POISONING IN MICHIGAN

A Joint Report Of

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SUMMARY

This is the fifth annual report on carbon monoxide (CO) poisoning surveillance in Michigan. This report provides information about the 823 individuals who were unintentionally poisoned by CO in Michigan in 2013, including 34 individuals who died from CO exposure. It is based on data collected as a result of regulations promulgated September 18, 2007, by the Michigan Department of Community Health (MDCH). The State's Public Health Code requires health care facilities and health care professionals to report unintentional CO poisoning. MDCH regulations also require laboratories to report carboxyhemoglobin test results

BACKGROUND

One of the leading causes of unintentional poisoning deaths in the United States is CO poisoning.[1] CO is an odorless and colorless gas found in combustion fumes, such as those produced by cars and trucks, small engines, burning charcoal and wood, natural gas or wood fired furnaces/stoves, and fires. The Environmental Protection Agency (EPA) allowable environmental exposure to CO in outdoor ambient air is 9 parts per million (ppm) for an 8-hour average.[2] Workplace standards set by the Michigan Occupational Safety and Health Administration (MIOSHA) for general industry require the CO level be kept below a time weighted average (TWA) of 35 ppm for an 8-hour day and a 200 ppm ceiling that should never be exceeded; for the construction industry, the TWA is 50 ppm averaged over an 8-hour work day without a standard for a ceiling level.[3,4] The National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life and Health (IDLH) is 1200 ppm.[5]

When inhaled, CO binds to hemoglobin in the blood as well as other proteins in the body such as myoglobin, reducing the delivery of oxygen to the brain, heart, and all other body tissues. Hemoglobin combines with CO to form a bright red compound called carboxyhemoglobin (COHb), which can be measured in the blood. Non-smoking individuals generally have less than 1.0% COHb in their blood as a consequence of the normal breakdown of red blood cells. Cigarette smokers have an average 4.0% COHb, with heavier smokers having higher values. Breathing CO at the MIOSHA TWA for general industry of 35 ppm will cause a 5.4% COHb blood level. Breathing CO at the TWA for construction of 50 ppm will cause a 7.4% COHb blood level.[6] CO home detectors manufactured to meet the requirements of ANSI/UL 2034 are designed to alarm at levels that would result in a COHb level of 10% in adults.[7] Exposure to CO from multiple sources is additive (e.g., the average cigarette smoker working at the MIOSHA general industry TWA would be expected to have 9.4% COHb level).[6] COHb has a half-life in the blood of four to six hours. Oxygen administration reduces the half-life to approximately an hour or less; hyperbaric oxygen treatment will reduce the half-life to less than half an hour.[6] In individuals with atherosclerosis, COHb levels as low as 3-4% can increase the frequency and severity of angina or claudication, 6% can induce cardiac arrhythmias, and 10% may precipitate a

myocardial infarction.[6] In individuals without atherosclerosis, COHb levels below 30% can cause headaches, nausea and muscle weakness. COHb levels above 30% can cause increased weakness and decreased metal awareness. Breathing higher levels of COHb can result in coma and death.[6]

METHODS

The major data sources for this report were the Michigan Poison Control Center (PCC), Michigan hospitals, and death certificates for the period 1/1/2013 to 12/31/2013. The PCC reported all calls where the substance was CO, the individual had one or more "clinical effects" (symptoms), and the reason for exposure was "unintentional". Hospitals were required to report patients who had ICD-9 discharge codes of 986, E868.3, E868.8, E868.9, or E982.1* as a discharge diagnosis. Death certificates were obtained where a contributing cause of death was ICD-10 code T58 ("Toxic effects of carbon monoxide…accidental (unintentional)").

Hospital medical records and PCC case reports were reviewed to determine if they met the following surveillance case definition. A confirmed case of CO poisoning was defined as an individual who was treated by a health care provider for symptoms related to unintentional CO exposure. If a person called PCC about CO and/or CO-related symptoms but did not seek medical care they were excluded. Also excluded were cases where the physician ruled out CO poisoning in the medical record notes, even though CO poisoning may have been suspected initially and thus assigned a CO ICD code in the discharge diagnosis string. It should be noted that individuals were included as cases regardless of laboratory confirmation based on the COHb result. In many cases the COHb result was not available or the blood specimen from the patient was collected too long after exposure or after treatment with oxygen to still be elevated. All death certificate cases with cause of death code T58 were considered confirmed cases.

Confirmed cases were abstracted into a uniform data system that included, for each individual case report, demographic information (age, gender and race), admission date, discharge date, exposure date, COHb test result, cigarette smoking status, report source(s), source of CO exposure (e.g. furnace, forklift), treatment (including hyperbaric chamber).

For individuals who had multiple reports for the same exposure, records were combined and considered as one case. This was done for individuals who had multiple reports from different reporting sources as well as multiple entries of the same report source (e.g. transfers between

* ICD-9 code definitions: 986 = ""Toxic effects of CO"; E868,3 = "CO from incomplete combustion of other domestic fuels"; E868.8 = "CO from other sources"; E868.9 = "Unspecified CO"; E982.1 = "Poisoning by other CO"

hospitals for treatment with hyperbaric oxygen, and multiple hospital visits due to the same exposure).

Frequencies and rates of CO poisoning were generated from these data. Denominators used to calculate rates were from the U.S. Census Bureau.[10]

RESULTS

A total of 938 reports of unintentional CO poisoning were received on 823 individuals, after deduplication of multiple reports on single individuals. Eighty of these individuals were poisoned at work, 668 were exposed in non-occupational settings and 75 were in unknown settings.

Death

There were 34 (4.1%) deaths from unintentional CO poisoning, none of which were work-related. Eight deaths were fire related. Source of CO was unknown for 9 deaths; 7 were from a generator, 5 were from a vehicle, 1 was from a furnace or water heater, 3 were from a space heater and 1 was from a boat.

Gender and Age

Gender was known for 813 individuals, of which 427 (52.5%) were male and 386 (47.4%) were female. (Of the 813 individuals where age and gender were known, 178 (21.9%) were 17 years old or younger, 308 (37.9%) were 18 – 44, 223 (27.8%) were 45 – 64, and 104 (12.8%) were 65 or older. Females age 18 – 44 (8.86/100,000) and males 65 and older (9.45/100,000) had the highest incidence rates. (Figure 1 and Table 1.)

Figure 1

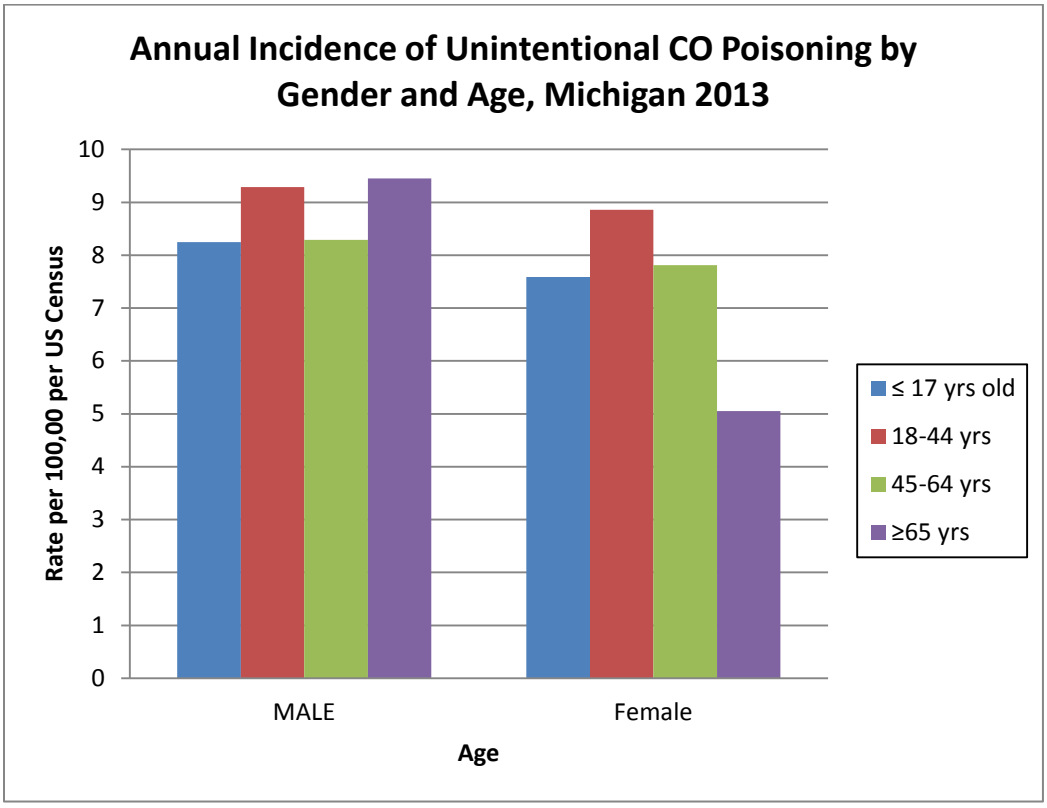


Table 1

Age	Male	MI Male Population	Male Rate/100000	Female	MI Female Population	Female Rate/100,000	Total
≤ 17 yrs old	95	1,151,379	8.25	83	10,931,134	7.59	178
18 - 44 yrs	158	1,700,348	9.29	150	1,692,595	8.86	308
45 - 64 yrs	112	1,350,562	8.29	111	1,420,570	7.81	223
≥65 yrs	62	655,849	9.45	42	831,185	5.05	104
Total	427			386			813

Race

Race was known for 340 (41.3%) individuals. Of the individuals where race was known, 229 (67.4%) were Caucasian, 93 (27.4%) were African American and 18 (5.3%) were Hispanic. African Americans had the highest incidence rate of CO poisoning (6.74/100,000). (Table 2)

Table 2

Unintentional CO Poisoning by Race, Michigan 2013			
Race	Michigan Population	# Cases	Rate/100,000
Caucasian	7,829,056	229	2.93
African American	1,378,237	93	6.74
Hispanic	465,419	18	3.87

Month of Poisoning

Month of exposure was known for 600 (72.9%) individuals (Table 3 and Figure 2). December was the month with the highest number of exposures - 124 (20.7% of 600 cases). There were severe weather events in southern Michigan in July and November of 2012 and November and December of 2013 resulting in widespread power failures. During these events the number of individuals with CO poisoning from backup power generators increased (Table 4 and Figure 3).

Table 3

Unintentional CO Poisoning by Month, Michigan 2013		
Month	# Individuals	%
Jan	60	10.0
Feb	56	9.3
Mar	49	8.2
Apr	51	8.5
May	51	8.5
Jun	37	6.2
Jul	17	2.8
Aug	25	4.2
Sep	18	3.0
Oct	37	6.2
Nov	75	12.5
Dec	124	20.7
Total	**600***	**100**

* Where month of exposure was known

Figure 2

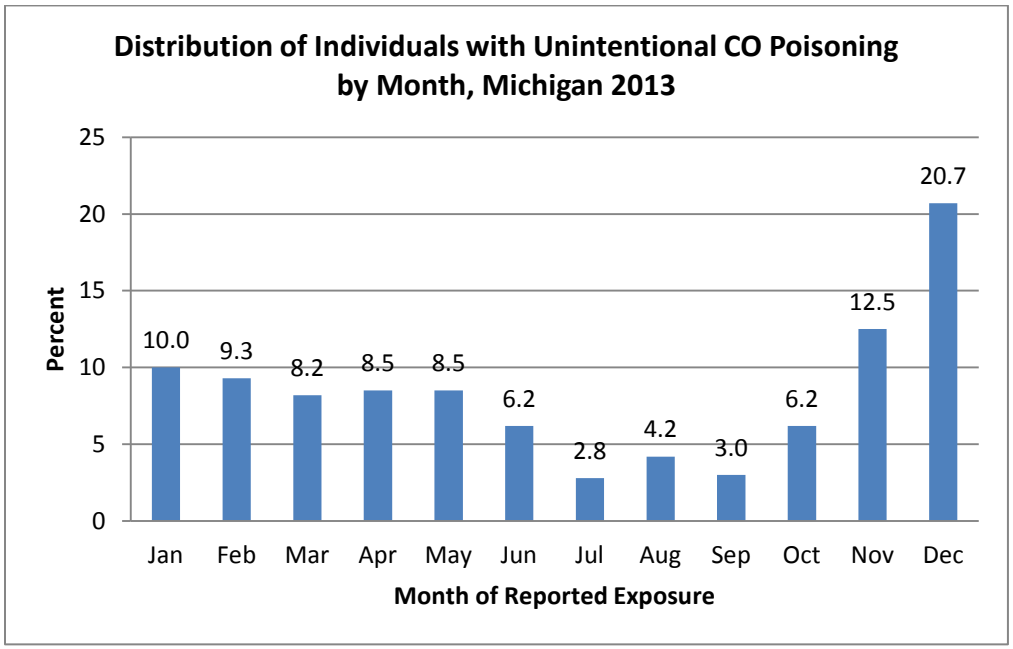
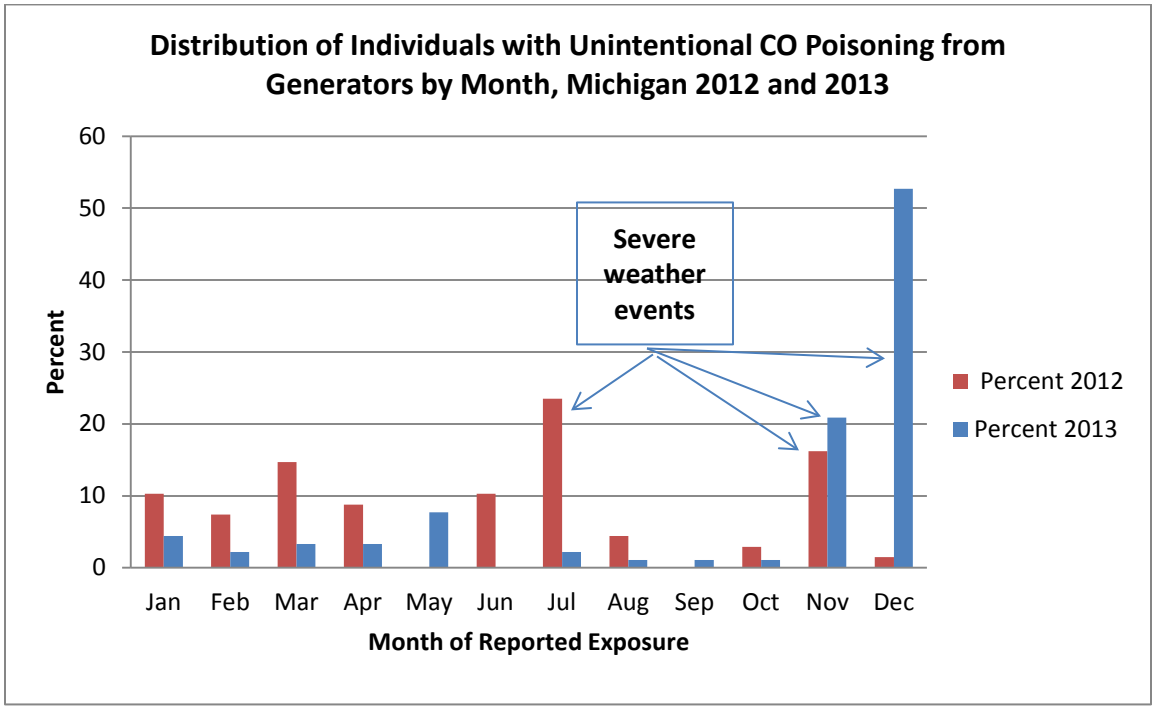


Table 4

Unintentional CO Poisoning from Generators by Month, Michigan 2012 and 2013				
Month	**# Individuals 2012**	**Percent 2012**	**# Individuals 2013**	**Percent 2013**
Jan	7	10.3	4	4.4
Feb	5	7.4	2	2.2
Mar	10	14.7	3	3.3
Apr	6	8.8	3	3.3
May	0	0	7	7.7
Jun	7	10.3	0	0
Jul	16	23.5	2	2.2
Aug	3	4.4	1	1.1
Sep	0	0	1	1.1
Oct	2	2.9	1	1.1
Nov	11	16.2	19	20.9
Dec	1	1.5	48	52.7
Total	**68**	**100**	**91**	**100**

Figure 3



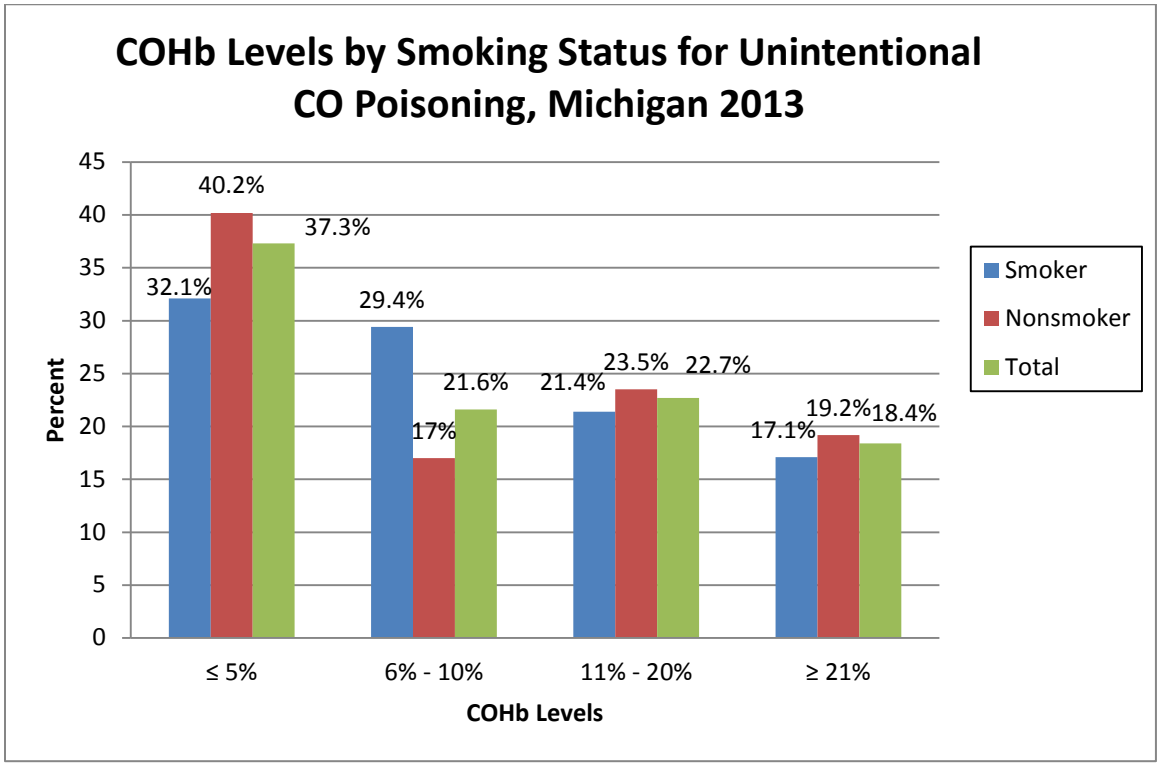
Carboxyhemoglobin Testing

COHb was known for 727 (88.3%) of the 823 individuals. The average COHb level for all individuals tested was 15.0%. The range of COHb was 0.0% to 55%. Three hundred and forty-four (47.3%) individuals had a COHb level greater than 10% and 134 (18.4%) individuals had a COHb level equal to or greater than 21.0%. Smoking status was known for 510 (70.2%) of the 727 individuals tested for COHb, and 548 (66.6%) of all 823 individuals. The distribution of COHb levels by smoking status is shown in Table 5 and Figure 4.

Table 5

COHb Levels by Smoking Status for Unintentional CO Poisoning, Michigan 2013						
	Smoking Status					
COHb Level	Smoker	%	Nonsmoker	%	Total	%
≤ 5%	60	32.1	130	40.2	190	37.3
6% - 10%	55	29.4	55	17.0	110	21.6
11% - 20%	40	21.4	76	23.5	116	22.7
≥ 21%	32	17.1	62	19.2	94	18.4
Total	187	100	323	100	510	100
Average COHb	12		11.75		15	
Median COHb	8.5		8.2		8.4	

Figure 4



Hyperbaric Treatment

Sixty-four (7.8%) individuals were known to have been treated with hyperbaric chamber oxygen. Sixty-two (96.9%) of the 64 patients treated with oxygen in a hyperbaric chamber had their COHb reported. The average COHb level recorded for these individuals was 26.8%.

Sixty-one (96.9%) of the hyperbaric treatments identified the occupational status of the exposure. Fifty-eight (93.5%) of the hyperbaric treatments were non-occupational exposures, including 17 from generator exposures, 4 from a fire, 6 from a vehicle exposure, 7 from a furnace or water heater exposure, and 18 from assorted other sources including a portable grill, a space heater, a boat and power machinery. For 6 individuals the source of non-occupational exposure was unknown. There were 3 occupational exposures that were treated with hyperbaric oxygen; 1 from power machinery, 1 from a furnace/water heater and 1 had an unknown source. Forty-two of the 62 (67.8%) treated individuals were over age 35.

CDC recommends to "Consider hyperbaric oxygen therapy (HBO) therapy when the patient has a COHb level of more than 25- 30%, there is evidence of cardiac involvement, severe acidosis, transient or prolonged unconsciousness, neurological impairment, abnormal neuropsychiatric

testing, or the patient is ≥36 years in age. HBO is also administered at lower COHb(<25%) levels if suggested by clinical condition and/history of exposure." [11] Table 6 shows the hyperbaric treatment status of the 282 individuals age 36 and older with known age, hyperbaric status and COHb level stratified by their COHb levels.

Table 6

Hyperbaric Treatment for Individuals 36 Years and Older					
Received Hyperbaric Treatment	Average COHb	Number of individuals			
		Total	COHb <25	COHb 25-30%	COHb >30
yes	29.7	40	14	7	19
no	10.9	242	217	11	14

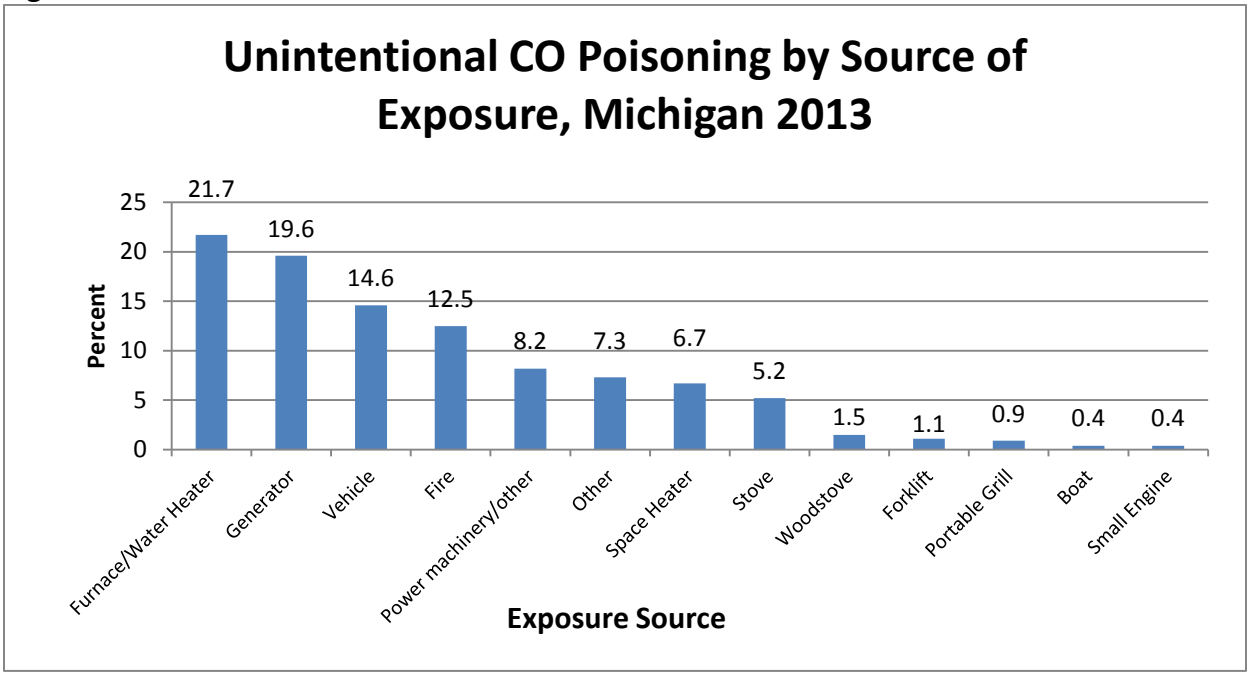
Source of Exposure

Exposure source was known for 465 (56.5%) of the 823 individuals (Table 7, Figure 5). The most common exposure source of exposure among these 497 individuals was furnace/water heater (21.7%), followed by exposure from a generator (19.6%) and then a vehicle exposure (14.6%). There were 344 (41.8%) individuals with CO exposure where the source of exposure was unknown.

Table 7

Unintentional Co Poisoning by Source of Exposure, Michigan 2013		
Source	**#**	**%**
Furnace/Water Heater	101	21.7
Generator	91	19.6
Vehicle	68	14.6
Fire	58	12.5
Power machinery/other	38	8.2
Other	34	7.3
Space Heater	31	6.7
Stove	24	5.2
Woodstove	7	1.5
Forklift	5	1.1
Portable Grill	4	0.9
Boat	2	0.4
Small Engine	2	0.4
Total	**465**	**100.1**

Figure 5



Fire

Fire was the source of CO exposure for 58 (12.5%) of the 465 individuals where a source was known. All 58 of the fire exposures were non-work related. Eight (13.8%) of the fire related exposures resulted in death; none of these deaths were work-related.

Hospitalizations

Of the 823 individuals with reported CO exposure, 111 (13.5%) were hospitalized overnight. The most common source of CO requiring overnight hospitalization included 22 (19.8%) from a fire exposure, 20 (18.0%) from generators, 9(8.1%) from a furnace or water heater, and 33 (29.7%) from other sources. For the 86 individuals where length of stay was known, the average stay was 4.2 days and median stay was 1 day. The longest hospitalization was for 69 days following a house fire. Fifty-four (62.8%) stayed two days or less, 19 (22.0%) stayed 3 to 7 days, 9 (10.5%) stayed 8 to 14 days, and 4 (4.7%) stayed more than two weeks.

Six (5.4%) of the 111 hospitalizations were due to occupational CO exposure. Of the 6 occupational exposure-related hospitalizations, 1 (16.7%) was from a furnace/water heater, 2 (33.3%) were from other sources, 1 (16.7%) was from a forklift and 2 (33.3%) were from an unknown source.

ANALYSIS OF OCCUPATIONAL EXPOSURES

Exposure location was known for 748 individuals in 2013 and 80 (10.7%) were identified as having occurred at work. Gender was known for all of the work-related cases; 43 (53.8%) male, 37 (46.3%) female. Fifty (62.5%) were between the age of 18 and 44, and 30 (37.5%) were 45 or older. (Table 8)

Table 8

Percent by Gender and Age of Unintentional Occupational CO Poisoning, Michigan 2013						
Age	**Gender**					
	Male	**% of Males**	**Female**	**% of Females**	**Total**	**% of Total**
Unknown Age	0	0	0	0	0	0
≤ 17 years old	0	0	0	0	0	0
18 - 44 yrs	27	62.8	23	62.2	50	62.5
≥ 45 yrs	16	37.2	14	37.8	30	37.5
Total	**43**	**53.8 % Male**	**37**	**46.3% Female**	**80**	**100**

Sixteen (55.2%) of the 29 with known race were Caucasian, 6 (20.7%) were African American, and 6 (20.7%) were Hispanic.

COHb tests were reported for 76 individuals with occupational exposure. The average COHb level for occupationally exposed individuals tested was 10.8%. Smoking status was known for 58 (76.3%) of the 76 occupationally exposed individuals with COHb levels. The distribution of COHb levels by smoking status is shown in Table 9.

Table 9

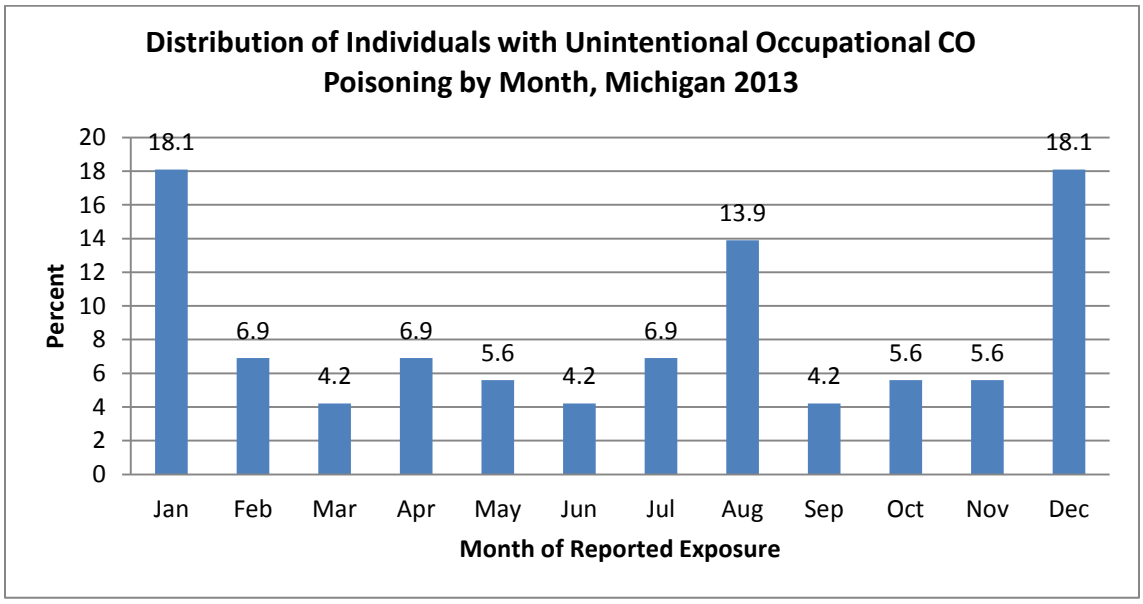
Unintentional Occupational CO Poisoning by Reported COHb Levels and Smoking Status, Michigan 2013								
COHB %	**Smoker**	**% of Smokers**	**Nonsmoker**	**% of Nonsmokers**	**Unknown**	**% of Unknown**	**Total**	**%**
≤ 5%	6	40.0	18	41.9	8	44.4	32	42.1
6 - 10%	4	26.7	5	11.6	1	5.6	10	13.2
11-20%	4	26.7	13	30.2	9	50.0	26	34.2
≥ 21%	1	3.7	7	16.3	0	0	8	10.5
Total	**15**	**19.8% Smokers**	**43**	**56.6% Nonsmokers**	**18**	**23.7% Unknown**	**76**	**100**
Average COHb	11.7		11.4		9.9		10.8	
Median COHb	7.0		7.7		10.2		7.0	

Of the 80 individuals occupationally exposed, the month of exposure was known for 72 (90.0%). (Table 10 and Figure 6) The largest percentage of reported exposure occurred in January and December with 13 (18.1%) exposures each month.

Table 10

Unintentional Occupational CO Poisoning by Month, Michigan 2013		
Month	**# Individuals**	**%**
Jan	**13**	**18.1**
Feb	**5**	**6.9**
Mar	**3**	**4.2**
Apr	**5**	**6.9**
May	**4**	**5.6**
Jun	**3**	**4.2**
Jul	**5**	**6.9**
Aug	**10**	**13.9**
Sep	**3**	**4.2**
Oct	**4**	**5.6**
Nov	**4**	**5.6**
Dec	**13**	**18.1**
Total	**72**	**100.2**

Figure 6

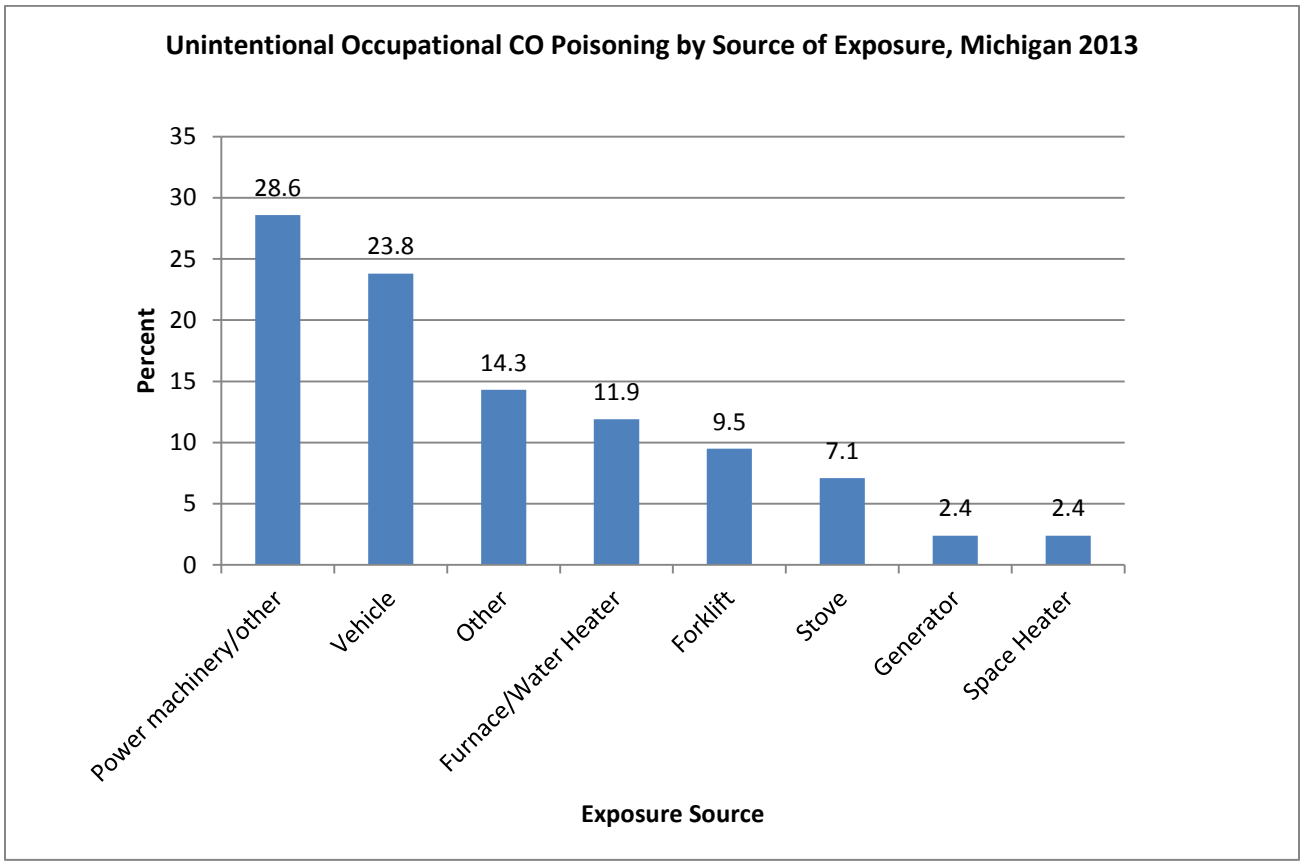


Of the 80 individuals occupationally exposed, source of exposure was known for 42 (52.5%). The most common source of work-related exposure was from power machinery (12 of 42 individuals, or 28.6%). (Table 11, Figure 7).

Table 11

Unintentional Occupational CO Poisoning by Source of Exposure, Michigan 2013		
Source	**#**	**%**
Power machinery/other	12	28.6
Vehicle	10	23.8
Other	6	14.3
Furnace/Water Heater	5	11.9
Forklift	4	9.5
Stove	3	7.1
Generator	1	2.4
Space Heater	1	2.4
Total	**42**	**100**

Figure 7

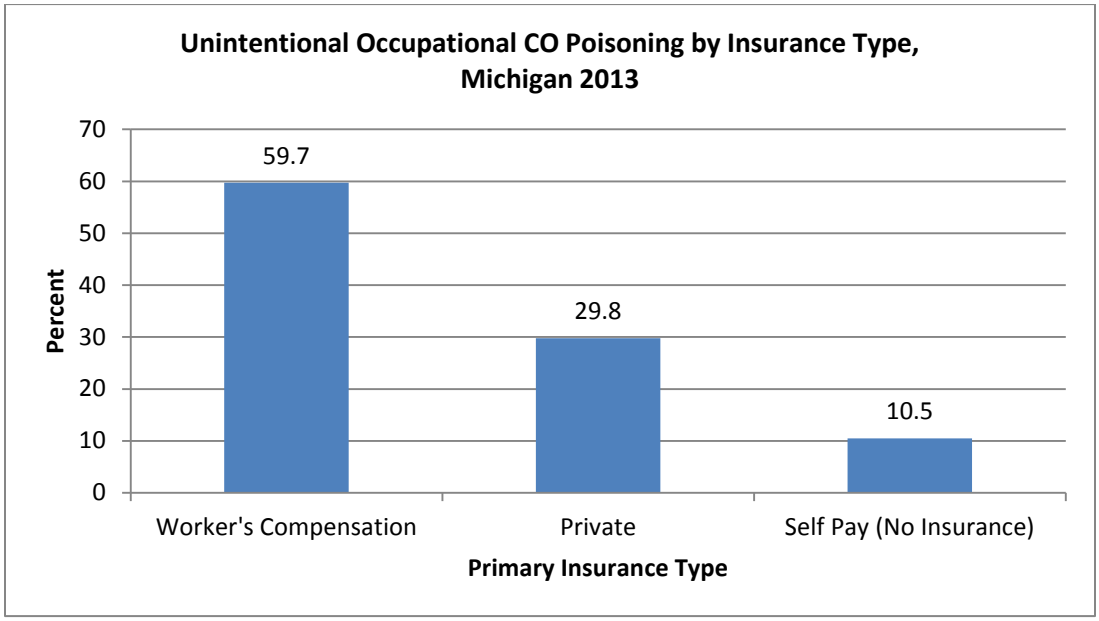


Of the 80 individuals occupationally exposed, insurance type was known for 57 employees (71.3%). For 34 (59.6%) of these 57, Worker's Compensation was the expected payer, 17 (29.8%) had private insurance and 6 (10.5%) did not have insurance (Table 12, Figure 8).

Table 12

Unintentional Occupational CO Poisoning by Insurance Type, Michigan 2013		
Insurance Type	**#**	**%**
Worker's Compensation	34	59.7
Private	17	29.8
Self Pay (No Insurance)	6	10.5
Total	**57**	**100**

Figure 8

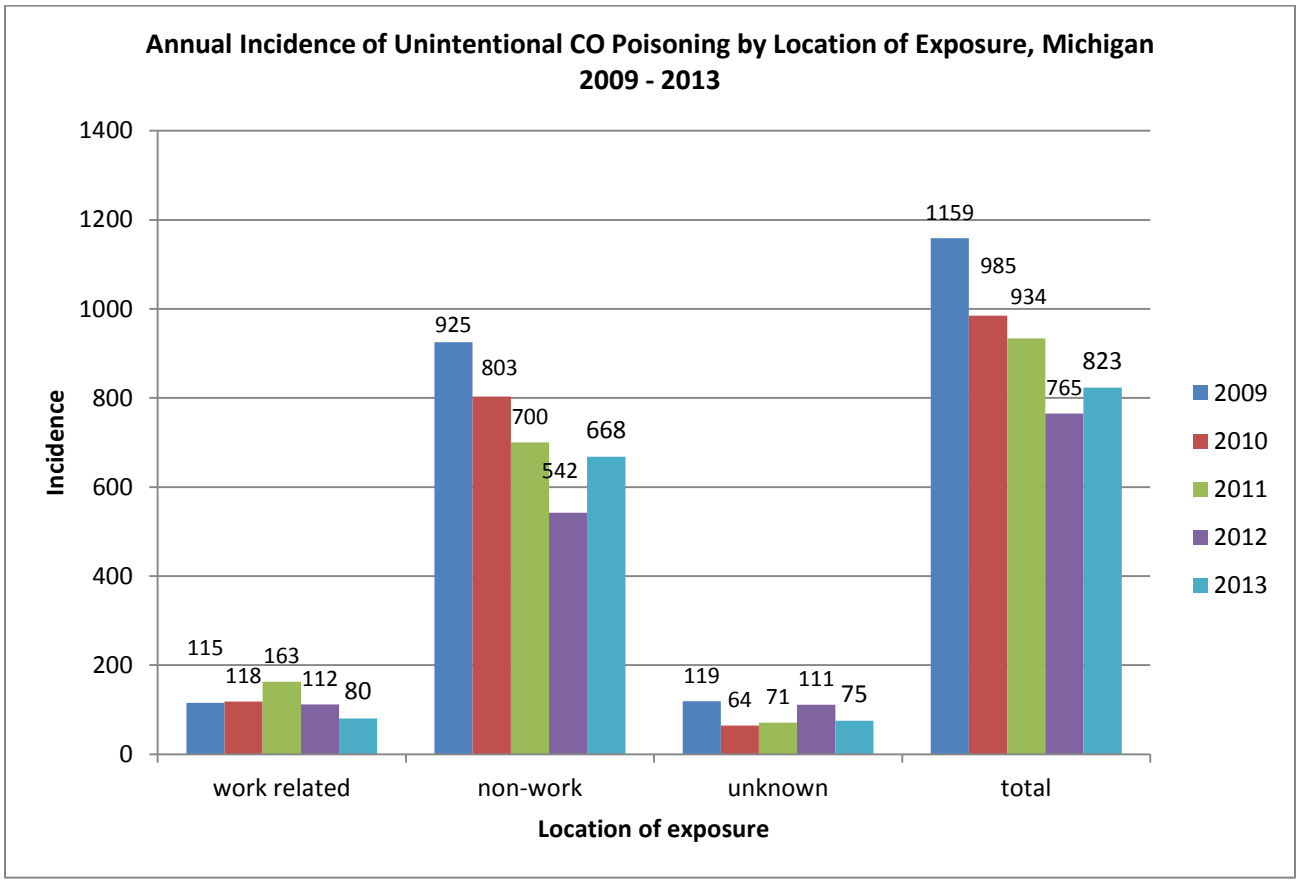


DISCUSSION

CO is one of the leading causes of unintentional poisoning deaths in the United States and 68,316 CO exposures were reported to poison centers in the U.S. during 2000—2009.[8] In Michigan, for the year 2013, reports were received on 823 individuals with confirmed unintentional CO poisoning. Thirty-four (4.1%) deaths were reported, 8 (23.5%) of which were

fire related. There were 32 fewer occupational poisonings, a 29% decrease from 2012 (Figure 9).

Figure 9



The most common exposure source was a furnace or water heater in 101 (21.7%) individuals with 5 individuals being exposed at work (Table 7 and Figure 5 – source of exposure of all CO poisonings, Table 11 and Figure 7 – occupational sources of exposure). The known source in occupational settings was most commonly power machinery (12, 28.6%)

Most unintentional CO poisoning exposures occurred in December (124, 20.7%). On December 21-22, 2013 southern Michigan experienced a sever ice storm resulting in an estimated 600,000 electric customers without power for up to 8 days.[12] The CO exposures from generators was found to be higher after severe weather events (Table 4, Figure 3). Further analysis of the relationship between power failures and CO exposures was attempted, however the data regarding the reported number and location of power outages was not available.

COHb testing was reported for 727 (88.3%) individuals. COHb reports are indicators of exposure; however levels reported cannot be considered an accurate measure of the true extent of the exposure for several reasons. Results from hospital records will be lower than the level an individual would have at the time of exposure due to time elapsed between exposure and medical evaluation, and the administration of oxygen in the ambulance or emergency department (ED) prior to the COHb test. In the general non-smoking population, normal levels of COHb are less than 1%. Of individuals with COHb measured levels, 40.2% were less than or equal to 5% (Table 5).

Hyperbaric oxygen treatment

Hyperbaric oxygen treatment is used to decrease the half-life of COHb. The Centers for Disease Control and Prevention (CDC) recommends considering hyperbaric treatment when the patient has:

- A COHb level of more than 25-30%
- Evidence of cardiac involvement
- Severe acidosis
- Transient or prolonged unconsciousness neurological impairment
- Abnormal neuropsychiatric testing
- Is greater than 36 years of age[11].

We did not have sufficient information to determine if the treating health care provider followed these CDC recommendations to consider hyperbaric oxygen and elected to not administer hyperbaric oxygen or did not follow the CDC guidelines (e.g. only 17% of individuals greater than 36 years of age were treated with hyperbaric oxygen).

Carbon monoxide detectors

Most of Michigan's unintentional CO exposures occurred in non-occupational settings. There are no non-occupational indoor air standards for CO in Michigan. Installation of CO detectors is recommended in homes that burn natural gas, oil or wood. Effective March 23, 2009, a modification to Michigan's Uniform Construction Code (Act 230 of 1972) mandated that all single-family and multi-family dwellings have CO detectors installed at the time of initial construction, addition of a bedroom, or other renovation in which a permit is required. The location of these detectors and other specifics are outlined in section 125.1504f of Michigan Compiled Laws.

The CO detectors cited in the Construction Code are required to meet ANSI/UL Standard 2034. Standard 2034 was designed to protect adults by alarming at a CO level which would produce a level of 10% COHb in an adult. For 2013, 727 individuals had a COHb level recorded. Of the 727, 383 (52.6%) had a COHb level of less than 10%.

Before Standard 2034 was revised, CO detectors alarmed at lower levels. This created a large number of false alarms in some communities during particular weather patterns or in areas of high vehicle traffic. In order to reduce the number of false alarms, CO detectors meeting Standard 2034 will not alarm at levels less than 30 ppm for 30 days. Individuals with atherosclerosis or history of heart disease or stroke may want to consider purchasing a CO detector with a digital readout and a button that can be pressed to give the highest reading recorded. Depending on the CO detector, the level on the readout may be lower than 30 ppm. This type of detector can be used to give an earlier warning of elevated CO in the home.

Limitations

Several limitations have been identified with Michigan's CO surveillance system: 1) Information may be missing in the different reporting sources (e.g., source or COHb level). 2) Hospitals and other sources may not be reporting all cases and some cases are just simply missed. 3) The surveillance system does not capture Michigan residents who were treated for CO poisoning in out-of-state hospitals. 4) CO poisoning, particularly at lower levels of exposure, is a difficult condition to diagnose. In addition, some individuals exposed to CO may not seek medical attention. Thus we presume there are additional cases of unrecognized CO poisoning.

Interventions

Identification of individuals diagnosed with CO poisoning is the first step to initiate preventive interventions. The four most common elevated CO exposures were from furnaces (21.7%), generators (19.6%), vehicles (14.6%) and fire (12.5%). After natural disasters or during prolonged periods of power interruptions, including construction projects, winter storms, and floods, the use of generators is quite common, increasing the potential of excessive CO exposure. In many cases of CO poisoning, the generator is operated close to a window, in an attached garage or even inside the home to prevent theft. These generators are often run under full load which increases the amount of CO produced. Studies have shown that a generator operating in the basement of a home can produce a lethal level of CO in 15 minutes.[9]

Educational materials and campaigns to address this issue have been developed by CDC (www.cdc.gov/co) and MDCH (www.michigan.gov/carbononoxide). Topics for public education include the potential sources of CO exposure, common symptoms associated with CO poisoning, and the hazards associated with CO, especially in the colder months when the frequency of adverse effects is greatest.

Prevention strategies in both the home and workplace include not allowing motor vehicles to idle in enclosed areas, regularly checking and maintaining motor vehicle emissions, ensuring all gas appliances are installed correctly and are located in properly ventilated areas and

substituting electric powered forklifts and other equipment for fuel powered equipment during indoor work.

For the workplace at the minimum, periodic air monitoring should be conducted to ensure that the Michigan Occupational Safety and Health Administration (MIOSHA) standard for General Industry of 35 parts per million (ppm) as an 8-hour time-weighted-average (TWA) exposure limit, with a 200 ppm ceiling, and, for construction 50 ppm TWA, with no ceiling limit is being met.

Ongoing vigilance is needed by the public to protect itself from CO exposure wherever combustion takes place. Health care providers need to be vigilant in recognizing CO toxicity by considering where a patient's symptoms are occurring and confirming with measurement of COHb.

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APPENDIX A

Appendix A Michigan Uniform Construction Code (Act 230 of 1972) section 125.1504f of Michigan Compiled Laws

STILLE-DEROSSETT-HALE SINGLE STATE CONSTRUCTION CODE ACT (EXCERPT)
Act 230 of 1972

125.1504f Single-family or multifamily dwelling; installation of operational and approved carbon monoxide device; requirements; failure to comply; penalty; liability; definitions; name of section.

Sec. 4f. (1) The director may provide for, at the time of initial construction of a single-family dwelling or a multifamily dwelling, or at the time of renovation of any existing single-family dwelling in which a permit is required, or upon the addition or creation of a bedroom, the installation of at least 1 operational and approved carbon monoxide device within the single-family dwelling or within each unit of the multifamily dwelling. A carbon monoxide device shall be located in the vicinity of the bedrooms, which may include 1 device capable of detecting carbon monoxide near all adjacent bedrooms; in areas within the dwelling adjacent to an attached garage; and in areas adjacent to any fuel-burning appliances.

(2) The carbon monoxide device described in subsection (1) may be battery-powered, plug-in with or without battery backup, wired into the dwelling's AC power line with secondary battery backup, or connected to a system by means of a control panel. If the international residential code is adopted by the director as part of a code adopted after the effective date of the amendatory act that added this section, those requirements apply and shall be followed upon the effective date of the code.

(3) An enforcing agency shall not impose a penalty for the failure of a person to comply with subsection (1) until the effective date of the code that may be adopted after the effective date of the amendatory act that added this section that incorporates that requirement.

(4) A person licensed under article 24 of the occupational code, 1980 PA 299, MCL 339.2401 to 339.2412, who is in compliance with this section or rules promulgated under the code and installs, in accordance with manufacturer's published instructions at the time of installation, a carbon monoxide device shall have no liability, directly or indirectly, to any person with respect to the operation, maintenance, or effectiveness of the carbon monoxide device.

(5) As used in this section:

(a) "Approved" means a carbon monoxide device that is listed as complying with either ANSI/UL 2034 or ANSI/UL 2075 and that is installed in accordance with the manufacturer's instructions.

(b) "Carbon monoxide device" means a device that detects carbon monoxide and alerts occupants via a distinct and audible signal that is either self-contained in the unit or activated via a system connection.

(c) "Operational" means working and in service.

(6) This section shall be known and may be cited as the "Overbeck law".

History: Add. 2008, Act 377, Eff. Mar. 23, 2009.

Popular name: Act 230

Popular name: Uniform Construction Code