



U.S. Department  
of Transportation

National Highway  
Traffic Safety  
Administration



# Research Note

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## Fatalities Associated With Carbon Monoxide Poisoning From Motor Vehicles, 1995-1997

### *Introduction*

NHTSA's National Center for Statistics and Analysis (NCSA) recently completed a second study of data from the National Center for Health Statistics (NCHS) to obtain an estimate of the number of persons killed as a result of carbon monoxide (CO) poisoning by exhaust gases of motor vehicles. This note updates the results of the study done in 1996 to assess the extent of fatalities associated with CO poisoning from motor vehicles using the NCHS data for the 1993 calendar year (NHTSA, 1996). This study focuses on the extent to which moving, as opposed to stationary, motor vehicles are involved in CO poisoning deaths. In addition, the study examined the proportion of accidental, i.e., unintentional CO deaths; the vehicle location for accidental CO fatalities involving stationary vehicles, and the season of the year in which the greatest proportion of accidental CO deaths occur.

Data for calendar years 1995-1997 were used in this study. NCHS obtains information on the cause(s) of death, as recorded on death certificates, from each of the fifty states, the District of Columbia, and the five boroughs of New York City. For the years 1995-97, the total number of fatalities due to CO poisoning decreased from 2,037 in 1995 to 1,678 in 1997. The total number of fatalities recorded in 1993 as a result of CO poisoning was 2,086. The majority of these fatalities involved stationary motor vehicles, ranging from 96 percent in 1995 to 97 percent in 1996 and 96 percent in 1997 (95 percent in 1993). On an average, almost 84% of the CO fatalities involving stationary motor vehicles were classified as intentional, or suicide. For moving motor vehicles, this pattern was

reversed, i.e., all of the CO fatalities involving moving vehicles were classified as unintentional or accidental.

### *Methodology*

The summary statistics of CO poisoning deaths due to motor vehicle exhaust gas have been generated by aggregating the International Classification of Diseases, 9<sup>th</sup> Revision (ICD-9)<sup>1</sup> Underlying Cause of Death Codes from the NCHS mortality data. Based on these underlying causes, the NCSA has adopted a listing comprised of fatalities due to CO poisoning from motor vehicle exhaust gas. The ICD-9 codes comprise a four-digit rubric. The fatalities along the various categories presented in this paper have been determined from the listing in the ICD-9 classification manual [Refer HHS, 1989]. In some cases, the Record Axis (RA) codes in the NCHS file were used in tandem with the ICD-9 codes. The RA codes facilitate a more detailed description of the ICD-9 code. This detailed description is captured in the form of twenty RA codes. The RA codes are classified in a manner comparable to the underlying cause of death classification, thereby facilitating joint analysis of the 20 RA codes, if available, and the underlying cause of death, which is death due to CO poisoning. The underlying cause as well as the RA codes literally represent the information conveyed in the ICD-9 four-digit rubrics. Table 1 presents the combination of the Underlying Cause of Death and the RA codes used in this analysis.

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<sup>1</sup>9<sup>th</sup> Revision, International Classification of Diseases, Department of Health and Human Services, 1989.

**Table 1 : Underlying Cause of Death and RA Codes used to determine CO Deaths**

	Nature of Death	Underlying Cause of Death	Record Axis
Stationary Vehicles	Suicide	952.0	-
	Accidental	868.2	-
	Unknown	982.0	-
Moving Vehicles	Suicide	952.0	809.0 to 825.9
	Accidental	809.0 to 825.9	986

Table 2 presents the literal description of the ICD-9 codes used in this study.

**Table 2 : Interpretation (ICD-9) of the Underlying Cause of Death and the RA codes**

ICD-9 Code	ICD-9 Description
809.0 to 825.9	Motor Vehicle Traffic Accidents
868.2	Accidental Poisoning from Motor Vehicle Exhaust Gas (Not in Transit)
952.0	Suicide from Motor Vehicle Exhaust Gas (Stationary)
982.0	CO Poisoning, undetermined whether accidentally or purposely inflicted
986	Toxic Effect of CO

Table 3 presents total CO fatalities from 1995-1997, by stationary vs. moving motor vehicles.

**Table3 : Fatalities Associated with CO Poisoning in 1995-1997**

	Nature of Death	1995	1996	1997	Total
Stationary Vehicles	Suicide (%)	1,663 (84.7)	1,511 (84.2)	1,368 (84.6)	4,542 (84.5)
	Accidental (%)	234 (11.9)	223 (12.4)	208 (12.9)	665 (12.4)
	Unknown (%)	67 (3.4)	61 (3.4)	41 (2.5)	169 (3.1)
Moving Vehicles	Suicide	0	0	0	0
	Accidental	73	59	61	193
<b>Total</b>		<b>2,037</b>	<b>1,854</b>	<b>1,678</b>	<b>5,569</b>

The NCHS data indicated that 234 CO fatalities involving stationary motor vehicles were

considered to be accidental in 1995, followed by 223 in 1996 and 208 in 1997. A CO fatality involving a stationary vehicle was one in which the death occurred either within or outside of the vehicle in an enclosed area. The majority of these fatalities, an average of 60 percent, occurred with vehicles located at home, as opposed to on a public roadway or in other locations. Table 4 presents the distribution of accidental CO fatalities involving stationary

vehicles by location. As indicated in Table 3, the total number of accidental CO fatalities involving stationary vehicles has decreased from 1995 to 1997 (234 to 208). Thus, the number of accidental CO fatalities involving stationary motor vehicles has decreased from a high of 245 in 1993. However, accidental CO deaths as a proportion of the total CO deaths in stationary vehicles, has increased from about 12 percent in 1995 to 13 percent in 1997.

**Table 4 : Accidental CO Fatalities with Stationary Vehicles by Vehicle Location, 1995-1997**

Vehicle Location	1995	1996	1997	Total
At Home	126 (53.8)	149 (66.8)	122 (58.6)	397 (59.7)
On Public Roadway	6 (2.6)	7 (3.2)	7 (3.4)	20 (3.0)
Other Locations	102 (43.6)	67 (30.0)	79 (38.0)	248 (37.3)
<b>Total</b>	<b>234</b>	<b>223</b>	<b>208</b>	<b>665</b>

**Table 5: All Accidental CO Fatalities in 1995-1997 by Season of Occurrence**

Season	1995	1996	1997	Total
Fall	77 (25.1)	62 (22.0)	77 (28.6)	216 (25.2)
Winter	105 (34.2)	109 (38.6)	89 (33.1)	303 (35.3)
Spring	76 (24.7)	63 (22.3)	71 (26.4)	210 (24.5)
Summer	49 (16.0)	48 (17.1)	32 (11.9)	129 (15.0)
<b>Total</b>	<b>307</b>	<b>282</b>	<b>269</b>	<b>858</b>

For stationary and moving motor vehicles combined, a total of 307 accidental CO fatalities occurred in 1995 followed by 282 in 1996 and 269 in 1997. Of these fatalities, the largest proportion, on an average, about 35 percent occurred during the winter months of December, January, and February. Table 5 presents the distribution of accidental CO fatalities from 1995 to 1997 by season of occurrence.

In the summer months, namely June, July and August, the incidence of accidental deaths due to CO poisoning was least compared to the other seasons, with an average of about 15 percent of the accidental CO deaths for the whole year.

## ***References***

*National Highway Traffic Safety Administration (1996)*. Fatalities associated with Carbon Monoxide Poisoning From Motor Vehicles in 1993. Washington, D.C.: Department of Transportation.

*Department of Health and Human Services (1989)*, International Classification of Diseases, 9<sup>th</sup> Revision (ICD-9).

For additional copies of this research note, please call (202) 366-5388 or fax your request to (202) 366-7078. For questions, please contact Rajesh Subramanian of the National Center of Statistics and Analysis, at (202) 366-5371. This research note and other general information on highway traffic safety may be accessed by Internet users at <http://www.nhtsa.dot.gov/people/nca>.