

## Observations on Drug Abuse Deaths in the State of Maryland

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**ABSTRACT:** The problem of drug abuse in America encompasses all ages, economic, and ethnic groups. The Office of the Chief Medical Examiner (OCME) has recorded a continuous increase in drug abuse deaths in Maryland over the past seven years. This report focuses on the epidemiological characteristics and pathological findings of victims of fatal drug abuse in Maryland investigated by the OCME in 1992 and 1993.

A retrospective study of OCME cases in 1992 and 1993 yielded a total of 605 deaths caused by drugs of abuse. 426 deaths were the result of narcotic drug use, 66 deaths due to cocaine, 102 deaths involved both narcotics and cocaine, 6 deaths were due to phencyclidine (PCP) and 5 involved both PCP and narcotic drugs. Drug abuse deaths most often involved individuals who were male (86%) and black (64%). Their ages ranged from 15 to 68 years with the majority (58%) of victims being in their 30's. Of the 605 drug deaths, 393 (65%) had a known history of drug abuse. 279 (46%) exhibited needle tracks, of which only 94 (16%) had identifiable fresh needle puncture marks. Drug paraphernalia (needles, syringes, etc.) was found at the scene in 22% of the cases. Twenty-nine (4.8%) cases showed complications of drug abuse which included pneumonia, endocarditis or myocarditis, pulmonary embolism, AIDS and intracerebral hemorrhage. 87 (14.4%) were positive for HIV antibodies, an incidence much higher than that identified in our general autopsy population (2.6%).

Drugs of abuse were also found in a significant portion of the homicides examined at this office in 1992 and 1993. 323 of the 1265 homicide victims (25%) showed evidence of some form of illicit drug activity.

**KEYWORDS:** forensic science, forensic pathology, drug deaths, epidemiology, homicides, Maryland

Drug abuse, today, is truly an international epidemic. The number of drug-dependent people who die directly or indirectly from drugs of abuse has risen tremendously since the eighties in America as well as the whole world (1–3). America has developed a drug oriented society. In the early 1960s, less than 5% of American population had any experience with illicit drugs. By the early 1970s, that percentage has doubled to over 10%, and by 1991, an estimated 37.1% (75.4 million) of Americans age 12 and older have used illicit drugs (4). The National Center for Health Statistics estimates that current substance abuse causes over 75,000 deaths annually (5). The OCME has witnessed a continual increase of drug related deaths in Maryland over the past seven years. This report focuses on certain epidemiological characteristics and patho-

logical findings in victims of drug abuse in Maryland in 1992 and 1993.

### Materials and Methods

All deaths investigated by the Office of the Chief Medical Examiner—State of Maryland, which require autopsy examination, are subjected to complete toxicology screening for drugs and alcohol. This includes essentially all deaths which are the result of trauma, and those which are suspicious or unusual as well as persons under the age of 60. Specimens including blood, urine, bile, and vitreous humor were collected from each victim at autopsy unless the condition of the victim's body precluded this. In individuals who have died after several hours or days of hospitalization, not only was the blood collected at autopsy, but the medical facility in which the individual had been tested was contacted to provide admission blood for toxicological analysis.

The biological samples were screened for a variety of illicit drugs and alcohol, using gas chromatography and radioimmunoassay techniques. All detected drugs and/or metabolites were confirmed using gas chromatography/mass spectrometry (GC/MS).

The forensic investigation performed by the Maryland OCME provides the following information: (1) identification of the victim; (2) personal information from an interview with the victim's relatives, acquaintances or witnesses at the scene of death (including the information of any medical or drug history); (3) evaluation of the scene and circumstances (including a search for the presence of illicit drugs and drug paraphernalia); (4) complete autopsy and toxicology studies to determine the cause and manner of death and contributory factors; (5) a serological study to identify communicable diseases.

The definition of drug abuse is the non-medical use of a substance for any of the following reasons: psychic effect, dependence, or suicide attempt/gesture. A drug-caused death is any death in which a toxic level of drug is found with no other cause of death present. In other words, a drug-caused death is a death that can be directly attributable to or is caused by drug intoxication. A drug abuse death is a death that is caused by illicit drug intoxication. A drug-related death is any death where the use of illicit drugs identified in the body, but is not the cause of death. Drugs of abuse are considered, for purpose of this paper, to be narcotic drugs (opiates), cocaine, phencyclidine, and amphetamine.

### Results

Yearly totals for drug abuse deaths in the Maryland area are shown graphically in Fig. 1. The number of drug abuse deaths investigated by the OCME increased sharply from 119 cases in 1986 to 356 in 1993, a 199% increase over seven years. Narcotic drugs, specifically heroin, have played a major role in the rising number of drug abuse deaths. Deaths from heroin use increased

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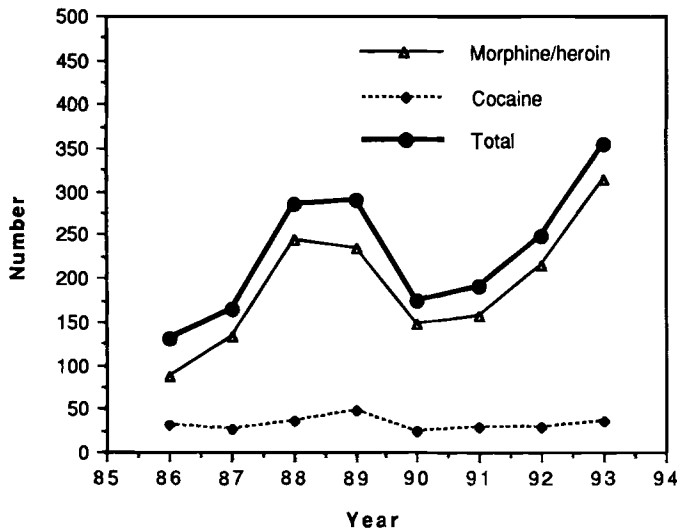


FIG. 1—Drug abuse deaths in Maryland 1986–1993.

from 88 to 314, a 251% increase during this period. The number of cocaine abuse deaths stayed relatively constant during this period.

We focused on the epidemiological characteristics of illicit drug related deaths investigated in 1992 and 1993. A total of 1115 deaths were identified in which illicit drugs were found by autopsy and toxicology study. Of the 1115 cases 605 (54%) were directly attributable to these drugs of abuse. Table 1 shows distribution of illicit drug related deaths in the OCME. Drugs of abuse were observed in a significant portion of the homicides examined in 1992 and 1993. Of the 1265 homicide victims, 323 (25%) showed evidence of recent illicit drug use.

Of the 605 drug abuse deaths, 446 (70%) involved the use of morphine/heroin, 11% of the deaths were due to cocaine, 17% had both narcotics and cocaine. Six deaths were due to PCP and there were five deaths in which both PCP and narcotics were identified (Fig. 2).

Maryland, with a population of 4,871,468 is made up of 23 counties and Baltimore City whose population is 736,014. In 1992, 64% (160/249) of these drug abuse deaths occurred in Baltimore City. This represented a rate of 21.7 deaths per 100,000 population in Baltimore. Drug abuse deaths in Baltimore increased significantly in 1993, to a 34.0 deaths per 100,000 population. It is very interesting that almost all other drug abuse deaths occurring in Maryland were distributed in the counties which immediately surround the major urban centers of Baltimore or Washington, D.C.

TABLE 1—Distribution of illicit drug related deaths by manner of death in Maryland 1992 and 1993.

Manner of Death	1992		1993	
	Total Cases	Drug Related Deaths (%)	Total Cases	Drug Related Deaths (%)
Natural	3498	28 (0.8)	5399	20 (0.4)
Accident	1146	60 (5.2)	1226	35 (2.9)
Homicide	623	187 (30.0)	642	136 (21.2)
Suicide	492	23 (4.7)	506	21 (4.1)
Undetermined <sup>a</sup>	362	249 (68.7)	460	356 (77.4)
<b>Total</b>	<b>6121</b>	<b>547 (8.9)</b>	<b>8233</b>	<b>568 (6.9)</b>

<sup>a</sup>After a thorough investigation of the circumstances of death, we were unable to decide if the death was accidental, suicidal or homicidal and therefore classified these cases as undetermined.

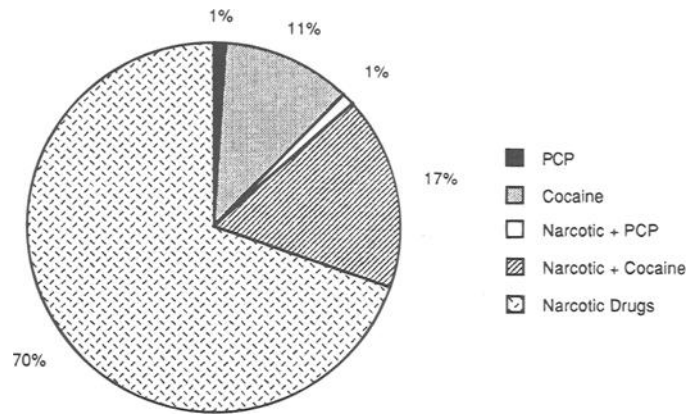


FIG. 2—Distribution of drug abuse deaths in Maryland 1992–1993.

The rate of the other counties in Maryland ranged from 0.0 to 5.7 per 100,000 population (Table 2).

The distribution of drug abuse deaths by month showed no significant difference in 1992 and 1993. February, March and December experienced more than those in the other months in 1992. However, drug abuse death occurred more frequently in March, May and July in 1993.

The age distribution of the drug abuse victims ranged from 15 to 68 years, with a mean age of 36. Drug abuse deaths mainly involved adults in their 30's (Table 3).

Drug abusers commonly used alcohol. More than 53% (322/605) of the victims whose deaths were drug-caused had consumed alcoholic beverages prior to death. Of the 605 cases, 32% showed blood alcohol concentrations greater than 0.10% (w/v) (Table 4).

TABLE 2—Distribution of drug abuse deaths in Maryland in 1992 and 1993.

County	Population <sup>a</sup>	Drug Abuse Deaths		Drug Abuse Deaths (per 100,000)	
		1992	1993	1992	1993
Baltimore City	736,014	160	250	21.7	34.0
Baltimore County	692,134	31	30	4.5	4.3
Prince George's	729,268	24	29	3.3	4.0
Montgomery	757,027	14	8	1.8	1.1
Anne Arundel	427,239	10	16	2.3	3.7
Harford	182,132	3	8	1.6	4.4
Frederick	150,208	2	3	1.3	2.0
Worcester	35,028	2	0	5.7	0
Cecil	71,347	1	1	1.4	1.4
Carroll	123,372	1	0	0.8	0
Somerset	23,440	1	0	4.2	0
Charles	101,154	0	1	0	1.0
Allegany	71,946	0	0	0	0
Calvert	51,372	0	2	0	3.9
Caroline	27,035	0	0	0	0
Dorchester	30,236	0	0	0	0
Garrett	28,138	0	0	0	0
Howard	187,328	0	4	0	2.1
Kent	17,842	0	0	0	0
Queen Anne's	33,953	0	0	0	0
St. Mary's	75,974	0	2	0	2.6
Talbot	30,549	0	1	0	3.2
Washington	121,393	0	1	0	0.8
Wicomico	74,339	0	0	0	0
<b>Total</b>	<b>4,781,468</b>	<b>249</b>	<b>356</b>	<b>5.2</b>	<b>7.4</b>

<sup>a</sup>Resident population. Bureau of the Census, 1990.

TABLE 3—Distribution of drug abuse deaths by age Maryland—1992.

Age	Population <sup>a</sup>	Drug Abuse Deaths		Drug Abuse Deaths (per 100,000)	
		1992	1993	1992	1993
<20 years	1,295,811	5	3	0.5	0.2
20–29	810,778	47	86	5.8	9.9
30–39	862,610	133	179	15.4	20.8
40–49	667,764	55	85	8.2	12.7
50–59	433,988	7	8	1.6	1.8
>60	710,517	1	1	0.1	0.1

<sup>a</sup>Resident population. Bureau of the Census, 1990.

TABLE 4—Distribution of drug abuse deaths in combination with alcohol—1992 and 1993.

Drugs	Total Deaths	Blood Alcohol [ $>100$ mg/dL] (%)	Blood Alcohol [ $<100$ mg/dL] (%)
Narcotics	426	161 (37.8)	73 (17.1)
Cocaine	66	11 (16.7)	21 (31.8)
Narcotics & Cocaine	102	19 (18.6)	27 (26.5)
Phencyclidine (PCP)	6	2 (33.3)	2 (33.3)
PCP & Narcotics	5	3 (60.0)	3 (60.0)
Total	605	196 (32.4)	126 (20.8)

Further analysis of the characteristics of the narcotic and cocaine intoxication cases revealed that 88% of the victims of narcotic drugs were male which represented a rate of 16.1 deaths per 100,000 male population in Maryland. Blacks were much more frequently involved in both narcotic and cocaine deaths than whites (Table 5).

### Physical Observations

46% of drug abuse victims exhibited needle-tracks, of which only 16% had fresh needle puncture marks. Of the 605 drug abuse deaths, 29 showed significant complications of chronic usage including pneumonia, endocarditis or myocarditis, pulmonary embolism, AIDS and intracerebral hemorrhage. In addition, 14%

TABLE 5—Distribution of narcotic and cocaine cases by sex and race—1992 and 1993.

	Population <sup>a</sup>	Narcotics No. (per 100,000)	Cocaine No. (per 100,000)	Narcotics & Cocaine No. (per 100,000)
Sex				
Male	2,317,778	374 (16.1)	51 (2.2)	85 (3.7)
Female	2,463,690	52 (2.1)	14 (0.6)	17 (0.7)
Race				
White	3,396,261	156 (4.6)	16 (0.5)	32 (0.9)
Black	1,188,930	269 (22.6)	49 (4.1)	69 (5.8)
Other	196,277	1 (0.5)	1 (0.5)	1 (0.5)
Total	4,781,468	426 (8.9)	66 (1.4)	102 (2.1)

<sup>a</sup>Resident population. Bureau of the Census, 1990.

of the cases were positive for HIV antibodies. This incidence was much higher than the general autopsy population (2.6%) (Table 6).

### Scene Observations

The scene investigation of drug abuse deaths demonstrated that most drug abuse victims (80%) were found in residences. The others were found on the streets, in parking lots, vehicles, and woods. Drug paraphernalia (needles, syringes, etc.) were found by investigators at the scene in only 22% of the cases.

### Discussion

Most recently, crime in America has been the center of the nation's attention. In this final decade of the 20th century, violent crime is likely to be at its highest level in American history. The relationship between violence, drug use and victimization has been noted (6). There has been considerable evidence to demonstrate that drug use, especially cocaine, is inextricably linked to criminality (7–9). In this study, the OCME examined 1265 homicide victims in Maryland in 1992 and 1993. 25% showed evidence of recent illicit drug use, which was much higher than the incidence identified in our general autopsy population (7.8%).

The most current data from the National Drug Abuse Warning Network Surveillance System (DAWN) indicated that cocaine was the most frequently reported drug in Medical Examiner cases (mentioned in 46% of drug-related deaths), followed by alcohol-in-combination (37%) and heroin/morphine (35%) (1). In Maryland, however, narcotics, specifically heroin, were the major drugs identified in the medical examiner's cases. In our study, more than 70% of illicit drug abuse victims in 1992 and 1993 involved the use of heroin/morphine.

Careful consideration of this dramatic increase in drug deaths, particularly those due to heroin, led us to search several available sources for explanation. We contacted individuals at the Center for Substance Abuse Research (CESAR), the National Institute of Drug Abuse (NIDA), the Baltimore City Police Crime Lab and the Maryland State Police. Most of the sources identified the increased purity of the drug as a major factor in the increased mortality rate. However, when we attempted to obtain hard data regarding the change in purity of heroin, we learned that between 1991 and 1993, the purity of "street" heroin had increased from 5.3% to 9.7%. However, this alone did not seem to be sufficient to explain the dramatic increase in mortality. Further study lead to identification of the following reasons:

1. The purity of heroin on the street has increased nationwide. The Domestic Monitor Program (DMP) of the Drug Enforcement

TABLE 6—Postmortem findings of drug abuse deaths—1992 and 1993.

	Drug Abuse Deaths (%)		Total
	1992	1993	
External			
Needle Tracks	114 (45.8)	165 (46.3)	279 (46.1)
Fresh Puncture Mark	39 (15.7)	55 (15.4)	94 (15.5)
Skin Popping	12 (4.8)	15 (4.2)	27 (4.5)
Internal			
Complications	15 (6.0)	14 (3.9)	29 (4.7)
HIV Antibody +	35 (14.1)	52 (14.6)	87 (14.4)

Administration (DEA) indicates that the purity of illicit heroin rose in 1992 by a mean of 37% in 20 major metropolitan areas (10). This was the highest annual average purity reported since the DMP was initiated ten years ago.

2. The market price of heroin has decreased significantly. While the purity of heroin has increased over the last several years, the price has fallen (11). For example, a heroin addict who three or four years ago would have maintained a \$100 to \$200 a day habit, now is able to satisfy his needs for \$60 to \$80. The presence of high-purity inexpensive heroin has led to speculation that a new heroin epidemic may be underway (12).

3. Heroin is much more available and easier to obtain. In fact, a supermarket atmosphere has developed in certain centers in Baltimore. In some areas, cocaine and heroin are sold on the same street corner, a phenomenon not previously seen.

4. A transition from cocaine addiction to heroin addiction was identified as a significant pattern of drug abuse (11). Many addicts found that they needed a drug like heroin to counteract the tremendous stimulant effects of cocaine (13). As a result of the dramatic increase in Baltimore, in cocaine and crack cocaine activity in 1990 and 1991, a secondary increase in the population of individuals using both cocaine and heroin was observed.

5. A significant shift from intravenous injection to intranasal use (snorting) has been noted among heroin addicts recently (14,15). This has been linked to fears of contracting the AIDS virus by use of the needle. Intranasal heroin administration has been reported to be effective in producing pharmacologic and behavioral effects (16). The ease of use and efficacy of the intranasal drug administration, combined with the decreased cost, and the reduced fear of infection could also lead some naive or infrequent drug users to heroin addiction.

One possible explanation for the age distribution of drug and specifically heroin fatalities, with the peak in the 30 year age group, is that the majority of crack and cocaine addicts are in the 20+ age group. The subsequent transition to heroin addiction with its fatal consequences extends over a ten year period.

## Summary

Maryland has witnessed a dramatic increase in deaths due to drug abuse particularly heroin. A number of very significant market factors have influenced this increase together with the intimate association between cocaine and heroin addiction.

Developing a strategy to counteract this dramatic increase in drug abuse and drug abuse fatalities represents a significant challenge for health and law enforcement officials at all levels of public and private sectors.

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