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Drug and Chemical Related Deaths: Incidence in the State of Maryland—1975 to 1980

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ABSTRACT: The incidence of drug and chemical related deaths was studied over a six-year period in the State of Maryland. Deaths were classified into the following categories: alcohol, carbon monoxide (CO), single drugs, multiple drugs, and narcotism. The last three categories were further subdivided as to the specific drugs or chemicals involved. Over the six-year period the number of alcohol and CO deaths remained steady, the number of barbiturate and propoxyphene deaths declined, while the number of tricyclic antidepressant drug deaths increased.

KEYWORDS: toxicology, death, surveys, narcotics, drugs

Drugs are commonplace in our society and much has been written regarding their use and abuse [*1-3*]. Like many aspects of our society, frequent changes are noted in the patterns of drugs being used. The medical examiner's cases reflect only a portion of these and it is doubtful that the incidence of drugs seen in these cases represents a full cross section of drug use in the community. Rather the drugs seen in these cases represent those drugs which are most commonly abused, those with a low therapeutic index, and those which significantly impair psychomotor function. This study compiles the incidence of all drugs and chemicals found in the medical examiner's cases over the six-year period, 1975 to 1980. The incidence of drugs in single drug and multiple drug deaths was tabulated both separately and together. The incidence of drugs found in nondrug related deaths was also tabulated. Certain categories and groups of drugs were selected for further study because of changes in use or because they have received considerable media coverage. Overall trends and changes in these patterns were compared to other studies and differences and similarities noted.

Methods

The data for these statistics came from the records of the Maryland State Office of the Chief Medical Examiner. The data are primarily from the years 1975 through 1980 but some of the studies were limited to data from 1977 through 1980. For the purpose of this study, drug and chemical deaths were divided into five major categories; single drug deaths, multiple drug deaths, narcotism, acute alcohol (ethanol) intoxication, and carbon monoxide (CO) intoxica-

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tion. Maryland has a population of approximately 4 million people and this study was abstracted from the approximately 3000 medical examiner cases each year that were submitted for toxicologic analyses.

A positive drug analysis was considered to be any trace of a drug quantifiable or not, in any body tissue such as liver or fluid such as bile, blood, urine, cerebrospinal fluid, or vitreous humor.

Comparison of the data and findings of the study with the findings of other studies was attempted. Studies from Dallas, TX [*4*] and Saint Louis, MO [*5*] were used for many comparisons because these studies covered similar periods of time and were performed on populations of similar size and mix [*6, 7*]. This process is not without difficulty because of the differences in classification (categorization) of drug deaths and the differences in the accepted toxic concentration of drugs.

Statistical analyses of the demographic and drug category data were performed using the Kolmogorov-Smirnov two-tailed test as described by Guilford [*8*]. Analyses were performed on a TRS-80® Model III computer using the VisiCalc® electronic spreadsheet.

Results

Table 1 presents a compilation of drug and chemical deaths for the six-year period covered in this study. Listed directly beneath the number of drug deaths in each category per year is the percentage of the total drug deaths for that year. Carbon monoxide intoxication includes suicide, accident, and fire deaths. The single drug deaths do not include any narcotism (narcotic related) deaths even in those cases where only a single narcotic, such as morphine, was present. Comparison trends in narcotism deaths show narcotism to be different from alcohol ($p < 0.05$), single drug deaths ($p < 0.10$), and multiple deaths ($p < 0.001$).

Table 2 is a complete listing of the drugs and chemicals found in single and multiple drug deaths from 1975 to 1980. The table lists primarily the parent compounds, but metabolites, particularly active metabolites, which are commonly measured are included in the table directly under the parent compound. The percent is the percent of single drug or multiple drug deaths in which the drug was found. The percentages in single drug deaths do not total 100% primarily because of the inclusion of the metabolites. The percentages in the multiple drug deaths also do not total 100% because of the variable number of drugs in each case.

TABLE 1—*Drug and chemical deaths in Maryland—1975 to 1980.*

	1975	1976	1977	1978	1979	1980	Total
Alcohol							
N	26	32	29	25	26	19	157
%	8.5	12.5	9.4	8.3	9.6	6.6	9.1
Carbon monoxide							
N	108	81	117	131	92	106	635
%	35.3	31.5	38.0	43.4	33.9	37.0	36.7
Single drug							
N	71	53	64	51	63	56	358
%	23.2	20.6	20.8	16.9	23.2	19.6	20.7
Multiple drug							
N	47	50	76	84	41	51	349
%	15.4	19.5	24.7	27.8	15.1	17.8	20.2
Narcotism							
N	54	41	22	11	49	54	231
%	17.6	16.0	7.1	3.6	18.1	18.9	13.4
Total							
N	306	257	308	302	271	286	1730

TABLE 2—*Incidence of drugs and chemicals occurring in drug deaths (excluding narcotism)—1975 to 1980.*[a]

Drug	Single Drug		Multiple Drug		Total	
	Number	%	Number	%	Number	%
Acetaminophen	1	0.3	30	8.6	31	4.4
Amitriptyline	41	11.5	37	10.6	78	11.0
Nortripyline	27	7.5	18	5.2	45	6.3
Arsenic	2	0.6	1	0.3	3	0.4
Benzene	1	0.3	0	0.0	1	0.1
Benztropine	1	0.3	0	0.0	1	0.1
Bromine	1	0.3	0	0.0	1	0.1
Barbiturates	62	17.3	174	49.9	234	33.1
Amobarbital	4	1.1	42	12.0	46	6.5
Butalbital	3	0.8	11	3.2	14	2.0
Pentobarbital	27	7.5	23	6.7	50	7.0
Phenobarbital	10	2.8	43	12.3	53	7.5
Secobarbital	17	4.7	53	15.2	70	9.9
Thiopental	1	0.3	0	0.0	1	0.1
Caffeine	1	0.3	1	0.3	2	0.3
Carisoprodol	1	0.3	1	0.3	2	0.3
Chloral hydrate	2	0.6	4	1.1	6	0.8
Chlordiazepoxide	1	0.3	13	3.7	14	2.0
Chlorinated hydrocarbons	1	0.3	1	0.3	2	0.3
Chloroform	1	0.3	0	0.0	1	0.1
Chloroquine	0	0.0	1	0.3	1	0.1
Chlorpheniramine	0	0.0	3	0.9	3	0.4
Chlorpromazine	6	1.7	7	2.0	13	1.8
Chlorzoxazone	0	0.0	1	0.3	1	0.1
Chromium	1	0.3	0	0.0	1	0.1
Cocaine	3	0.8	7	2.0	10	1.4
Codeine	2	0.6	26	7.4	28	4.0
Colchicine	0	0.0	1	0.3	1	0.1
Cyanide	6	1.7	0	0.0	6	0.8
Desipramine	6	1.7	11	3.2	17	2.4
Diatrizoic acid	1	0.3	0	0.0	1	0.1
Diazepam	3	0.8	79	22.6	82	11.6
Nordiazepam	2	0.6	22	6.3	24	3.4
Diphenydramine	1	0.3	6	1.7	7	1.0
Disopyramide	1	0.3	0	0.0	1	0.1
Doxepin	19	5.3	14	4.0	33	4.7
Nordoxepin	11	3.1	5	1.4	16	2.3
Ethchlorvynol	11	3.1	40	11.5	51	7.2
Ethylene glycol	2	0.6	1	0.3	3	0.4
Fluorocarbons	9	2.5	1	0.3	10	1.4
Flurazepam	0	0.0	9	2.6	9	1.3
Glutethimide	11	3.1	2	0.6	13	1.8
Hexachlorophene	1	0.3	0	0.0	1	0.1
Hydromorphone	0	0.0	2	0.6	2	0.3
Hydroxyzine	0	0.0	1	0.3	1	0.1
Imipramine	4	1.1	16	4.6	20	2.8
Isopropanol	5	1.4	3	0.9	8	1.1
Lidocaine	2	0.6	9	2.6	11	1.6
Lithium	1	0.3	1	0.3	2	0.3
Meperidine	2	0.6	8	2.3	10	1.4
Meprobamate	1	0.3	21	6.0	22	3.1
Mesoridazine	8	1.4	5	1.4	13	1.8
Methadone	17	4.7	44	12.6	61	8.6
Methamphtamine	1	0.3	0	0.0	1	0.1
Methanol	3	0.8	1	0.3	4	0.6
Methapyrilene	2	0.6	7	2.0	9	1.3
Methaqualone	3	0.8	12	3.4	15	2.1

TABLE 2—*Continued.*

Drug	Single Drug		Multiple Drug		Total	
	Number	%	Number	%	Number	%
Methyprylon	2	0.6	0	0.0	2	0.3
Morphine	1	0.3	20	5.7	21	3.0
Nitrous oxide	1	0.3	0	0.0	1	0.1
Oxazepam	0	0.0	2	0.6	2	0.3
Oxycodone	0	0.0	2	0.6	2	0.3
Pentazocine	4	1.1	8	2.3	12	1.7
Perphenazine	0	0.0	1	0.3	1	0.1
Phencyclidine	2	0.6	11	3.2	13	1.8
Phenothiazines (unclassified)	1	0.3	2	0.6	3	0.4
Phenytoin	0	0.0	11	3.2	11	1.6
Primidone	0	0.0	1	0.3	1	0.1
Prochlorperazine	0	0.0	1	0.3	1	0.1
Propoxyphene	66	18.4	133	38.1	199	28.1
Norpropoxyphene[b]	14	3.9	25	7.2	39	5.5
Propranolol	1	0.3	1	0.3	2	0.3
Pyrilamine	1	0.3	0	0.0	1	0.1
Quinidine	2	0.6	1	0.3	3	0.4
Quinine	2	0.6	4	1.1	6	0.8
Salicylates	9	2.5	16	4.6	25	3.5
Salicylamide	0	0.0	4	1.1	4	0.6
Thioridazine	11	3.1	5	1.4	16	2.3
Trichloroethanol	0	0.0	5	1.4	5	0.7
Trifluoperazine	0	0.0	2	0.6	2	0.3
Tripelennamine	0	0.0	2	0.6	2	0.3
Triprolidine	0	0.0	1	0.3	1	0.1

[a] Total number of single drug overdose cases in the six years = 358.
Total number of multiple drug overdose cases in the six years = 349.
Total number of all drug overdose cases in the six years = 707.
[b] These results limited to 1979 and 1980, only.

In this study, we did not consider ethanol to be a second drug because a parallel investigation revealed no statistical difference in mean drug concentrations with and without ethanol. Many (38.6%) of the single drug deaths had a positive blood alcohol analysis. Likewise, caffeine and nicotine were also not considered as a second drug except in the two cases where the blood caffeine concentrations were in excess of 30 mg/L. As noted earlier, drug deaths as a result of narcotics such as morphine and methadone are not included in the single drug or multiple drug deaths but are listed separately in Table 7.

Table 2 indicates the drugs most commonly found in single drug deaths are as follows: propoxyphene (18.4%), amitriptyline (11.5%), pentobarbital (7.5%), doxepin (5.3%), secobarbital (4.7%), and methadone (4.7%). Note that the methadone and morphine percentages would be increased significantly if the narcotism cases caused by methadone or morphine intoxication or both were included in these figures.

The drugs found in multiple drug deaths differ considerably from those found in single drug deaths. First, the percent of occurrence is greatly increased simply because these are multiple drug deaths. The order of occurrence is also drastically altered. Propoxyphene (38.1%) is still the most commonly seen, but diazepam, which is rarely seen in single drug deaths, is the second most common drug in multiple drug overdoses (22.6%). These two are followed by secobarbital (15.2%), methadone (12.6%), phenobarbital (12.3%), amobarbital (12.0%), ethchlorvynol (11.5%), amitriptyline (10.6%), acetaminophen (8.6%), codeine (7.4%), pentobarbital (6.7%), and morphine (5.7%). As was the case with single drug deaths, both

methadone and morphine percentages would have been much higher if narcotism data had not been maintained separately.

A table that covers six years of postmortem cases does not necessarily give the most complete or accurate picture of drug use and abuse. In a compilation study trends may not be visible. Furthermore, most overdoses that receive prompt and adequate medical treatment survive. To illustrate such trends the data in Tables 3 and 4 are presented. These deal only with the most commonly seen drugs or drugs of special interest.

The data in Table 3 show that barbiturate and propoxyphene overdose deaths are decreasing as compared to the tricyclic antidepressant drugs, amitriptyline ($p < 0.001$) and doxepin ($p < 0.01$). Table 3 also shows that methaqualone, a much publicized drug nationwide, caused very few deaths in this region. Acute ethanol intoxication remains a principal problem.

TABLE 3—*Trends in single drug deaths 1975 to 1980 (numbers of cases).*

Drug Category	1975	1976	1977	1978	1979	1980	Total
Barbiturates	17	11	14	6	11	3	62
Diazepam	1	1	0	0	0	1	3
Methaqualone	0	0	0	0	2	1	3
Propoxyphene	23	10	10	9	9	5	66
Tricyclic antidepressants	5	4	9	8	22	22	70
Amitriptyline	2	3	6	3	14	13	41
Desipramine	0	0	0	1	2	3	6
Doxepin	1	1	3	3	5	6	19
Imipramine	2	0	0	1	1	0	4
Total single drug (excluding alcohol)	71	53	64	51	63	56	358
Acute alcohol	26	32	29	25	26	19	157

TABLE 4—*Trends in multiple drug deaths 1975 to 1980 (number and percent of cases).*

Drug Category		1975	1976	1977	1978	1979	1980	Total
Barbiturates	*N*	33	39	38	31	21	12	174
	%	70	78	50	37	51	24	50
Diazepam	*N*	13	15	16	20	8	7	79
	%	28	30	21	24	20	14	23
Methaqualone	*N*	1	2	2	0	1	6	12
	%	2	4	3	0	2	12	3
Propoxyphene	*N*	21	22	34	32	12	12	133
	%	45	44	45	38	29	24	38
Tricyclic antidepressants	*N*	3	13	10	13	15	24	78
	%	6	26	13	15	37	47	22
Amitriptyline	*N*	1	8	7	6	6	9	37
	%	2	16	9	7	15	18	11
Desipramine	*N*	0	0	0	1	4	6	11
	%	0	0	0	1	10	12	3
Doxepin	*N*	1	3	3	2	1	4	14
	%	2	6	4	2	2	8	4
Imipramine	*N*	1	2	0	4	4	5	16
	%	2	4	0	5	10	10	5
Two drugs	*N*	38	22	50	47	26	35	218
Three drugs	*N*	6	19	18	25	10	10	88
Four or more drugs	*N*	3	9	8	12	5	6	43
Total multiple drug cases		47	50	76	84	41	51	349

Table 4 confirms the observations seen in Table 3. There is a decrease in the number of cases where barbiturates and propoxyphene were found and a concomitant rise in the number of cases where the tricyclic antidepressant drugs were found ($p \leq 0.001$). Diazepam abuse also appears to be limited in comparison to the tricyclic antidepressant drugs ($p < 0.01$). Methaqualone still does not appear to be a significant problem.

Table 5 shows the demographics of the victims of single and multiple drug deaths. The table does not include narcotism deaths which are presented in Table 6. Table 5 indicates that the two common types of individuals to die from a drug overdose (nonnarcotic) are white males between the ages of 21 and 30 and white females over the age of 40. Relatively, few black males over 40 years of age succumb to nonnarcotism drug deaths. Statistically ($p < 0.001$) the white females as a group are different from the other three population groups (white males, black females, and black males) in regard to age distribution. Also note that almost all the deaths in the 10- to 20-year range were 17 years old or older.

Table 6 shows the narcotism demographics for the six-year period. Statistically, there is no difference in the age distribution between the four groups (white male, white female, black male, and black female).

There are marked differences between the data in Tables 5 and 6. While white males between the ages of 21 and 30 are the largest group in the nonnarcotic drug deaths, black males in the same age group show an even higher incidence of narcotism deaths. These numbers are more meaningful when compared to population data for the Baltimore metropolitan area. According to the 1980 census data people in the age group 20 to 29 account for 18% of the Maryland population [7]. In Tables 5 and 6, this same age group, 21 to 30, accounted for 31% of the nonnarcotism deaths and 64% of the narcotism deaths. The white males in the age group 21 to 30 accounted for almost 15% of the nonnarcotic drug deaths, but white males in the age group 20 to 29 are only 7% of the total United States population and an estimated 6% of the Maryland population [7]. Similarly, black males constitute approximately 13% of the metropolitan

TABLE 5—*Drug deaths (excluding narcotics) demographs 1975 to 1980.*

	Age							
Race/Sex	Unknown	<10	10-20	21-30	31-40	41-50	>50	Total
Black male	...	2	9	41	16	8	5	81
Black female	1	...	8	22	11	10	6	58
White male	3	...	30	103	45	30	44	255
White female	...	...	21	53	58	68	99	299
Oriental male	...	...	...	...	1	...	...	1
Oriental female	...	...	...	...	1	...	...	1
Total	4	2	68	219	132	116	154	695

TABLE 6—*Narcotism drug deaths demographics 1975 to 1980.*

	Age						
Race/Sex	11-20	21-30	31-40	41-50	>50	Unknown	Total
Black male	15	78	27	7	3	...	130
Black female	0	11	2	0	0	1	14
White male	7	47	10	2	1	1	68
White female	3	11	2	0	0	...	16
Total	25	147	41	9	4	2	228

area and 27% of the Baltimore city population [7] but this group accounted for 57% of the narcotism deaths.

Table 7 shows ten-year statistics on narcotic related (narcotism) deaths and Table 8 is a compilation of the drugs found. Note that beginning in 1977, radioimmunoassay (RIA) was employed as an analytical technique in these cases. Detectability was improved thus accounting for an increase in the number of positive morphine cases. The relatively high occurrence of both alcohol and quinine in narcotism cases is also noteworthy. Among those cases without a positive morphine analysis, methadone is the principal drug detected particularly in 1979.

TABLE 7—*Narcotic related (narcotism) deaths.*

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Total
Number of deaths	105	78	57	79	54	41	22	11	49	54	550
Narcotic drug detected	71	56	46	61	23	31	22	10	23	37	380
No narcotic drug detected	34	20	11	18	31	10	0	1	19	17	161

TABLE 8—*Drugs in narcotism deaths.*

Year	1977	1978	1979	1980	Total
Total Cases	22	11	49	54	136
		MORPHINE			
N	7	3	23	37	70
%	32	27	47	69	51
		ALCOHOL			
N	8	6	29	29	72
%	36	55	59	54	53
		QUININE			
N	5	5	24	29	63
%	23	45	49	54	46
		METHADONE			
N	6	4	17	5	32
%	27	36	35	9	24
		MEPERIDINE			
N	1	0	1	0	2
%	5	0	2	0	1
		COCAINE			
N	0	1	1	1	3
%	0	9	2	2	2
		PENTAZOCINE			
N	0	0	1	1	2
%	0	0	2	2	1

Discussion

The number and type of drug deaths per year as shown in Table 1 remained fairly constant over the six-year period. There are three noticeable fluctuations. First is the CO intoxications which are due primarily to house fires. Second is the number of multiple drug deaths in 1977 and 1978. Third is the marked decline in narcotism deaths in 1977 and 1978.

The changes in CO intoxications reflects changes in the number of house fires. Indeed, if the CO intoxication cases are subtracted from the total, the remaining drug deaths would fall between 171 and 197 each year. Therefore, there appears to be little change in the average number of drug deaths per year during this period. These findings are consistent with the findings of Garriott et al [*4*] in Dallas County for the same period.

The noticeable rise in multiple drug deaths in 1977 and 1978 and the concommitant fall in narcotism deaths may have been due to a decrease in the availability of heroin during this two-year period. Garriott et al did report a low in the number of narcotism deaths in 1977 but did not report the concomitant rise in multiple drug deaths [*4*].

The number of deaths caused by acute alcohol intoxication was fairly constant over the five-year period averaging 9.1% of the drug deaths. This figure is consistent with the 8% reported by Garriott et al [*4*]. These figures are slightly higher than the 4.8% acute alcohol intoxication deaths reported by Poklis and Gantner for the St. Louis area in 1977 to 1978 [*5*]. If the CO deaths are excluded from this study, as they were from the study of Poklis and Gantner, the acute alcohol deaths represent 14.3% of the drug deaths. The difference between the studies would be intensified in the narcotism cases which appear to have been excluded from their study are also excluded from our figures (18.2%).

The percentage of drug deaths as a result of narcotism for the five-year period was 13.4%. This percentage agrees with the findings of Garriott et al (15%) for the Dallas area for the ten-year period of 1971 to 1980 [*4*].

The six drugs listed in Table 2, propoxyphene (18.4%), amitriptyline (11.5%), pentobarbital (7.5%), doxepin (5.3%), secobarbital (4.7%), and methadone (4.7%), occurring most frequently in single deaths account for 52.1% of all single drug deaths during the six-year period covered by this study. During the same period acute ethanol intoxication was directly responsible for 157 deaths, a total only slightly less than the 187 deaths caused by the other six drugs combined. Additionally, ethanol was present in 39% of the single drug cases and in 35% of the multiple drug deaths. Garriott et al [*4*] reported 33% for multiple drug deaths. These are considerably above the 25% found in drug cases by Poklis and Gantner in a similar study of the St. Louis area [*5*]. The figures are more in line with the 32% ethanol occurrence rate found by Kaplan et al [*9*], the 44% reported by Rango et al [*10*], and the 42% positive blood alcohol concentration (BAC) reported by Bailey and Manoguerra in their studies of hospital emergency room admissions for drug overdose [*11*].

If the single drug deaths were arranged into groups similar to those of the Garriott et al study [*4*], the present study would be as follows: narcotics 31.0%, ethanol 21.0%, tricyclic antidepressants 9.4%, propoxyphene 8.8%, and barbituates 8.3%. These findings differ from those of Garriott et al. Their figures for the same six years were: narcotics 10.6%, ethanol 12.0%, tricyclic antidepressants 19.0%, propoxyphene 18.8%, and barbiturates 19.2% [*4*].

The twelve drugs occurring the most frequently in the multiple drug overdoses in this study (propoxyphene [38.1%], diazepam [22.6%], secobarbital [15.2%], methadone [12.6%], phenobarbital [12.3%], amobarbital [12.0%], ethchlorvynol [11.5%], amitriptyline [10.6%], acetaminophen [8.6%], codeine [7.4%], pentobarbital [6.7%], and morphine [5.7%]) are in general agreement with the results of previous studies in the United States [*12,13*]. Note that alcohol was present in 35.0% of the multiple drug deaths examined in this study. This is exceeded only by the occurrence of propoxyphene (38.1%) and the occurrence of all types of barbiturates which was 49.9%. Garriott et al reported the following as the most prominent agents in mixed drug deaths during the same time period: propoxyphene 36.1%, barbiturates 40.4%, diazapam 39.8%, ethanol 25.3%, tricyclic antidepressants 27.7%, methaqualone

10.8%, and codeine 8.4% [*4*]. If we had not kept separate data on narcotism cases, morphine and methadone occurrence would be second and third, respectively, in the multiple drug cases and the first and third most common drugs in the single drug overdoses. This would result in almost total agreement with the other studies [*12, 13*]. The major difference from the DAWN study is our high incidence of propoxyphene.

Tables 3 and 4 show a marked reduction in the occurrence of propoxyphene and barbiturates in both single drug deaths and multiple drug deaths during the period covered by this study. Garriott et al reported a similar trend in barbiturate related deaths in Dallas County from 1971 to 1980 [*4*]. In the Drug Abuse Warning Network (DAWN) study, a national study of major metropolitan areas (which included Garriott et al's and our figures) there was a peak in propoxyphene in 1977 followed by a decline in 1978 and 1979 [*13*]. The data from our study alone show a peak of propoxyphene in single drug deaths in 1975 followed by a dramatic and steady decline through 1980. Our study shows continued high occurrence of propoxyphene in multiple drug deaths through 1978 with a marked decline in 1979 and 1980. The decrease in the occurrence of barbiturates is similar to that seen by Campbell and Mason in a Scottish study of fatal ingestions from 1974 to 1978 [*14*].

Tables 3 and 4 show a dramatic increase in the tricyclic antidepressant drug deaths during the period covered by this study. Garriott et al reported that the incidence of tricyclic antidepressant drugs in drug related deaths more than quadrupled during the period 1971 to 1980 [*4*]. This increase in the tricyclic antidepressant drugs was also documented by Alha et al in a 1979 study of fatal poisonings in Finland [*15*]. In our study the number of tricyclic antidepressant drugs in single drug deaths rose steadily from 5 in 1975 to 22 in 1980. Similarly, the number of tricyclic antidepressant drugs in multiple drug deaths rose markedly from 3 in 1975 to 24 in 1980. As reported in the Garriott et al study, these drugs are not euphoric and deaths caused by this class of drugs are most often suicides [*4*]. The principal tricyclic antidepressant drug found in this and other studies was amitriptyline. Amitriptyline occurred in 58.6% of all single drug deaths and in 47.4% of all multiple drug deaths involving tricyclic antidepressant drugs. Nortriptyline, which is occasionally used as a therapeutic agent, was considered to be a metabolite for the purpose of this study and was not included in the calculations. This increase in the tricyclic antidepressant drugs was also documented by Alha et al in a 1979 study of fatal poisonings in Finland [*15*].

An encouraging finding in these statistics is that there were only two children who died of a fatal drug overdose. Similarly, Poklis and Gantner reported only 1 fatal child poisoning in 147 drug deaths [*5*]. This may not mean that child poisonings are rare events, rather that public awareness and rapid medical intervention are saving lives. The Maryland Poison Information Center reocrded 14 076 exposures in 1975 and 29 344 exposures in 1980.[3] (An exposure is defined as any accidental or intentional human exposure to a poisonous or nonpoisonous substance by any route.) In 1975, 55 to 60% of all exposures were in children less than six years old and in 1980 this number remained steady at 62%.[3] Thus, in 1980 when 17 825 exposures were in children less than 6 years old, only 1 death was reported.[3]

The occurrence of a positive blood alcohol in narcotism deaths, 53%, does not compare favorably with the 71% occurrence reported by Ruddick and Luke in a study of the Washington, DC area [*16*]. However, their percentage was based on only 14 narcotism cases. On the other hand, Weston reported a 20% incidence of positive blood alcohol in narcotic deaths in the United States but the source of this figure was not cited [*17*].

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