

Mortality Attributed to Misuse of Psychoactive Drugs, 1979–88

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Synopsis

To assess mortality attributed to misuse of psychoactive drugs in the United States from 1979 through 1988, the authors obtained from death certificates the annual number of, and age-, sex-,

and race-specific data for, deaths in which psychoactive drugs were coded as the underlying or contributing cause.

Deaths with psychoactive drugs specified as underlying cause (drug-induced) increased from 6,500 (2.9 per 100,000) in 1979 to more than 10,000 (3.8 per 100,000) in 1988. Deaths with psychoactive drugs specified as either underlying or contributing cause (drug-related) increased from 7,200 (3.2 per 100,000) in 1979 to more than 14,400 (5.5 per 100,000) in 1988.

The drugs that primarily accounted for this increase were illicit, in particular, the opiates (heroin) and cocaine, with most of the remainder accounted for by misuse of various legal drugs. The largest increases between 1979 and 1988 occurred among black men ages 35–44 whose drug-induced death rates rose from 8 to 36 per 100,000 and whose drug-related death rates from 10 to 82 per 100,000. These data identify a high-risk group for targeting efforts to prevent deaths due to misuse of psychoactive drugs.

FOR PLANNING AND POLICY decisions, it is important to track the number of deaths in a country due to psychoactive drugs, particularly illicit psychoactive drugs. In the United States, two data bases exist that are used for this purpose—the Drug Abuse Warning Network (DAWN) of the National Institute on Drug Abuse (NIDA) (1), and death certificate data from the National Center for Health Statistics (NCHS). The DAWN data base does not provide complete coverage of the United States, so we used death certificate data to study trends in deaths attributed to misuse of legitimately prescribed and illicit psychoactive drugs in United States residents from 1979 through 1988. No other database provides national coverage and annual age-, sex-, and race-specific cause of death information.

Methods

A physician may indicate in several places on a death certificate that a death is due to drugs. Drugs may be implicated as the underlying or as a contributing cause of death. To assess trends in psychoactive drug-related deaths, we used multiple cause of death data from the National Center for Health Statistics for 1979 through 1988 that provide counts of both underlying and contributing causes on death certificates (2).

In this report, we defined drug-attributed deaths in two ways—(a) deaths with drugs implicated as the underlying cause are referred to as drug-induced and (b) deaths with drugs implicated as the underlying or contributing cause (multiple cause) are referred to as drug-related. Data included all

Table 1. Deaths attributed to psychoactive drugs by underlying cause (UC) and multiple cause (MC), by ICD-9 Codes, United States, 1979 and 1988

ICD-9 Codes	1979		1988		ICD-9 Codes	1979		1988	
	UC	MC ¹	UC	MC ¹		UC	MC ¹	UC	MC ¹
292 Drug psychoses:					E853 Accidental poisoning				
.0 Drug withdrawal syndrome	4	17	4	9	by tranquilizers:				
.1 Paranoid or hallucinatory states or both	0	0	0	1	.0 Phenothiazine-based	34	37	33	38
.2 Pathological drug intoxication	0	0	0	0	.1 Butyrophenone-based	2	2	5	6
.8 Other	0	0	1	3	.2 Benzodiazepine-based	54	70	36	46
.9 Unspecified	0	2	2	7	.8 Other	13	19	6	9
304 Drug dependence:					.9 Unspecified	3	6	3	3
.0 Morphine type	21	32	14	32	E854 Accidental poisoning				
.1 Barbiturate type	0	8	2	8	by other psychotropic agents:				
.2 Cocaine	5	6	19	33	.0 Antidepressants	105	116	147	171
.3 Cannabis	0	0	0	0	.1 Psychodysleptics	3	5	3	7
.4 Amphetamine type and other psychostimulants	0	0	0	3	.2 Psychostimulants	23	29	78	99
.5 Hallucinogens	0	0	0	0	E855 Accidental poisoning				
.6 Other	11	65	12	93	by other drugs acting on central and autonomic nervous systems:				
.7 Combination of morphine type drug with any other	3	3	1	1	.2 Local anesthetics (includes cocaine)	116	135	1,087	1,313
.8 Combination excluding morphine type drug	0	0	0	0	.9 Unspecified	1	2	2	4
.9 Unspecified	478	668	904	2,723	E858 Accidental poisoning				
305 Nondependent abuse of drugs:					by other drugs:				
.2 Cannabis	0	4	1	32	.8 Other (includes drug combinations)	405	458	811	914
.3 Hallucinogens	0	1	1	7	.9 Unspecified	472	549	771	963
.4 Barbiturates and tranquilizers	2	12	0	6	E950 Suicide and self-inflicted poisoning by solid or liquid substances:				
.5 Morphine type	2	7	10	38	.0 Analgesics, antipyretics, and antirheumatics	357	371	351	357
.6 Cocaine type	2	7	89	349	.1 Barbiturates	615	631	139	150
.7 Amphetamine type	0	5	1	22	.2 Other sedatives and hypnotics	173	175	44	45
.8 Antidepressants	0	0	0	3	.3 Tranquilizers and other psychotropic agents (includes antidepressants)	765	790	1,016	1,039
.9 Other, mixed, or unspecified	114	321	825	2,746	.4 Other specified drugs and medicaments	546	560	710	741
E850 Accidental poisoning by analgesics, antipyretics, antirheumatics:					.5 Unspecified drug or medicament	578	598	650	677
.0 Opiates and related narcotics	341	380	798	880	E980 Poisoning by solid or liquid substances, undetermined intent:				
.8 Other (pentazocine, for example)	93	335	172	332	.0 Analgesics, antipyretics, and antirheumatics	192	207	438	463
.9 Unspecified	5	7	3	3	.1 Barbiturates	97	105	17	19
E851 Accidental poisoning by barbiturates	180	198	29	34	.2 Other sedatives and hypnotics	36	40	7	7
E852 Accidental poisoning by other sedatives and hypnotics:					.3 Tranquilizers and other psychotropic agents (includes antidepressants)	158	167	153	164
.0 Chloral hydrate group	10	11	1	1	.4 Other specified drugs and medicaments	202	221	409	445
.1 Paraldehyde	2	3	0	0	.5 Unspecified drug or medicament	183	196	204	214
.2 Bromine compounds	1	2	2	2					
.3 Methaqualone compounds	12	16	0	0					
.4 Glutethimide group	13	15	0	0					
.5 Mixed sedatives NEC ²	28	28	16	16					
.8 Other	21	25	4	5					
.9 Unspecified	9	9	7	11					

¹ Multiple cause of death includes counts of underlying and contributing cause.

² Not elsewhere classified.

certified deaths occurring in the resident population of the United States, including the 50 States and the District of Columbia.

We reviewed "The Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision," (ICD-9), (3) to select codes that implied misuse or abuse of psychoactive drugs. Specific four-digit codes selected to tabulate psychoactive drug-induced deaths (table 1) are subsumed under the following three-digit categories:

Drug psychoses (ICD 292), Drug dependence (ICD 304), Nondependent abuse of drugs (ICD 305), Accidental poisoning by drugs, medicaments, and biologicals (in which "took overdose of drug," poisoning by a drug, or toxic reaction to a drug would be coded) (4), (ICD E850-E855, E858) Suicide and self-inflicted poisoning by solid or liquid substances (E950), and Poisoning by solid or liquid substances, undetermined whether accidentally or purposely inflicted (E980).

The following categories of deaths were excluded:

Those due to assault from poisoning by drugs and medicaments because of small numbers, those due to adverse effects of drugs in therapeutic (correct) use because they did not involve misuse and represent different demographic characteristics than those involving misuse, and those of infants due to maternal drug abuse because of small numbers and different demographics. Also, we did not include alcohol as a psychoactive drug.

Some codes, such as E950.0, Suicide and self-inflicted poisoning by analgesics, antipyretics, and antirheumatics, include drugs other than psychoactive ones; in this and other similarly aggregated drug classes, it is not possible to separate data for psychoactive drugs, and the total count was used. This coding feature, and the fact that physicians often do not specify a single drug, such that other, mixed, or unspecified categories frequently are the largest ones, make it difficult to analyze mortality by a specific drug or drug class. However, we looked for four-digit drug codes that could explain the observed secular changes in the numbers of deaths.

Nature of injury (N) codes (table 2), that are not coded as underlying causes of death and are always accompanied by external cause (E) codes (4), were reviewed to check that only deaths with appropriate

Table 2. Numbers of deaths with psychoactive drugs specified as contributing causes, by ICD-9 Nature of Injury (N) Codes, United States, 1979 and 1988

N Codes ¹	1979	1988
N965 Poisoning by analgesics, antipyretics and antirheumatics:		
.0 Opiates and related narcotics..	927	2,050
.8 Other (Pentazocine, for example)	440	668
.9 Unspecified	13	7
N967 Poisoning by sedatives and hypnotics:		
.0 Barbiturates	1,315	357
.1 Chloral hydrate group	93	19
.2 Paraldehyde	3	0
.3 Bromine compounds	8	0
.4 Methaqualone compounds	69	2
.5 Glutethimide group	90	31
.6 Mixed sedatives, NEC ²	10	4
.8 Other	184	29
.9 Unspecified	44	39
N968 Poisoning by other central nervous system depressants:		
.5 Surface and infiltration anesthetics	185	2,290
.9 Other and unspecified local anesthetics	88	87
N969 Poisoning by psychotropic agents:		
.0 Antidepressants	1,058	1,506
.1 Phenothiazine-based tranquilizers	225	151
.2 Butyrophenone-based tranquilizers	14	22
.3 Other antipsychotics, neuroleptics, and major tranquilizers	9	13
.4 Benzodiazepine-based tranquilizers	638	523
.5 Other tranquilizers	139	69
.6 Psychodysleptics	4	44
.7 Psychostimulants	55	224
.8 Other psychotropic agents	8	4
.9 Unspecified	25	12
N977 Poisoning by other and unspecified drugs and medicaments³:		
.8 Other drugs and medicaments.	47	201
.9 Unspecified drug or medication	2,928	4,574

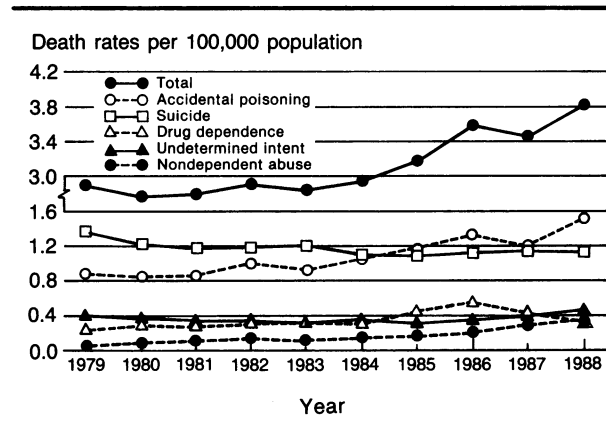
¹ Counts in table 2 cannot simply be added to those in table 1 to obtain a total number of deaths due to a specific drug or drug class.

² Not elsewhere classified.

³ Includes deaths from 'drug poisoning,' a large proportion of which are likely due to psychoactive drugs.

E codes were included. For the total number of psychoactive drug-related deaths based on underlying and contributing causes, we avoided double counting those with both N and E codes or with a mix of any of the codes in tables 1 and 2. Since psychoactive drug-related deaths can be assigned to more than one of the ICD-9 codes of interest, subtotals of the various categories do not add to total numbers. Also, counts in table 2 cannot simply be added to those in table 1 to obtain a

Figure 1. Rates (per 100,000 population) of psychoactive drug-induced deaths¹ based on underlying cause, for ICD-9 codes, United States, 1979 through 1988



¹Age-adjusted to the 1980 population.

total number of deaths due to a specific drug or drug class.

Psychoactive drug-induced and drug-related deaths were tabulated for the ICD-9 three- and four-digit codes presented in table 1 for 1979, the first year of use of ICD-9, through 1988. Rates were calculated using annual estimates from the Bureau of the Census of age, sex, and race distributions of the resident population of the United States (5,6). Total annual drug-induced and drug-related death rates were age-adjusted to the 1980 U.S. population by the direct method. T-tests for trend were performed to test the hypothesis of no change in rates between 1979 and 1988 for drug-induced and drug-related deaths.

Results

Psychoactive drug-induced deaths based on underlying cause. From 1979 through 1988, psychoactive drug-induced deaths based on underlying cause increased from 6,490 (2.9 per 100,000 population) to 10,036 (3.8 per 100,000), a 1.3-fold increase in rates ($P < 0.001$) (fig. 1). The ICD-9 rubric experiencing the largest increase in rates (7-fold, from .05 to .35 per 100,000) was Nondependent abuse of drugs (fig. 1), with 120 deaths in 1979 and 927 in 1988. Most of these deaths were coded to the Other, mixed, or unspecified drugs category, ICD 305.9 (table 1). Also, the ICD rubric Drug dependence, and in particular, the unspecified category, 304.9 (where "intravenous narcotism" is coded), experienced a 1.5-fold increase in rates over the 10-year period, with 518 deaths in 1979 and 952 in 1988 (table 1).

Despite these large relative increases, Accidental poisoning by drugs (where "took overdose" is coded) with 4,014 and Suicide by drug poisoning with 2,910 were the categories with the largest numbers of deaths in 1988 from psychoactive drugs. The increase in drug-induced deaths attributed to Accidental poisoning was primarily accounted for by (a) E855.2, Accidental poisoning by other drugs acting on the central and autonomic nervous systems, where cocaine is coded (116 deaths in 1979, 1,087 in 1988) and (b) E850.0, Accidental poisoning by opiates and related narcotics where heroin is coded (341 deaths in 1979, 798 in 1988) (table 1).

Besides increases in deaths attributed to the opiates and cocaine, examination of four-digit ICD-9 codes revealed increases in deaths attributed to psychostimulants such as amphetamine and decreases in deaths attributed to barbiturates, methaqualone, glutethimide, and "mixed" and "other" sedative hypnotics (table 1). These decreases were particularly noteworthy for the barbiturates.

Annual rates of psychoactive drug-induced deaths were consistently higher for males than females, with a widening of the gap over time. By 1988, males had a 2-fold higher death rate than females, while annual rates for females remained stable. Both black males and white males experienced increases in rates over the 10-year period, but in 1988 rates for black males were 2.4 times those for white males and 7 times those for nonwhite nonblack males. In all race categories, the highest rates for men occurred in age groups 25-34 and 35-44 years. In 1988, rates reached 22.3 deaths per 100,000 in 25-34-year-old black men and 39.7 per 100,000 in black men ages 35-44, the highest rates in that year of all age, sex, and race groups.

Among females, only blacks experienced increases in rates over the 10-year period, amounting to a 1.5-fold increase. The highest rates occurred for black women ages 25-34, with 8.5 deaths per 100,000, and ages 35-44, with 11 deaths per 100,000 in 1988, the highest annual rate among females of any race. For white females in most age groups, rates decreased between 1979 and 1988, with major decrements occurring in the early 1980s.

Psychoactive drug-related deaths based on multiple cause data. From 1979 through 1988, psychoactive drug-related deaths based on counts of underlying or contributing cause increased from 7,206 (3.2 per 100,000 population) to 14,408 (5.5 per 100,000), a 1.7-fold increase in rates ($P = 0.03$) (fig. 2). In 1979, the largest proportion of drug-related deaths

was contributed by the ICD-9 rubric Suicide by drug poisoning, but beginning in 1984 and continuing through 1988, that category was outranked by Accidental poisoning by drugs (fig. 2). The increase in drug-related deaths attributed to Accidental poisoning was primarily accounted for by (a) E855.2 in which cocaine is coded (135 deaths in 1979, 1,313 in 1988) and (b) E850.0 in which opiates and related narcotics are coded (380 deaths in 1979, 880 in 1988) (table 1).

The categories experiencing the largest increases in rates between 1979 and 1988 were Nondependent abuse of drugs (7.4-fold increase) and Drug dependence (3-fold increase). The increase in drug-related deaths attributed to Nondependent abuse of drugs was primarily accounted for by 305.9, the category of Other, mixed, or unspecified (321 deaths in 1979, 2,746 in 1988) (table 1).

The increase in drug-related deaths attributed to Drug dependence (primarily 304.9 in which intravenous narcotism is coded) was largely due to its being listed as a contributing cause in deaths from AIDS and *Pneumocystis carinii* pneumonia.

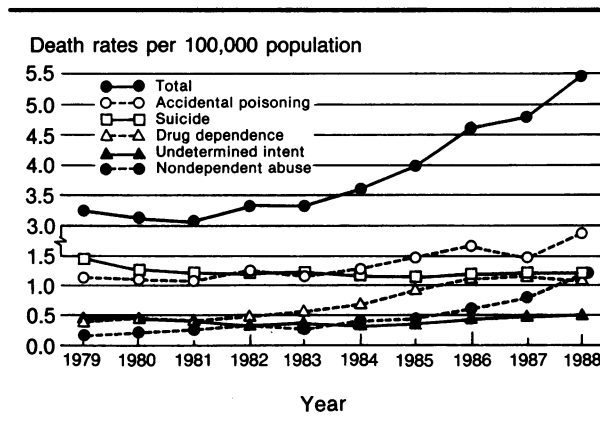
Psychoactive drug-related death rates for males were twice as high as those for females in 1988. Rates for females increased markedly between 1979 and 1988 only in the black race—from 7.3 per 100,000 to 15.6 in the 25-34 year age group, 4.9 to 21.7 in the 35-44 year age group, and 3.6 to 8.2 in the 45-54 year age group. In 1979, there were 614 (4.9 per 100,000) drug-related deaths in black males compared with 3,193 (22.7 per 100,000) in 1988, a 4.6-fold increase in rates. The largest increases occurred in three black male age groups—35-44, whose rates increased 7.9-fold from 10.4 to 82.3 (the highest rate of any age, sex, and race group); 45-54, whose rates increased more than 6-fold; and 55-64, whose rates increased nearly 7.5-fold.

Discussion

In the 10-year period from 1979 through 1988, when both AIDS and cocaine abuse epidemics emerged, deaths of U.S. residents attributed to psychoactive drugs as the underlying cause increased from 6,500 to more than 10,000, corresponding to a 1.3-fold increase in rates. During this period, the broader group of deaths attributed to psychoactive drugs as either underlying or contributing causes increased from 7,200 to more than 14,400, corresponding to a 1.7-fold increase in rates.

For both categories of deaths attributed to psychoactive drugs, the largest increases occurred among 35-44-year-old black men, whose 1988

Figure 2. Rates (per 100,000 population) of psychoactive drug-related deaths¹ based on multiple cause, for ICD-9 codes, United States, 1979 through 1988



¹Age-adjusted to the 1980 population.

death rates based on underlying cause reached 35.8 deaths per 100,000 population and for multiple cause 82.3 per 100,000, the highest rates of any age, sex, and race group. Rates for 35-44-year-old black women also increased markedly between 1979 and 1988, reaching 11 per 100,000 based on underlying cause and 21.7 per 100,000 for multiple cause in 1988. By contrast, white and nonwhite nonblack females had the lowest and most stable rates over the 10-year period.

The overall increase in psychoactive drug-induced deaths based on underlying cause was due primarily to the increase in deaths attributed to the ICD-9 rubric Accidental poisoning by drugs and, to a lesser extent, by Drug dependence and Nondependent abuse of drugs. This increase was not due to deaths from AIDS associated with intravenous drug use, because such deaths are usually reported with AIDS, not intravenous drug use, as the underlying cause, according to a 1985 personal communication from Joyce Scott, Medical Codification Specialist, Office of the Center Director, NCHS, reverified in 1991. The increase is primarily attributable to the epidemics of opiate and cocaine abuse during the 1980s. Independent confirmation of the importance of deaths caused by opiates and cocaine and of the age, sex, and race distributions of these deaths during this period has been reported by NIDA using statistics from DAWN (1) and the National Drug and Alcoholism Treatment Survey (7).

Previous studies and results using the same data base (8,9) are not strictly comparable because of inclusion of different codes and use of different revisions of the ICD. They are of historical interest, however. One study reported that in 1958 there

were 69 deaths due to drug addiction, 549 deaths due to accidental poisoning by drugs, and 1,163 due to suicide and self-inflicted poisoning by analgesic and soporific substances, compared with deaths in 1967 of 202 by drug addiction, 1,860 by accidental poisoning, and 2,689 by suicide and self-inflicted poisoning (8). Of particular note was the remarkable increase in fatal drug poisonings certified as suicides in the month following the August 6, 1962, death of Marilyn Monroe by an overdose of sleeping pills (8). In July 1962, 541 were reported; in August, 699 (8).

A second study (9) that used death certificate data for 1963 through 1971 reported 5,138 deaths due to drugs in 1963 and 9,920 in 1971. In 1971, 4,155 (42 percent) of the 9,920 deaths were suicides, and 1,953 (47 percent) of the 4,155 suicides were due to barbiturate overdoses (9).

The data in our report document a different picture, with illicit drugs as the predominant psychoactive drugs causing death, and a large decrease in deaths due to barbiturates and nonbarbiturate, nonbenzodiazepine sedative hypnotics, such as methaqualone and glutethimide, that parallel the major decline in prescriptions for these drugs during this period (10). The possibility exists that the statistically significant increases between 1979 and 1988 in the rates of psychoactive drug-induced and drug-related deaths may be due to better reporting by physicians. This presumed better reporting, however, does not explain the changes in drugs used and nature of these deaths, nor is it likely to explain a large proportion of the total.

In fact, despite possibly better reporting by physicians and our use of multiple cause of death statistics that capture total mentions of psychoactive drugs on death certificates, it is likely that deaths involving psychoactive drugs are underestimated by the death certification system in the United States. In a recent study (11), Pollock and coworkers found 75 percent more cocaine-related deaths reported to DAWN than to national vital statistics data from 25 metropolitan areas from 1983 through 1988. These discrepancies may be explained by their apparent omission from death certificate analyses of ICD-9 codes 304.9, Drug dependence unspecified, and 305.9, Nondependent abuse of other, mixed, or unspecified drugs. The unspecified categories include drugs in combination (as is often the case in cocaine-related deaths) and would need to be included to capture the total. With the inclusion of these codes, the numbers between DAWN and vital statistics data would be more similar. Nevertheless, there is no "gold stand-

ard" for data on deaths due to misuse of psychoactive drugs, and it may not be reasonable to generalize from a study on cocaine the extent that vital statistics data underreport deaths due to misuse of all psychoactive drugs.

The data in this report provide counts and rates of both psychoactive drug-induced and drug-related deaths, which is a more complete picture of deaths due to misuse of psychoactive drugs. Compilation of annual age-, sex-, and race-specific cause of death information enables systematic national monitoring of deaths attributed to misuse of psychoactive drugs during this period of AIDS, cocaine, and opiate abuse epidemics. The high rates of deaths for 35-44-year-old black men, in particular, identify a high-risk group for targeting programs to prevent premature deaths due to misuse of psychoactive drugs.

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