

# Recent Trends in Fatal Poisoning by Opiates In the United States

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**Abstract:** Deaths in the United States classified as unintentional poisoning by drugs and medicaments fell from 14.7 per million population in 1975 to 8.8 in 1978, a 40 per cent decrease. Seventy-three per cent of this drop was attributable to a reduction in deaths coded to opiates and intravenous narcotism. These two categories accounted for 38 per cent of all unintentional drug deaths in 1975 but only 15 per cent in 1978. There was no simultaneous increase in other drug-related deaths, including suicides, to account for the reduction in

deaths coded to opiates. The highest mortality rates and the greatest variation in mortality during 1970-78 occurred in 20-29 year old non-White males. Racial and sex differences in opiate poisoning mortality, notable early in the decade, were greatly reduced by 1978 due to a relatively larger decline in mortality of males and non-Whites. Time trends in mortality from opiate poisoning appear to coincide with variations in the amount of heroin smuggled into the country. (*Am J Public Health* 1982; 72:1251-1256.)

Fatal poisoning, although widely regarded as a childhood problem, is predominantly an adult phenomenon in the United States. Changes in the formulation, packaging, and use of paint, kerosene, aspirin, and other products have been associated with a dramatic reduction in deaths among children:<sup>1</sup> for children under age five, the number of unintentional poisoning deaths from solids and liquids dropped from 445 in 1960 to 81 in 1978. For ages 20 and over, the corresponding numbers were 1,189 and 2,752.<sup>2</sup>

For all ages combined, 63 per cent of fatal unintentional poisonings from solids and liquids involve drugs, licit and illicit. In 1978, 1,906 deaths in the United States were ascribed to unintentional poisoning by drugs.<sup>2</sup> An observation that such deaths had declined sharply since 1975 led us to review published mortality data for the 1970s. Our preliminary study suggested intriguing similarities between epidemiologic trends in unintentional drug poisoning from 1970-1978\* and trends in acute narcotism deaths in several cities,<sup>3-8</sup> opiate abuse,<sup>5,9-11</sup> and heroin availability and purity.<sup>3,6,10,12</sup> All of these phenomena followed U-shaped curves in the first half of the decade, then dropped precipitously to their lowest values in 1978. A more detailed study of mortality data was therefore undertaken.

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\* 1978 is the most recent year for which detailed mortality data are available from the National Center for Health Statistics.

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## Materials and Methods

The National Center for Health Statistics (NCHS) provided unpublished data for 1970-78 on the numbers of deaths in each four-digit subcategory of the ten categories of unintentional\*\* poisoning by drugs and medicaments (ICDA E850-859). The numbers of deaths due to drug dependence (ICDA 304), suicide by ingestion of drugs and medicaments (ICDA E950.0-950.3), and ingestion of drugs and medicaments with undetermined intent (ICDA E980.0-980.3) were also provided. These figures are determined by NCHS on the basis of death certificate information obtained from the states.

Deaths were subdivided by poisoning agent and by sex, race, and five-year age intervals. Annual mortality rates were calculated using estimates of the appropriate mid-year populations.<sup>13</sup>

## Results

During the nine years studied, there were 67,851 deaths in the United States ascribed to poisoning by drugs, of which 22,826 (34 per cent) were classified as unintentional (Table 1). The annual number of deaths from unintentional poisoning by drugs and medicaments rose from 2,505 in 1970 to a high of 3,132 in 1975, then dropped to 1,906 in 1978. Between 1975 and 1978, the mortality rate per million population declined by 40 per cent, from 14.7 to 8.8.

During the same three-year period, the rates for drug poisoning deaths coded as suicidal or of undetermined intent declined by 10 per cent and 20 per cent, respectively, and "drug dependence" deaths decreased by 59 per cent. For all categories of drug poisoning deaths combined, deaths per

\*\* Although the ICDA uses the word "accidental", "unintentional" is now the preferred term as it avoids the connotation of an unpreventable random event, implicit in the term "accidental."

million population increased by 8 per cent from 1970–1975, then decreased by 30 per cent, from a rate of 39.9 in 1975 to 27.8 in 1978 (Table 1).

Unintentional drug poisoning deaths were further analyzed by host characteristics and by specific poisoning agent.

**Host Characteristics in Unintentional Drug Poisonings**

The death rate for males was approximately twice the rate for females (Table 2). The secular variation in mortality rates occurred almost exclusively in the male population (Figure 1). Male mortality was 19.6 per million population in 1975, the year of highest mortality, but only 9.8 in 1978, a 50 per cent reduction in three years. The secular changes in mortality of females, while less pronounced, were in the same direction as for males.

Mortality was substantially lower under age 15 than for other ages (Figure 1). The rates for 15–19 year olds were intermediate between those for children under age 15 and for persons over age 19. Males aged 20–29 had much higher death rates than younger or older males, whereas women aged 20–29 had death rates which were not consistently higher than those of older women.

The male excess in mortality mentioned above occurred primarily in the third decade of life (20–29 year age range). Not only was mortality greatest among 20–29 year olds, but most of the observed changes over time in death rates for the population as a whole are attributable to this group. There-

**TABLE 2—Unintentional Poisoning by Drugs and Medicaments: Average Annual Death Rates Per Million Population, by Race and Sex, United States, 1970–1978**

| Sex    | Race  |           | Total |
|--------|-------|-----------|-------|
|        | White | Non-White |       |
| Male   | 13.4  | 28.6      | 15.4  |
| Female | 8.2   | 12.7      | 8.8   |
| Total  | 10.8  | 20.6      | 12.0  |

fore, the remainder of this report will emphasize the trends in unintentional drug poisoning experienced by this group.

For all ages combined, mortality was twice as high in non-White males as in White males, and 1.5 times as high in non-White females as in White females (Table 1).

Among 20–29 year old Whites, no decline in mortality occurred until the second half of the decade, and then it was limited to males (Figure 2). In non-Whites, on the other hand, the decrease began in the first half of the decade and reversed temporarily in 1974–1975. The drop in mortality was greater among non-White males than among non-White females.

**Agents of Unintentional Drug Poisoning**

The Eighth Revision of the ICDA classifies unintentional drug poisonings as shown in Table 3; the Table also gives

**TABLE 1—Deaths from Poisoning by Drugs and Medicaments**

| Year                                | Unintentional<br>E-850-859 | Suicide<br>E950.0-.3 | Undetermined<br>Intent E980.0-.3 | Drug<br>Dependence*<br>304 | Total  |
|-------------------------------------|----------------------------|----------------------|----------------------------------|----------------------------|--------|
| <b>Numbers of Deaths</b>            |                            |                      |                                  |                            |        |
| 1970                                | 2,505                      | 3,251                | 1,345                            | 399                        | 7,500  |
| 1971                                | 2,528                      | 3,330                | 913                              | 1,355                      | 8,126  |
| 1972                                | 2,516                      | 3,222                | 884                              | 1,388                      | 8,010  |
| 1973                                | 2,444                      | 3,116                | 853                              | 1,019                      | 7,432  |
| 1974                                | 2,742                      | 2,904                | 803                              | 1,174                      | 7,623  |
| 1975                                | 3,132                      | 3,078                | 935                              | 1,358                      | 8,503  |
| 1976                                | 2,839                      | 3,002                | 924                              | 1,143                      | 7,908  |
| 1977                                | 2,214                      | 3,125                | 791                              | 551                        | 6,681  |
| 1978                                | 1,906                      | 2,843                | 757                              | 562                        | 6,068  |
| Total 1970–1978                     | 22,826                     | 27,871               | 8,205                            | 8,949                      | 67,851 |
| <b>Rates per Million Population</b> |                            |                      |                                  |                            |        |
| 1970                                | 12.3                       | 16.0                 | 6.6                              | 2.0                        | 36.8   |
| 1971                                | 12.2                       | 16.1                 | 4.4                              | 6.5                        | 39.2   |
| 1972                                | 12.1                       | 15.5                 | 4.3                              | 6.7                        | 38.5   |
| 1973                                | 11.6                       | 14.8                 | 4.0                              | 4.9                        | 35.3   |
| 1974                                | 13.0                       | 13.8                 | 3.8                              | 5.5                        | 36.1   |
| 1975                                | 14.7                       | 14.4                 | 4.4                              | 6.4                        | 39.9   |
| 1976                                | 13.2                       | 14.0                 | 4.3                              | 5.3                        | 36.8   |
| 1977                                | 10.2                       | 14.4                 | 3.6                              | 2.5                        | 30.8   |
| 1978                                | 8.8                        | 13.0                 | 3.5                              | 2.6                        | 27.8   |
| Avg. Annual Rate<br>1970–1978       | 12.0                       | 14.7                 | 4.3                              | 4.7                        | 35.7   |

\*In 1971 a coding change in the ICDA required that any unintentional ("accidental") death or death of undetermined intent due to certain drugs (those classifiable to E853.0, .4, .5, or .9; 854; 855.1, .2, or .4; E856; E859.0 or .9. E980.0, .2 or .3) with a potential for dependence, in which drug dependence was mentioned on the death certificate, was to be coded not as "accidental" or of "undetermined" manner, but as a "natural" death consequent to drug dependence (ICDA 304).<sup>13</sup>

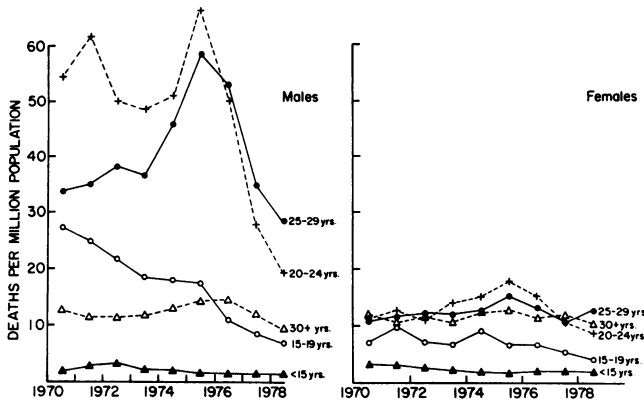


FIGURE 1—Mortality from Unintentional Poisoning by Drugs and Medicaments (E 850-859), US Population, by Age and Sex, 1970-1978

the numbers of deaths in 1975 and 1978. Seventy-three per cent of the reduction in drug deaths between 1975 and 1978 was due to reductions in poisoning by "opiates" (E853.0) or "intravenous narcotism" (E854.8). These accounted for 38 per cent of all unintentional drug poisoning deaths in 1975 but only 15 per cent in 1978. The number of deaths in these two groups dropped from 1,184 in 1975 to 292 in 1978, a 77 per cent decrease. During the same period, unintentional deaths due to barbiturates decreased by 55 per cent; deaths from all other drugs, by 12 per cent.

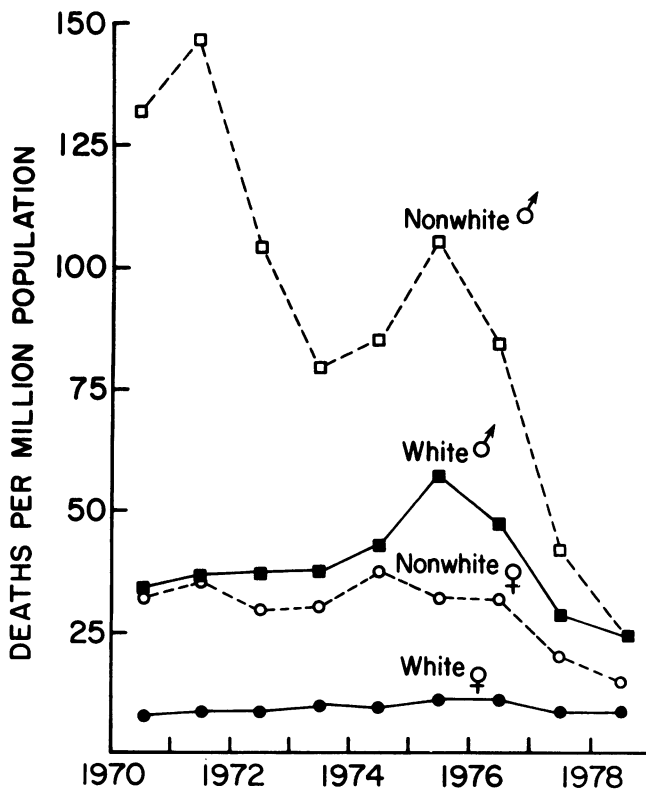


FIGURE 2—Mortality from Unintentional Poisoning by Drugs and Medicaments (E 850-859), US Population Aged 20-29 Years, by Race and Sex, 1970-1978

Mortality from opiates for ages 20-29 peaked sharply in 1971 among non-White males (Figure 3). For all race/sex groups combined, opiate mortality peaked in 1975 and then declined rapidly. Marked racial and sex differences in opiate poisoning mortality were evident early in the decade and decreased after 1975; by 1978, there was virtually no racial difference in male death rates at these ages (Figure 3).

Beginning in 1971, drug deaths that formerly were coded as unintentional ("accidental") or of undetermined intent were coded as due to natural causes (304) if drug dependence was mentioned on the death certificate. (For example, a fatal overdose of heroin must be coded as a natural death due to drug dependence if the death certificate mentioned that the decedent used the drug chronically, otherwise it would be coded as accidental poisoning or as drug poisoning of undetermined intent. Since the death certificate often does not state explicitly whether or not the decedent was a chronic drug user, an unknown number of deaths related to drug dependence are coded under accidental deaths.) Mortality rates for "drug dependence" (Table 1) followed a time course similar to that of opiate mortality, with peaks in 1971

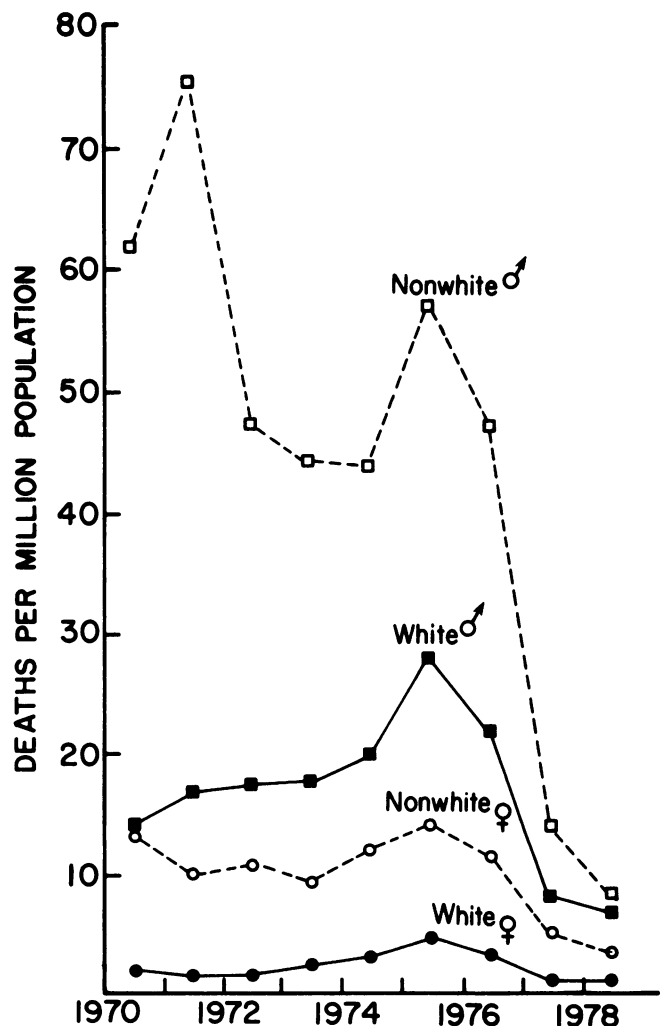


FIGURE 3—Mortality from Unintentional Poisoning by Opiates (E 853.0), US Population Aged 20-29 Years, by Race and Sex, 1970-1978

**TABLE 3—Unintentional Drug Poisoning Deaths in 1975 and 1978, United States, All Ages**

| ICDA code, 8th Revision | Description  | Number of Deaths |      |        |
|-------------------------|--|------------------|------|--------|
|                         |  | 1975             | 1978 | Change |
| E850                    | Antibiotics and other anti-infectives                | 27               | 15   | - 12   |
| E851                    | Hormones and synthetic substitutes                   | 32               | 17   | - 15   |
| E852                    | Systemic and hematologic agents                      | 61               | 58   | - 3    |
| E853                    | Analgesics and antipyretics                          |                  |      |        |
| 853.0                   | opiates and synthetic analogues                      | 1031             | 269  | -762   |
| 853.1                   | salicylates and congeners                            | 98               | 71   | - 27   |
| 853.3-.9                | other  | 146              | 112  | - 34   |
| E854                    | Other sedatives and hypnotics                        |                  |      |        |
| 854.0                   | barbiturates   | 266              | 126  | -140   |
| 854.1-.3                | chloral hydrate, paraldehyde, bromides               | 8                | 8    | 0      |
| 854.8                   | intravenous narcotism                                | 153              | 23   | -130   |
| 854.9                   | other  | 130              | 74   | - 56   |
| E855                    | Autonomic nervous system and psychotherapeutic drugs | 178              | 168  | - 10   |
| E856                    | Other CNS depressants and stimulants                 | 37               | 45   | + 8    |
| E857                    | Cardiovascular drugs                                 | 158              | 172  | + 14   |
| E858                    | Gastrointestinal drugs                               | 3                | 4    | + 1    |
| E859                    | Other and unspecified drugs                          | 804              | 744  | - 60   |
| Total, E850-859         |  | 3132             | 1906 | -1226  |

and 1975. As with deaths coded to opiates, mortality rates were especially high for ages 20-29, for males, and for non-Whites.

Mortality from barbiturates followed a different epidemiologic pattern. Death rates declined, but the remarkable secular pattern seen in opiate poisoning mortality, with the peak in 1975 and steep decline thereafter, did not occur in barbiturate poisoning even for ages 20-29 (Figure 4). The barbiturate death rate for White males ages 20-29 was twice the female rate, although the proportion of unintentional drug deaths attributed to barbiturates was two and one-half times as high for White females as for males (Figure 4).

Mortality from drugs other than opiates and sedatives/hypnotics did not decrease during the study period. This is shown graphically for 20-29 year olds in Figure 5.

*Discussion*

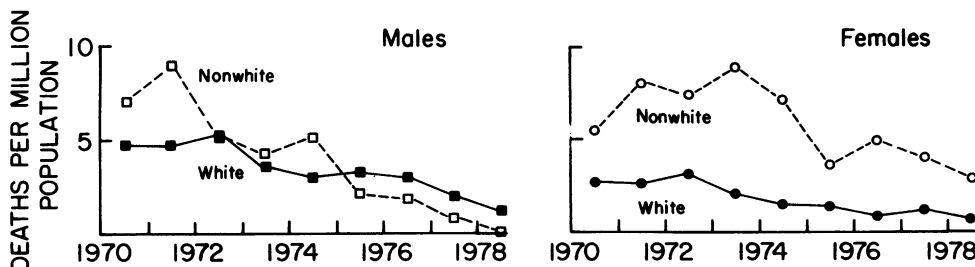
The increase in unintentional drug poisoning deaths between 1954-57 and 1964-67, from 5.6 to 9.7 per million population, was termed the "first decade of an epidemic."<sup>15</sup> In the succeeding decade, the death rate continued to

increase, to 14.7 in 1975. Yet no change during these two decades was as abrupt as the 40 per cent drop in just three years, from 1975-1978, in the death rate from unintentional poisoning.

Our analysis shows that 73 per cent of this drop was due to a decline in poisoning ascribed to opiates and intravenous narcotics. Moreover, males age 20-29, who experienced 55 per cent of all opiate deaths in 1975, were primarily responsible for the patterns observed.

The analysis of vital statistics data for drug-related deaths is complicated by the fact that whether a heroin overdose is coded as "accidental," "undetermined," or a "natural death due to drug dependence" depends upon the information available to the medical examiner or coroner and the data recorded on the death certificate. Gottshalk and others found tremendous variability from one jurisdiction to another in the investigation, reporting, and coding of deaths from drugs.<sup>4,16-18</sup> Therefore it is important to note that the totals for the categories "drug death, undetermined" and "drug dependence" (Table 1) peak in 1971 and 1975, showing the same pattern as deaths attributed to unintentional opiate poisoning.

Several of our major findings regarding opiate deaths,



**FIGURE 4—Mortality from Unintentional Poisoning by Barbiturates (E 854.0), US Population Aged 20-29 Years, by Race and Sex, 1970-1978**

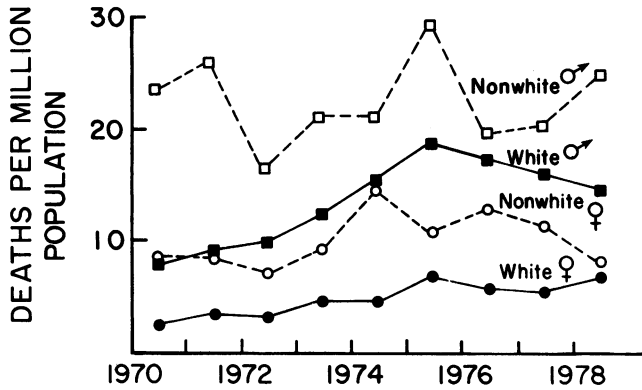


FIGURE 5—Mortality from Unintentional Poisoning by Drugs Exclusive of Opiates (E 853.0) and Other Sedatives/Hypnotics (E 854), US Population Aged 20–29 Years, by Race and Sex, 1970–1978

such as especially high rates for males, for ages 20–29, and for non-Whites, confirm observations by other investigators based on numbers of deaths. In several studies, males comprised 80 per cent or more of the narcotic related deaths,<sup>3,4,19-21</sup> and the most common (modal) age for narcotic deaths was in the 20s. The higher death rates that we found nationally among non-Whites are consistent with data from medical examiners in several cities.<sup>4,17,18</sup>

Heroin and methadone deaths are not distinguishable from each other in the national vital statistics data. Heroin was reported to be the causal agent in 96 per cent of non-suicide narcotic deaths in a survey of drug-involved deaths in four major US cities.<sup>18</sup> Hirsch reports that most deaths from intravenous administration of drugs occur in heroin users.<sup>22</sup> It seems reasonable, therefore, to compare national trends in opiate mortality with various indicators of heroin use. One such indicator is the number of emergency room visits involving heroin or morphine abuse by patients treated in facilities that are part of the Drug Abuse Warning Network (DAWN). The number of such visits decreased by 36 per cent from 1976 to 1977,<sup>23</sup> and by an additional 24 per cent in 1978.<sup>24</sup>

Secular trends similar to those we describe nationally for opiate mortality have been reported regarding the numbers of deaths from heroin in several cities during 1970 to 1978.<sup>3,5,6</sup> Heroin mortality then rose sharply in 1979<sup>3</sup> and again in 1980.<sup>25</sup> National figures are not available for opiate-related deaths since 1978, but the number of deaths reported to DAWN by a consistently reporting panel of medical examiners increased by 40 per cent (from 598 to 839) between 1978 and 1980.<sup>25</sup>

Although it has been argued on theoretical grounds that demand for heroin is relatively inelastic,<sup>26</sup> investigators have demonstrated that temporal variations in the availability and purity of heroin on the streets are directly and significantly related to trends in heroin use and heroin deaths, while street price is inversely related.<sup>3,6,7,10,18,27</sup> Reported correlation coefficients for the relationship between heroin mortality and street-level purity of heroin range from +0.41<sup>3</sup> to +0.83.<sup>28</sup>

On the national level, secular variations in the number and rate of deaths coded as unintentional poisoning by

opiates or as natural deaths resulting from drug dependence appear to coincide with changes in the supply of heroin entering the US (Figure 6). Supplies were reduced by disruption of the "French Connection"\*\*\* in mid-1972. A relative scarcity of heroin persisted until mid-1974, when heroin from Mexico began to fill the void in the heroin market.<sup>6,7,12</sup> In 1976, the availability of Mexican heroin was greatly reduced in most parts of the US when the Mexican government launched an opium-poppy eradication program in conjunction with US Drug Enforcement Administration (DEA) efforts to prevent smuggling of heroin across the Mexican-US border.<sup>12</sup>

By 1979, Southwest Asia had become the major source of heroin smuggled into the US.<sup>12</sup> The Asian heroin that replaced the Mexican supply was five times the potency of the Mexican drug. The present state of political upheaval in Iran and Afghanistan bodes ill for efforts to eliminate the production of opium and flow of heroin to this country, and may presage an increase in heroin-related mortality in the early 1980s.

The question of whether the observed fluctuations in mortality were, in fact, a function of heroin availability cannot be answered directly without more detailed data than were available for this analysis. Also outside the scope of our data is the exploration of alternative or complementary hypotheses regarding the effect on mortality of other policies and programs—for example, increased availability of methadone maintenance programs. Data from the Drug Abuse Warning Network (DAWN) suggest that the mortality reduc-

\*\*\* Heroin grown in Turkey was shipped to the United States through the French port of Marseilles.

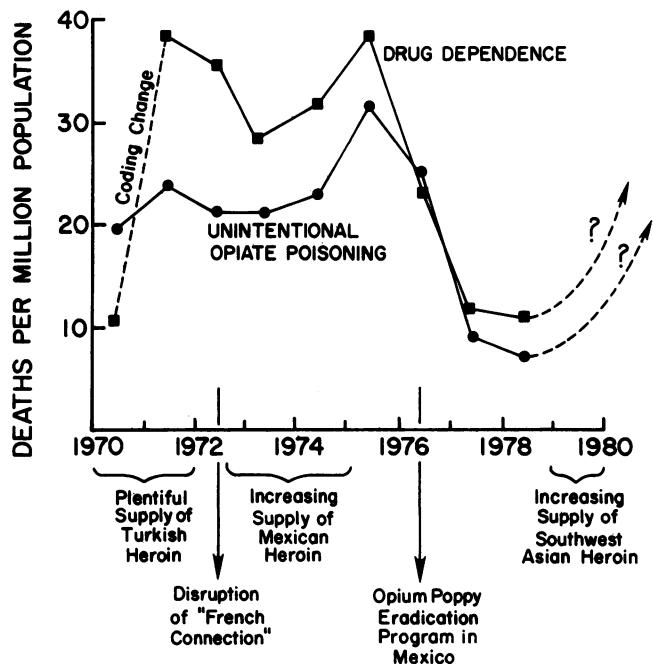


FIGURE 6—Mortality from Drug Dependence (304) and Unintentional Poisoning by Opiates (E 853.0), US Male Population Aged 20–29 Years, in Relation to Changes in Heroin Supply

tions cannot be explained by improved treatment of heroin overdoses, since cases of heroin poisoning treated in emergency rooms also dropped markedly in late 1976 and 1977.<sup>23</sup>

The marked drop in non-White mortality rates from opiates and drug dependence between 1975 and 1978 raises questions to which the drug abuse literature provides few clues:

- What factors (economic, social, or both) might cause heroin availability trends to be reflected more in death rates of non-White males in their 20s than of other groups?

- Are certain populations of users more vulnerable to being "priced out" of the heroin market, making the heroin-smuggling control efforts of the DEA particularly efficacious for these groups?

- Are some population groups more responsive to therapeutic programs?

- If heroin mortality does increase in the early 1980s, will a disproportionate share of the increase be in young non-White males?

- What are the most effective ways to reduce the morbidity and mortality from drug use?

These questions await further study.

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