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Maine Drug-Induced Deaths: A Brief White Paper Prepared for the SPF-SIG State Epidemiology Workgroup, August, 2007

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What is the link between the drug-induced mortality and substance abuse? How strong is the evidence of the linkage? How does the public perceive the link?

The link between substance abuse and drug-induced mortality is direct in a large proportion of deaths ruled by the medical examiner as accidental or suicidal manner of death. This connection is clear in the investigative details and the medical histories for these cases. A very small minority of cases are the result of an adverse reaction to a prescribed drug taken as directed. The vast majority of cases are due to consumption of illicit drugs or pharmaceuticals, often in combination.

Pharmaceuticals have been implicated in roughly 82% of accidental drug-induced deaths 1997-2005, frequently in combination with illicit substances. Pharmaceuticals may have been intentionally misused by the person for whom they were prescribed, diverted illegally from prescriptions for others, obtained by fraud, or stolen.

The Office of Chief Medical Examiner (OCME) and police collect medications and related evidence, such as empty pill bottles or drug paraphernalia, at the scenes. In addition, medical histories are obtained for the decedents. If methadone is involved, the OCME checks with local methadone clinics to find out whether the decedent has been a patient. Full qualitative (screening) and quantitative (levels) toxicology testing is done on all suspected drug-induced deaths. In nearly all cases a pattern of drug abuse/misuse is reported, or in evidence from the medical history, drug paraphernalia, or high toxicology levels.

The link between substance abuse and drug-induced mortality is, nevertheless complex. This is due to the fact that the risk of death is higher with some substances and patterns of use than it is in others. For example, the Maine Prescription Monitoring Program reports that the highest volume of controlled substance prescriptions is for hydrocodone; by contrast, the pharmaceutical associated with the most deaths is methadone (the majority from pills prescribed for pain and somewhat fewer from liquid prescribed in opiate replacement therapy). Similarly, patterns of abuse/misuse involving multiple narcotics taken together, or narcotics taken in combination with tranquilizers or alcohol are particularly dangerous, even though pharmaceutical narcotics and tranquilizers are usually safe when taken appropriately as prescribed.

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The medical examiner's interpretation of postmortem drug levels is extremely difficult and complex, particularly when multiple substances have been combined, and in association with positive histories of heart, lung, or liver problems. Because of this, mortality patterns are not well-understood by the public, which seeks explanations that point to simple causes. For example, public and media efforts have sought to implicate methadone clinics without appreciating broader issues around narcotic abuse, pain medication prescribing, differential risk factors, and patterns of misuse involving alcohol and tranquilizers. They also often seek to blame the user/abuser for the consequence. Misusers/abusers are often unable to assess risk and tolerance in themselves or others, which leads to risky behaviors resulting in overdose or death.

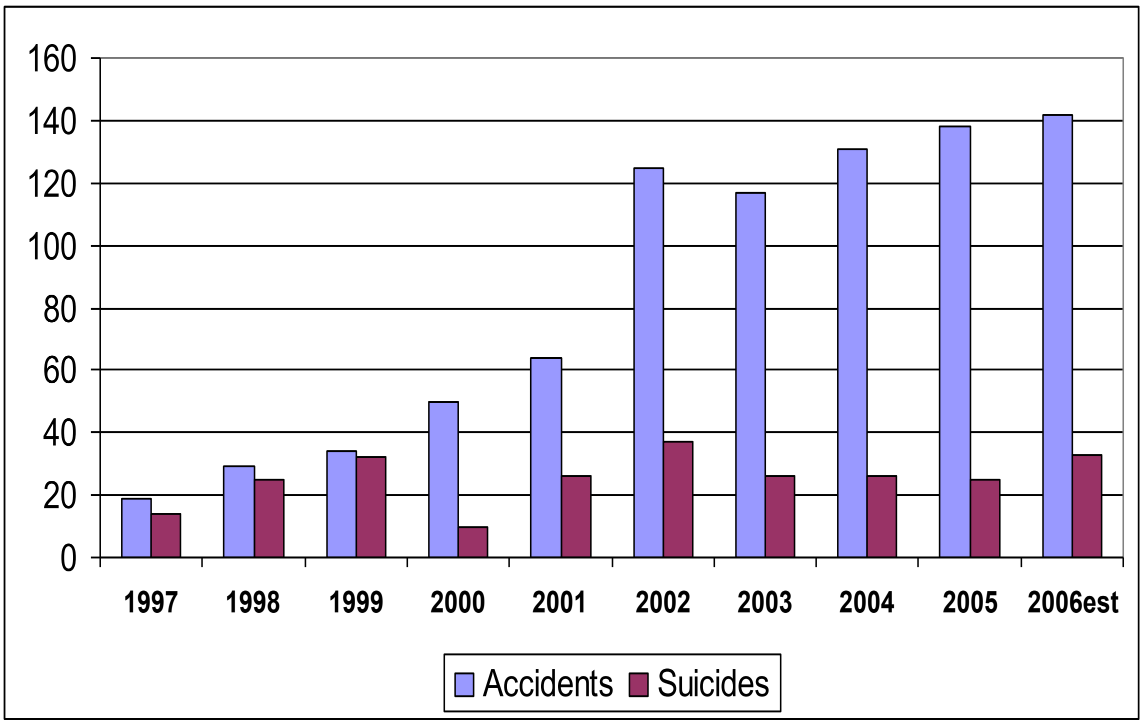


Figure 1. Drug-induced deaths in Maine, 1997-2006.

What are the consumption patterns? Which substances and what populations are involved?

The overall number of drug-induced deaths has risen 429% in the last decade from 34 in 1997 to an estimated 180 in 2006 (Figure 1). The 657% increase in accidental deaths has accounted for the bulk of this rise. Although the numbers of deaths caused by heroin and cocaine have increased, the dramatic increase in accidental drug deaths has been driven by the diversion and misuse of pharmaceuticals, particularly narcotic pain medications (opiates and opioids) and tranquilizers (benzodiazepines). Frequently more than one drug is implicated in the death. Suicidal overdose deaths are less likely to involve illicit drugs.

Accidental drug deaths in Maine are caused primarily by narcotics (89%), including heroin and pharmaceutical opiates and opioids, whereas only 37% of suicides are caused by narcotics. Methadone and "morphine/heroin"[2] are the top two drugs causing death. In the majority of accidental cases with methadone causing death, about 60% are the pill form prescribed for pain, and about 40% the liquid form used for opiate replacement therapy (methadone clinics). Alcohol and tranquilizers (benzodiazepines) are often combined with narcotics. Large doses of single narcotics, or smaller doses when taken in combination with other drugs and alcohol, can cause death, often due to respiratory depression. Rates of cocaine death have risen recently, and increasingly cocaine is found combined with heroin or pharmaceutical narcotics. Nine percent of accidents and 14% of suicides are caused by benzodiazepines, either alone or in combination with other drugs. Similarly, 12% of accidents and 8% of suicides are caused by alcohol in combination with other substances.

Routes of administration used by decedents are often unknown, unless there are very recent injection track marks, or a needle still present in the vein. Pills and diskettes may have been taken orally or crushed for snorting, smoking or injection.

Compared to the general population of the state (based upon the 2000 U.S. Census), victims of accidental drug-related deaths are much more likely to be male, slightly less likely to be Maine natives, and much less likely to be married (Table 1). The average age of drug-induced death victims 2002-2005 is 39 years (males 38; females 42). Most victims are male (61%). The proportion of males among accidental death victims (66%) is much higher than among suicides (46%). Among accident victims, more are single or divorced (77%) than among suicides (67%). Most accident victims have a high school education (76%), although fewer than among suicides (87%) or the general population (85%).

Table 1. Highlighted demographic characteristics for all drug related deaths, 2002-2005, compared to the Maine population*

	Accidents	Suicides	Maine Pop.
Males	66%	46%	49%
Born in Maine	63%	40%	67%
Married	20%	24%	58%
Never Married/Divorced	77%	67%	36%
Education high school or greater	77%	87%	85%

**State population percentages based upon Maine 2000 census*

Are there any sub-populations disproportionately impacted by drug-induced mortality?

Figure 2 displays the accidental death rate per hundred thousand in Maine calculated for specific age groups. The 20-24 age group has the highest rate, 98. The

[2] Morphine and heroin frequently cannot be differentiated by postmortem toxicology tests.

rates decline by age after that from 86 in the group 25-34 to 69 for those 35-44. The crude rate for accidental drug deaths in the state as a whole is 40. Males constitute 66% of the accident victims, much higher than their proportion (49%) in the general population. Single and divorced males are at higher risk. Misusing methadone puts persons at a higher risk than do other narcotics. Persons with a history of heart, liver, and lung disease are at higher risk, as are those that are obese. Misusing multiple narcotics, or narcotics in combination with benzodiazepines, cocaine, and/or alcohol puts persons at greater risk. Persons who have been abstinent after a period of using narcotics and methadone in particular are more likely to overestimate their drug tolerance. Persons in the first two few weeks of opioid replacement therapy with methadone (induction) are at greater risk. Recent research suggests there may be a genotype that makes a person more susceptible to cardiac arrhythmias when taking methadone, however, these genes have not been specifically identified.

Figure 3 compares the accidents and suicide according to the proportion of deaths in specific age groups. Although the age means are similar in these two populations, the accidents include more persons in their early 20's.

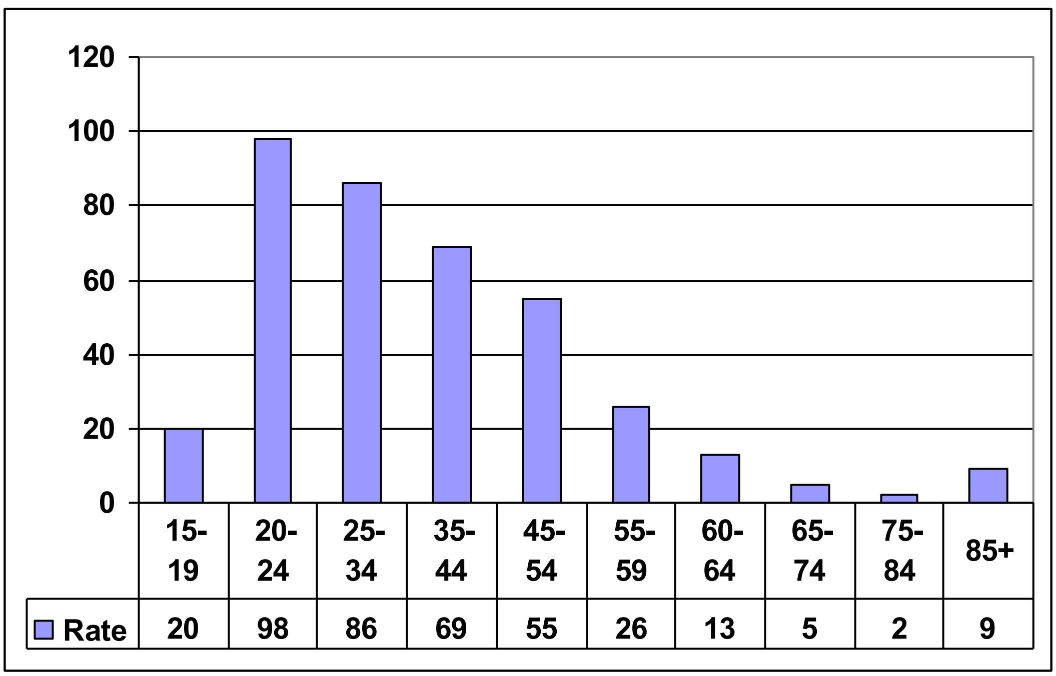
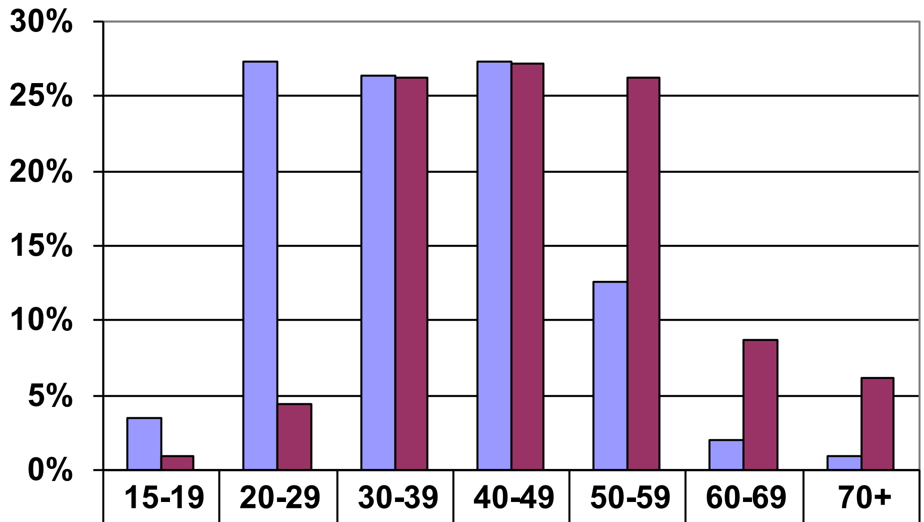


Figure 2. Age-adjusted crude death rates due to drug-induced accidents in Maine based on the U.S. Census 2000.



	15-19	20-29	30-39	40-49	50-59	60-69	70+
Accident	4%	27%	26%	27%	13%	2%	1%
Suicide	1%	4%	26%	27%	26%	9%	6%

Figure 2. Comparison of age structures of accidental and suicidal drug induced deaths. (Note: accidents outnumber suicides five to one)

Can we impact the consequence by changing the consumption patterns using prevention strategies?

Drug death statistics for Cumberland County declined following an effort at public health information targeted at users/misusers. Specific education messages aimed at young adults, particularly males and 20-34 year olds will potentially reach the most at risk group. Messages regarding the dangers of diversion, recognition of snoring as a warning sign of respiratory distress, the benefits of placing users in the "recovery position to maximize airway access are being used in Cumberland and Kennebec Counties.

Education efforts targeted at health care providers who write narcotic prescriptions and the patients who receive them should be supported, particularly encouraging messages about the risks of misusing or diverting prescriptions, the need for proper storage and disposal, and the dangers of combining narcotics with other pain medication, tranquilizers, or alcohol, as well as the effective use of Maine's Prescription Monitoring Program.