CONNECTICUT DEPARTMENT OF PUBLIC HEALTH

Keeping Connecticut Healthy

REPORT TO THE GENERAL ASSEMBLY

PUBLIC ACT 03-159
A REPORT ON FATAL AND NON-FATAL DRUG OVERDOSES IN CONNECTICUT

JANUARY 2004

State of Connecticut
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State of Connecticut
Department of Public Health

Report to the General Assembly

Public Act 03-159
A Report on Fatal and Non-Fatal Drug Overdoses
In Connecticut

Table of Contents

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I. EXECUTIVE SUMMARY

This report was completed in response to Public Act 03-159, *An Act Concerning the Treatment of Drug Overdoses*. This report goes beyond the minimal requirement of the legislation by providing morbidity and mortality information on: 1) all drug-induced conditions, 2) drug poisoning, 3) heroin and related narcotics-induced conditions, and 4) heroin and related narcotics overdose in Connecticut, and by providing mortality trend information for more than just three years. In some cases, statistics presented identify group differences and trends that cannot be easily explained without additional research.

Drug-Induced Mortality Trends, Connecticut Residents

1992-1998

- From 1992 to 1998, drug-induced mortality increased by almost 11% for Connecticut females and 4% for Connecticut males.
- Since 1992, drug-induced mortality rates have tended to be higher among Connecticut male residents than among males nationwide. In 1998, the drug-induced mortality rate was higher for Connecticut female residents than the comparable national rate.
- There was a small but statistically significant increase in the unintentional opiate overdose crude death rate from 1992 to 1998.

1999 – 2002

- While numbers of drug-induced and unintentional opiate overdose deaths among Connecticut residents increased slightly from 1999 to 2002, there were *not* statistically significant increases in either the drug-induced or opiate overdose crude death rate from 1999 to 2002.

Drug-Induced Deaths, Connecticut Resident Subgroup Differences

1996 – 1998

- Males aged 20 to 49 accounted for about 64% of all drug-induced deaths.
- White Connecticut residents accounted for 88% of all drug-induced deaths.
- Hispanic males had the highest age-adjusted drug-induced death and premature mortality rates of all racial and ethnic subgroups followed by black and white males.
- Opiates and related narcotics accounted for almost one-fourth of all drug-induced deaths.

Unintentional Opiate Overdose Deaths, Connecticut Residents

2000 – 2002

- Males comprised about 84% of all unintentional opiate overdose deaths.
- About 73% of unintentional opiate overdose decedents were white and 8% were black. Almost 18% of decedents were Hispanic (of any race).
- The largest numbers of unintentional opiate overdose deaths and highest death rate occurred in the 40 to 44 year old age group.
- About 41% of unintentional opiate and related narcotics poisoning deaths took place in the decedent's home.

Drug-Induced and Opiate ED Non-Admissions* and Hospitalizations, Connecticut Acute Care Hospitals, 2000 – 2002

- Males made up the majority of all drug-induced emergency department (ED) non-admissions and hospitalizations, but females made up the majority of all drug poisoning ED non-admissions and hospitalizations.
- Patients aged 15 to 49 accounted for about 85% of drug-induced ED non-admissions and 79% of drug-induced hospitalizations.
- Males made up 71% of all opiate-induced ED non-admissions and about 64% of all opiate-induced hospitalizations.
- Patients aged 15 to 49 accounted for 94% of opiate-induced ED non-admissions and almost 90% of opiate-induced hospitalizations.
- The number of drug-induced ED non-admissions increased by 27% from 2000 to 2002.
- The number of opiate-induced ED non-admissions increased by 50% from 2000 to 2002.

* An "ED non-admission" is an emergency department encounter that does not result in hospitalization.

Connecticut Poison Control Center Emergency Calls, 2000 - 2002

- Prescription drugs, over-the-counter medications, and other supplements comprised about 96% of all pharmaceutical-related calls to the Connecticut Poison Control Center, while heroin and other street drugs and stimulants accounted for a total of about 3% of such calls.

- Exposures by children aged 5 and younger accounted for about 45% of all pharmaceutical-related calls to the CPCC during this period, while exposures by adults aged 20 and older accounted for about 37% of all such calls.

Suggested Improvements in Data Collection and Analysis

- Two community-based studies of intravenous drug users in Connecticut indicate that a large number of persons experiencing an overdose did not seek out medical assistance. Further research is needed to identify the specific structural and perceived barriers to medical treatment of drug overdose in Connecticut.

- Research studies suggest that multiple drug use is involved in a majority of non-fatal overdoses and drug poisoning deaths. A better understanding of the common patterns of multiple drug use and overdose among population subgroups in Connecticut can provide useful information regarding appropriate intervention strategies.

- Naloxone appears to be the most promising current intervention strategy to reduce overdose mortality. Evaluation studies that determine the effectiveness of naloxone in reducing narcotics overdose deaths in a variety of community settings are warranted.

SPECIAL REPORT

JANUARY 1, 2004

II. INTRODUCTION

Public Act 03-159 (Appendix A)

Public Act 03-159 (Section 2) directs the Commissioner of Public Health to report on statewide fatal and nonfatal drug overdoses for at least the past three years. The report is required to include: (1) trends in drug overdose death rates and (2) suggested improvements in data collection. The Commissioner is required to report on or before January 1, 2004 to the Governor and the joint standing committee of the General Assembly having cognizance of matters relating to public health in accordance with section 11-4a of the general statutes.

The act also allows those health care practitioners licensed to prescribe an opioid antagonist, such as physicians and surgeons, physician assistants, dentists, advanced practice registered nurses, and podiatrists, to prescribe, dispense, distribute, or administer it to a drug user in need of intervention without being civilly or criminally liable. Under the bill, an "opioid antagonist" is defined as naloxone hydrochloride or any other similarly acting and equally safe drug approved by the Federal Food and Drug Administration (FDA) for treatment of a drug overdose.

This report examines mortality trends, hospitalization admissions, and emergency department "non-admissions" due to drug poisoning (overdose or wrong substance given or taken) *and* drug-induced causes. Drug-induced causes encompass poisonings as well as chronic drug abuse, drug dependence, and drug psychoses. While poisoning comprises the vast majority of drug-induced causes, examination of the larger category of drug-induced mortality, hospitalizations, and emergency department (ED) encounters provides a broader, more detailed picture of drug-related illness and death. Because of the specific focus of PA 03-159 on the use of opioid antagonists as an intervention for opiate drug overdose, this report also examines the subcategories of heroin and related opiate-induced and overdose mortality, hospitalizations, and ED encounters.

In addition to mortality, hospital, and emergency department data, this report includes information from the Connecticut Poison Control Center on drug poisoning-related phone calls as well as information from two community-based studies regarding non-fatal drug overdoses that do not present themselves to the medical care system. Finally, this report identifies gaps in knowledge and data related to drug overdose in Connecticut and makes suggestions for improvements in data collection.

III. SOURCES OF INFORMATION

Mortality data (1992 to 1998 and 1999 to 2002), the key source of information for drug-induced deaths and fatal opiate overdoses, are taken from the Connecticut Death Registry maintained by the Connecticut Department of Public Health. Virtually all deaths occurring to Connecticut residents in the United States and Canada are included in this database.

Statewide aggregate inpatient hospitalization and emergency department (ED) data for drug-induced and heroin-induced encounters (2000 to 2002) were obtained from the Connecticut Hospital Association's ChimeData program. The ChimeData program obtains encounter-level demographic, clinical, and billing data from all non-federal acute care hospitals in Connecticut.

Information on emergency phone calls related to poisoning by pharmaceuticals and other drugs (2000 to 2002) were obtained from the Connecticut Poison Control Center. CPCC is a passive surveillance system in that it relies on information reported via telephone on a voluntary basis.

Information on intravenous drug users' overdose experiences were obtained from two community-based studies conducted by Yale University researchers: The *Syringe Access, Use, and Discard: Context in AIDS Risk* (SAUDA) project (1999 to 2001) and the *Diffusion of Benefit through Syringe Exchange Programs* (DOB) project (1998 to 2000) [Grau and Heimer, unpublished data].

Detailed descriptions of these data sources are presented in Appendix B of this report. Appendix G contains a glossary of terms used in this report.

IV. TRENDS IN DRUG-INDUCED MORTALITY, 1989-1998 AND 1999-2002 PERIODS

Connecticut Resident Drug-Induced and Opiate Overdose Deaths, 1989-1998

During the period 1989 – 1998, 1,921 Connecticut residents died from drug-induced causes[1], of which 1,800 were by poisoning, that is an overdose or wrong substance given or taken [see Appendix C for a detailed listing of these causes of death]. The number of drug-induced deaths climbed steadily during the decade with more deaths occurring in 1998 than in any previous year. Improved reporting of cause of death beginning in 1991 is a partial explanation for the apparent increase in drug-induced mortality between 1989 and 1992. Beginning with the 1992 mortality data, the Connecticut Department of Public Health (DPH) was able to significantly reduce the number of deaths identified as "pending further investigation" by the Connecticut Medical Examiner's (ME) Office through an improved system of communication. Speedier processing of findings from the ME investigations has resulted in more complete and more accurate cause-of-death classification being entered into the death records. Prior to 1992, many drug-induced deaths tend to be included in the category of "pending" (Mueller, Hynes, et al. 2003). For this reason, time trends discussed here begin with the period 1992.

Drug-induced deaths include those due to drug abuse (excluding alcohol), drug dependence, drug psychoses, and poisoning by use of either legally prescribed or illicit drugs. Drug-induced poisoning deaths may be intentional (suicide or homicide), unintentional, or of unknown intent (see Appendix C for ICD-9 and Appendix D for ICD-10 detailed listing of drug-induced causes of death). This definition is consistent with that used by the Centers for Disease Control and Prevention (CDC) and the National Center for Health Statistics (NCHS). Reported deaths are based on the underlying (primary) cause of death. Poisoning accounted for 94 percent of all drug-induced deaths among Connecticut residents from 1992-1998, while drug dependence and drug abuse each accounted for about 3 percent of drug-induced deaths. Age, gender, and race/ethnicity are the relevant social variables to consider in drug-induced mortality.

By Age

Age-specific drug-induced death rates (1996-1998) were highest in the 30 to 49 year old age groups (data not shown). Figure 1 depicts age-specific drug-induced death rates for males and females compared with proportionally adjusted rates for all other causes of death. It shows that drug-induced death rates for males aged 15-49 and females aged 15-59 exceeded proportionally adjusted rates for all other causes of death, after which point they decreased relative to all other causes of death.

[1] Drug-induced causes include ICD-9 codes 292, 304, 305.2-305.9, E850-E858, E950.0-E950.5, E962.0, and E980.0-E980.5.

By Gender

Males were almost three times more likely than females to die from drug-induced causes (Table 1). Males aged 20 to 49 accounted for about 64 percent of all drug-induced deaths (N=768) but only 6 percent of deaths due to other causes (data not shown).

By Race and Ethnicity

White Connecticut residents accounted for 88 percent of all drug-induced deaths in the 1996-1998 period. White males accounted for 62 percent of all such deaths (Table 1). An examination of age-adjusted deaths rates shows that Hispanic males had the highest age-adjusted drug-induced death and premature mortality rates of all racial and ethnic subgroups followed by black and white males (Table 1). Hispanic males had 1.8 times the death and premature mortality rates of white males ($p < .01$ for both comparisons). Black males had 1.6 times the death rate ($p < .05$) but not a significantly different premature mortality rate compared with white males. There were insufficient numbers of drug-induced deaths among Asian/Pacific Islander and Native American males to report reliable rates.

White females accounted for almost 90 percent of all Connecticut female drug-induced deaths in 1996-1998. Age-adjusted death and premature mortality rates of white and black females were not significantly different (Table 1). There were too few deaths among Hispanic, Asian/Pacific Islander, and Native American females to calculate reliable drug-induced death and premature mortality rates.

Figure 1.

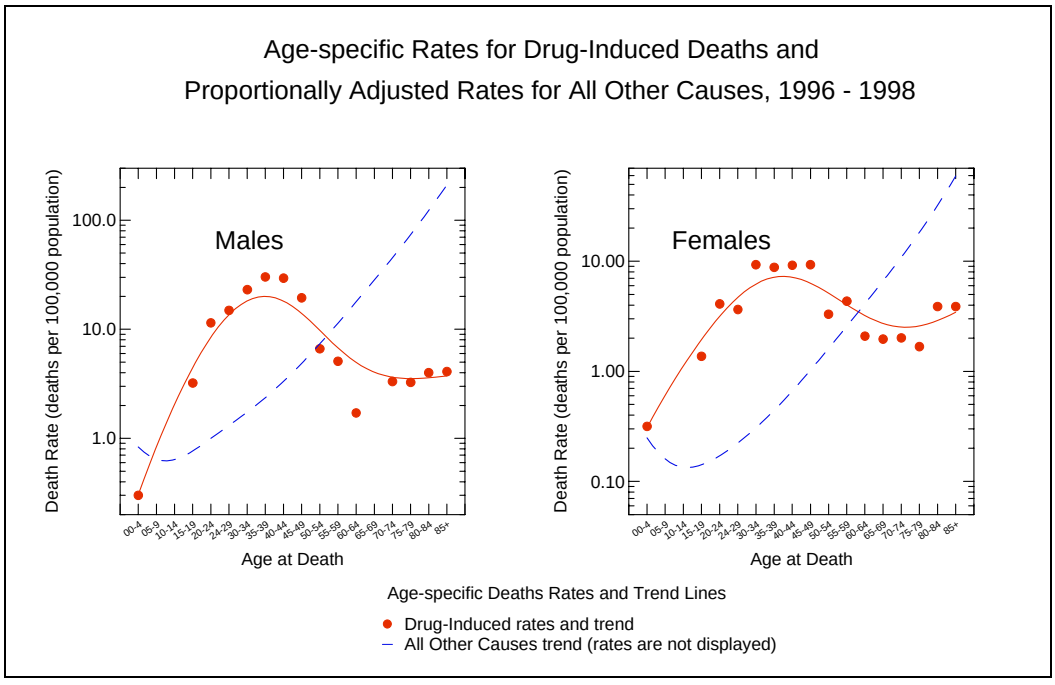


Table 1. Drug-Induced Deaths[1], Connecticut Residents by Gender, Race and Ethnicity[2], 1996-1998

Group	Number of Deaths	Age-Adjusted Mortality Rates[3] AAMR[4]	Change since 1992-94[5]	Age-Adjusted Premature Mortality Rates to Age 75[3] YPLL[4]	Change since 1992-94[5]
All Residents	768	7.5	↑	283.5	↑
All males	547	10.9	ns	418.9	ns
White	479	10.8	↑	421.2	↑
Black	67	17.3*	ns	592.9	ns
Asian PI	1	—		—	
Native American					
Hispanic	72	19.4**	ns	738.5**	ns
All females	221	4.2	↑	149.7	↑
White	198	4.3	↑↑	152.3	↑↑
Black	21	4.5	ns	161.8	ns
Asian PI	1	—		—	
Native American	1	—		—	
Hispanic	15	—		—	

Notes:

1. This cause of death category includes ICD-9 codes 292,304,305.2-.9,E850-E858,E950.0-.5, E962.0,E980.0-.5. (*Healthy People 2000* cause of death classification refers to codes 292,304,305.2-.9, E850-E858,E950.0-.5, E962.0,E980.0-.5 as "Drug-Related Deaths").

2. Racial groupings (White, Black, Asian & Pacific Islander, Native American) include persons of Hispanic ethnicity.

3. Age-adjusted Mortality Rates (AAMR) and Years of Potential Life Lost (YPLL) rates are per 100,000 based on race and ethnicity specific population estimates. Age-adjusted rates were calculated by the direct method using the 2000 U.S. standard population. Rates were not calculated for fewer than 15 events.

4. Statistical tests were conducted to evaluate differences in rates between race/ethnic groups. The white population serves as the reference group in each comparison (black vs. white, Asian & PI vs. white, Native American vs. white, Hispanic vs. white). Following are explanations of the notations:

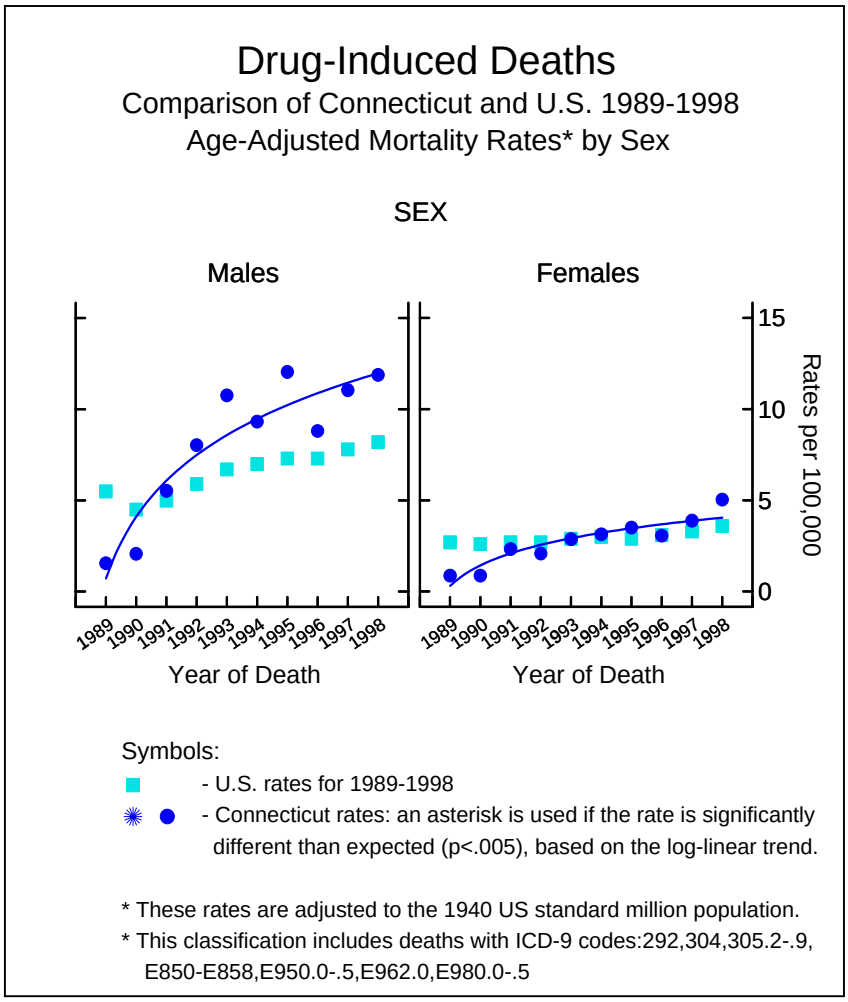
   * Significantly different than the respective white resident rate at $p < .05$.
   ** Significantly different than the respective white resident rate at $p < .01$.
   — Rate was not calculated due to small numbers.

5. Statistical tests were conducted to evaluate changes in rates over time. Comparisons of 1996-98 vs. 1992-94 rates are made within each race/ethnicity group. Following are explanations of the notations:

   ↑ 1996-98 rate is significantly higher than the 1992-94 rate at $p < .05$.
   ↑↑ 1996-98 rate is significantly higher than the 1992-94 rate at $p < .01$.
   ns Indicates the change from 1992-94 to 1996-98 is not statistically significant.

Time Trends

Figure 2.



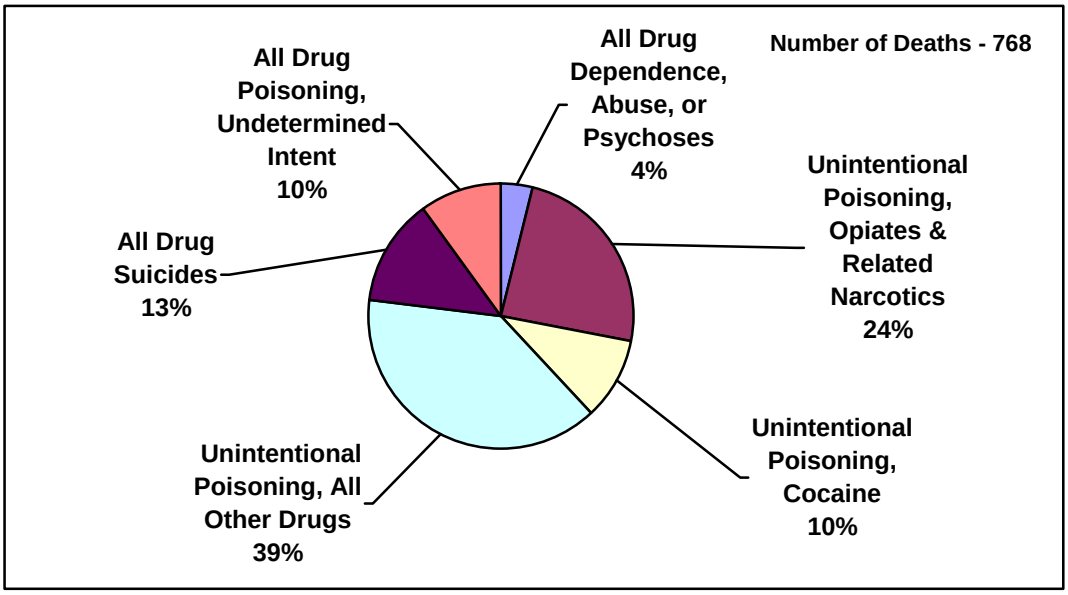
Both age-adjusted death and premature mortality rates increased significantly for white males and white females from the 1992-1994 to 1996-1998 period, while drug-induced death and premature mortality did not appear to increase significantly for other racial, ethnic, and gender subpopulations (Table 1). Assessment of the annual percent change in drug-induced mortality for the years 1992-1998 indicate significant increases of 10.7 percent for all females ($p < .001$) and 3.9 percent for all males ($p < .01$).

Since 1992, drug-induced mortality rates have tended to be higher among Connecticut male residents than among males nationwide. In 1998, the drug-induced mortality rate was higher for Connecticut female residents than the comparable national rate. Connecticut resident male and female drug-induced mortality rates exceeded the U.S. Department of Health and Human Services' *Healthy People 2000* target (Figure 2). There is no *Healthy Connecticut* target for drug-induced mortality.

Subtypes of Drug-Induced Deaths

In the 1996-1998 period, the main subcategories of drug-induced deaths included opiates and related narcotics (that is, heroin, methadone, morphine, codeine, opium, and pethidine); cocaine; and all other drug overdoses that were unintentional, suicides, or of undetermined intent (Figure 3). Opiates and related narcotics accounted for almost one-quarter of all drug-induced deaths.

Figure 3. Drug-Induced Deaths - Percent by Type, Connecticut Residents, 1996-1998



Opiate Overdose Deaths

Opiate and related narcotics "overdose" deaths are defined as those in which unintentional poisoning (E850.0) is listed as the primary cause of death. Drug deaths categorized as morphine "dependence" (304.0) or "abuse" (305.4) are not considered overdose. Numbers of opiate-induced (heroin and related narcotics) deaths by subtype for 1992 to 1998 are presented in Table 2. ICD-9 codes were used to determine opiate-induced deaths from 1992 to 1998.

The number of unintentional opiate overdose deaths as a primary cause of death in Connecticut increased steadily from 1992 (N=37) to 1998 (n=75) with the exception of 1996, which showed a decrease from the previous year. Opiate overdose deaths (as a primary cause of death) appeared to increase relative to other drug-induced deaths during the 1992-1998 period, accounting for 21 percent of all such deaths in 1992 and 26 percent in 1998. In contrast, unintentional cocaine overdose as a primary cause of death appeared to be on the decline. Cocaine (as a primary cause of death) accounted for about 15 percent of all drug-induced deaths in 1992 compared with 9 percent in 1998, while the percentage of deaths from all other drug-induced causes remained about the same in 1992 and 1998. Linear trend analysis revealed a small but statistically significant increase in the opiate overdose crude death rate (all Connecticut residents) from 1992 to 1998 ($p = .0013$). About 36 percent of all opiate overdose deaths (1996-1998) occurred at home.

Table 2. Opiate & Related Narcotics Deaths by Type, Connecticut Residents, 1992-1998 [1]

Year	*Total Deaths*	*Drug Dependence*	*Drug Abuse*	*Unintentional Poisoning*
1992	37	0	0	37
1993	54	0	0	54
1994	57	0	0	57
1995	71	0	1	70
1996	41	0	1	40
1997	71	0	1	70
1998	75	0	0	75

[1] Includes ICD-9 codes 304.0, 305.5, and E850.0

Connecticut Resident Drug-Induced and Opiate Overdose Deaths, 1999-2002

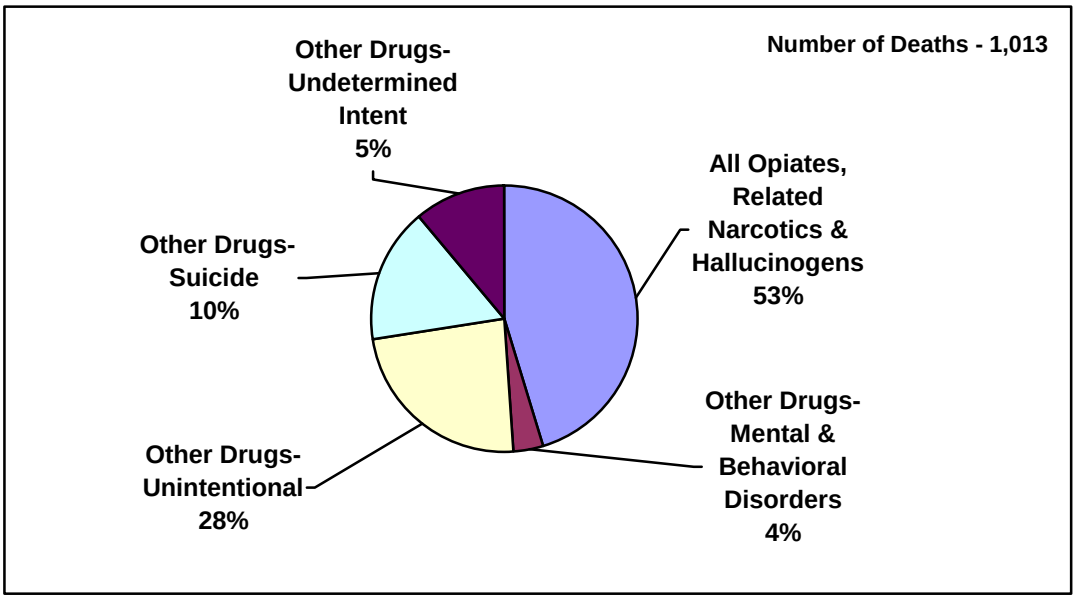
Drug-induced deaths for the 1999-2002 period are coded according to ICD-10 classification,[2] and as such, are not directly comparable to drug-induced deaths for prior years (see Appendix D for a detailed listing of these causes of death). More Connecticut resident deaths due to drug-induced causes occurred in 2002 than in any previous year since 1999 (367 deaths in 2002 compared with 318 deaths in 1999); however, changes in the crude death rate from 1999 to 2002 were not statistically significant.

The ICD-10 category of drug-induced causes includes deaths from legal and illegal drug use, both dependent and non-dependent use. It also includes poisoning from medically prescribed and other drugs. It does not include deaths due to accident or homicide that are indirectly related to drug use (U.S. Department of Health and Human Services 2002). Appendix E describes the comparability of ICD-9 and ICD-10 classifications of drug-induced deaths.

In 2000-2002, a total of 1,013 Connecticut resident deaths were attributed to drug-induced causes. This is about 30 percent higher than the drug-induced death count for 1996-1998 based on ICD-9 codes. Due to the lack of direct comparability between ICD-9 and ICD-10, we cannot say with certainty whether or not this increase is simply an artifact of the coding system, whether it represents a real increase in drug-induced deaths, or both. Comparability analyses conducted by the National Center for Health Statistics suggest that there is an increase in assignment of drug-induced deaths using ICD-10 compared with ICD-9 (See Appendix E for a discussion of drug-induced death comparability ratios). About 34 percent of Connecticut resident drug-induced deaths (341) were unintentional poisoning deaths due to opiates and related narcotics (Figure 4).

[2] Drug-induced causes include ICD-10 codes F11.0-.5, F11.7-.9, F12.0-F12.5, F12.7-9, F13.0-.5, F13.7-.9, F14.0-.5, F14.7-.9, F15.0-.5, F15.7-.15.9, F16.0-.5, F16.7-.9, F17.0, F17.3-.5, F17.7-.9, F18.0-.5, F18.7-.9, F19.0-.5, F19.7-.9, X40-X44, X60-X64, X85, and Y10-Y14.

Figure 4. Drug-Induced Deaths - Percent by Type, Connecticut Residents, 2000-2002



Opiate Overdose Deaths

Numbers of opiate-induced deaths by subtype for 1999 to 2002 are presented in Table 3. Because of the change in the ICD coding of deaths between 1998 and 1999, it is not possible to completely account for the large difference in opiate-induced deaths (75 deaths in 1998 versus 96 deaths in 1999). The number of unintentional opiate overdose deaths increased slightly from 1999 to 2002; however, linear trend analysis did *not* reveal a statistically significant increase in the opiate overdose crude death rate (all Connecticut residents) from 1999 to 2002.

In 2000-2002, males comprised 83.5 percent and females 16.5 percent of all unintentional opiate overdose deaths. About 73 percent of decedents were white and 8.5 percent were black. Almost 18 percent of decedents were Hispanic (of any race). The largest numbers of deaths and highest death rate occurred in the 40 to 44 year old age group. During this period, 41 percent of unintentional opiate and related narcotics poisoning deaths took place in the decedent's home (Figure 5).

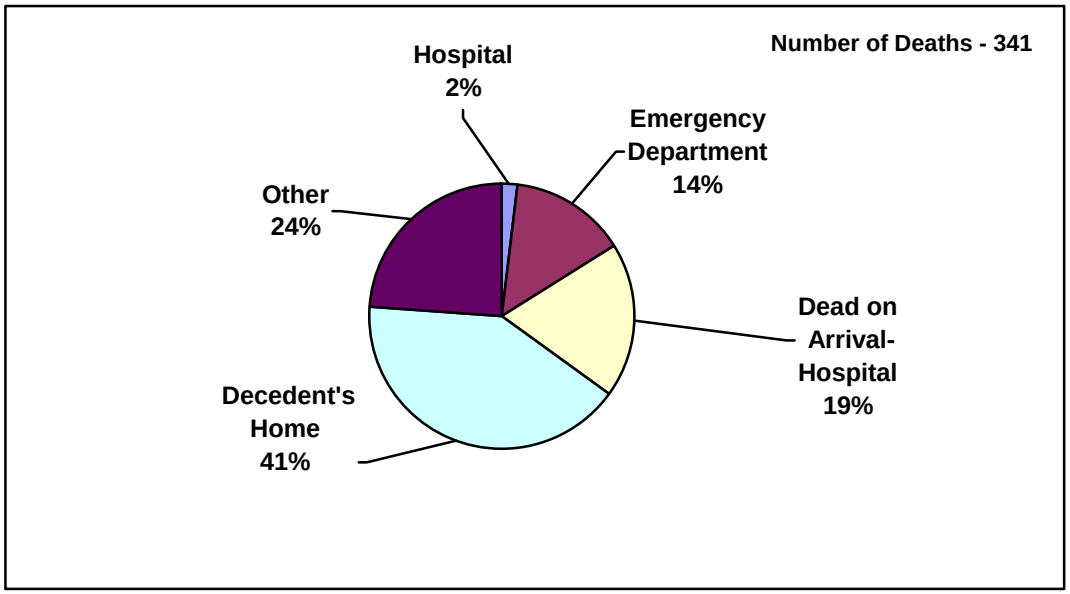
Table 3. 1999-2002 Heroin & Related Narcotics Deaths by Type

Year	*Total Deaths*	*Mental & Behavioral Disorders –Opioid Use*[1]	*Unintentional Poisoning – Heroin & Related Narcotics*[2]
1999	96	3	93
2000	114	2	112
2001	118	5	113
2002	122	6	116

1 Includes ICD-10 code F11.

2 Includes ICD-10 code X42, only when T40.0, T40.1, T40.2, T40.3, or T40.4 are coded as a secondary cause of death.

**Figure 5. Opiate Unintentional Poisoning Deaths,
Percent by Place of Death – Connecticut Residents, 2000-2002**



V. DRUG-RLATED EMERGENCY DEPARTMENT NON-ADMISSIONS & HOSPITALIZATIONS, 2000-2002

"Drug-induced" emergency department (ED) non-admissions and hospitalizations are defined as those due to drug dependence, drug psychoses, or drug abuse and those due to poisoning by legally or illegally prescribed drugs (excluding alcohol) and medicinal substances. Poisoning codes are used to indicate overdose or wrong substance given or taken. An emergency department "non-admission" indicates an ED encounter that does not result in a hospital admission. A "hospitalization" indicates admission as a registered inpatient with a stay of 24 hours or more. Drug-induced ED non-admissions and hospitalizations may include a "principal" or first diagnosis related to drug use. In addition, any secondary diagnosis of drug use is informative because the first diagnosis, e.g. respiratory distress, may be a related but "non-drug" diagnosis.

This report examines all hospitalizations and emergency department non-admissions in all Connecticut acute care hospitals for the following conditions: 1) all drug-induced conditions; 2) all drug poisoning; 3) all chronic and acute opiate-induced conditions; and 4) opiate overdose. Inpatient and ED encounter data are presented for fiscal years 2000 to 2002, the most recent three-year period for which data are available. Unless otherwise noted, all drug-induced ED non-admissions and hospitalizations reported here refer to the principal diagnosis only.

Drug-Induced and Drug Poisoning ED Non-Admissions and Hospitalizations

A. ED Non-Admissions

Among ED non-admissions in Connecticut hospitals for 2000-2002, 30,206 carried a "drug-induced" principal diagnosis, whereas 50,890 ED non-admissions carried *any* (principal or secondary) drug-induced diagnosis (See Appendix F for a detailed listing of ICD-9 CM diagnoses codes). Males accounted for about 61 percent of all ED non-admissions with any drug-induced diagnosis. Approximately 88 percent of cases with any drug-induced diagnosis were between the ages of 15 and 49 with the highest rates occurring among those aged 20 to 39 (data not shown).

Drug-induced and drug poisoning ED non-admissions (principal diagnosis only) for 2000-2002 are displayed in Table 4. Poisonings, defined as an overdose or wrong substance given or taken, accounted for 34.7 percent of all drug-induced ED non-admissions in the three-year period. Males made up the majority of all drug-induced ED non-admissions (60.2 percent), whereas females made up the majority of poisoning ED non-admissions (53.8 percent). Patients aged 15 to 49 accounted for about 85 percent of drug-induced ED non-admissions, with the highest rates occurring in persons aged 20 to 34 years. The highest rates of drug poisoning ED non-admissions were found among persons aged 15 to 24 (data not shown).

The number of drug-induced ED non-admissions increased by 27 percent from 2000 to 2002, while the number of drug poisoning ED non-admissions remained relatively unchanged. Thus, most of the increase in drug-induced ED non-admissions occurred in the drug psychoses, drug dependence and drug abuse subcategories. During this same period, all ED non-admissions in Connecticut acute care hospitals increased by about 8 percent. The observed increase in drug-induced conditions appears to be sizeable relative to the overall increase in ED non-admissions (Pell and Lyon, unpublished data).

Table 4. Drug-Induced Emergency Department Non-Admissions, Principal Diagnosis Only - Connecticut Acute Care Hospitals, 2000-2002

Year		All Drug-Induced (ICD-9 CM CODES 292, 304, 305.2-.9, 960-979)		Drug Poisoning Only (ICD-9 CM CODES 960-979)	
		Number	Percent	Number	Percent
2000	All	8,865	100.0	3,445	100.0
	Male	5,196	58.6	1,594	46.3
	Female	3,669	41.4	1,851	53.7
2001	All	10,048	100.0	3,387	100.0
	Male	6,104	60.7	1,557	46.0
	Female	3,944	39.3	1,830	54.0
2002	All	11,293	100.0	3,661	100.0
	Male	6,882	60.9	1,699	46.4
	Female	4,411	39.1	1,962	53.6
3-Year Total	**All**	**30,206**	**100.0**	**10,493**	**100.0**
	Male	18,182	60.2	4,850	46.2
	Female	12,024	39.8	5,643	53.8

B. Hospitalizations

For the period 2000-2002, 11,811 hospitalizations had a "drug-induced" principal diagnosis. Almost four times as many hospitalizations (44,756) had drug-induced as *any* (principal or secondary) diagnosis. Males accounted for 54.5 percent of hospitalizations with any drug-induced diagnosis. About 80 percent of all cases with any drug-induced diagnosis were aged 15 to 49 with the highest rates occurring among persons aged 35 to 44 (data not shown).

Drug-induced and drug poisoning hospitalizations for 2000-2002 are displayed in Table 5. Poisonings accounted for about 47.1 percent of all drug-induced hospitalizations in the three-year period. Males accounted for 52.7 percent of all drug-induced hospitalizations, but females comprised the majority of all poisoning hospitalizations (57.2 percent) for 2000-2002. Persons aged 15 to 49 accounted for 78.7 percent of drug-induced hospitalizations with the highest rates occurring in those aged 30 to 44 years. The highest rates of drug poisoning hospitalizations were found among patients aged 15 to 44 (data not shown).

The numbers of drug-induced and drug-poisoning hospitalizations were generally stable from 2000 to 2002. Relative to all hospitalizations in Connecticut acute care hospitals, drug-induced hospitalizations appeared to decline during this period. Whereas drug-induced hospitalizations decreased by 2.6 percent, all hospitalizations increased by about 5 percent (Pell and Lyon, unpublished data).

Table 5. Drug-Induced Hospitalizations, Principal Diagnosis Only - Connecticut Acute Care Hospitals, 2000-2002

Year		All Drug-Induced (ICD-9 CM CODES 292, 304, 305.2-.9, 960-979)		Drug Poisoning Only (ICD-9 CM CODES 960-979)	
		Number	Percent	Number	Percent
2000	All	4,002	100.0	1,863	100.0
	Male	2,063	51.5	786	42.2
	Female	1,939	48.5	1,077	57.8
2001	All	3,912	100.0	1,798	100.0
	Male	2,070	52.9	761	42.3
	Female	1,842	47.1	1,037	57.7
2002	All	3,897	100.0	1,901	100.0
	Male	2,090	53.6	835	43.9
	Female	1,807	46.4	1,066	56.1
3-Year Total	**All**	**11,811**	**100.0**	**5,562**	**100.0**
	Male	6,223	52.7	2,382	42.8
	Female	5,588	47.3	3,180	57.2

Opiate-Induced and Opiate Poisoning ED Non-Admissions and Hospitalizations

A. ED Non-Admissions

Opiate-induced and opiate poisoning ED non-admissions for 2000-2002 are displayed in Table 6. Poisonings accounted for about 20.4 percent of all opiate-induced ED non-admissions in the three-year period. Males made up the majority of all opiate-induced and opiate poisoning ED non-admissions (approximately 71 percent) for 2000-2002. Patients aged 15 to 49 accounted for 94 percent of opiate-induced ED non-admissions, with the highest rates occurring in persons aged 20 to 34 years. The highest rates of opiate poisoning ED non-admissions occurred among those aged 20 to 44 (data not shown).

The number of opiate-induced ED non-admissions increased by 50 percent from 2000 to 2002, while the number of opiate poisoning ED non-admissions remained relatively stable. Thus, most of the increase in opiate-induced ED non-admissions occurred in the drug psychoses, drug dependence and drug abuse subcategories. During this same period all ED non-admissions in Connecticut acute care hospitals increased by about 8 percent, so the observed increase in opiate-induced conditions appears to be large relative to the overall increase in ED non-admissions (Pell and Lyon, unpublished data).

Table 6. Opiate-Induced Emergency Department Non-Admissions, Principal Diagnosis Only - Connecticut Acute Care Hospitals, 2000-2002

Year		All Opiate-Induced (ICD-9 CM CODES 304.0, 304.7, 305.5, 965.0)		Opiate Poisoning Only (ICD-9 CM CODE 965.0)	
		Number	Percent	Number	Percent
2000	All	2,225	100.0	591	100.0
	Male	1,579	71.0	435	73.6
	Female	646	29.0	156	26.4
2001	All	2,943	100.0	524	100.0
	Male	2,096	71.2	364	69.5
	Female	847	28.8	160	30.5
2002	All	3,339	100.0	619	100.0
	Male	2,333	69.9	431	69.6
	Female	1,006	30.1	188	30.4
3-Year Total	**All**	**8,507**	**100.0**	**1,734**	**100.0**
	Male	6,008	70.6	1,230	70.9
	Female	2,499	29.4	504	29.1

B. Hospitalizations

Opiate-induced and opiate poisoning hospitalizations for 2000-2002 are displayed in Table 7. Poisonings accounted for 16.4 percent of all opiate-induced hospitalizations in the three-year period. Males made up 63.8 percent of all opiate-induced hospitalizations and 58 percent of all opiate poisoning hospitalizations. Connecticut residents aged 15 to 49 accounted for almost 90 percent of opiate-induced hospitalizations, with the highest rates occurring in persons aged 30 to 44 years. The highest rates of opiate poisoning hospitalizations occurred among those aged 30 to 49 (data not shown).

The number of opiate-induced hospitalizations remained relatively unchanged from 2000 to 2002, while the number of opiate poisoning hospitalizations increased by about 27 percent. The increase in opiate poisoning hospitalizations appears large relative to the increase in all hospitalizations during this period, which was about 5 percent (Pell and Lyon, unpublished data).

Table 7. Opiate-Induced Hospitalizations, Principal Diagnosis Only - Connecticut Acute Care Hospitals, 2000-2002

Year		All Opiate-Induced (ICD-9 CM CODES 304.0, 304.7, 305.5, 965.0)		Opiate Poisoning Only (ICD-9 CM CODE 965.0)	
		Number	Percent	Number	Percent
2000	All	1,216	100.0	200	100.0
	Male	753	61.9	119	59.5
	Female	463	38.1	81	40.5
2001	All	1,393	100.0	212	100.0
	Male	894	64.2	114	53.8
	Female	499	35.8	98	46.2
2002	All	1,215	100.0	255	100.0
	Male	792	65.2	154	60.4
	Female	423	34.8	101	39.6
3-Year Total	**All**	**3,824**	**100.0**	**667**	**100.0**
	Male	2,439	63.8	387	58.0
	Female	1,385	36.2	280	42.0

VI. CONNECTICUT POISON CONTROL CENTER DRUG-RELATED EMERGENCY CALLS, 2000-2002

Approximately 40 percent of all calls to the Connecticut Poison Control Center (CPCC) involve "exposures" to pharmaceutical substances, or more than 12,000 calls annually for the period 2000-2002.[3] A "poisoning exposure" may often, but not always, indicate a case of overdose. Prescription drugs, over-the-counter medications, and other supplements comprised about 96 percent of all pharmaceutical-related calls to the CPCC, while heroin and other street drugs and stimulants accounted for a total of about 3 percent of such calls (Table 8). Exposures by children aged 5 and younger accounted for about 45 percent of all pharmaceutical-related calls to the CPCC during this period, while exposures by adults aged 20 and older accounted for about 37 percent of all such calls.

Table 8. Connecticut Poison Control Center Contacts Regarding Exposures to Pharmaceuticals, 2000-2002

	All Pharmaceuticals		**Prescription, Over the Counter Drugs, and Other Supplements**		**Heroin**		**All Other Street Drugs and Stimulants**		**Unknown Drug**	
Year	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2000	12,607	100%	12,067	96%	38	< 1%	352	3%	150	1%
2001	12,767	100%	12,265	96%	27	< 1%	338	3%	137	1%
2002	13,381	100%	12,774	96%	42	< 1%	423	3%	142	1%
Total	**38,755**	**100%**	**37,106**	**96%**	**102**	**< 1%**	**1,113**	**3%**	**429**	**1%**

[3] "Pharmaceutical substances" include the following categories of drugs: analgesics, anesthetics, anticholinergic drugs, anticoagulants, anticonvulsants, antidepressants, antihistamines, antimicrobials, antineoplastics, asthma therapies, cardiovascular drugs, cold and cough preparations, diagnostic agents, dietary supplements/herbals/homeopathic, diuretics, electrolytes and minerals, eye/ear/nose/throat preparations, gastrointestinal preparations, hormones and hormone antagonists, miscellaneous drugs, muscle relaxants, narcotic antagonists, radiopharmaceuticals, sedative/hypnotics/antipsychotics, serums/toxoids/vaccines, stimulants and street drugs, topical preparations, veterinary drugs, vitamins, and unknown drugs.

About 63 percent of all phone calls regarding heroin exposures involved persons aged 20 to 39 (Figure 6), and male victims accounted for 68 percent of all heroin-related calls to CPCC. The victim's home was the most common location identified for heroin exposure phone calls, followed by some public location (Figure 7). Other opioid exposures commonly reported to CPCC for the 2000-2002 period included codeine, meperidine, methadone, morphine, oxycodone, and propoxyphene.

Figure 6. Heroin Exposure Calls to the Connecticut Poison Control Center, Percent by Age of Victim – 2000-2002

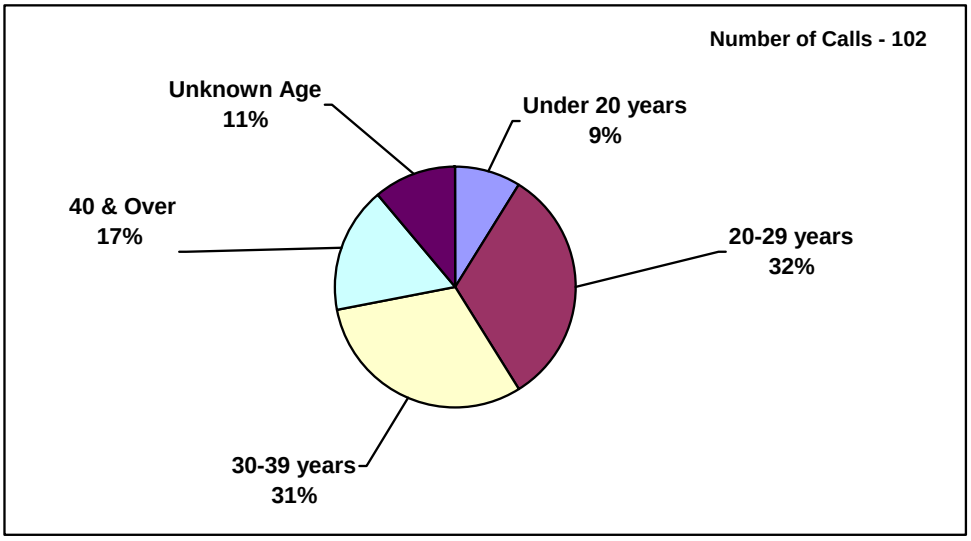
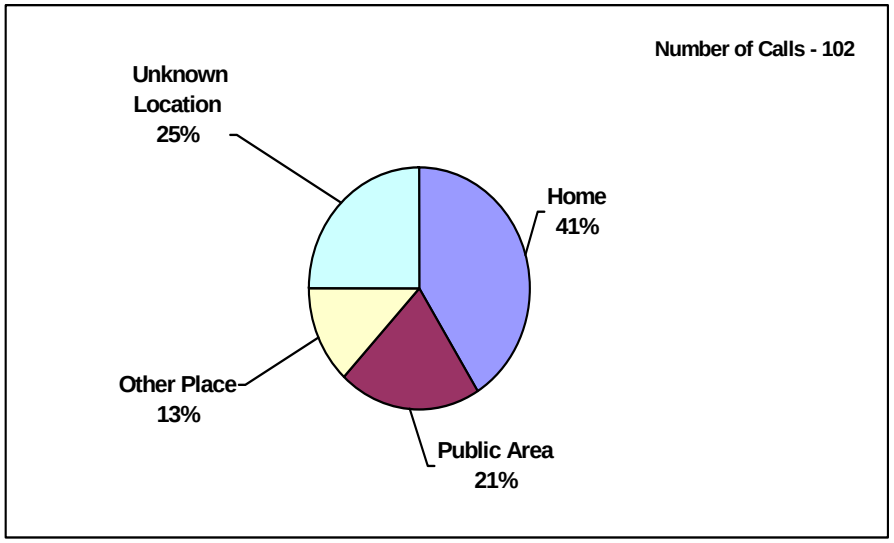


Figure 7. Heroin Exposure Calls to the Connecticut Poison Control Center, Percent by Location of Occurrence – 2000-2002



Medical Outcomes of Poisoning Exposures

Approximately four percent of all pharmaceutical poisoning exposures reported to CPCC in the 2000-2002 period were characterized as "adverse reactions," that is, an adverse experience that occurred with normal, prescribed, labeled, or recommended use of the drug. Thirty-eight percent of these cases were managed within a health care facility. About two percent of heroin exposures reported during the same period were characterized as adverse reactions and 94 percent of heroin exposures reported were managed in a health care facility.

CPCC also characterizes poisoning exposures by type of effect. During the 2000-2002 period, 16 percent of all pharmaceutical exposures were characterized as having "no effect," meaning that the patient did not develop symptoms as a result of exposure. Twenty-three percent were characterized as 1)"minor effect" or 2)"moderate effect," meaning that 1) the patient exhibited minimal symptoms from the exposure, or 2) symptoms that were more pronounced or more prolonged as a result of the exposure. Four percent of all pharmaceutical exposures were characterized as having a "major effect," that is life-threatening symptoms or symptoms that resulted in significant disability or disfigurement. Less than one percent of all pharmaceutical exposures reported to CPCC resulted in the death of the patient.

Heroin poisoning exposures reported to CPCC during this same period were characterized with greater severity of effects compared to all pharmaceutical exposures. While 11 percent of heroin exposures were characterized as having no effect, 45 percent were characterized as having either minor or moderate effect, 25 percent reported major effect, and two percent resulted in death.

VII. COMMUNITY-BASED STUDIES, 1999-2001 AND 1998-2000

While Department of Public Health and Connecticut Hospital Association databases contain information about fatal drug overdoses and non-fatal drug overdoses that present themselves to the hospital or emergency department, very little is known about persons having non-fatal overdoses who do *not* seek out medical assistance. Research evidence suggests that active intravenous (i.v.) drug users, fearing police involvement, may not always seek out emergency medical treatment for heroin overdose (Sporer 1999).

Findings from two Yale University studies of adult i.v. drug users in Hartford, New Haven, and Springfield, Massachusetts (1999-2001) and Hartford, Chicago, Illinois, and Oakland, California (1998-2000) support this observation. The Hartford, New Haven, and Springfield survey of 988 users found that about 39 percent of participants reported having ever had an overdose and about 23 percent of those who overdosed did not seek out medical attention for the overdose. About 35 percent of Hartford participants (N=147) in the Hartford, Chicago, and Oakland study reported ever having had an overdose and about 40 percent of those who overdosed did not seek out medical attention (Grau and Heimer, unpublished data).

Because these two studies did not employ random samples of the drug-using population in Connecticut and other cities, it is not possible to extrapolate their findings to the larger population. Nevertheless, both studies present strong and consistent evidence that a substantial number of injectors do not seek medical attention for treatment of their drug overdose. Further research is needed to identify the specific structural and perceived barriers to medical treatment of drug overdose.

VIII. SUGGESTIONS FOR IMPROVEMENTS IN DATA COLLECTION & ANALYSIS

The Connecticut resident age-adjusted drug-induced death rate and the heroin overdose crude death rate (a leading subtype of drug-induced deaths in Connecticut) increased significantly between 1992 and 1998. Both of these trends are notable. It is also worth noting that Connecticut male drug-induced death rates exceeded comparable U.S. figures for the 1992-1998 period, while the Connecticut female drug-induced death rate exceeded the comparable U.S. figure for 1998. Continued surveillance of drug-induced mortality as well as its major subtypes in Connecticut is warranted. While this report presented hospitalizations and emergency department encounter trends for Connecticut, significance testing of these trends was not conducted. Data presented for 2000-2002 provide baseline information by which to monitor long-term hospitalization and ED trends in the future. Calls to the Connecticut Poison Control Center provide useful information by which to monitor types of prescription and illicit drug poisoning, although they are not a critical source of poisoning mortality data. Community-based studies can provide important contextual information regarding the circumstances surrounding drug use and drug overdose in Connecticut.

In addition to continued surveillance of drug-induced morbidity and mortality in Connecticut, a few areas warrant further study: 1) the role of combinations of drugs in overdose morbidity and mortality; 2) a more detailed profile of drug overdose victims, including the sociodemographics, patterns of drug use, and circumstances surrounding the drug overdose; and finally, 3) an evaluation of naloxone hydrochloride as an intervention strategy in the treatment of drug overdose. A discussion of the resources required to make these enhancements is beyond the scope of this report.

Role of Multiple Drug Use

Research studies suggest that multiple drug use is involved in more than 50 percent of non-fatal overdoses (McGregor, Darke, et al. 1998; Ochoa, Hahn, et al. 2001) and drug poisoning deaths (Darke, Shane, et al. 1996; Strang, Griffiths, et al. 1999; Coffin, Galea, et al. 2003). Data also suggest that drug combinations such as opiates, cocaine, and/or alcohol may account for a sizeable portion of non-fatal and fatal unintentional drug overdoses (Coffin, Galea, et al. 2003). Some research suggests that concomitant use of other central nervous system (CNS) depressants besides alcohol, like benzodiazepines, appears to be a common practice among heroin users. Simultaneous use of CNS depressants with heroin may make a "normal" dose of heroin fatal (Darke, Shane et al. 1996). An examination of multiple drug overdose patterns and trends may shed light on their

relationship to overdose mortality, suggest appropriate interventions to prevent overdose, and predict future overdose trends (Coffin, Galea, et al. 2003).

This report primarily uses underlying (principal) cause of death information from the death record to identify drug-induced and poisoning deaths. The use of the secondary cause of death codes as well as medical examiner records in addition to underlying-cause codes can improve cause-of-death classification (Landen, Castle, et al. 2003). Multiple cause of death information in the mortality data files can provide additional information by which to specify poisoning or overdose deaths. One large subcategory of drug poisoning deaths in the ICD-9 "unintentional poisoning due to other drugs" is used when multiple drugs are reported in Part I of the death certificate but the drugs are of different types, e.g., opiates and cocaine (Landen, Castle, et al. 2003). During the 1992 to 1998 period, for example, 156 Connecticut resident deaths were identified as "unintentional poisoning due to other drugs" (E 858.8). More specific information on type of drug involved may be available in the secondary cause of death field on the death record. Currently the Department of Public Health (DPH) mortality file for ICD-9 classified deaths (1998 and prior years) does not contain information on poisoning subcategories that may appear as secondary causes of death. For technical reasons, certain cause of death codes that are not routinely used in morality tabulations are omitted from the DPH death files prior to 1999. These include the ICD-9 natural cause of death codes in the range 800-999. Special arrangements would need to be made with National Center for Health Statistics to obtain this information for Connecticut.

The Office of the Chief Medical Examiner is an additional source of information on Connecticut resident drug-related deaths. According to Connecticut law, all drug deaths related to poisoning, drug abuse, or addiction are considered reportable cases to the OCME. About 4,000 of a total of 32,000 deaths annually in Connecticut result in Medical Examiner (ME) death certificates. While there is a close correspondence between drug-related deaths in the ME and the DPH mortality databases, there is not complete correspondence. The disparity in the death counts may be due to two factors: one, some Connecticut resident deaths in the DPH database may not have occurred in state and hence are not Connecticut "ME cases;" and secondly, while the OCME database is continually updated based on new information regarding cause of death, the DPH data system (part of the National Center for Health Statistics system) is a closed system that is not updated once it is closed each year following completion of normal processing. A New Mexico study found that use of records from both the state mortality database and the ME database identified 5.4 percent more poisoning deaths than records from either database alone (Landen, Castle, et al. 2003). Supplementing DPH drug-related mortality with OCME data would allow for better specification of drug poisoning cause(s) of death.

A Profile of Drug Overdose Victims

Research also suggests that fatal heroin overdose commonly occurs in older, dependent users, who are predominantly male. Connecticut data show that numbers of unintentional heroin overdose deaths and death rates (2000-2002) are highest in the 40-44 year old age group and that males

comprise about 84 percent of all decedents. One study of unintentional drug overdose deaths in New York City suggests that the combinations of drugs used differ by gender and within racial and ethnic subpopulations (Coffin, Galea, et al. 2003). A more detailed understanding of the common patterns of multiple drug use and overdose among population subgroups in Connecticut can provide useful information regarding appropriate intervention strategies.

Circumstances Leading to Non-Fatal Overdose

Two community-based studies of intravenous drug users in Connecticut indicated that a substantial number of persons experiencing an overdose did not seek out medical assistance. Further research is needed to identify the specific structural and perceived barriers to medical treatment of drug overdose in Connecticut. Several other studies have examined the circumstances of nonfatal overdose and found that a majority occurs in the home and in the presence of other people. The primary stated reason for not calling the 911 emergency response network was fear of police involvement (Sporer 1999). Other research studies of i.v. drug users point to some commonly stated reasons for nonfatal overdose including: higher dose than usual; more potent heroin than usual; heroin in combination with alcohol; and heroin use after a period of abstinence. Approximately 13 percent of people report that their last overdose followed release from prison or other incarceration program (Sporer 1999).

Circumstances Leading to Fatal Overdose

Research studies have indicated that the majority of overdose deaths occur in the presence of others, and that these fatalities occur over a relatively long period of time (e.g. over two or three hours). In a majority of fatal overdose cases, no medical intervention is sought prior to the victim's death (Darke, Shane, et al. 1996). These three facts suggest that there may be a missed opportunity for life-saving interventions in many drug overdose deaths.

Other studies have suggested that a loss of tolerance after prolonged abstinence may play a role in drug-related deaths. One British study found higher overdose mortality among persons in the year after they had successfully completed inpatient treatment for opiate addiction compared with other patients who did not complete treatment (Strang, McCambridge, et al. 2003). Other studies have found increased mortality among former injection drug users soon after release from prison (Seaman, Brettle, et al. 1998; Bird and Hutchinson 2003). The problem of opiate overdose following a period of non-use deserves further study and may present a promising opportunity for prevention.

Evaluation of the Effectiveness of Naloxone Hydrochloride as an Intervention Strategy in the Treatment of Drug Overdose

PA 03-159 allows certain licensed health care practitioners in Connecticut to prescribe, dispense, distribute, or administer an opioid antagonist, such as naloxone hydrochloride, to a drug user for treatment of a drug overdose without being civilly or criminally liable. Naloxone appears to be the most promising current intervention strategy to reduce overdose mortality. Given this fact, several

issues regarding the more widespread use of naloxone in the treatment of drug overdose should be addressed. Expressed concerns include the possibility that with easy access to naloxone users may be less likely to seek out emergency medical services, and that they may be more likely to use more or more potent drugs (Galea and Coffin 2003). Evaluation studies that address such concerns and also determine the effectiveness of naloxone in reducing narcotics overdose deaths in a variety of community settings are warranted.

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APPENDIX A.

Substitute Senate Bill No. 1144

Public Act No. 03-159

AN ACT CONCERNING THE TREATMENT OF DRUG OVERDOSES.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. (*Effective July 1, 2003*) The Commissioner of Public Health shall publish a report on state-wide drug overdose trends that reviews state death rates from available data to ascertain changes in the causes or rates of fatal and nonfatal drug overdoses for the preceding period of not less than three years. The report shall include: (1) Trends in drug overdose death rates; and (2) suggested improvements in data collection. The commissioner shall report, in accordance with section 11-4a of the general statutes, on or before January 1, 2004, to the Governor and the joint standing committee of the General Assembly having cognizance of matters relating to public health.

Sec. 2. (NEW) (*Effective October 1, 2003*) A licensed health care professional who is permitted by law to prescribe an opioid antagonist may, if acting with reasonable care, prescribe, dispense or administer an opioid antagonist to a drug user in need of such intervention without being liable for damages to such person in a civil action or subject to criminal prosecution. For purposes of this section, "opioid antagonist" means naloxone hydrochloride or any other similarly acting and equally safe drug approved by the federal Food and Drug Administration for the treatment of drug overdose.

Approved June 26, 2003

APPENDIX B. SOURCES OF INFORMATION

Connecticut Department of Public Health Death Files

Mortality data, the key source of information for drug-induced deaths and fatal opiate overdoses, are taken from the Connecticut Death Registry. Virtually all deaths occurring to Connecticut residents in the United States and Canada are included in this database. Mortality data are derived from the cause of death information reported on Connecticut death certificates that are completed by funeral directors, attending physicians, medical examiners, or coroners. Sociodemographic information on death certificates is often based on report by next of kin. Original records are filed in the state registration offices.

Classification of cause of death data is based on the International Classification of Diseases, the internationally accepted coding system for determining the underlying and contributing causes of death (World Health Organization 1977). The ICD is revised periodically to take into account the discovery of new diseases and advances in medical diagnoses. Deaths from 1979 through 1998 are classified according to the ninth revision of the International Classification of Diseases, or ICD-9. In this report, Connecticut resident deaths due to drug-induced causes and opiate overdoses are reported for the period 1992-1998. Beginning with 1999 deaths, the ICD-9 was replaced by the tenth revision of the International Classification of Diseases (ICD-10). Changes adopted with the ICD-10 coding affect how the leading causes of death are determined (Anderson and Rosenberg 1998). As a result, drug-induced deaths and fatal overdoses for 1999-2000 are not comparable to drug-induced deaths and fatal overdoses for the 1992-1998 period. Consequently, 1999-2000 Connecticut resident drug-induced deaths and fatal overdoses are reported separately from 1992-1998 deaths in this report. ICD-9 and ICD-10 codes are listed in Appendices C and D, respectively, of this report. Appendix E contains a discussion of the comparability of ICD-9 and ICD-10 classifications of drug-induced deaths.

Connecticut Hospital Association
Inpatient Hospitalization and Emergency Department Non-Admission Data

Statewide aggregate inpatient hospitalization and emergency department (ED) data were obtained from the Connecticut Hospital Association's ChimeData program. The ChimeData program obtains encounter-level demographic, clinical, and billing data from all non-federal acute care hospitals in Connecticut. Counts of hospitalizations or ED encounters reflect hospitalizations or ED discharges, not persons. For example, a patient admitted to a hospital or ED on two separate occasions in 2000 would be counted twice in these data. In this report, hospitalization and ED discharges are reported for the fiscal years 2000 through 2002 (October 1, 1999 through September 30, 2002). These data sets contain information on both Connecticut residents and non-residents who received care in the state during this time period.

Diagnoses related to hospitalizations and ED visits through 2002 are coded according to the ninth revision of the International Classification of Diseases, Clinical Modification or ICD-9-CM. ICD-9-CM codes are listed in Appendix F of this report.

Connecticut Poison Control Center (CPCC) Telephone Hotline Data

The Connecticut Poison Control Center provides 24-hour emergency telephone hotline service for poisoning exposures in the state and is staffed by medical specialists in poisoning management. CPCC data on phone calls related to poisoning by pharmaceuticals and other drugs for the years 2000 through 2002 are presented in this report. A poisoning exposure is defined as anything foreign that enters or contacts the body via any route; it may often, but not always, indicate an overdose. Exposure data are reported as *occurrences*, not individuals. In other words, one individual may have multiple exposures reported within any given year, and so would be counted multiple times during the period.

Blinded exposure data collected by CPCC are sent to the Toxic Exposure Surveillance System (TESS), a national database of poisoning statistics. CPCC is a "passive" surveillance system in that it relies on information reported on a voluntary basis. While CPCC data are one important source of information on poisoning, these data should not be interpreted as being inclusive or representative of all poisoning occurrences in the state.

Community-Based Studies (Yale University)

Information on intravenous drug users' overdose experiences were obtained from the following community based studies:

The *Syringe Access, Use, and Discard: Context in AIDS Risk* (SAUDA) project used epidemiological, ethnographic, and bioassay research methods to identify and compare risk factors for HIV and hepatitis infection at the individual, neighborhood, and city level. Participants were adults 18 years and older who reported having injected illicit drugs in the past 30 days. A total of 988 surveys were completed between December 1999 and December 2001. (Hartford=337, Springfield, Massachusetts=331 New Haven=320). The sample was 70 percent male and 30 percent female. Most participants were middle age, from low-income, minority backgrounds. Thirty-three percent of survey participants were African-American, 20 percent white, 46 percent Hispanic and one percent other ethnicities. The mean age of participants was 39 years with a range of 18 to 67 years.

The *Diffusion of Benefit through Syringe Exchange Programs* (DOB) project sought to determine whether there was a diffusion of benefit (e.g., harm reduction equipment and HIV prevention information) beyond direct syringe exchange participants. A total of 584 participants completed baseline interviews between July 1998 and December 2000 in the three

study sites (Chicago, Illinois=289, Hartford=147, Oakland, California=148). Participants were adults 18 years and older who reported having injected illicit drugs in the past 30 days. The sample was 57.5 percent male and 42.5 percent female. Most participants were middle age, from urban, low-income, minority backgrounds. Approximately 41 percent of participants were African-American, 18 percent white, 38 percent Hispanic and 3 percent other ethnicities. The mean age of participants was 41 years with a range of 18 to 68 years (Grau and Heimer, unpublished data).

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Appendix C.

ICD-9 Drug-Induced Death Subcategories
(292, 304, 305.2-.9, E850-E858, E950.0-.5, E962.0, E980.0-.5)

292 Drug Psychoses
- 292.0 Drug withdrawal syndrome
- 292.1 Paranoid and/or hallucinatory states induced by drugs
- 292.2 Pathological drug intoxiction

No other subcategories listed
- 292.8 Other
- 292.9 Unspecified

304 Drug Dependence
- 304.0 Morphine type
- 304.1 Barbiturate type
- 304.2 Cocaine
- 304.3 Cannabis
- 304.4 Amphetamine type and other psychostimulants
- 304.5 Hallucinogens
- 304.6 Other
- 304.7 Combinations of morphine type drug with any other
- 304.8 Combinations excluding morphine type drug
- 304.9 Unspecified

305 Nondependent Abuse of Drugs (305.2-305.9 only)
- 305.2 Cannabis
- 305.3 Hallucinogens
- 305.4 Barbiturates and tranquilizers
- 305.5 Morphine type
- 305.6 Cocaine type
- 305.7 Amphetamine type
- 305.8 Antidepressants
- 305.9 Other, mixed or unspecified

E850-E858 Accidental Poisoning by Drugs, Medicaments and Biologicals

E850 Accidental poisoning by analgesics, antipyretics, antirheumatics
- E850.0 Opiates and related narcotics
- E850.1 Salicylates
- E850.2 Aromatic analgesics, not elsewhere classified
- E850.3 Pyrazole derivatives
- E850.4 Antirheumatics
- E850.5 Other non-narcotic analgesics

No other subcategories listed
- E850.8 Other
- E850.9 Unspecified

E851 Accidental poisoning by barbiturates

E852 Accidental poisoning by other sedatives and hypnotics
- E852.0 Chloral hydrate group
- E852.1 Paraldehyde
- E852.2 Bromine compounds
- E852.3 Methaqualone compounds
- E852.4 Glutethimide group
- E852.5 Mixed sedatives, not elsewhere classified

No other subcategories listed
- E852.8 Other
- E852.9 Unspecified

Appendix C. continued
ICD-9 Drug-Induced Death Subcategories

E853 Accidental poisoning by tranquilizers
- E853.0 Phenothiazine-based
- E853.1 Butyrophenone-based
- E853.2 Benzodiazepine-based

No other subcategories listed
- E853.8 Other
- E853.9 Unspecified

E854 Accidental poisoning by other psychotropic agents
- E854.0 Antidepressants
- E854.1 Psychodysleptics [Hallucinogens]
- E854.2 Psychostimulants
- E854.3 Central nervous system stimulants

No other subcategories listed

E855 Accidental poisoning by other drugs acting on central and autonomic nervous systems
- E855.0 Anticonvulsant and anti-Parkinsonism drugs
- E855.1 Other central nervous system depressants
- E855.2 Local anaesthetics
- E855.3 Parasympathomimetics
- E855.4 Parasympatholytics and spasmolytics
- E855.5 Sympathomimetics
- E855.6 Sympatholytics

No other subcategories listed
- E855.8 Other
- E855.9 Unspecified

E856 Accidental poisoning by antibiotics

E857 Accidental poisoning by anti-infectives

E858 Accidental poisoning by other drugs
- E858.0 Hormones and synthetic substitutes
- E858.1 Primarily systemic agents
- E858.2 Agents primarily affecting blood constituents
- E858.3 Agents primarily affecting cardiovascular system
- E858.4 Agents primarily affecting gastrointestinal system
- E858.5 Water, mineral and uric acid metabolism drugs
- E858.6 Agents primarily acting on the smooth and skeletal muscles and respiratory system

E858.7 Agents primarily affecting skin and mucous membrane, ophthalmological, otorhinolaryngological and dental drugs
- E858.8 Other
- E858.9 Unspecified

E950 Suicide and self-inflicted injury (E950.0-E950.5 only)
- E950.0 Analgesics, antipyretics and antirheumatics
- E950.1 Barbiturates
- E950.2 Other sedatives and hypnotics
- E950.3 Tranquilizers and other psychotropic agents
- E950.4 Other specified drugs and medicaments
- E950.5 Unspecified drug or medicament

E962 Assault by poisoning (E962.0 only)
- E962.0 Drugs and medicaments

Appendix C. continued
ICD-9 Drug-Induced Death Subcategories

E980 Poisoning by solid or liquid substances, undetermined whether accidentally or purposely inflicted (E980.0-E980.5 only)
- E980.0 Analgesics, antipyretics and antirheumatics
- E980.1 Barbiturates
- E980.2 Other sedatives and hypnotics
- E980.3 Tranquilizers and other psychotropic agents
- E980.4 Other specified drugs and medicaments
- E980.5 Unspecified drug or medicament

APPENDIX D.

ICD-10 Drug-Induced Death Subcategories

(F11.0-.5, F11.7-.9, F12.0-F12.5, F12.7-9, F13.0-.5, F13.7-.9, F14.0-.5, F14.7-.9, F15.0-.5, F15.7-.15.9, F16.0-.5, F16.7-.9, F17.0, F17.3-.5, F17.7-.9, F18.0-.5, F18.7-.9, F19.0-.5, F19.7-.9, X40-X44, X60-X64, X85, Y10-Y14)

F11	Mental and behavioral disorders due to use of opioids	
	F11.0	Acute intoxication
	F11.1	Harmful use
	F11.2	Dependence syndrome
	F11.3	Withdrawal state
	F11.4	Withdrawal state with delirium
	F11.5	Psychotic disorder
	F11.7	Residual and late-onset psychotic disorder
	F11.8	Other mental and behavioral disorders
	F11.9	Unspecified mental and behavioral disorder
F12	Mental and behavioral disorders due to use of cannabinoids	
	F12.0	Acute intoxication
	F12.1	Harmful use
	F12.2	Dependence syndrome
	F12.3	Withdrawal state
	F12.4	Withdrawal state with delirium
	F12.5	Psychotic disorder
	F12.7	Residual and late-onset psychotic disorder
	F12.8	Other mental and behavioral disorders
	F12.9	Unspecified mental and behavioral disorder
F13	Mental and behavioral disorders due to use of sedatives or hypnotics	
	F13.0	Acute intoxication
	F13.1	Harmful use
	F13.2	Dependence syndrome
	F13.3	Withdrawal state
	F13.4	Withdrawal state with delirium
	F13.5	Psychotic disorder
	F13.7	Residual and late-onset psychotic disorder
	F13.8	Other mental and behavioral disorders
	F13.9	Unspecified mental and behavioral disorder
F14	Mental and behavioral disorders due to use of cocaine	
	F14.0	Acute intoxication
	F14.1	Harmful use
	F14.2	Dependence syndrome
	F14.3	Withdrawal state
	F14.4	Withdrawal state with delirium
	F14.5	Psychotic disorder
	F14.7	Residual and late-onset psychotic disorder
	F14.8	Other mental and behavioral disorders
	F14.9	Unspecified mental and behavioral disorder

APPENDIX D. continued
ICD-10 Drug-Induced Death Subcategories

F15	Mental and behavioral disorders due to use of other stimulants, including caffeine	
	F15.0	Acute intoxication
	F15.1	Harmful use
	F15.2	Dependence syndrome
	F15.3	Withdrawal state
	F15.4	Withdrawal state with delirium
	F15.5	Psychotic disorder
	F15.7	Residual and late-onset psychotic disorder
	F15.8	Other mental and behavioral disorders
	F15.9	Unspecified mental and behavioral disorder
F16	Mental and behavioral disorders due to use of hallucinogens	
	F16.0	Acute intoxication
	F16.1	Harmful use
	F16.2	Dependence syndrome
	F16.3	Withdrawal state
	F16.4	Withdrawal state with delirium
	F16.5	Psychotic disorder
	F16.7	Residual and late-onset psychotic disorder
	F16.8	Other mental and behavioral disorders
	F16.9	Unspecified mental and behavioral disorder
F17	Mental and behavioral disorders due to use of tobacco	
	F17.0	Acute intoxication
	F17.3	Withdrawal state
	F17.4	Withdrawal state with delirium
	F17.5	Psychotic disorder
	F17.7	Residual and late-onset psychotic disorder
	F17.8	Other mental and behavioral disorders
	F17.9	Unspecified mental and behavioral disorder
F18	Mental and behavioral disorders due to use of volatile solvents	
	F18.0	Acute intoxication
	F18.1	Harmful use
	F18.2	Dependence syndrome
	F18.3	Withdrawal state
	F18.4	Withdrawal state with delirium
	F18.5	Psychotic disorder
	F18.7	Residual and late-onset psychotic disorder
	F18.8	Other mental and behavioral disorders
	F18.9	Unspecified mental and behavioral disorder
F19	Mental and behavioral disorders due to multiple drug use and use of other psychoactive substances	
	F19.0	Acute intoxication
	F19.1	Harmful use
	F19.2	Dependence syndrome
	F19.3	Withdrawal state
	F19.4	Withdrawal state with delirium
	F19.5	Psychotic disorder
	F19.7	Residual and late-onset psychotic disorder
	F19.8	Other mental and behavioral disorders
	F19.9	Unspecified mental and behavioral disorder
X40	Accidental poisoning by and exposure to nonopioid analygesics, antipyretics and antirheumatics	
X41	Accidental poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	

APPENDIX D. continued
ICD-10 Drug-Induced Death Subcategories

X42	Accidental poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified
X43	Accidental poisoning by and exposure to other drugs acting on the autonomic nervous system
X44	Accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances
X60	Intentional self-poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics
X61	Intentional self-poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified
X62	Intentional self-poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified
X63	Intentional self-poisoning by and exposure to other drugs acting on the autonomic nervous system
X64	Intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances
X85	Assault by drugs, medicaments and biological substances
Y10	Poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics, undetermined intent
Y11	Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified, undetermined intent
Y12	Poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified undetermined intent
Y13	Poisoning by and exposure to other drugs acting on the autonomic nervous system, undetermined intent
Y14	Poisoning by and exposure to other and unspecified drugs, medicaments and biological substances, undetermined intent

Additional (non-primary) codes that specify heroin and other narcotics:

T40	Poisoning by narcotics and psychodysleptics [hallucinogens]	
	T40.0	Opium
	T40.1	Heroin
	T40.2	Other opoids
	T40.3	Methadone
	T40.4	Other synthetic narcotics

Appendix E. ICD-9 and ICD-10 Comparability Ratios

1996 Drug-Induced Deaths Using ICD-9 and ICD-10 Comparability Ratios

Approximately every ten to twenty years, the International Classification of Diseases (ICD) used to classify causes of deaths is revised. Beginning with 1999 deaths, the International Classification of Disease, tenth revision (ICD-10) is used. The shift from the ICD-9 to ICD-10 revision has produced a disjuncture in the comparability of deaths prior to 1999 and those beginning in 1999. Extensive comparability of the ICD-9 and ICD-10 has been carried out by the National Center for Health Statistics (NCHS) with the key statistic used being the *comparability ratio*. A comparability ratio of 1.00 indicates that the same number of deaths was assigned to a particular cause of death for both the ICD-9 and ICD-10. Drug-induced deaths show a ratio of 1.1950 (ICD-9 assigned 969 U.S. resident deaths to drug-induced causes, while ICD-10 assigned 1,158 deaths to drug-induced causes in 1996). This indicates an almost 20 percent increase in assignments of deaths due to drug-induced causes in ICD-10 compared with drug-induced causes in ICD-9.

References

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Hoyert, Arias, Smith, et al. 2001. Deaths: Final data for 1999. *National Vital Statistics Reports* 49(8): 1-116.

Appendix F.

ICD-9CM Drug-Induced Hospitalization Subcategories (292, 304, 305.2-.9, 960-979)

Subcategories: Primary Diagnosis

292 Drug Psychoses
- 292.3 Drug withdrawal syndrome
- 292.4 Paranoid and/or hallucinatory states induced by drugs
- 292.5 Pathological drug intoxication

No other subcategories listed
- 292.10 Other
- 292.11 Unspecified

304 Drug Dependence
- 304.0 Opioid type
- 304.1 Barbiturate & similarly acting sedative or hypnotic
- 304.2 Cocaine
- 304.3 Cannabis
- 304.4 Amphetamine type and other psychostimulants
- 304.5 Hallucinogens
- 304.6 Other specified
- 304.7 Combinations of opioid type drug with any other
- 304.8 Combinations excluding opioid type drug
- 304.9 Unspecified

305 Nondependent Abuse of Drugs (305.2-305.9 only)
- 305.2 Cannabis
- 305.3 Hallucinogens
- 305.4 Barbiturates & similarly acting sedative or hypnotic
- 305.5 Opioid type
- 305.6 Cocaine type
- 305.7 Amphetamine or related acting sympathomimetic type
- 305.8 Antidepressants
- 305.9 Other, mixed or unspecified

960-979 Poisoning by Drugs, Medicinal and Biological Substances

960 Poisoning by Antibiotics
- 960.0 Penicillins
- 960.1 Antifungal antibiotics
- 960.2 Chloramphenicol group
- 960.3 Erythromycin and other macrolides
- 960.4 Tetracycline group
- 960.5 Cephalosporin group
- 960.6 Antimycobacterial
- 960.7 Antineoplastic
- 960.8 Other specified antibiotics
- 960.9 Unspecified antibiotics

961 Poisoning by Other Anti-infectives
- 961.0 Sulfonamides
- 961.1 Arsenical
- 961.2 Heavy metal
- 961.3 Quinoline and hydroxyquinoline derivatives
- 961.4 Antimalarials and drugs acting on other blood protozoa
- 961.5 Other Antiprotozoal
- 961.6 Anthelmintics
- 961.7 Antiviral
- 961.8 Other antimycobacterial
- 961.9 Other and unspecified anti-infectives

Appendix F. continued
ICD-9CM Drug-Induced Hospitalization Subcategories

962 Poisoning by Hormones and Synthetic Substitutes
- 962.0 Adrenal cortical steroids
- 962.1 Androgens and anabolic congeners
- 962.2 Ovarian hormones and synthetic substitutes
- 962.3 Insulins and antidiabetic agents
- 962.4 Anterior pituitary hormones
- 962.5 Posterior pituitary hormones
- 962.6 Parathyroid and parathyroid derivatives
- 962.7 Thyroid and thyroid derivatives
- 962.8 Antithyroid agents
- 062.9 Other and unspecified hormones and synthetic substitutes

963 Poisoning by Primarily Systemic Agents
- 963.0 Antiallergic and antiemetic drugs
- 963.1 Antineoplastic and immunosuppressive drugs
- 963.2 Acidifying agents
- 963.3 Alkalizing agents
- 963.4 Enzymes, not elsewhere classified
- 963.5 Vitamins, not elsewhere classified
- 963.8 Other specified systemic agents
- 963.9 Unspecified systemic agent

964 Poisoning by Agents Primarily Affecting Blood Constituents
- 964.0 Iron and its compounds
- 964.1 Liver preparations and other antianemic agents
- 964.2 Anticoagulants
- 964.3 Vitamin K
- 964.4 Fibrinolysis-affecting drugs
- 964.5 Anticoagulant antagonists and other coagulants
- 964.6 Gamma globulin
- 964.7 Natural blood and blood products
- 964.8 Other specified agents affecting blood constituents
- 964.9 Unspecified agent affecting blood constituents

965 Poisoning by Analgesics, Antipyretics, and antirheumatics
- 965.0 Opiates and related narcotics
- 965.1 Salicylates
- 965.4 Aromatic analgesics, not elsewhere classified
- 965.5 Pyrazole derivatives
- 965.6 Antirheumatics [antiphlogistics]
- 965.7 Other non-narcotic analgesics
- 965.8 Other specified analgesics and antipyretics
- 965.9 Unspecified analgesic and antipyretic

966 Poisoning by Anticonvulsants and Anti-Parkinsonism Drugs
- 966.0 Oxazolidine derivatives
- 966.1 Hydantoin derivatives
- 966.2 Succinimides
- 966.3 Other and unspecified anticonvulsants
- 966.4 Anti-Parkinsonism drugs

No other subcategories listed

Appendix F. continued
ICD-9CM Drug-Induced Hospitalization Subcategories

967 Poisoning by Sedatives and Hypnotics
- 967.0 Barbiturates
- 967.1 Chloral hydrate group
- 967.2 Paraldehyde
- 967.3 Bromine compounds
- 967.4 Methaqualone compounds
- 967.5 Glutethimide group
- 967.6 Mixed sedatives, not elsewhere classified
- 967.8 Other sedatives and hypnotics
- 967.9 Unspecified sedative or hypnotic

968 Poisoning by Other Central Nervous System Depressants and Anesthetics
- 968.0 Central nervous system muscle-tone depressants
- 968.1 Halothane
- 968.2 Other gaseous anesthetics
- 968.3 Intravenous anesthetics
- 968.4 Other and unspecified general anesthetics
- 968.5 Surface (topical) and infiltration anesthetics
- 968.6 Periperal nerve- and plesus-blocking anesthetics
- 968.7 Spinal anesthetics
- 968.9 Other and unspecified local anesthetics

969 Poisoning by Psychotropic Agents
- 969.0 Antidepressants
- 969.1 Phenothiazine-based tranquilizers
- 969.2 Butyrophenone-based tranquilizers
- 969.3 Other antipsychotics, neuroleptics, and major tranquilizers
- 969.4 Benzodiazepine-based tranquilizers
- 969.5 Other tranquilizers
- 969.6 Psychodysleptics (hallucinogens)
- 969.7 Psychostimulants
- 969.8 Other specified psychotropic agents
- 969.9 Unspecified psychotropic agent

970 Poisoning by Central Nervous System Stimulants
- 970.0 Analepics
- 970.1 Opiate antagonists
- 970.8 Other specified
- 970.9 Unspecified

971 Poisoning by Drugs Primarily Affecting the Autonomic Nervous System
- 971.0 Parasympathomimetics
- 971.1 Parasympatholytics and spasmolytics
- 971.2 Sympathomimetics
- 971.3 Sympatholytics
- 971.9 Unspecified

Appendix F. continued
ICD-9CM Drug-Induced Hospitalization Subcategories

972 Poisoning by Agents Primarily Affecting the Cardiovascular System
- 972.0 Cardiac rhythm regulators
- 972.1 Cardiotonic glycosides and drugs of similar action
- 972.2 Antilipemic and antiarteriosclerotic drugs
- 972.3 Ganlion-blocking agents
- 972.4 Coronary vasodilators
- 972.5 Other vasodilators
- 972.6 Other antihypertensive agents
- 972.7 Antivaricose drugs, including sclerosing agents
- 972.8 Capilary-active drugs
- 972.9 Other and unspecified agents

973 Poisoning by Agents Primarily Affecting the Gastrointestinal System
- 973.0 Antacids and antigastric secretion drugs
- 973.1 Irritant cathartics
- 973.2 Emollient carthartics
- 973.3 Other cathartics, including intestinal antonia drugs
- 973.4 Diogestants
- 973.5 Antidiarrheal drugs
- 973.6 Emetics
- 973.8 Other specified agents primarily affecting the gastrointestinal system
- 973.9 Unspecified agent

974 Poisoning by Water, Mineral, and Uric Acid Metabolism Drugs
- 974.0 Mercurial diuretics
- 974.1 Purine derivative diuretics
- 974.2 Carbonic acid anhydrase inhibitors
- 974.3 Saluretics
- 974.4 Other diuretics
- 974.5 Electroytic, caloric, and water-balance agents
- 974.6 Other mineral salts, not elsewhere classified
- 974.7 Uric acid metabolism drugs

975 Poisoning by Agents Primarily Acting on the Smooth and Skeletal Muscles and Respiratory System
- 975.0 Oxtocic agents
- 975.1 Smooth muscle relaxants
- 975.2 Skeletal muscle relaxants
- 975.3 Other and unspecified drugs acting on muscles
- 975.4 Antitussives
- 975.5 Expectorants
- 975.6 Anti-common cold drugs
- 975.7 Antiasthmatics
- 975.8 Other and unspecified respiratory drugs

976 Poisoning by Agents Primarily Affecting Skin and Mucous Membrane, Ophthalmological, Otorhinolaryngological, and Dental Drugs
- 976.0 Local anti-invectives and anti-inflammatory drugs
- 976.1 Antipruritics
- 976.2 Local astringents and local detergents
- 976.3 Emollients, demulcents, and protectants
- 976.4 Keratolytics, keratoplastics, other hair treatment drugs and preparations
- 976.5 Eye anti-infectives and other eye drugs
- 976.6 Anti-infectives and other drugs and preparations for ear, nose, and throat
- 976.7 Dental drugs topically applied
- 976.8 Other agents primarily affecting skin and mucous membrane
- 976.9 Unspecified agent primarily affecting skin and mucous membrane

Appendix F. continued
ICD-9CM Drug-Induced Hospitalization Subcategories

977 Poisoning by Other and Unspecified Drugs and Medicinal Substances
- 977.0 Dietetics
- 977.1 Lipotropic drugs
- 977.2 Antidotes and chelating agents, not elsewhere classified
- 977.3 Alcohol deterrents
- 977.4 Pharmaceutical excipitents
- 977.8 Other specified drugs and medicinal substances
- 977.9 Unspecified drug or medicinal substance

978 Poisoning by Bacterial Vaccines
- 978.0 BCG
- 978.1 Typhoid and paratyphoid
- 978.2 Cholera
- 978.3 Plague
- 978.4 Tetanus
- 978.5 Diphtheria
- 978.6 Pertussis vaccine, including combnations with a pertussis component
- 978.8 Other and unspecified bacterial vaccines
- 978.9 Mixed bacterial vaccines, except combinations with a pertussis component

979 Poisoning by Other Vaccines and Biological Substances
- 979.0 Smallpox
- 979.1 Rabies
- 979.2 Typhus
- 979.3 Yellow fever
- 979.4 Measles
- 979.5 Poliomyelitis
- 979.6 Other and unspecified viral and rickettsial
- 979.7 Mixed viral-rickettsial and bascterial vaccines, except combinations with a pertussis component
- 979.9 Other and unspecified vaccines and biological substances

Appendix G. Glossary

Age-adjusted mortality rates (AAMR) – used to compare relative mortality risk across groups and over time. They are not actual measures of mortality risk but rather an index of risk. They are weighted statistical averages of the age-specific death rates, in which the weights represent the fixed population proportions by age (Murphy 2000). The age-adjusted rates in this report were computed by the direct method. Calculation of AAMRs was based on Fleiss's (1981) formula and calculation of the standard error of AAMRs was based on that of Keyfitz (1966).

The 2000 U.S. standard million population distributions are shown below:

Age group	2000
0-4	69,136
5-9	72,533
10-14	73,032
15-19	72,169
20-24	66,477
25-29	64,529
30-34	71,044
35-39	80,762
40-44	81,851
45-49	72,118
50-54	62,716
55-59	48,454
60-64	38,793
65-69	34,264
70-74	31,773
75-79	26,999
80-84	17,842
85+	15,508
Total	1,000,000

Age-specific mortality rates – can pinpoint age-related differences that are hidden in overall age-adjusted rates. These rates are informative when the frequency of mortality varies with age. Such detailed information is valuable when there is substantial variation by age group and intervention can then be targeted appropriately. For this report, the age-specific mortality rate was calculated based on the number of deaths among individuals within a specific age group and calendar year, divided by the mid-year population of all residents in that same age group and then multiplied by 100,000.

Age standardization – a technique that allows for the comparison of death rates in two or more populations. The National Center for Health Statistics (NCHS) has used the 1940 standard million population in reporting national mortality statistics for over 50 years. Implementation of the new year 2000 population standard will begin with deaths occurring in 1999. Age-adjustment based on the year 2000 standard often results in age-adjusted death rates that are larger than those based on the 1940 standard. The new standard will affect trends in age-adjusted death rates for certain causes of death and will decrease race and ethnicity differentials in age-adjusted death rates (Anderson and Rosenberg 1998).

Alkaloid – a large class of chemical compounds characterized by colorless, complex, and bitter organic bases containing nitrogen and usually oxygen. Alkaloids occur especially in seed plants, such as the poppy. Opium poppy produces a broad array of alkaloids, including morphine and codeine.

Analgesic – a drug that relieves pain.

Benzodiazepines – a class of drugs that act as tranquilizers and can cause drowsiness. Benzodiazepines are typically used in the treatment of anxiety. Commonly recognized trademark names include *Valium*, *Xanax*, and *Klonopin*.

Cause-of-death classification Mortality statistics for this report were compiled in accordance with the World Health Organization (WHO) regulations, which specify that member nations classify causes of death by the current Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, which is the ninth (prior to 1999) and tenth (1999 and after) revisions of the International Classification of Diseases (ICD-9 and ICD-10).

Tabulations of cause-of-death statistics in this report are based solely on the underlying cause of death unless otherwise stated. The "underlying" cause of death is the disease or injury that initiated the series of events leading directly to death, or the circumstances of the event that resulted in the fatal injury. If more than one cause or condition of death is entered, the underlying cause is then determined by the sequence of conditions on the death certificate and selection rules of the ICD (Murphy 2000).

Cocaine – a potent addictive anesthetic extracted from leaves of the the cocoa scrub, a plant native to the Andean highlands of South America.

Codeine – a narcotic pain reliever (analgesic) derived from morphine. Codeine is weaker in action than morphine and is commonly used in cough remedies.

Drug-induced deaths – include deaths due to drug abuse (excluding alcohol), drug dependence, and drug psychoses, as well as unintentional, suicide, homicide, and unknown intent poisonings by use of either legally prescribed or illicit drugs. See Appendix C for ICD-9 codes and Appendix D for ICD-10 codes.

Drug-induced ED admissions and hospitalizations – emergency department non-admissions and hospitalizations due to drug dependence, drug psychoses, or drug abuse and those due to poisoning by legally or illegally prescribed drugs (excluding alcohol) and medicinal substances. See Appendix F for ICD-9CM codes.

Emergency department (ED) non-admission – an ED encounter that does not result in hospitalization.

Heroin – a semisynthetic drug derived from, but more potent than, morphine. Heroin is a physiologically addictive narcotic that is prohibited for medical use in the United States but is used illicitly for its euphoric effects.

Healthy People 2000 – part of a national strategy addressing the prevention of major chronic illnesses, injuries, and infectious diseases. It is the product of an effort involving expert working groups, a consortium of national organizations, all state health departments, and the Institute of Medicine of the National Academy of Sciences to set health objectives for the nation. After extensive national and regional hearings were conducted with a period of public review, the health objectives were published as *Healthy People 2000—National Health Promotion and Disease Prevention Objectives*.

Healthy Connecticut 2000 – the effort of a consortium of groups in Connecticut, modeled on the national Healthy People initiative, to set public health priorities for the state. *Healthy Connecticut 2000 Baseline Assessment Report* (1997) set health status and risk reduction objectives to be achieved by the year 2000. A second document *Looking Toward 2000 – An Assessment of Health Status and Health Services* (1999) was produced after extensive public review and comment and hearings in local communities.

Hospitalization – an admission as a registered inpatient into one of Connecticut's acute care general hospitals with a stay of 24 hours or more.

International Classification of Diseases (ICD-9, ICD-10) – the internationally accepted coding system for determining cause of death since the early 1900s. It is periodically revised. This report employs the ninth revision (ICD-9), used for deaths from 1975-1998, and the tenth revision (ICD-10), beginning with 1999 deaths.

Preliminary estimates of the comparability of ICD-9 to ICD-10 have been published and indicate that the discontinuity in trends from 1998 to 1999 for some leading causes of death (septiciemia, influenza and pneumonia, Alzheimer's disease, nephritis, nephrotic syndrome, and nephrosis) is substantial (Anderson, Miniño, et al. 2001).

International Classification of Diseases, Clinical Modification (ICD-9CM) – the coding system for determining diagnoses associated with emergency department (ED) non-admissions and hospitalizations. ICD-9-CM guidelines for coding and reporting were developed cooperatively and approved by the following organizations: American Hospital Association,

American Health Information Management Association, Health Care Financing Administration, and the National Center for Health Statistics (National Center for Health Statistics 2003). This report employs the ninth revision (ICD-9CM), used for ED non-admission and hospitalization encounter data.

Meperidine – a short-acting, synthetic narcotic drug used in its hydrochloride form as an analgesic, sedative, and antispasmodic. Also called *isonipecaine, pethidine*. Known by the trademark name *Demerol*.

Methadone – a synthetic opiate most commonly used as a legal substitute for heroin in some drug treatment programs and for pain relief.

Morphine – a powerful narcotic with analgesic (pain relief) action and other effects on the central nervous system that is highly addictive. Morphine is a naturally occurring member of a large chemical class of compounds called alkaloids. Morphine is the principal alkaloid of opium.

Multiple cause of death *See* Cause-of-death classification.

Narcotic – a drug that in moderate doses dulls the senses, relieves pain, and induces profound sleep but in excessive doses causes stupor, coma, or convulsions. When used for a long time, a narcotic may cause mental or physical dependence. Physical dependence may lead to withdrawal side effects when the dependent individual stops taking the medicine.

Narcotic analgesics – pain-relieving drugs that act on the central nervous system (CNS) to relieve pain. Some narcotic analgesics are used prior to or during an operation to help the anesthetic work better. Codeine and hydrocodone are used to relieve coughing. Methadone is also used by some people to help control their dependence on heroin or other narcotics.

Opiate - a highly addictive medication or drug, such as heroin, codeine, and morphine, derived from the opium poppy. Opiates are narcotic sedatives that depress central nervous system activity, alleviate pain, and induce sleep.

Opioid - a synthetic narcotic that resembles naturally occurring opiates but is not derived from opium. Opioids bind to or affect opiate receptors on the cell surface and possess some characteristics and effects of opiate narcotics.

Opium – a highly addictive narcotic drug produced from the unripe seedpods of the opium poppy. Opium produces a feeling of well being, hallucinations, and drowsiness that can result in coma or death if the dose is excessive. Opium was used as a painkiller for centuries. Since 1909 its sale and manufacture has been prohibited in the United States.

Overdose – too great a dose of a drug or therapeutic agent given or taken. Overdose, for purposes of this report, is defined as poisoning by either an over-the-counter, legally prescribed,

or illicit pharmaceutical substance taken in error. As a verb, overdose is defined as *giving* too many doses to, or else *taking* too many doses that results in toxicity.

Oxycodone – a synthetic opiate and prescription narcotic analgesic (painkiller) that has become a popular recreational drug. Oxycodone is used especially in its hydrochloride form *OxyContin*.

OxyContin – a time-release, morphine-like narcotic intended to relieve moderate to severe chronic pain. Oxycodone is the active ingredient in OxyContin. A common method of abusing Oxycontin involves crushing the pills to disable their time-release mechanism and then snorting or injecting it for an immediate high.

Pethidine – see Meperidine.

Poisoning – toxicity by chemical substances that can cause illness, injury, or death. See Appendices C, D, and F for specific poisoning codes used for mortality (Appendices C and D, emergency department, and hospitalization data (Appendix F).

Population bases for computing mortality rates are taken from the U.S. Census Bureau *Estimates of the population of states by age, sex, race, and Hispanic origin*. These data are estimates of the population of Connecticut by 5-year age groups (age 0 to 4, 5 to 9,…85 and over), sex (male, female), modified race (white; black; Native American including Alaska Natives; Asian and Pacific Islander) and Hispanic origin (Hispanic, non-Hispanic) for each year, July 1, 1989 through July 1, 1998. Population estimates for 1989 are taken from the series *1981 to 1989*; estimates for 1990 through 1997 are taken from the series *1990 to 1997* released on September 4, 1998; and estimates for 1998 are taken from the series *1990 to 1998* released on September 15, 1999.

Population rates in this report are on an annual basis and are per 100,000 estimated population in a specified group.

Propoxyphene – an opioid analgesic (pain reliever) similar to methadone but less addicting. Opioid analgesics, including propoxyphene, reduce pain by blocking the receptors in the brain that are involved in the perception of pain. Combinations of opioids (like propoxyphene or codeine) and aspirin are often found in combination in drugs. Propoxyphene is administered in its hydrochloride form and is commonly recognized by the trademark names *Darvocet-N* and *Darvon.*

Race – a population of individuals identified from a common history, nationality, or geographical place. Race is widely considered a valid scientific category, but not a valid biological or genetic category (Lewontin 1995; Gould 1981). Available scientific evidence indicates that racial and ethnic classifications do not capture biological distinctiveness, and that there is more genetic variation within racial groups than there is between racial groups (Williams, Lavizzo-Mourey, and Warren 1994; American Anthropological Association 1998). Contemporary race divisions result from historical events and circumstances and reflect current

social realities. Thus, racial categories may be viewed more accurately as proxies for social and economic conditions that put individuals at higher risk for certain disease conditions.

In this report, mortality data are presented for two racial groups in Connecticut: white and black. Individuals identified as either 'white' or ' black' can be of any ethnic group, including Hispanic. Conversely, individuals identified as "Hispanic" can be of any race, and are also counted in the race breakdown as either 'white' or 'black.'

Quality of race data – several studies have examined the reliability of racial status reported on the death certificate by comparing race on the death certificate with that reported on another data source, such as the census or a survey. Differences occur as a result of differences in who provides race information on the two records. Race information on the death certificate is reported by the funeral director as provided by a next of kin or on the basis of observation. Race on the census or on the Current Population Survey (CPS) is obtained by self-report of the individual or by another household member. As such, racial information reported on the census and CPS are considered more valid than death certificate information. High levels of agreement between the death certificate and the census or survey report are indicative of unbiased death rates by race (Rosenberg, Maurer, Sorlie, et al. 1999).

Several studies show that undercoverage of minority groups in the census and the resultant population estimates introduce biases into death rates by race (Rosenberg, Maurer, Sorlie, et al. 1999). It is estimated that the net effect of the combined bias due to race misclassification on death certificates and undernumeration on the 1990 census has resulted in an overstatement of death rates for whites and blacks by about one and five percent, respectively in official U.S. publications. Mortality rates are understated in official U.S. publications for American Indians and Asian or Pacific Islander, by about 21 percent and 11 percent, respectively (Rosenberg, Maurer, Sorlie, et al. 1999).

Random variation – mortality data in this report represent all Connecticut resident deaths and are, therefore, not subject to sampling error. Mortality data, however, may be affected by random variation. When the number of events is small (less than 100) and the probability of such an event is small, random variation may be relatively large, and thus considerable caution must be used in interpreting the data. Random variation is typically measured in terms of variance or standard error. The following formulas were used in calculating the standard error in this report:

A. standard error of the age-adjusted mortality rate:

$$\sqrt{\sum_{i=1}^{18} d_i \left(\frac{std_i}{n_i}\right)^2}$$

where Index *i* represents 18 age groups in five year increments ranging from ages 0 to 85 and older; d_i is the total number of deaths for age group *i*; std_i is the standard population for age group *i*, and n_i is the population for age group *i*.

B. standard error of the age-adjusted years of potential life lost:

$$\frac{\sqrt{\sum_{i=1}^{15} d_i \left(\frac{std_i}{n_i} YPLL_i\right)^2}}{\sum_{i=1}^{15} std_i}$$

where d_i, std_i, and p_i are the same as indicated in the standard error formula. $YPLL_i$ is the years of potential life lost for a given endpoint (age 75 in this report) within each age group *i*. The weighting factors are as follows: 74.5 for age group 1 (ages 0-4), 67.5 for age group 2 (ages 4-9), 62.5 for age group 2 (ages 10-15), etc. $YPLL_i$ is zero for age groups 75 and older.

- related cause of death – *see* Cause-of-death classification.

Standard error calculation – s*ee* Random variation.

Years of potential life lost (YPLL) – represents the number of years of potential life lost by each death before a predetermined end point (e.g., 65 or 75 years of age). Whereas the crude and adjusted death rates are heavily influenced by the large number of deaths among the elderly, the YPLL measure provides a picture of premature mortality by weighting deaths that occur at younger ages more heavily than those occurring at older ages. It thereby emphasizes different causes of death. Age-adjusted YPLLs are calculated using the methodology of Romeder and McWhinnie (1977).

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