

Excerpts from: Issues to Consider When Analyzing ICD-10 Coded Data on Drug Poisoning (Overdose) Deaths^a

This document provides a brief description of issues to consider when using death certificate data to study drug overdose deaths. These issues include such factors as variation in the extent and quality of death investigations, the specificity of information included on the death certificate, and limitations resulting from the use of the *International Classification of Diseases*¹ to code the underlying and contributory causes of death. By understanding these issues and how they impact the quality and completeness of the death certificate data, researchers will be better informed when interpreting analysis results.

I. Death investigation and the death certification process

When a person dies, a medical certifier, such as a physician, medical examiner or coroner, is responsible for investigating the death and determining the underlying cause and manner of death, including whether the death resulted from drug overdose and the specific drugs involved. Most drug overdose deaths are sudden and unexpected and will be certified by a medical examiner or coroner. The certifier then enters this information into various sections of the death certificate (Fig. 1).²⁻³

CAUSE OF DEATH (See instructions and examples)				Approximate Interval: Onset to death
32. PART I. Enter the chain of events -- diseases, injuries, or complications -- that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
To be Completed by: MEDICAL CERTIFIER	IMMEDIATE CAUSE (Final disease or condition resulting in death)		a. MULTIPLE DRUG INTOXICATION	
	Due to (or as a consequence of):			
	Sequentially list conditions, if any, leading to the cause listed on line a. Show the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST		b.	
	Due to (or as a consequence of):			
c.		Due to (or as a consequence of):		
d.		Due to (or as a consequence of):		
PART II. Enter one significant condition contributing to death but not resulting in the underlying cause given in Part I.			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant but pregnant within 42 days of death <input type="checkbox"/> Not pregnant but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year		39. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Pending <input type="checkbox"/> Accident <input type="checkbox"/> Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined <input type="checkbox"/> Homicide		
38. DATE OF INJURY (No Day/No Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home, construction site, restaurant, wooded area) HOME		41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No
42. LOCATION OF INJURY: State:		City or Town:	Apartment No.	Zip Code:
43. DESCRIBE HOW INJURY OCCURRED DRUG INGESTION		44. IF TRANSPORTATION INJURY, SPECIFY <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)		

Figure 1. Cause of Death Section of the 2003 US standard death certificate

^a From: Hedegaard, H., Warner, M., Paulozzi, L., and Johnson, R. Issues to Consider When Analyzing ICD-10 Coded Data on Drug Poisoning (Overdose) Deaths. In clearance at the National Center for Health Statistics and the National Center for Injury Prevention and Control.

To create electronic data files for analysis, software is used to convert the text information from the various fields in the cause of death section into appropriate codes from the *International Classification of Diseases, version 10* (ICD-10). Nosology rules established by the World Health Organization are applied to identify and assign the codes for the underlying and contributory causes of death. Many overdose deaths cannot be coded using the automated software and coding is done manually.

Table 1 provides a list of the ICD-10 codes used to identify drug overdose deaths based on the underlying cause of death, and categorized by intent or manner of death.

Table 1: ICD-10 underlying cause codes in the CDC definition of drug overdose death

		ICD-10 Codes for Underlying Cause	
Intent	Underlying Cause Code	Description	
Unintentional (Accidental)	X40	Poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics	
	X41	Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	
	X42	Poisoning by and exposure to narcotics and psychodysleptics, not elsewhere classified	
	X43	Poisoning by and exposure to other drugs acting on the autonomic nervous system	
	X44	Poisoning by and exposure to other and unspecified drugs, medicaments, and biological substances	
Intentional Self-harm/Suicide	X60	Self-poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics	
	X61	Self-poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	
	X62	Self-poisoning by and exposure to narcotics and psychodysleptics, not elsewhere classified	
	X63	Self-poisoning by and exposure to other drugs acting on the autonomic nervous system	
	X64	Self-poisoning by and exposure to other and unspecified drugs, medicaments, and biological substances	
Assault/Homicide	X85	Assault by drugs, medicaments and biological substances	
Undetermined Intent	Y10	Poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics	
	Y11	Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	
	Y12	Poisoning by and exposure to narcotics and psychodysleptics, not elsewhere classified	
	Y13	Poisoning by and exposure to other drugs acting on the autonomic nervous system	
	Y14	Poisoning by and exposure to other and unspecified drugs, medicaments, and biological substances	

Codes for contributing causes can be used to identify the specific drug involved, if the specific drug is documented on the death certificate. Contributory or multiple cause codes for drugs include the ICD-10 codes in the range of T36-T50. A comprehensive list of all the subcategories of these codes is too extensive for this document, however descriptions of the broad categories in the T36-T50 range are provided in Table 2. For a detailed description of the subcategories of the codes, please refer to an ICD-10 coding manual or the World Health Organization website at <http://apps.who.int/classifications/icd10/browse/2010/en>.

Table 2: ICD-10 codes for poisoning by drugs, medicaments and biological substances

ICD-10 code	Description
T36	Poisoning by systemic antibiotics
T37	Poisoning by other systemic anti-infectives and antiparasitics
T38	Poisoning by hormones and their synthetic substitutes and antagonists, not elsewhere classified
T39	Poisoning by nonopioid analgesics, antipyretics and antirheumatics
T40	Poisoning by narcotics and psychodysleptics [hallucinogens]
T41	Poisoning by anaesthetics and therapeutic gases
T42	Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs
T43	Poisoning by psychotropic drugs, not elsewhere classified
T44	Poisoning by drugs primarily affecting the autonomic nervous system
T45	Poisoning by primarily systemic and haematological agents, not elsewhere classified
T46	Poisoning by agents primarily affecting the cardiovascular system
T47	Poisoning by agents primarily affecting the gastrointestinal system
T48	Poisoning by agents primarily acting on smooth and skeletal muscles and the respiratory system
T49	Poisoning by topical agents primarily affecting skin and mucous membrane and by ophthalmological, otorhinolaryngological and dental drugs
T50	Poisoning by diuretics and other and unspecified drugs, medicaments and biological substances

II. Considerations when using death certificate data to study drug overdose deaths

Several issues should be considered when analyzing ICD-10 coded data from death certificates to study drug overdose deaths. Broadly grouped, these include issues of causality and issues of specificity.

Issues of causality

Deaths with an ICD-10 underlying cause code of R99: *Other ill-defined and unspecified causes of mortality*

Because the circumstances of a drug poisoning death are often quite complicated, a full investigation, including toxicological analysis, may take a long time. Most states have regulations regarding timely reporting of the occurrence of a death. To meet the requirements for timely reporting of the occurrence of the death, certifiers occasionally submit the death certificate with the cause and manner of death as “pending”. While these death certificates should be amended as the investigation is completed and additional information becomes available, this does not always occur.

Deaths that lack sufficient detail to determine the cause of death are assigned an underlying cause code of *R99: Other ill-defined and unspecified causes of mortality*. This code is assigned to deaths with a “pending” cause and manner if no other cause of death information is included on the certificate. Analysis of national data indicates that approximately 80% of deaths with a manner of death of “pending” are assigned an underlying cause code of R99.

When studying drug overdose deaths, it is important to know the percent of deaths with R99 as the underlying cause of death in the jurisdiction and time period of interest. An analysis of national data shows that in 2010 the percent of deaths with R99 as the underlying cause varied by state, with an average of 1.4% and a range from 0.3% to 4.1%.⁴ Studies suggest that some of the deaths assigned an underlying cause code of R99 might actually have resulted from drug overdose.

A high percent of deaths coded to R99 might complicate efforts to understand the magnitude and trends in drug overdose deaths. If the jurisdiction of interest has significant variability in the R99 deaths that corresponds to variability in drug overdose mortality during the same time period, consider noting this finding when presenting the results of a trend analysis. This is especially true if the variability is seen for deaths involving adults ages 20-64 years, the peak age group for drug overdose deaths.

Deaths in which drugs may be contributory but not causal

As mentioned above, per the CDC surveillance case definition, drug overdose deaths are deaths with an ICD-10 underlying cause code of X40-X44, X60-X64, X85 or Y10-Y14. The drugs involved in the death are described using contributory cause codes in the range of T36-T50.

In addition to the drug overdose deaths, deaths from other injury external causes (i.e., an injury death for which the underlying cause code is not X40-X44, X60-X64, X85 or Y10-Y14) may mention a drug as a contributory cause. In 2008-2010, there were 115,245 injury deaths that included T36-T50 as a contributory cause. Approximately 2.5% (2862, or an average of 942 deaths per year) did not have drug overdose as the underlying cause. The underlying cause for these deaths included drowning (22.5% of the 2862 deaths), suffocation (22.2%), motor vehicle traffic (16.1%), fall (9.9%), firearm (6.7%) and other external causes of injury (22.6%).⁴

While it is important to be aware that drugs may contribute to other types of injury deaths, only those deaths with an underlying cause of death code of X40-X44, X60-X64, X85 or Y10-Y14 should be included in an enumeration of the number of deaths due to drug overdose.

Issues of specificity

Deaths with an ICD-10 underlying cause code of Y10–Y14: Drug overdose of undetermined intent

As with other injuries, poisonings can be categorized based on the manner of death. Some drug overdose deaths are categorized as unintentional (i.e., accidental) while others are considered to be intentional (e.g., suicide or homicide by overdose).

In some cases it can be difficult for the medical certifier to identify whether or not the poisoning or overdose was intentional or unintentional, even after thorough investigation. In most cases, the drug use was intentional, but it can be unclear whether the person intended to harm themselves or another person. Medical examiners and coroners may differ in the level of certainty they need before assigning intentionality or manner of death. In 2008-2010, approximately 8% of drug overdose deaths in the US had a manner of death of undetermined intent; at the state level, the percent of drug overdose deaths with undetermined intent ranged from 1% to 85%.⁵

Because of this potential for wide variation in the percent of deaths of undetermined intent over time, for different demographic groups and from jurisdiction to jurisdiction, it is recommended that numbers and rates of drug overdose deaths be reported as a total, regardless of intent. If results are reported by intentionality (i.e., unintentional, suicide,

homicide), the numbers or rates of drug overdose deaths with undetermined intent should be shown as well.

Lack of specificity on the drugs involved

To determine the specific drug(s) involved, toxicology testing is usually done. However, because there is no national standard for the death investigation process, the use and quality of toxicology testing can vary from jurisdiction to jurisdiction.⁵ Cost and budget issues can influence decisions about whether a drug test is done as well as the type of testing method used.

Because toxicology testing results may take time, the needed information might not be readily available at the time of certification. Some details might be unknown, ill defined, or not described consistently. In 2008-2010, only 75% of drug overdose deaths in the US had a specific drug reported on the death certificate. In the remaining quarter, the literal text was vague, with such phrases as “multiple drug intoxication” or “drug overdose” without naming the specific drugs. Significant variation was also seen among states. In ten states, specific drugs were mentioned for 95% or more of the deaths, while in 11 states, the drugs involved were specified for only 33-65% of the deaths.⁵

Deaths with an ICD-10 contributory cause code of *T50.9: Other and unspecified drug(s)*

Frequently researchers want to study deaths resulting from particular types of drugs, such as heroin, cocaine or opioid analgesics. Specific ICD-10 codes exist for these drugs so selecting deaths for inclusion is relatively straightforward. However, a complicating issue is the problem of deaths for which a specific drug is not reported, as described above. These deaths are often assigned an ICD-10 contributory cause code of *T50.9: Other and unspecified drugs*.

The percent of drug deaths with the ICD-10 code T50.9 as the sole drug code (no other contributory cause code in the range of T36-T50.8) should be determined before making comparisons between groups or over time, and particularly when studying deaths from specific drugs. In 2010, nearly 25% of the drug poisoning deaths had T50.9 as the sole drug code; the percent varied by state and ranged from 1.1% to 64.1% of the drug poisoning deaths.⁴ If a large percent of drug overdose deaths are coded solely with T50.9, reporting the numbers of deaths by specific drugs might underestimate the number of deaths or at the least, be highly inaccurate.

Deaths with an ICD-10 contributory cause code of *T40.6: Other and unspecified narcotics*

If a research study focuses on deaths due to opioids, care should be taken to understand the percent of deaths that have been assigned *T40.6: Other and unspecified narcotics*. The term

“narcotic” in ICD-10 includes both cocaine derivatives as well as opioids. When a large percent of deaths are coded with T40.6, there can be a significant underestimation of the contribution of a particular type of narcotic (e.g., opium, heroin, other opioids, methadone, cocaine) in drug overdose deaths. In 2008-2010, 7.5% of narcotic deaths (T40.0-T40.6) were identified as having T40.6 alone (that is, they did not also include a code in the T40.0-T40.5 range). At the state level, the percent of narcotic overdose deaths identified by T40.6 alone ranged from 1% to 39%; for four states, more than 25% of the narcotic overdose deaths were identified by T40.6 alone.⁴

As with other codes described earlier, the use of this code can vary across time, within a jurisdiction and across jurisdictions.

Deaths with more than one contributory cause (T code) for poisoning

For drug overdose deaths, information on the specific types of drugs involved are coded using ICD-10 codes T36-T50. Because more than one type of drug might have contributed to the death, multiple T codes may be assigned. With improvements in toxicology testing and in reporting on the death certificate, the number of drugs that are identified may change over time or differ by jurisdiction. In reporting trends in numbers or rates for specific drugs, one should consider the possible influence of changes in testing and reporting practices over time.

Because more than one T code can be assigned in deaths involving multiple types of drugs, reporting of the number of deaths by a specific drug type can be problematic. When presenting tables of results by specific drug types, it should be noted that the number of deaths in each drug category may sum to more than the total number of drug overdose deaths, if deaths involving multiple drugs are attributed to more than one drug category.

Conclusion

By understanding some of the factors that can impact the quality, completeness and utility of death certificate data on drug overdose deaths, researchers will be better informed when interpreting epidemiologic trends and in making decisions on the appropriateness of conducting comparisons among groups (e.g., state to state comparisons) or over time.

References

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