Drug Overdose Deaths: Let's Get Specific

Svetla Slavova, PhD[a]
Daniella Bradley O'Brien[b]
Kathleen Creppage, MPH[c]
Dan Dao, MPH[d]
Anna Fondario, MPH[e]
Elizabeth Haile, MS[f]
Beth Hume, MPH[g]
Thomas W. Largo, MPH[h]
Claire Nguyen, MS[i]
Jennifer C. Sabel, PhD[j]
Dagan Wright, PhD[k]
Members of the Council of State and Territorial Epidemiologists Overdose Subcommittee

Good quality surveillance data are the foundation of public health work. For opioid analgesic- and heroin-related deaths, however, the methods used to classify deaths on death certificates may be leading to a substantial undercount of these deaths, resulting in surveillance data that inaccurately portray the magnitude of this public health problem.

In the United States, a total of 38,329 drug overdose deaths were reported via death certificates in 2010, for an age-adjusted rate of 12.3/100,000 population.[1] In 16,651 of these deaths, an opioid analgesic (or a combination of opioid analgesics) was listed as contributing to the overdose death (5.4/100,000 population). However, an additional 9,429 drug overdose deaths (3.0/100,000 population) were associated only with "other and unspecified drugs." Previous work has shown that about 25% of U.S. overdose deaths had no drugs specified on the death certificate, so it is likely that national statistics underestimate by a substantial fraction the number of opioid analgesic- and heroin-related deaths.[2] Furthermore, the degree of underestimation varied depending on the type of death certification system the state had in place. States with centralized state medical examiner systems had on average a higher percentage (92%) of drug overdose death certificates listing specific drugs than states with other types of systems, such as a decentralized coroner system, in which 62% of death certificates had a drug-specified, hybrid system—county coroner and medical

[a]University of Kentucky, College of Public Health, Lexington, KY
[b]New York City Department of Health and Mental Hygiene, New York, NY
[c]North Carolina Division of Public Health, Raleigh, NC
[d]Kansas Department of Health and Environment, Topeka, KS
[e]Utah Department of Health Violence and Injury Prevention Program, Salt Lake City, UT
[f]Maryland Department of Health & Mental Hygiene, Baltimore, MD
[g]Massachusetts Department for Public Health, Boston, MA
[h]Michigan Department of Community Health, Bureau of Disease Control, Prevention, and Epidemiology, Division of Environmental Health, Lansing, MI
[i]Oklahoma State Department of Health, Oklahoma City, OK
[j]Washington State Department of Health, Olympia, WA
[k]Oregon Public Health Division, Injury and Violence Prevention Program, Portland, OR
Address correspondence to: Svetla Slavova, PhD, University of Kentucky College of Public Health, Kentucky Injury Prevention and Research Center, 333 Waller Ave., Ste. 242, Lexington, KY 40504; tel. 859-323-7873; fax 859-257-3909; e-mail <ssslav2@email.uky.edu>.

examiners (73%)—or decentralized county or district medical examiner system (71%).[2]

Typically, when an overdose death occurs, coroners or medical examiners determine the cause of death and complete a death certificate. The information listed on the death certificate is then coded according to the guidelines of the International Classification of Diseases, Tenth Revision (ICD-10) to allow standardized classification and analysis of the causes of death.[3] The actual coding of the medical information on the death certificates is done by the National Center for Health Statistics (NCHS) using software that automates and standardizes the process.[4] The ICD considers a death to be a drug overdose death if any one of the following ICD-10 codes, indicating poisoning by drugs, medicaments, and biological substances, is in the underlying cause of death: X40–X44 (unintentional), X60–X64 (suicide), X85 (assault), and Y10–Y14 (undetermined intent). ICD-10 allows for the identification of specific drug classes in overdoses by the ICD-10 codes T36–T50, "Poisoning by drugs, medicaments, and biological substances."[3]

For deaths involving opioid analgesics, this process is less than perfect for surveillance purposes, because coroners and medical examiners exercise varying approaches to recording the drug's contribution to the death on the death certificate. For example, if they write the name of an opioid analgesic (e.g., hydrocodone, methadone, or tramadol), the death will be coded with an appropriate ICD-10 code in the T40.2–T40.4 range for opioid analgesics. If they instead write "opioid" alone, the death will be coded to T40.6, "other and unspecified narcotics," because the information is not sufficient to assign a specific ICD-10 code (i.e., T40.2, "other opioids"; T40.3, "methadone"; or T40.4, "other synthetic narcotics"). Finally, if they write simply "drug overdose" without specifying any of the drugs involved, the contribution of the opioid analgesic will not be reflected in how the death is coded. The death will instead receive a code of "other and unspecified drugs" (T50.9).

To help address these and other problems in drug overdose surveillance, the Safe States Alliance, a nonprofit professional organization focused on injury and violence prevention, convened its seventh Injury Surveillance Workgroup (ISW7) in 2009.[5] The ISW7 published its Consensus Recommendations for National and State Poisoning Surveillance in April 2012.[6] The ISW7 proposed standardized definitions and tools to strengthen the ability of state health departments and other agencies to conduct surveillance on drug overdoses (i.e., acute drug poisonings) and other types of poisoning. The ISW7 recommended the development of poisoning indicators based on the ISW7's definitions and identification of possible shortcomings among indicators before they are widely adopted as surveillance tools by state and local jurisdictions.

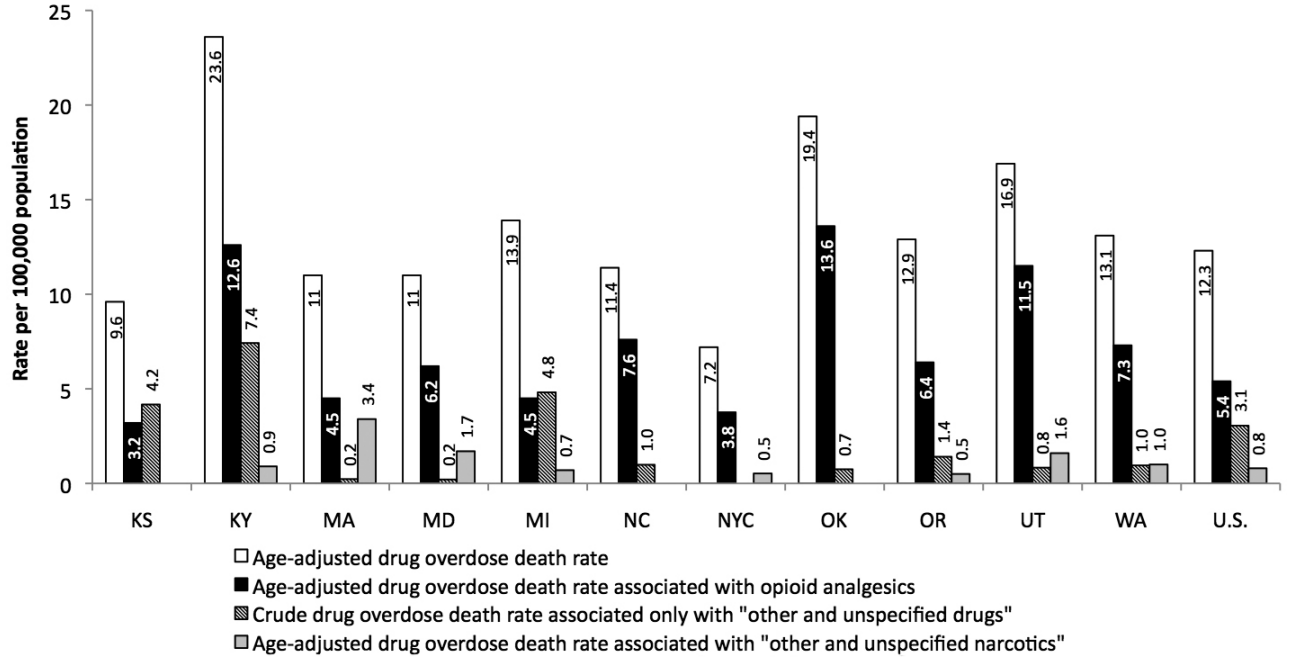
Shortly thereafter, epidemiologists from 11 jurisdictions (Kansas, Kentucky, Maryland, Massachusetts, Michigan, New York City, North Carolina, Oklahoma, Oregon, Utah, and Washington) and members of the Council of State and Territorial Epidemiologists (CSTE) Overdose Subcommittee[7] volunteered to analyze ISW7 mortality indicators. Death certificate data for 2010 from each jurisdiction were used initially to assess how variations in the completeness of terminology used to record specific drugs on death certificates could affect the validity and reliability of the drug overdose surveillance statistics and comparison among jurisdictions. Some limitations in how drug overdose deaths are counted at the local level came to light during this process.

For the purpose of this commentary, we set out to illustrate some of the state-to-state variations by using 2010 multiple-cause-of-death (MCOD) data. The MCOD files are compiled from death certificate data for U.S. citizens and are available on the Centers for Disease Control and Prevention (CDC) WONDER (Wide-Ranging Online Data for Epidemiologic Research) website,[1] giving readers the opportunity to verify the results and calculate similar indicators for other jurisdictions. The following drug overdose indicators were calculated for the 11 jurisdictions and the United States:

- Age-adjusted drug overdose death rate per 100,000 population, where drug overdose deaths were identified as deaths with an underling cause of death of X40–X44, X60–X64, X85, or Y10–Y14;
- Age-adjusted drug overdose death rate associated with opioid analgesics (counting only overdose deaths with at least one MCOD code in the T40.2–T40.4 range);
- Age-adjusted drug overdose death rate associated with "other and unspecified narcotics" (based on drug overdose deaths with an MCOD code T40.6, "other and unspecified narcotics"); and
- Crude drug overdose death rate associated only with "other and unspecified drugs" (based on drug overdose deaths with code T50.9 only and no other drug poisoning codes in the range T36–T50.8; the crude rate was reported, as the age-adjusted rate cannot be calculated directly using a CDC WONDER query).

The indicator measures for the 11 jurisdictions are shown in the Figure. Kentucky had the highest age-

Figure. Drug overdose death rates[a], by jurisdiction: United States and selected states, 2010[b]



[a]Per the National Center for Health Statistics reporting rules, the following rates were suppressed (based on fewer than 10 deaths): the New York City overdose death rate associated only with "other and unspecified drugs" and the Kansas and Oklahoma overdose death rates associated with "other and unspecified narcotics". The North Carolina overdose death rate associated with "other and unspecified narcotics" was unreliable (based on fewer than 20 deaths). Both the suppressed and unreliable rates were omitted from the figure.

[b]Source: Centers for Disease Control and Prevention (US). CDC WONDER: multiple cause of death data [cited 2015 Jan 16]. Available from: URL: http://wonder.cdc.gov/mcd.html

adjusted drug overdose death rate (23.6/100,000 population). The jurisdiction with the highest age-adjusted rate of overdose deaths involving opioid analgesics was Oklahoma (13.6/100,000 population), giving the impression that Oklahoma had the greatest problem with this class of drugs. However, Oklahoma's high rate reflected in part its low rate of deaths attributed to "other and unspecified drugs" (T50.9) (only 28 drug overdose deaths, or 4% of all drug overdose deaths in Oklahoma, were not attributed to a specific drug category). Even if all of these Oklahoma deaths were due to opioid analgesics, the rate of opioid analgesic overdose deaths would have increased by less than 1.0/100,000 population. In contrast, the rates of deaths not attributed to any specific drug were relatively high in Kansas (4.2/100,000 population), Michigan (4.8/100,000 population), and Kentucky (7.4/100,000 population). In fact, in Kansas and Michigan, more drug overdose deaths were attributed to "other and unspecified drugs" than to opioid analgesics. It is possible, even likely, that a significant proportion of the overdoses due to "other and unspecified drugs" in these states was in fact due to opioid analgesics. Therefore, it is not unreasonable to believe that the reported involvement of opioid analgesics in Kansas, Michigan, and Kentucky was significantly underestimated with ICD-10 coded data due to the nonspecific language used on the death certificates.

Massachusetts and Maryland each had a small number of deaths where a specific drug/class of drugs was not listed (0.2/100,000 population), but a substantial proportion of drug overdose deaths in these states was associated with "other and unspecified narcotics" (3.4/100,000 population in Massachusetts and 1.7/100,000 population in Maryland). These cases could have been overdose deaths with opioid analgesics, heroin, or cocaine that were described vaguely as "opioids" or "narcotics" on the death certificates (Figure).

The use of nonspecific language to identify specific drugs on death certificates can, therefore, result in undercounting various drug classes. Further study is needed, but in the meantime, the CSTE Overdose Subcommittee workgroup believes that ranking jurisdictions by specific drug types identified on death certificates might be misleading. The comparison of

jurisdictions should be based on total drug overdose rates. Trends in jurisdictional rates for specific drug types remain useful as long as the degree of specification of drugs does not vary markedly from year to year.

Factors that contribute to differences in how states record drug overdose deaths should be identified and addressed at state and local levels. In 2013, the National Association of Medical Examiners and the American College of Medical Toxicology Expert Panel on Evaluating and Reporting Opioid Deaths recommended that certifiers list all substances responsible for a fatal overdose on the death certificate.[8] In 2013, the Substance Abuse and Mental Health Services Administration consensus panel of medical examiners, coroners, toxicologists, epidemiologists, and other public health officials proposed uniform standards and case definitions for classifying opioid-related deaths.[9] Until such recommendations are consistently adopted, epidemiologists and other public health practitioners need to be aware of the quality and limitations of the death certificate data in their jurisdiction, evaluate when possible the level of completeness and accuracy of the ICD-10 codes, and interpret the reported counts and rates with caution when the proportion of deaths with unspecified drugs is considerable. In addition, states/jurisdictions might want to determine, by comparison with medical examiner/coroner and state toxicology laboratory records where possible, exactly which drugs were involved in deaths coded nonspecifically to provide better estimates of the contributions of individual drug types to their overdose problem.

Further standardization and consensus among medical examiners and coroners will help reduce state variation and improve national death certificate-based drug overdose surveillance. Efforts by NCHS and selected states are underway to improve the specification of drugs involved in overdose deaths. Vital statistics registrars should work with their medical examiners and coroners to improve the quality of information available on death certificates.

The authors thank Dr. Leonard Paulozzi, Centers for Disease Control and Prevention (CDC), for his mentorship during the study and thoughtful review of the manuscript; Dr. Margaret Warner, CDC, for providing insight on working with multiple cause of death files; Dr. Denise Paone, Council of State and Territorial Epidemiologists (CSTE) Overdose Subcommittee chair, for her leadership during the project; Scott Proescholdbell for his role as the liaison between the CSTE and Safe States Injury Surveillance Workgroup on Poisoning; and Annie Tran, CSTE, for coordinating the CSTE Overdose Subcommittee workgroup.

REFERENCES

1. Centers for Disease Control and Prevention (US). CDC WONDER: multiple cause of death data [cited 2015 Jan 16]. Available from: URL: http://wonder.cdc.gov/mcd.html
2. Warner M, Paulozzi LJ, Nolte KB, Davis GG, Nelson LS. State variation in certifying manner of death and drugs involved in drug intoxication deaths. Acad Foren Path 2013;3:231-7.
3. World Health Organization. International classification of diseases, tenth revision: version 2010 [cited 2014 Jul 18]. Available from: URL: http://apps.who.int/classifications/icd10/browse/2010/en
4. Centers for Disease Control and Prevention (US). National Vital Statistics System: mortality data [cited 2013 Apr 8]. Available from: URL: http://www.cdc.gov/nchs/deaths.htm
5. Safe States Alliance. Injury Surveillance Workgroups (ISW) [cited 2015 Jan 6]. Available from: URL: http://www.safestates.org/?ISW
6. Injury Surveillance Workgroup 7. Consensus recommendations for national and state poisoning surveillance: report from the Injury Surveillance Workgroup (ISW7). Atlanta: Safe States Alliance; 2012. Also available from: URL: www.cste.org/resource/resmgr/injury/ISW7.pdf [cited 2015 Jan 12].
7. Council of State and Territorial Epidemiologists. Cross cutting: overdose [cited 2015 Jan 6]. Available from: URL: http://www.cste.org/group/overdoseworkgroup
8. Davis GG; National Association of Medical Examiners and American College of Medical Toxicology Expert Panel on Evaluating and Reporting Opioid Deaths. Recommendations for the investigation, diagnosis, and certification of deaths related to opioid drugs. Acad Foren Path 2013;3:77-83.
9. Goldberger BA, Maxwell JC, Campbell A, Wilford BB. Uniform standards and case definitions for classifying opioid-related deaths: recommendations by SAMHSA consensus panel. J Addict Dis 2013;32:231-43.