

Appendix 9

Drug Abuse Warning Network

Methodology, estimation procedures, and data limitations

This information was excerpted from U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, *Emergency Department Trends from the Drug Abuse Warning Network, Final Estimates 1995-2002*, Drug Abuse Warning Network Series: D-24 (Rockville, MD: U.S. Department of Health and Human Services, 2003), pp. 34, 35, 117-125, 129-134, T-3, T-5; and information provided by the U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. Non-substantive editorial adaptations have been made.

Methodology

These data were collected by the Substance Abuse and Mental Health Services Administration through the Drug Abuse Warning Network (DAWN). The data are weighted estimates representing all drug abuse-related emergency department episodes in the 48 contiguous States, the District of Columbia, and 21 metropolitan areas. For 2002, the sample consisted of 549 eligible hospitals; 437 sample hospitals provided data to DAWN. The table below details hospital participation in DAWN and the estimates of total drug-related episodes and drug mentions for 1994-2002.

	Hospitals		Estimated number	
	Number providing data	Response rate	Drug-related episodes	Drug mentions
1994	488	76%	518,880	899,600
1995	489	77	513,429	899,977
1996	452	74	513,841	906,078
1997	465	77	526,671	941,627
1998	471	79	542,250	981,286
1999	488	82	554,570	1,013,688
2000	466	81	601,392	1,098,915
2001	458	81	638,345	1,165,148
2002	437	80	670,307	1,209,938

Hospitals eligible for DAWN are non-Federal, short-stay general surgical and medical hospitals in the coterminous United States that have a 24-hour emergency department. The American Hospital Association's (AHA) 1984 and 1985 Annual Surveys of Hospitals were used to obtain a sampling frame. Hospitals in the sampling frame were stratified according to several characteristics.

First, the sampling frame was divided into the 21 DAWN metropolitan areas and the remainder of the country (called the National Panel). Hospitals having 80,000 or more annual emergency department visits were assigned to a single stratum for selection with certainty. Then, the remaining hospitals in the 21 metropolitan areas were classified by location--inside or outside the central city, and by whether the hospital had an organized outpatient department and/or a chemical/alcohol inpatient unit--whether they had zero, one, or both types of units. Similarly, hospitals in the National Panel were classified by the presence/absence of such units. Total eligible hospitals in the original sample numbered 685.

The number of eligible sample facilities has not remained at the original 685 because some hospitals have closed or become ineligible since the sample was selected. To preserve the integrity of the sample, a sample maintenance procedure is employed to randomly select "newly eligible" hospitals from the AHA survey each year using the same selection probabilities. This procedure allows the sample to be kept up-to-date and representative of DAWN-eligible hospitals in the coterminous United States.

The national response rate was 80% in 2002; this rate is based on the number of eligible hospitals in the sample and the number actually responding. Data from the 21 oversampled metropolitan areas were pooled with data from the National Panel to produce the national estimates.

For the purpose of reporting to the DAWN system, drug abuse is defined as the nonmedical use of a substance for psychic effect, dependence, or suicide attempt/gesture. Nonmedical use includes: the use of prescription drugs in a manner inconsistent with accepted medical practice; the use of over-the-counter drugs contrary to approved labeling; or the use of any other substance (heroin, cocaine, marijuana/hashish, glue, aerosols, etc.) for psychic effect, dependence, or suicide.

Within each facility participating in the DAWN system, a designated DAWN reporter, usually a member of the emergency department or medical records staff, is responsible for reviewing medical charts to identify drug abuse episodes, and recording and submitting data on each case. An episode report is submitted for each drug abuse patient who visits a DAWN emergency department and meets the following criteria: (1) the patient was treated in the hospital's emergency department; (2) the patient's presenting problem(s) was induced by or related to drug use, regardless of when the drug use occurred; (3) the case involved the use of an illegal drug or the use of a legal

drug or other chemical substance for nonmedical purposes; and (4) the patient's reason for using the substance(s) included one of the following: dependence, suicide attempt or gesture, or psychic effects. Each report of a drug abuse episode includes demographic information about the patient and information about the circumstances of the episode. In addition to drug overdoses, reportable emergency department episodes may result from the chronic effects of habitual drug use or from unexpected reactions. Unexpected reactions include cases where the drug's effect was different than anticipated (e.g., caused hallucinations). DAWN cases do not include accidental ingestion or inhalation of a substance with no intent of abuse, or adverse reactions to prescription or over-the-counter medications taken as prescribed. Up to four different substances, in addition to alcohol-in-combination, can be specified for each episode. It should be noted that alcohol is reported to DAWN only when used in combination with a reportable substance. It also should be noted that episodes involving children under 6 years of age are not reported to DAWN.

A drug episode is defined as an emergency department visit that was induced by or related to the use of an illegal drug, or the nonmedical use of a legal drug or substance for persons age 6 and older. The number of emergency department episodes reported in DAWN is not equivalent to the number of individuals involved. One person may make repeated visits to an emergency department or to several emergency departments, thus producing a number of episodes. No patient identifiers are collected, therefore it is impossible to determine the number of individuals involved in the reported episodes.

A drug mention refers to a substance that was mentioned (recorded) during a drug-related emergency department episode. In addition to alcohol-in-combination, up to four substances may be reported for each drug-related episode; thus, the total number of mentions exceeds the total number of episodes. It should be noted that a particular drug mentioned may or may not be the sole or confirmed "cause" of the episode. Even when only one substance is reported for an episode, allowance still should be made for reportable drugs not mentioned or for other contributory factors.

Estimation procedures

The national estimates of total emergency department drug episodes and drug mentions are obtained by adding the estimates from the 21 metropolitan areas and the estimate from the National Panel for each estimation category. The weights are calculated each quarter for each hospital in the sample and are the product of a

three-component model that considers (1) the base sampling weight calculated as the reciprocal of the sampling probability; (2) an adjustment for nonresponse, based either on complete nonparticipation or failure to provide data for all the reporting days in a given time period; and (3) a correction factor, applied within metropolitan areas, that adjusts the total number of emergency department visits among participating sample hospitals to the total for the population of hospitals as determined from the sampling frame.

Revised estimates

DAWN estimates for 1994-2000 have been revised as a result of improvements in the coding and classification of drugs mentioned in emergency department visits. Revisions to estimates published previously are the result of a major change in the underlying method by which drugs are coded and classified in DAWN. DAWN relies on a detailed "drug vocabulary" to categorize the thousands of substances that are reported each year. The drug vocabulary is the language--the codes and terminology--that DAWN uses to record and classify drugs and other substances collected from emergency departments. It was necessary to implement substantial changes to the existing vocabulary to ensure that reported substances are accurately and consistently classified.

In 1999, an internal DAWN workgroup composed of DAWN staff and representatives from two DAWN contractors convened to evaluate the old DAWN drug vocabulary. The workgroup concluded that an externally maintained code set--one designed and maintained by subject matter experts apart from DAWN--would serve DAWN's needs better than a system developed and maintained in-house.

The drug terminology produced by Multum Information Services Inc., a private sector firm, provided a framework into which components that are unique to substance abuse and DAWN could be added. These include street names for illicit substances, metabolites commonly reported in DAWN mortality data, household products and other non-medicinal substances, and substances classified based on their route of administration as "inhalants."

In 2000, DAWN adopted the Multum Lexicon, a drug vocabulary and classification tool developed and maintained by Multum Information Services, Inc. Multum distributes the Lexicon (a complete database in Microsoft Access format) and regular updates through its website. DAWN uses only a fraction of the Multum Lexicon because DAWN case reports typically lack the most precise drug product information. For example,

DAWN case reports supply drug names, but not strength or dosage, so it is not feasible to code drugs at the level of detail supported by the Multum Lexicon. On the other hand, the specificity of drug information reported to DAWN varies depending on the detail available in the source documents, that is, emergency department medical records or death investigation files. The Multum Lexicon not only accommodates such variability but it provides a consistent method for aggregating very detailed information (such as brands) into consistent generic drug categories.

To accommodate DAWN data on substances that are not part of the Multum Lexicon, DAWN staff adopted the Multum Lexicon structure and designed a drug database that incorporates Multum Lexicon content for generic names, brand or trade names, and 3-level nested categories, and adds other DAWN reportable substances in a compatible structure.

The result of this combination of the Multum Lexicon and DAWN-specific substances is referred to as the DAWN Drug Reference Vocabulary. All drug entries in DAWN were translated into the new vocabulary. When possible, automated procedures were used to make this translation. When necessary, drug entries were assigned manually. All assignments were subjected to multiple, iterative layers of quality control. New DAWN data files, beginning with the 1994 data, were developed and revised estimates were produced. The revised estimates for total emergency department episodes deviate only slightly (no more than 0.08% in any year) from previously published estimates.

Preliminary versus final estimates

Final estimates are produced once a year when all hospitals participating in DAWN have submitted their data for that year and when additional ancillary data used in estimation become available. The differences between preliminary and final estimates are due to several factors:

(1) Final estimates include data from a small number of late-reporting hospitals. Data from some late-reporting facilities are received for each time period. Therefore, later files will usually include more complete data (i.e., have a higher response rate).

(2) Additional hospitals are added to the sample and incorporated into the final estimates for a given year (not the preliminary estimates for that same year). Most of these hospitals are "newly eligible" because they became DAWN eligible sometime after the original sample was selected. The final DAWN estimates are produced after the most current AHA's Annual Survey of Hospitals file is received. This file was used initially

to establish a sampling frame for DAWN. Subsequently, the most current AHA file is used once a year to maintain the representativeness of the sample. Between the releases of the preliminary and final estimates, the use of the newer AHA survey can result in hospitals being added to the sample and incorporated into the final estimates.

(3) Data from the most current AHA file are used to produce the final weights.

Data limitations

When producing estimates from any sample survey, two types of errors are possible--sampling and nonsampling errors. The sampling error of an estimate is the error caused by the selection of a sample instead of utilizing a census of hospitals. Sampling error is reduced by selecting a large sample or by using efficient sample design and estimation strategies such as stratification, optimal allocation, and ratio estimation.

Nonsampling errors occur from nonresponse, difficulties in the interpretation of the collection form, coding errors, computer-processing errors, errors in the sampling frame, and reporting errors. Many procedures are in place to minimize nonsampling errors such as data auditing and periodic retraining of data collectors. Further, nonrespondent hospitals are identified for additional recruitment. Late reporters are assigned for priority data collection and respondents with changes in reporting are designated for followup.

It also is important to recognize that DAWN does not provide a complete picture of medical problems associated with drug use, but rather focuses on the impact that these problems have on hospital emergency departments in the United States. If a person is admitted to another part of the hospital for treatment, treated in a physician's office, or treated at a drug treatment center, the episode is not included in DAWN.