DAWN
Drug Abuse Warning Network

SAMHSA
Substance Abuse and Mental Health
Services Administration

CBHSQ

Non-Fatal Overdoses Short Report | Companion Document

The Drug Abuse Warning Network (DAWN) is a nationwide public health surveillance system, whose mission is to provide early warning and ongoing monitoring of emerging drug trends and characteristics of drug and/or alcohol-related emergency department (ED) visits. DAWN is administered by the Center for Behavioral Health Statistics and Quality (CBHSQ), Substance Abuse and Mental Health Services Administration (SAMHSA), an agency within the U.S. Department of Health and Human Services (HHS).

DAWN eligible hospitals are non-federal, short-stay, general surgical and medical hospitals that operate at least one 24-hour ED with more than 100 annual ED visits.

Identification and Data Collection of Drug-Related Visits

DAWN's data collection involves the direct record review of all ED visits from 53 participating hospitals. Trained medical record abstractors review key areas of each patient's ED visit record to assess whether drugs and/or alcohol were either the direct cause or a contributing factor to the visit. Drugs include most substances including, but not limited to illicit drugs, prescription medications, over-the-counter pharmaceuticals, dietary supplements, and select non-pharmaceuticals abused by inhalation. If drugs and/or alcohol were determined to be involved, key data items from the record are abstracted. Data elements include demographic data, date of visit, and substances involved in addition to verbatim text from clinician diagnoses and the case description, a narrative describing why this visit is considered a drug-related visit using open text fields (e.g., triage documents, clinician's assessment).

DAWN Non-Fatal Overdose Definition

For the purposes of this report SAMHSA defined a non-fatal overdose as a drug-related ED visit with a non-fatal suspected poisoning or overdose directly related to use of licit or illicit drugs. ED visits with an ED disposition of death, visits where alcohol was the only substance involved, and visits that were designated as an adverse reaction were excluded.

Non-Fatal Overdose Selection Criteria

Developing Search Criteria and Programs

To identify non-fatal overdoses in DAWN data, a list of relevant search terms or phrases was established. The initial list included terms used in other non-fatal overdose related surveillance, suggestions from a literature review, and expert input.[1] Using an iterative process, identified terms and alternate spellings were used to search the open text fields of all drug-related visits to determine which terms most accurately identified overdose cases and which terms should be considered for exclusion. A final set of inclusion and exclusion criteria was determined and validated. The text-based query involved using a spell checker function, simple pattern matching, and manual tweaks as relevant.

Inclusion and Exclusion Criteria

STEP 1 **Automatic *exclusion* criteria based on the non-fatal overdose definition:**

    a. Exclude drug-related visits with an ED disposition of death

    b. Exclude drug-related visits where alcohol was the only substance involved in the visit

    c. Exclude drug-related visits designated as an adverse reaction

STEP 2 **Include *drug-related visits* when the following words or phrases are present in a *diagnosis* field:** "overdose", "od", "poison", "poisoning", "Narcan", or "naloxone".

    a. Exclude drug-related visits when only the inclusion of a term states "history" or "hx of" overdose or naloxone

    b. Exclude drug-related visits when only the inclusion of a term states alcohol poisoning or carbon monoxide poisoning

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1 Caudarella, A., Dong, H., Milloy, M. J., Kerr, T., Wood, E., & Hayashi, K. (2016). Non-fatal overdose as a risk factor for subsequent fatal overdose among people who inject drugs. *Drug and Alcohol Dependence*, 162, 51-55.

Centers for Disease Control and Prevention (CDC). (2022, December 1). *Drug overdose surveillance and epidemiology (DOSE) system*. Atlanta, GA. https://www.cdc.gov/drugoverdose/nonfatal/dashboard

Hallowell, B. D., Chambers, L. C., Rhodes, J., Basta, M., Viner-Brown, S., & Lasher, L. (2021). Using emergency medical services data to monitor nonfatal opioid overdoses in real time: Development, validation, and use of a case definition, Rhode Island, 2018. *Public Health Reports*, 136(1_suppl), 40S-46S.

Kinner, S. A., Milloy, M. J., Wood, E., Qi, J., Zhang, R., & Kerr, T. (2012). Incidence and risk factors for non-fatal overdose among a cohort of recently incarcerated illicit drug users. *Addictive Behaviors*, 37(6), 691-696.

Pickens, C. M., Scholl, L., Liu, S., Smith, H., & Snodgrass, S. (2022). Development and validation of a syndrome definition for suspected nonfatal unintentional/undetermined intent stimulant-involved overdoses. *Public Health Reports*, 137(6), 1079-1090.

STEP 3 **Include *drug-related visits* when the following words or phrases are present in the *case description* field:** "overdose", "od", "poison", "poisoning", "Narcan", or "naloxone" present in the case description **AND** "altered mental status", "ams", "seizure", "tachycardia", "tachy", "loss of consciousness", "loc", "shortness of breath", "sob", "unresponsive", "rhabdomyolysis", "rhabdo", "aloc", "respiratory depression", "respiratory failure", "delirium", or "unresponsive" are present in the ***diagnosis*** field.

    a. Exclude "plans to" or "planning to", "wanting to", "history" or "hx of", "complaining of" overdose, poisoning, Narcan, or naloxone

    b. Exclude when only inclusion of a term states alcohol poisoning, carbon monoxide poisoning, or poison ivy

Validating Inclusion and Exclusion Criteria

Validity testing was conducted to ensure this process used to detect non-fatal overdoes was as accurate as possible. To conduct this process, a random sample of 2,000 ED visits in the study time frame was identified, sampling ~1,000 visits identified by the query (Index Test) to be non-fatal overdose cases and ~1,000 determined to not be non-fatal overdose cases. Two reviewers with expertise in toxicology and the DAWN data system manually reviewed these ED visits to determine whether they meet the clinical definition of a non-fatal overdose (Gold Standard). Reviewers were blinded to whether the case was identified as a non-fatal overdose using the query. The two reviewers agreed 94 percent of the time. They discussed instances where they did not agree and came to resolution. In the rare event that they could not reach resolution, a third person involved in conversations served as the tie breaker. The results show that the query has high validity in detecting non-fatal overdose cases (Sensitivity = 95.1 percent) and excluding non-cases (Specificity = 98.4 percent) indicating that the query has high validity. See the table below.
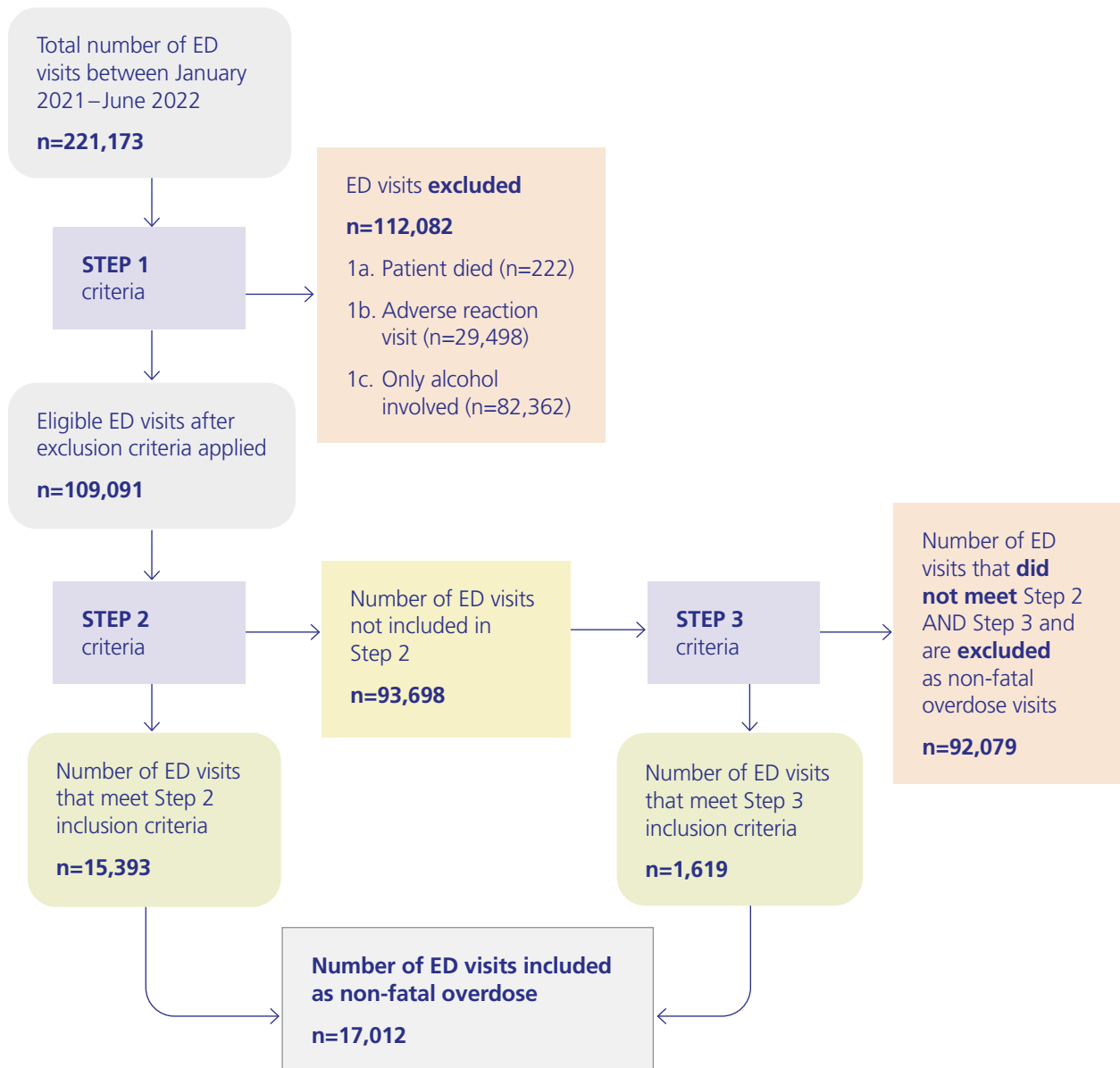
Index Test	Gold Standard	
	Yes	No
Yes	1,005	15
No	52	927
Total	1,057	942

Sensitivity 95.1%
Specificity 98.4%

Statistical Methods

Populations

For this analysis, all DAWN non-fatal overdose-related visits were identified from January 2021 to June 2022 using the validated query. Of the unweighted 221,173 total drug-related visits captured by data abstractors, 17,012 visits (13 percent) were determined to be non-fatal overdoses analyzed for this report. The number included and excluded by step are further detailed in the following figure.

Total number of ED visits between January 2021–June 2022

n=221,173

STEP 1 criteria

ED visits **excluded**

n=112,082

1a. Patient died (n=222)

1b. Adverse reaction visit (n=29,498)

1c. Only alcohol involved (n=82,362)

Eligible ED visits after exclusion criteria applied

n=109,091

STEP 2 criteria

Number of ED visits not included in Step 2

n=93,698

STEP 3 criteria

Number of ED visits that **did not meet** Step 2 AND Step 3 and are **excluded** as non-fatal overdose visits

n=92,079

Number of ED visits that meet Step 2 inclusion criteria

n=15,393

Number of ED visits that meet Step 3 inclusion criteria

n=1,619

Number of ED visits included as non-fatal overdose

n=17,012

Weighting and Estimation

DAWN employed a multi-step weighting process to produce nationally representative estimates given DAWN's hybrid sentinel surveillance and probability sample design. The multi-step weighting process involved (1) calculating initial base weights for each sampling part/stratum, (2) adjusting the initial base weights for changes in the sample design and sampling frame, (3) adjusting for hospital non-response, and (4) post-stratification to adjust DAWN estimates of ED visit totals to American Hospital Association (AHA) ED visits for the given stratum. More details can be found here: **Drug Abuse Warning Network (DAWN): Findings From Drug-Related Emergency Department Visits, 2021 | CBHSQ Data (samhsa.gov)**.

Analysis

Weighted percentages, unadjusted rates per 100,000, and respective 95% confidence intervals were calculated to represent the national population. Percentages were calculated using the number of qualifying non-fatal overdose cases as the denominator and weighted frequency for each category as the numerator. Rates were calculated using the weighted frequency as the numerator and U.S. Census Resident Midpoint population estimate (October 2021) as the denominator.

The unadjusted rates are calculated as:

$$\text{Unadjusted rate} = \frac{\text{Weighted frequency}}{\text{Midpoint U.S. resident population}} \times \frac{100{,}000 \text{ persons}}{1.5 \text{ years}}$$

Unadjusted rates were calculated by age, sex, race, and ethnicity.

Pairwise t-tests were calculated to determine whether the crude rates between each variable level were significantly different. We used the Bonferroni correction for each demographic variable to account for multiple tests. That is, if there are n comparisons being made (note that if there are k levels to a variable, then n=k*(k-1)/2), then the updated significance level to which we compare the resulting t-test p-value is compared is 0.05/n.

Data Notes and Limitations

- DAWN collects data on ED visits and not individuals. This means that a patient who has multiple drug-related ED visits was counted as a separate drug-related ED visit each time.
- Caution should be exercised when interpreting findings as the precision offered by DAWN's small sample size (53 hospitals) is limited, and can lead to unreliable estimates.
- To ensure patient confidentiality and that no incorrect conclusions are drawn based on the estimates provided, estimates were suppressed from this report when the relative standard error was greater than 50 percent or the count was less than 10 or greater than 0.
- This report could not address estimates for ethnicity, region, and some substances due to a relative standard error greater than 50 percent.
- Rx and Other Opioids includes non-heroin opioids such as fentanyl, oxycodone, codeine, and carfentanil.
- Data should not be compared between legacy DAWN (1992–2011) and the current DAWN version. The sample designs are different with the current iteration's design established to provide surveillance.