Patterns of Abuse Among Unintentional Pharmaceutical Overdose Fatalities

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In 1997, 2 expert panels in the United States introduced clinical guidelines for management of chronic pain.1,2 Both guidelines encouraged expanded use of opioid pain medications after careful patient evaluation and counseling when other treatments are inadequate. In subsequent years, experts have continued to advocate for improved pain management,3 and the Federation of State Medical Boards has encouraged adoption of model policies to promote more compassionate pain management by clinicians.4 States have increasingly complied by enacting new regulations or issuing guidelines or policy statements promoting improved pain management.5 In the 10 years (1997-2007) since the guidelines were first published, per capita retail purchases of methadone, hydrocodone, and oxycodone in the United States increased 13-fold, 4-fold, and 9-fold, respectively.6

Concurrent with the increase in legitimate sales of opioids, diversion of these drugs to nonmedical uses has also increased. The National Survey on Drug Use and Health discovered that an annual average of 4.8% of persons 12 years or older consumed a prescription pain reliever for nonmedical reasons in the previous year during 2002-2005.7 Rates of emergency department visits for opioid analgesic overdoses have also increased.8 Unintentional drug poisoning deaths increased 68% during 1999-2004.

Context Use and abuse of prescription narcotic analgesics have increased dramatically in the United States since 1990. The effect of this pharmacoepidemic has been most pronounced in rural states, including West Virginia, which experienced the nation’s largest increase in drug overdose mortality rates during 1999-2004.

Objective To evaluate the risk characteristics of persons dying of unintentional pharmaceutical overdose in West Virginia, the types of drugs involved, and the role of drug abuse in the deaths.

Design, Setting, and Participants Population-based, observational study using data from medical examiner, prescription drug monitoring program, and opioid treatment program records. The study population was all state residents who died of unintentional pharmaceutical overdoses in West Virginia in 2006.

Main Outcome Measures Rates and rate ratios for selected demographic variables. Prevalence of specific drugs among decedents and proportion that had been prescribed to decedents. Associations between demographics and substance abuse indicators and evidence of pharmaceutical diversion, defined as a death involving a prescription drug without a documented prescription and having received prescriptions for controlled substances from 5 or more clinicians during the year prior to death (ie, doctor shopping).

Results Of 295 decedents, 198 (67.1%) were men and 271 (91.9%) were aged 18 through 54 years. Pharmaceutical diversion was associated with 186 (63.1%) deaths, while 63 (21.4%) were accompanied by evidence of doctor shopping. Prevalence of diversion was greatest among decedents aged 18 through 24 years and decreased across each successive age group. Having prescriptions for a controlled substance from 5 or more clinicians in the year prior to death was more common among women (30 [30.9%]) and decedents aged 35 through 44 years (23 [30.7%]) compared with men (33 [16.7%]) and other age groups (40 [18.2%]). Substance abuse indicators were identified in 279 decedents (94.6%), with nonmedical routes of exposure and illicit contributory drugs particularly prevalent among drug diverters. Multiple contributory substances were implicated in 234 deaths (79.3%). Opioid analgesics were taken by 275 decedents (93.2%), of whom only 122 (44.4%) had ever been prescribed these drugs.

Conclusion The majority of overdose deaths in West Virginia in 2006 were associated with nonmedical use and diversion of pharmaceuticals, primarily opioid analgesics.

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2004; the majority of this increase has been attributed to deaths associated with opioid analgesics. During 1999-2004, West Virginia experienced the nation’s most substantial increase (550%) in unintentional poisoning mortality. State vital records indicate that the increase in drug overdose mortality rates continued after 2004. Therefore, we conducted a study to better understand these unintentional drug poisoning deaths. Our objective was to characterize persons dying of drug overdoses in West Virginia in 2006 with regard to potential risk factors and the types of drugs that resulted in their deaths. Because West Virginia has centralized death investigation records maintained by the state medical examiner as well as centralized prescription records maintained by the state’s prescription drug monitoring program, we also were able to assess the decedents’ prescription histories in the year before their deaths. This information might help practitioners and public health officials understand how prescription drugs involved in fatal overdoses are obtained and might help prevent future overdoses.

METHODS

Case Finding

We identified all state residents who died of unintentional drug overdose in West Virginia in 2006. Decedents were included if their death certificates listed the underlying cause of death to be unintentional drug poisoning (International Classification of Diseases, 10th Revision [ICD-10] codes X40–X44). All cases were initially identified by searching an electronic database of vital records at the Health Statistics Center of the West Virginia Department of Health and Human Resources using the appropriate ICD-10 codes. Identifying information was cross-referenced with the case logbook and electronic database of the investigations of the Office of the Chief Medical Examiner (OCME) to identify decedent records. We excluded cases certified by county coroners or physicians without benefit of autopsy and decedents whose only toxicology tests were performed by an admitting hospital. We then focused our analyses on overdoses that involved prescription pharmaceuticals by excluding those overdoses due exclusively to nonpharmaceuticals (ie, illicit drugs such as cocaine and heroin), over-the-counter products, or alcohol. Human subjects review by the Centers for Disease Control and Prevention determined this study to be a public health investigation; as such, institutional review board approval was not required.

OCME Toxicology and Death Certification Protocol

In West Virginia, the state medical examiner system imposes uniform death investigation and certification practices over a statewide jurisdiction and maintains a central registry of case files pertaining to all deaths investigated and certified by that system. The OCME routinely screens all decedents suspected of drug overdose for illicit drugs and pharmaceuticals, including narcotics (eg, heroin and opioid analgesics), marijuana, stimulants (eg, cocaine and amphetamines), depressants (eg, benzodiazepines and barbiturates), and other pharmaceuticals (eg, antidepressants and antihistamines). Blood (or in unusual circumstances urine or other matrices) is screened using automated enzyme immunoassay. Positive findings are confirmed and quantitated using gas or liquid chromatography with mass spectrometry detection.

Specimens are also screened for alcohol and other volatile compounds using gas chromatography with flame ionization detection. Case toxicology testing is preferentially performed using peripheral blood samples collected from subclavian, iliac, or femoral sites. The autopsy protocol also includes assessment and sampling of gastric contents, as well as collection of urine, vitreous fluid, and liver tissue. For cases in which peripheral blood or urine is not available, liver tissue is most often used for toxicology testing.

West Virginia OCME death certification protocol requires that a scene-of-death investigation report be prepared for all cases by trained and certified death investigators, with subsequent case investigation directed by OCME forensic pathologists’ initial peer review. Following receipt of all investigative reports and records deemed necessary, including board-of-pharmacy records, medical records, police investigative reports, and toxicology reports, each case receives final peer review to determine which factors, including drugs, are contributory to death.

The manner of death (ie, unintentional vs intentional) is also established through this process. The manner of death, referring to the general circumstances surrounding drug overuse (ie, “accidental,” inferring recre-ational or other unintentionally fatal drug overuse, vs intentionally fatal drug overuse, described as “suicide,” “homicide,” or “undetermined manner”) is also established through this process, which requires final overall case review and cosignature by a senior staff pathologist and is based on toxicology and autopsy results; death investigation findings, including routes of drug administration; status of drug prescription access; witnessed-death circumstances; and other considerations. Multiple drugs may be deemed contributory to death if they are present at therapeutic levels or greater and have potentially deleterious physiological effects (eg, respiratory depression). Drugs found through toxicology testing can be considered contributory to death only if they meet these criteria.

Data Sources

In late 2007, we abstracted information from autopsy reports, toxicology reports, death-scene investigation reports, death certificates, and copies of medical records in OCME files. The West Virginia Board of Pharmacy also provided decedent prescription histories from the state’s Controlled Substances Monitoring Program (CSMP), which maintains electronic records of all Schedule II, III, and IV controlled

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ABUSE AMONG UNINTENTIONAL PHARMACEUTICAL OVERDOSE FATALITIES

Substances (as defined by the Controlled Substances Act) dispensed by West Virginia pharmacies since 2003. Furthermore, all 8 opiate treatment programs (OTPs) in West Virginia provided information concerning whether any of the decedents were enrolled in outpatient substance abuse treatment for opiate addiction at the time of death. These are the only facilities in the state that can dispense methadone for long-term treatment of addiction. Decedents were linked to their CSMP and OTP records using name, date of birth, and date of death, where applicable.

Demographic information regarding decedents (eg, sex, age, marital status, highest education level, and county of residence) was collected from death certificates. Office of the Chief Medical Examiner death-scene investigation reports and medical records provided information that might indicate that the overdose was related to substance abuse (eg, whether the decedent had a history of drug overdoses and whether the decedent used a pharmaceutical by a nonmedical route of administration such as snorting, inhalation, or injection). Medical records, death-scene investigation reports, and autopsy reports from OCME files were also used to determine past medical histories and comorbid conditions, including cardiovascular disease, pulmonary disease, mental illness, and pain. Contributory drugs were identified based on medical examiner conclusions stated in the autopsy report and categorized on the basis of the drug reference vocabulary established by the Drug Alert and Warning Network.

Among decedents with contributory prescription pharmaceuticals, CSMP and OCME sources were used to determine whether decedents had ever had a documented prescription. For Schedule II drugs, CSMP and OCME sources were also used to determine if decedents had a prescription dispensed within 30 days of death. In West Virginia, Schedule II drugs may only be dispensed up to a 30-day supply with no refills. Decedents enrolled in an OTP at the time of death were considered to have current prescriptions for methadone. Records from the CSMP also provided the number of prescribing clinicians and dispensing pharmacies for controlled substances for each decedent during the 12 months prior to death. Records from the OCME were the sole source of information for non-controlled prescription drugs not included in the CSMP.

Statistical Analysis

Census estimates for 2006 were used to calculate death rates per 100,000 population and rate ratios with corresponding 95% confidence intervals (CIs). Consistent with Census methodology, the analysis of highest level of education attained was limited to decedents 25 years or older, and marital status analysis included only decedents 15 years or older. As a proxy for socioeconomic status, the decedents’ counties of residence were categorized into quartiles based on the percentage of families with income below the poverty line, on the basis of 2005 poverty estimates. The threshold used to determine poverty status depends on family size and composition, as defined by the US Census Bureau. To evaluate overdose death rates by rural residence, counties were also categorized into quartiles of population density on the basis of 2006 Census data and 2000 land-area estimates. Trends in rates were tested using the Mantel-Haenszel χ² test for trend.

We examined 2 mechanisms by which decedents had obtained their drugs: being given or purchasing diverted drugs on the street and doctor shopping. A death involving drug diversion was defined as one involving a prescription drug used without documented prescription records. Doctor shopping was defined as having received prescriptions for controlled substances from 5 or more clinicians during the year prior to death. Associations between both diversion and doctor shopping and demographic factors and other indicators of substance abuse were quantified by odds ratios (ORs) and corresponding 95% CIs. The specific substance abuse indicators analyzed included nonmedical route of drug administration, history of substance abuse based on OCME and medical records, previous overdose, current OTP enrollment, presence of a contributory illicit drug, and presence of contributory alcohol.

We also classified decedents based on the specific pharmaceuticals that contributed to death. For each drug, we calculated the proportion of decedents with prescription documentation as well as the proportion with documentation within 30 days of death for Schedule II drugs. We calculated the proportion of decedents using each drug who also were using other contributory prescription drugs, illicit drugs, alcohol, or no other contributory substances. All analyses were performed using Epi Info version 3.4 (Centers for Disease Control and Prevention, Atlanta, Georgia), with significance set at 95% based on 2-sided testing.

RESULTS

Based on vital records, we identified 355 unintentional pharmaceutical over-
dose deaths with the appropriate ICD-10 codes. Cross-referencing with OCME records identified 5 duplicate records and 6 ICD-10 coding errors in the vital records database, leaving 344. Of these, we excluded 49, leaving a study population of 295 (Figure).

The overall unintentional pharmaceutical overdose death rate was 16.2 per 100 000 population (Table 1). Men accounted for 198 (67.1%) of fatalities and had a drug overdose death rate more than 2 times that of women. The age range was 18 to 70 years (mean, 39 years; median, 39 years). The majority (91.9%) of decedents were aged 18 through 24 years; in this group, 41 (91.1%) of the decedents lacked prescription documentation for 1 or more contributory pharmaceutical. Furthermore, diversion rates consistently decreased among each successive age group ($\chi^2$ for trend, $P < .001$). No significant differences in rates were observed for county population density.

Among all decedents, 186 (63.1%) had used contributory pharmaceuticals without documented prescriptions (ie, diversion), and 63 (21.4%) had 5 or more clinicians prescribe them controlled substances in the year prior to death (ie, doctor shopping) (Table 2). Women were significantly more likely to have evidence of doctor shopping than men (30.9% vs 16.7%; OR, 2.2; 95% CI, 1.2-4.1), although no differences in prevalence of diversion were noted by sex. Prevalence of diversion was greatest among the group aged 18 through 24 years; in this group, 41 (91.1%) of the decedents lacked prescription documentation for 1 or more contributory pharmaceutical. Furthermore, diversion rates consistently decreased among each successive age group ($\chi^2$ for trend, $P < .001$). In contrast, relative to all other age groups, the group aged 35 through 44 years was associated with a significantly greater rate of doctor shopping (30.7% vs 18.2%; OR, 2.0; 95% CI, 1.1-3.8). Decedents who had never been married were more likely to have evidence of diversion than those who were married at the time of death (76.3% vs 53.4%; OR, 2.8; 95% CI, 1.5-5.4). No significant differences in rates of diversion or doctor shopping were noted by education or poverty level.

Of all 295 decedents, 279 (94.6%) had at least 1 indicator of substance abuse (Table 3). Indicators associated with pharmaceutical diversion were not the same as those associated with doctor shopping. Compared with deaths involving prescribed pharmaceuticals, deaths involving diversion were associated with history of substance abuse (82.3% vs 71.6%; OR, 1.8; 95% CI, 1.0-3.4), nonmedical route of pharmaceutical administration (26.3% vs 15.6%; OR, 1.9; 95% CI, 1.0-3.8), and a contributory illicit drug (19.4% vs 10.1%; OR, 2.1; 95% CI, 1.0-4.9). In contrast, decedents with evidence of doctor shopping were significantly more likely to have had a previous overdose (30.2% vs 13.4%; OR, 2.8; 95% CI, 1.4-5.6) and significantly less likely to have used contributory alcohol (7.9% vs 19.8%; OR, 0.3; 95% CI, 0.1-0.9), compared with decedents who had fewer than 5 clinicians prescribe them controlled substances in the year prior to death. A significant negative association was observed between drug diversion and doctor shopping (OR, 0.3; 95% CI, 0.1-0.5), with only 24 dece-
decedents (8.1%) meeting the definition of both.

Based on OCME conclusions, 234 decedents (79.3%) had used multiple substances contributing to their fatal overdoses. The mean number of contributory prescription drugs was 2.0, with a range of 1 to 5 drugs. The specific drug combinations and prescription documentation for each drug are described in TABLE 4. Opioid analgesics were the most prevalent class of drugs, contributing to 275 deaths (93.2%); of these, only 122 (44.4%) included evidence of prescription documentation for all of the contributory opioids. Furthermore, among the 227 decedents for whom Schedule II opioid analgesics contributed to death, 66 (29.1%) had prescriptions dispensed within 30 days prior to death, as would be required in West Virginia. Among all decedents using contributory opioid analgesics, 59 (21.5%) were using no other contributory substances, such as alcohol, illicit drugs, or other prescription pharmaceuticals. The most common drug identified was methadone, which was involved in 112 (40.0%) of all deaths. The percentage of decedents with valid prescriptions for methadone (32.1%) was lower than the percentage of those with valid prescriptions for hydrocodone (85.1%) or oxycodone (60.7%).

Psychotherapeutic drugs contributed to 144 deaths (48.8%), though all but 1 of these deaths (attributed to amitriptyline) involved other contributory substances, primarily opioid analgesics. Benzodiazepines were involved in 113 (78.5%) of the deaths involving psychotherapeutic drugs. Decedents who overdosed on psychotherapeutic drugs had a lower prevalence of contributory illicit drugs (8.3%) and a higher prevalence of contributory alcohol (20.8%) than decedents who used opioid analgesics (16.0% and 13.5%, respectively).

**COMMENT**

In recent years, West Virginia has had one of the highest unintentional drug overdose mortality rates in the United States. This study of such deaths in 2006 revealed that almost all the unintentional drug overdose deaths in West Virginia involved prescription drugs. Moreover, almost all the prescription drug–related deaths showed signs of drug abuse. Risk factors for prescription drug deaths included being male, having less education, and living in the most impoverished counties of the state. Prescription opioid analgesics played a dominant role in the deaths, with a secondary contribution from psychotherapeutic drugs. Relatively few deaths (<25%) involved alcohol, illicit drugs, or nonmedical routes of administration such as injection.

A number of factors may have contributed to West Virginia’s steep increase in overdose rates and high rank among states. Rapid rate increases between 1999 and 2004 have been correlated with the percentage of the population living in rural areas, and West Virginia was the third most rural state in 2000. Previous work has associated higher rates of unintentional drug overdose mortality with high levels of use of opioids per capita, and Drug Enforcement Administration data indicated higher rates of unintentional drug overdose deaths in West Virginia compared to other states. The study of deaths in 2006 revealed that almost all the deaths were attributed to prescription drugs, with a higher prevalence of contributory alcohol (20.8%) than decedents who used opioid analgesics (16.0% and 13.5%, respectively).

### Table 2. Rates of Pharmaceutical Diversion and Doctor Shopping Among Unintentional Pharmaceutical Overdose Deaths by Sociodemographic Characteristics, West Virginia, 2006

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Any Diverted Pharmaceuticals&lt;sup&gt;a&lt;/sup&gt;</th>
<th>≥5 Clinicians&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Deaths, No. (%)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>97 (60.9)</td>
<td>0.9 (0.5-1.6)</td>
</tr>
<tr>
<td>Men</td>
<td>198 (63.6)</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td><strong>Age, y</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>45 (91.1)</td>
<td>12.1 (2.9-58.8)</td>
</tr>
<tr>
<td>25-34</td>
<td>69 (73.9)</td>
<td>3.4 (1.2-9.9)</td>
</tr>
<tr>
<td>35-44</td>
<td>75 (80.0)</td>
<td>1.8 (0.6-5.0)</td>
</tr>
<tr>
<td>45-54</td>
<td>82 (46.3)</td>
<td>1.0 (0.4-2.8)</td>
</tr>
<tr>
<td>≥55</td>
<td>24 (45.8)</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td><strong>Marital status&lt;sup&gt;d&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>103 (53.4)</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td>Never married</td>
<td>97 (76.3)</td>
<td>2.9 (1.5-5.4)</td>
</tr>
<tr>
<td>Divorced</td>
<td>86 (59.3)</td>
<td>1.3 (0.7-2.4)</td>
</tr>
<tr>
<td>Widowed</td>
<td>9 (66.7)</td>
<td>1.8 (0.4-11.3)</td>
</tr>
<tr>
<td><strong>Highest education&lt;sup&gt;e&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12th grade</td>
<td>77 (61.0)</td>
<td>1.4 (0.6-3.1)</td>
</tr>
<tr>
<td>High school diploma</td>
<td>128 (57.0)</td>
<td>1.2 (0.5-2.4)</td>
</tr>
<tr>
<td>Any college</td>
<td>43 (53.5)</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td><strong>Below poverty line in county of residence, %&lt;sup&gt;f&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>295 (66.3)</td>
<td>19 (26.4)</td>
</tr>
<tr>
<td>Quartile 1</td>
<td>72 (59.7)</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td>Quartile 2</td>
<td>65 (63.1)</td>
<td>1.2 (0.6-2.4)</td>
</tr>
<tr>
<td>Quartile 3</td>
<td>62 (74.2)</td>
<td>1.9 (0.9-4.3)</td>
</tr>
<tr>
<td>Quartile 4</td>
<td>96 (58.3)</td>
<td>0.9 (0.5-1.8)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Diverted pharmaceuticals include those that contributed to death but were not prescribed to the decedent.

<sup>b</sup> Includes clinicians who prescribed controlled substances to the decedent during the year prior to death, based on Controlled Substances Monitoring Program records.

<sup>c</sup> Percentages among given sociodemographic group (row percentages) are reported.

<sup>d</sup> Individuals 15 years or older (n = 295).

<sup>e</sup> Individuals 25 years or older with known education level (n = 248).

<sup>f</sup> Excludes deaths in jail or prison.

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cate that West Virginia had one of the highest rates of opioid use per capita in the United States in 2006.6 This may be in part because higher prevalences of prescription opioid use are associated with eligibility for Medicaid and with lower family income,19 and West Virginia is the third poorest state.15 The increase in the overdose rate is not likely owing to a change in the classification of suicidal overdoses to unintentional overdoses, because the rate of drug-related suicide in West Virginia did not decline between 1999 and 2004.20

The prescription histories of the decedents revealed that drug diversion and doctor shopping involved different sub-populations of persons abusing prescription drugs. Those in the group using diverted drugs resemble those traditionally associated with the abuse of street drugs in that more than two-thirds were men, half were younger than 35 years, and most were unmarried or divorced.21 Consistent with this profile, individuals who had used diverted drugs were more likely to have used a nonmedical route of exposure and to have combined prescription with illicit drugs in their fatal overdose and were more likely to have a recognized history of substance abuse. Those with a history of abusing prescription drugs report beginning use of psychothera-

### Table 3. Substance Abuse Indicators Among Unintentional Pharmaceutical Overdose Deaths Involving Pharmaceutical Diversion and Doctor Shopping, West Virginia, 2006

<table>
<thead>
<tr>
<th>Substance Abuse Indicator</th>
<th>All Deaths, No. (%)</th>
<th>Any Diverted Pharmaceuticalsa</th>
<th>≥5 Cliniciansb</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of substance abuse</td>
<td>231 (78.3)</td>
<td>153 (62.3)</td>
<td>9 (1.4)</td>
</tr>
<tr>
<td>Any diverted pharmaceuticals</td>
<td>186 (63.1)</td>
<td>NA</td>
<td>24 (38.1)</td>
</tr>
<tr>
<td>Nonmedical route of administration</td>
<td>66 (22.4)</td>
<td>49 (26.3)</td>
<td>9 (14.3)</td>
</tr>
<tr>
<td>≥5 Clinicians prescribed controlled substancesb</td>
<td>63 (21.4)</td>
<td>24 (12.3)</td>
<td>NA</td>
</tr>
<tr>
<td>Contributory alcohol</td>
<td>51 (17.3)</td>
<td>34 (18.3)</td>
<td>5 (7.9)</td>
</tr>
<tr>
<td>Previous overdose</td>
<td>50 (16.9)</td>
<td>29 (15.6)</td>
<td>19 (30.2)</td>
</tr>
<tr>
<td>Contributory illicit drugc</td>
<td>47 (15.9)</td>
<td>36 (19.4)</td>
<td>9 (14.3)</td>
</tr>
<tr>
<td>Current OTP enrollment</td>
<td>12 (4.1)</td>
<td>4 (2.2)</td>
<td>2 (3.2)</td>
</tr>
<tr>
<td>Any indicatorf</td>
<td>279 (94.6)</td>
<td>167 (89.8)</td>
<td>55 (87.3)</td>
</tr>
<tr>
<td>Total</td>
<td>295 (100)</td>
<td>186 (100)</td>
<td>63 (100)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; NA, not applicable; OR, odds ratio; OTP, opiate treatment program.

aDiverted pharmaceuticals include those that contributed to death but that were not prescribed to the decedent.

bIncludes clinicians who prescribed controlled substances to the decedent during the year prior to death, based on Controlled Substances Monitoring Program records.

cPercentages among those with any diverted pharmaceuticals or ≥5 clinicians (column percentages) are reported.

D Odds ratio compares those with given substance abuse indicator vs those without as the reference group.

Includes cocaine, heroin, and methamphetamine.

Excludes not applicable indicators, as noted.

### Table 4. Contributory Drugs Involved in Unintentional Pharmaceutical Overdose Fatalities, West Virginia, 2006

<table>
<thead>
<tr>
<th>Contributory Prescription Drug</th>
<th>Deaths, Total (%)</th>
<th>Prescribed, %a</th>
<th>Dispensed Within 30 d of Death, %b</th>
<th>Other Prescription Drugs</th>
<th>Illicit Drugsc</th>
<th>Alcohol</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opioid analgesic</td>
<td>275 (93.2)</td>
<td>44.4</td>
<td>29.1</td>
<td>63.3</td>
<td>16.0</td>
<td>13.5</td>
<td>21.5</td>
</tr>
<tr>
<td>Methadone</td>
<td>112 (40.0)</td>
<td>32.1</td>
<td>26.8</td>
<td>62.5</td>
<td>13.4</td>
<td>9.8</td>
<td>25.9</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>67 (22.7)</td>
<td>85.1</td>
<td>NA</td>
<td>83.6</td>
<td>9.0</td>
<td>11.9</td>
<td>7.5</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>61 (20.7)</td>
<td>60.7</td>
<td>39.3</td>
<td>70.5</td>
<td>14.8</td>
<td>9.8</td>
<td>18.0</td>
</tr>
<tr>
<td>Morphine</td>
<td>46 (15.6)</td>
<td>21.7</td>
<td>15.2</td>
<td>54.3</td>
<td>28.3</td>
<td>28.3</td>
<td>21.7</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>31 (10.5)</td>
<td>41.9</td>
<td>32.3</td>
<td>77.4</td>
<td>19.4</td>
<td>9.7</td>
<td>12.9</td>
</tr>
<tr>
<td>Other Schedule II opioid analgesic</td>
<td>4 (1.4)</td>
<td>25.0</td>
<td>25.0</td>
<td>100</td>
<td>25.0</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Other Schedule III opioid analgesic</td>
<td>24 (8.1)</td>
<td>50.0</td>
<td>NA</td>
<td>91.7</td>
<td>8.3</td>
<td>8.3</td>
<td>0</td>
</tr>
<tr>
<td>Psychotherapeutic</td>
<td>144 (48.8)</td>
<td>54.9</td>
<td>NA</td>
<td>93.8</td>
<td>8.3</td>
<td>20.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Diazepam</td>
<td>66 (22.4)</td>
<td>45.5</td>
<td>NA</td>
<td>92.4</td>
<td>7.6</td>
<td>19.7</td>
<td>0</td>
</tr>
<tr>
<td>Alprazolam</td>
<td>54 (18.5)</td>
<td>64.8</td>
<td>NA</td>
<td>100</td>
<td>5.6</td>
<td>11.1</td>
<td>0</td>
</tr>
<tr>
<td>Other benzodiazepine</td>
<td>5 (1.7)</td>
<td>80.0</td>
<td>NA</td>
<td>100</td>
<td>0</td>
<td>20.0</td>
<td>0</td>
</tr>
<tr>
<td>Antidepressant</td>
<td>49 (16.6)</td>
<td>71.4</td>
<td>NA</td>
<td>93.9</td>
<td>10.2</td>
<td>20.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Other psychotherapeutic</td>
<td>16 (5.4)</td>
<td>68.8</td>
<td>NA</td>
<td>93.8</td>
<td>0</td>
<td>37.5</td>
<td>0</td>
</tr>
<tr>
<td>Other prescription drug</td>
<td>33 (11.2)</td>
<td>60.1</td>
<td>NA</td>
<td>97.0</td>
<td>9.1</td>
<td>12.1</td>
<td>3.0</td>
</tr>
<tr>
<td>All decedents</td>
<td>295 (100)</td>
<td>36.9</td>
<td>NA</td>
<td>62.4</td>
<td>15.9</td>
<td>17.3</td>
<td>20.7</td>
</tr>
</tbody>
</table>

Abbreviation: NA, not applicable.

aFor decedents with multiple contributory drugs from a given category, percentage includes only those who had all drugs prescribed to them.

bApplicable to 227 decedents with Schedule II drugs, which can be dispensed as no more than a 30-day supply with no refills in West Virginia. For decedents with multiple contributory drugs from a given category, percentage includes only those who had all drugs dispensed to them within 30 days of death.

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peutic drugs as a way to moderate the ef-
fects of street drugs and beginning use
of prescription opioids as a substitute
when street drugs are not available.21

The Drug Enforcement Administra-
tion confirms that drug diversion was
widespread in West Virginia22 and the
Appalachian region23 during this pe-
riod. The primary methods of diver-
sion were illegal sale and distribution
by health care professionals, em-
ployee theft, forged prescriptions, and
the Internet.23 Persons arrested for drug-
related crime in West Virginia during
2003-2004 resembled the young men
using diverted drugs in this study.24

A much smaller subset of dece-
dents, roughly 1 in 5, met our defini-
tion of doctor shopping. In contrast to
the group defined by their use of di-
verted drugs, doctor shoppers were 48%
women, and only 29% were younger
than 35 years. The doctor shoppers re-
semble patients typically receiving opi-
oid analgesics in their greater average
age25 and more equal proportions of
men and women.26 Doctor shoppers
tended to come from higher-income
counties, to be less likely to have been
drinking when they overdosed, and to
take their drugs orally. Doctor shop-
ners may represent that part of the
drug-abusing population that is less
willing to engage in illegal or deviant
activities.

Among all deaths, opioid analgesics
were involved in 93% and psychothera-
peutic drugs in 49%. Among the 61
single-drug deaths, however, only 1 was
due to a psychotherapeutic drug, sug-
gest that fatal overdose is less likely
with a single psychotherapeutic drug
than with a single opioid analgesic.
Methadone was responsible for more
single-drug deaths and was involved in
far more deaths than any other drug. The
Drug Enforcement Administration has
listed methadone along with hydro-
codone, diazepam, and alprazolam as
drugs commonly diverted and abused in
West Virginia22 but has not published any
comparisons of the rates at which dif-
f erent opioids are being diverted.
Methadone was prescribed in much
smaller volumes than other opioids in
West Virginia in 2006. Not including
methadone from OTPs, methadone was
distributed at a rate of 2375 g/100 000
population in West Virginia, whereas
the rate for oxycodone was 17 385
g/100 000 population and that for hy-
drocodone was 20 390 g/100 000 popu-
lation.8 Even accounting for metha-
done’s greater potency,27 there is no
indication that it being used more of-
ten than these other opioids. Given the
small number of methadone dece-
dents enrolled in the OTP, it is also un-
likely that OTP-provided methadone
contributed much to the total metha-
done deaths. This suggests either that
methadone is for unknown reasons fa-
vored by drug diverters or that metha-
done is more risky to users than other
opioids.

This study did not examine the
sources of the involved opioids. How-
ever, the majority of persons using pre-
scription pain relievers for nonmedical
indications report receiving their drugs
free from a friend or relative; among
these, the majority report that the friend
or relative received the drug from a single
clinician.19 National data from 2003-
2004 indicate that 40% of opioids were
prescribed by primary care clinicians, and
39% were prescribed by physicians in
emergency departments.25

Strengths of this study include the
consistency provided by having a single
medical examiner’s office and toxicol-
yogy laboratory as the source for most in-
formation, completeness of toxicology
testing in West Virginia, and availabil-
ity of historical prescription and narcot-
ics treatment program records. To our
knowledge, no previous studies have
made use of the prescription monitor-
ing program records of all decedents.

The majority of limitations of this
study are related to missing or possibly
erroneous information concerning de-
cedents’ histories and circumstances of
their drug use and the potential for re-
porting bias when information is pro-
vided by friends or family members.
Therefore, the reported prevalences of
histories of substance abuse and previ-
sous drug overdoses and other measures
likely are underestimates. In addition,

Author Contributions: Dr Hall had full access to all of
the data in the study and takes responsibility for the in-
tegrity of the data and the accuracy of the data analysis.
Study concept and design: Hall, Logan, Kaplan, Bixler,
Crosby, Paulozzi.
Acquisition of data: Hall, Logan, Toblin, Kaplan, Krane.
Analysis and interpretation of data: Hall, Logan, Toblin,
Kaplan.
Drafting of the manuscript: Hall, Logan, Bixler, Paulozzi.
Critical revision of the manuscript for important in-
tellectual content: Hall, Logan, Toblin, Kaplan, Bixler,
Crosby, Paulozzi.

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Statistical analysis: Hall, Logan, Toblin.
Administrative, technical, or material support: Kramer, Bixler, Crosby, Paulozzi.
Study supervision: Hall, Bixler, Crosby, Paulozzi.
Financial Disclosures: None reported.
Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

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REFERENCES