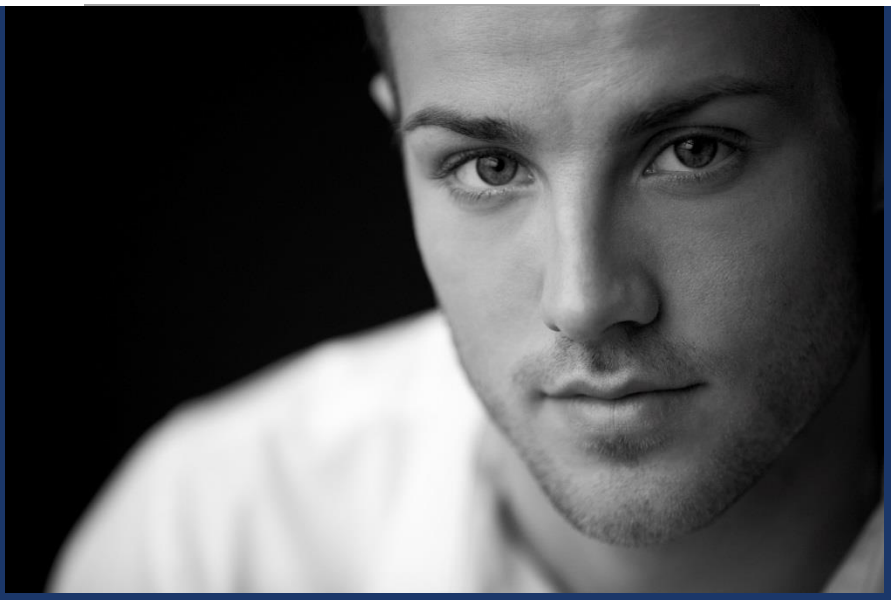

# OUTBREAK REPORT

## Opioid-Related Overdose — Huntington, West Virginia, August 2016


WEST VIRGINIA Department of Health & Human Resources
BUREAU FOR PUBLIC HEALTH

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## EXECUTIVE SUMMARY

An opioid-related overdose incident occurred in Huntington, West Virginia on August 15, 2016. The Huntington Mayor's Office of Drug Control Policy notified the Cabell Huntington Health Department (CHHD) of an acute increase in opioid-related drug overdoses the same day. This event occurred over five hours and received local and national news media coverage. On August 18, 2016 the CHHD contacted the West Virginia Bureau for Public Health (BPH) to request assistance to investigate the overdose cluster. The investigation objectives were to characterize the cluster of suspected opioid overdoses, define health outcomes, and identify opportunities for continued collaborative improvement between the public health sector and healthcare systems to monitor, evaluate, and respond to opioid overdoses in Cabell County, West Virginia.

The investigation team requested records from the West Virginia Poison Center (WVPC), the West Virginia Office of Emergency Medical Services (EMS), and police and fire departments in Cabell County corresponding to a 53-hour period (3 on August 14, 2016 to 8 on August 16, 2016). The team obtained medical records from two City of Huntington hospitals corresponding to the same time period for review and abstraction of variables of interest. The team conducted descriptive analysis using Microsoft Excel and SAS 9.3. The team developed a case definition to classify individual records of opioid-related overdose as probable or confirmed based on clinical and laboratory criteria.

Of 887 patient encounters at the two hospital EDs during the 53-hour time period, 32 (3.6%) were selected for further record review and abstraction. Of all records identified through screening, 72.8% had prehospital records with 69.7% documenting transport to an ED. Following extensive record review and linking of cases, a total of 20 persons had records that met the case definition for a confirmed or probable opioid-related overdose. The demographic profile of cases was predominately white and non-Hispanic, with near gender parity; the age

range in 50% of cases was 26–35 years. Records documented indicators of poverty in nine (45%) cases.

Extensive community resources were involved in the response to this outbreak. First responder intervention occurred in 18 (90%) cases, and 12 (60%) cases involved responders (e.g. police or fire personnel) in addition to EMS. Sixteen (80%) cases documented naloxone administration. All cases had ED encounters, and three (15%) were admitted, with one (50%) requiring mechanical ventilation. Only 10 cases had toxicology screenings; of these, six (60%) were positive for opioids, five (50%) were positive for cocaine, three (30%) were positive for cannabinoids, and two (20%) were positive for benzodiazepines. All 20 patients survived; 12 (60%) left against medical advice, five (25%) were treated and released, and none were referred for substance use disorder, opioid addiction treatment, opioid withdrawal, or harm reduction counselling.

Opioid overdose is a serious public health concern in Cabell County, West Virginia. The investigation of this cluster of 20 cases on August 15, 2016 identified three areas for potential public health intervention. First, systems of investigation and surveillance of opioid overdose need to be developed to produce actionable real-time data that can be used to prevent deaths from opioid overdose outbreaks. Second, the continuum of care for opioid overdose response and treatment should not stop at the point of resuscitation by responders or EDs; to prevent subsequent morbidity and mortality of resuscitated survivors, an opportunity for referral to harm reduction programs and recovery services must be incorporated into the medical response to each overdose. Third, a focus on community intervention and educational efforts to treat and prevent substance use disorders through collaborative public health, behavioral health, healthcare providers, public safety, and community resource (such as harm reduction and other educational programs) efforts should be coordinated with information from overdose surveillance to target high-risk populations.

## INTRODUCTION

At 5:15 p.m. on August 15, 2016, the Cabell-Huntington Health Department (CHHD) in Huntington, West Virginia was notified by the Huntington Mayor's Office of Drug Control Policy that an unusually high number of calls regarding suspected opioid-related overdose had been received by the emergency medical system (EMS) within the preceding few hours. Huntington (population 48,638) is the largest city in Cabell County, bordering the state of Ohio. The county population estimate on July 1, 2015 was 96,844, with 91.1% White alone, 5.0% Black or African American alone, 1.3% Asian alone, 1.1% Hispanic or Latino, 0.2% American Indian or Native Alaskan alone, 2.2% two or more races. On August 16, 2016 local news media reported there were 26 opioid-related overdoses within five hours in Cabell County, and later reports attributed two deaths to the event (1, 2). The event drew national attention (3). Similar overdose clusters have been reported among opioid user communities in Cincinnati, Ohio, and in Philadelphia, Pennsylvania; it has been speculated that these events are related to heroin adulterated with high-potency opioids (4, 5). Opioid-related overdose outbreak alerts have been announced in neighboring states to alert medical providers to the presence of "brands" of heroin adulterated with high-potency opioids like fentanyl (5).

Nationally, efforts are underway to improve the understanding of events known as opioid-related overdose outbreaks (6). Use of the opioid antagonist naloxone to reverse the potentially fatal effects of opioid-related overdose is supported by a recent review of the efficacy of this adjunct to basic resuscitation efforts in a multi-year overdose outbreak (7). Although this practice has been promoted as a part of routine care for opioid-related overdose by first responders in West Virginia, the use of naloxone in a single outbreak event has not yet been evaluated (8). Recently, available guidance for community public health, law enforcement, healthcare systems, and emergency medical services regarding the problem of opioid misuse

and opioid overdose was provided in the 2016 Surgeon General's Report on Alcohol, Drugs, and Health. However, this guidance is broad in scope and does not prescribe investigation methods and intervention policies that are specific to overdose outbreaks (9). The lack of specific guidance is an obstacle to identifying, investigating, and providing effective public health intervention in opioid overdose outbreaks such as the one that occurred in Cabell County.

On August 18, 2016, CHHD contacted the West Virginia Bureau for Public Health (BPH) to request assistance investigating the overdose cluster. The objective of this investigation was for BPH and CHHD to provide a characterization of the scope and nature of the alleged opioid overdose cluster in Huntington on August 15, 2016, to define health outcomes of the event, to describe the health system response to the event, and to identify areas for continued collaborative improvement between the public health sector and healthcare systems to monitor, evaluate, and respond to opioid overdoses in Cabell County.

## METHODS

The investigation team obtained information related to the event from state and local partners, including CHHD Harm Reduction Program (HRP), the City of Huntington Police Department and Fire Department, two hospitals (Hospital A and Hospital B) in Huntington, the West Virginia Poison Center (WVPC), and the West Virginia Office of Emergency Medical Services (OEMS). These data consisted of naloxone administration reports from police and fire first responders, EMS run logs, and hospital emergency department (ED) medical records.

### Records Screening

The investigation team reviewed run logs from EMS responses in Cabell County for a 53-hour period from 3 p.m. on August 14, 2016 to 8 p.m. on August 16, 2016 (24 hours before to 24 hours after the five-hour incident reported by news media). The team searched for records

that contained any of the following words: apnea, bag-valve mask, drug, heroin, ingestion, naloxone, narcan, narcotic, opioid, overdose, poisoning, or unresponsive. The team applied screening criteria to retain EMS records with any of these key words in any of the following sections:

- Medication administration section contains “naloxone”, “narcan”, or “narcotic antagonist”
- Dispatch complaint section contains “ingestion” or “poisoning”
- Chief complaint section contains the word “overdose” or “heroin”
- Procedure section contains “airway” or “bagged”
- Alcohol/drug use indicator section contains the word “drug”
- Impression section contains “poisoning/drug ingestion”

The team obtained WVPC records of naloxone administration by police and fire personnel in Cabell County for the 53-hour period and crosschecked them against EMS records. The team obtained police and fire department records matching the patients identified in EMS and WVPC records to supplement first responder observations of persons associated with the event.

The team obtained a list of ED encounters for the same 53-hour period (3 p.m. on August 14, 2016 to 8 p.m. on August 16, 2016) from both hospitals. The team applied search criteria to the reason for visit (chief complaint) with the terms apnea, arrest, bradycardia, bradypnea, drugs, fall, heroin, ingestion/poisoning, loss of consciousness, naloxone, narcan, opioid, overdose, pain, paraphernalia, seizure, or vehicle accident. Encounters with these terms in the chief complaint were flagged for screening of the medical provider note. If any of the above terms were contained (with the exception of “pain”) in the medical provider note, these records were selected for further review and abstraction. A medical record abstraction tool was created to extract variables of interest such as demographics, vital signs, rescue and resuscitation measures, medical and social history, laboratory findings, diagnostic impression,

and final disposition from first responder and ED records into a database by using Epi Info™ (V 7.2) (Appendix A). The team performed descriptive analysis on data from the database by using Microsoft® Excel (2013), and SAS® (V 9.3 SAS Institute, Cary, North Carolina).

### Case Definition

No national standard case definition for nonfatal suspected opioid overdose outbreaks has been promulgated (10). The team developed a case definition specific to this incident to classify individual records as meeting a confirmed drug overdose case status, probable drug overdose case status, or not a case of drug overdose (Appendix B). The team applied the case definition to all records obtained from EMS case-finding efforts and ED case-finding efforts. The team conducted a brief survey among the members of the community of persons who inject drugs (PWID) in Cabell County through the CHHD HRP to estimate the proportion of persons who received resuscitation from emergency responders to evaluate the sensitivity of the investigation methods (Appendix C).

## RESULTS

### Records Screening

Twenty-seven (10.3%) of 262 records of EMS runs in Cabell County during the 53-hour period met initial search criteria; the secondary screening criteria were met by 24 (88.9%) of these records. Of these 24 EMS records, 23 (95.8%) had corresponding ED records; and one record documented that the person did not go to the ED. WVPC records documented single doses of intranasal naloxone administered to three persons. All three WVPC records had a corresponding record among the 24 EMS records obtained through application of the screening criteria. Of 887 patient encounters at the two hospital EDs during the 53-hour time period, 404 (45.5%) encounters met the search criteria for ED records, and 32 (3.6%) records met the

secondary screening criteria and were selected for further record review and abstraction. This resulted in a total of 33 persons identified with records that met the EMS or the ED screening criteria for being involved in this incident. Twenty (60.6%) of these 33 persons had records that met the case definition for a probable or confirmed case of opioid-related overdose (Figure 1).

**Demographics**

Demographic characteristics are presented in Table 1. The mean age of all persons whose records met the case definition was 33.4 (range 20–59) years (Figure 2). Most case patients were white, and none identified as Hispanic (Figure 3). Eleven (55%) patients were male, nine (45%) were female (Figure 4). Fourteen (70%) records indicate first prehospital or ED contact was on August 15 between 3 p.m. and 8 p.m. (Figure 5). Figure 6 maps the relative location of overdose occurrence, which was mostly within Huntington city limits and focused in a single neighborhood. Indicators of poverty (including Medicaid enrolment, unemployment, homelessness, and receipt of government assistance) were documented in nine (45%) cases. Mental health disorder was documented in six (30%) cases, but physical disability was not documented in any record.

**Clinical Presentation and Treatment**

The most frequent presenting symptom was altered level of consciousness (13 cases; 65%). The next most frequent presenting symptom was respiratory failure; 11 (55%) case patients received assisted ventilation. In nine (45%) cases drug paraphernalia was documented at the scene. Sixteen (80%) cases documented prior history of drug use; 10 (50%) cases documented heroin was used prior to presentation at the ED. Sixteen (80%) case patients received naloxone; 14 (70%) received naloxone prehospital, two (10%) received naloxone during both prehospital and ED treatment, and two (10%) received naloxone only in the ED (Table 2). The naloxone dose and route administered varied (Table 3). Ten (50%) cases

documented toxicology laboratory screenings; eight (80%) of these were positive for drugs (Table 4). Opioids were detected in six of 10 (60%) screenings, and more than one substance was identified in half of screenings. Two (10%) cases documented transfer to intensive care, one (5.0%) documented transfer to a clinical decision unit. There were no deaths among cases.

**Prehospital Records**

Seventeen (85.0%) cases had prehospital records; one arrived at the ED by EMS but a prehospital record was not available. At least one other first responder in addition to EMS was documented in 10 (58.8%) cases, most commonly law enforcement (7; 41.2%) and fire personnel (2; 11.8%). Documented reasons for EMS call include drug-related reasons (12; 70.6%), medical-related reasons (5; 29.4%), and a motor vehicle accident (1; 5.9%). A prehospital neurologic assessment was documented in all 17 (100%) cases with prehospital records. However, vital signs were documented in only 15 (88.2%) prehospital records. Naloxone administration prior to arrival in the ED was documented in 13 (76.5%) cases with prehospital records; 10 (76.9%) of these documented a post-naloxone neurologic assessment. Pain scores were not documented in any prehospital record. The mean time to arrival at ED after first responder contact was 32 (range 16–50) minutes.

**Hospital Records**

All 20 cases documented ED encounters. Eighteen (90%) arrived by EMS and two patients (10%) were self-presenting. Four (20%) patients were triaged to a monitored bed, and two (10%) received assisted ventilation. Other ED initial assessments and procedures are presented in Table 7. Medical history was documented in 19 (95%) cases (Table 8). The most frequently included word in the chief complaint was “overdose” (16; 80%). The most frequently included word in the diagnosis was “overdose” (14; 70%); only two (10%) patients were diagnosed with substance abuse (Table 9). Pain scores were not documented. No cases

documented withdrawal syndrome; however, 12 (60%) patients left against medical advice, and five (25%) were discharge home. No ED records documented referrals for substance use disorder, opioid addiction treatment, opioid withdrawal, or harm reduction counselling.

### Harm Reduction Clinic Survey

The CHHD Harm Reduction Program survey was administered to 156 clients during one day's clinic. A response was received from 128 (82.1%) clients. Of these respondents, 10 (7.8%) indicated that they used some of the batch of heroin reported on local news media as associated with the cluster of overdoses; of these five (50%) reported overdose symptoms (Figure 8). Three (60%) of the five respondents who reported overdose symptoms received help (rescue breathing or naloxone administration or both) from professional first responders; two (40%) did not receive help from professional first responders.

## DISCUSSION

The investigation team identified a cluster of 20 cases of opioid-related overdose in Cabell County on August 14–16, 2016. The medical history and response to naloxone among records meeting the case definition are consistent with a diagnosis of opioid overdose. In 50% of cases, patients reported heroin use prior to the ED visit, and 60% of toxicology screenings were positive for opioids based on screening urine toxicology, and confirmatory opioid testing results were not found in the medical records. Although the screening toxicology does not identify synthetic opioids, the clustering of overdoses in place and time suggests a point source intoxication with a high-potency opioid (such as carfentanil, a synthetic opioid). The racial and ethnic profile of cases closely matches the make-up of the county. The sex distribution approaches gender parity, which represents a departure from proportions of opioid overdose deaths in the region, and 50% of cases were between age 26–35 years (11). Less than half of

cases documented poverty, and less than a third documented mental illness. Extensive community resources were required to respond to this outbreak. First responder intervention occurred in 90% of cases, and more than half of prehospital records documented first responders in addition to EMS. Naloxone was administered in 80% of cases. All cases had ED encounters, and 15% were admitted, with 5% requiring mechanical ventilation. All cases survived.

Opioid antagonists may cause withdrawal syndrome when given to an overdose victim. The lack of documentation of withdrawal syndromes in the hospital record is surprising given the high rate (75%) of naloxone administration among cases. Reasons for under-reporting of signs and symptoms of withdrawal syndrome are unknown, although the absence of pain score documentation in the medical record, or perhaps the fact that 60% left the ED against medical advice, might have contributed. It is possible that withdrawal symptoms prompted departure from the ED to seek relief through repeated drug use. Persons who have abrupt withdrawal from opioids are at higher risk for overdose when they use again, a risk that should be considered by medical providers in the ED who evaluate persons that have received naloxone as part of resuscitation for suspected opioid overdose (9). Even with the large proportion of discharge dispositions documented leaving against medical advice, documentation of referral for substance misuse disorders or addiction treatment was not observed among any records identified by the screening criteria. Lifesaving therapy was provided for all cases; however, the opportunity for referral to substance use disorder treatment was not realized for any case.

Although recent news media reports of opioid-related overdose outbreaks have become more common in the region, no standard approach for public health investigation of these outbreaks was previously employed. Recent epidemiologic reports have focused on mortality from opioid overdose. The team developed a novel approach to investigate an overdose outbreak in which no cases resulted in death, and for which there was no confirmed etiology,

using collaborative partnerships for data sharing between state and local health departments, the state poison center, EMS, local fire and law enforcement offices, and local hospitals. Screening criteria identified 33 records, and 20 records met the case definition; EMS records identified 85% of cases, WVPC records identified 30% of cases, and ED records identified 100% of cases. However, the CHHD HRP survey results demonstrated that only 60% of persons who self-reported overdose symptoms from heroin use on August 15, 2016 received professional assistance. This proportion suggests that a characterization of the outbreak from ED or EMS records alone might not capture a representative sample of all persons affected by the outbreak who survived overdose, though it does provide valuable clinical information about persons who interacted with the response system.

**Limitations**

This observational study is subject to limitations. The case definition restricted analysis to records with clinically documented findings consistent with opioid overdose. Some records were excluded by this criterion if there was missing information, or if there was incomplete documentation because the patient left against medical advice, for example. Use of the case definition biases selection toward records of persons with more severe symptoms of opioid overdose and persons that required medical attention. Also, differences in medical records acquisition procedures from the two hospitals may have introduced some variation in the application of the ED record screening protocol. Screening variation may introduce selection bias in the case-finding process. Last, medical examiner records from the period of interest were not available for review at the time this investigation was initiated, therefore cases resulting in death that would not have been identified through medical records were not included in these results.

**Next Steps**

The 2016 Surgeon General's Report on Alcohol, Drugs, and Health outlines steps to address the exceptionally grave public health hazards of the current epidemic of opioid misuse in the United States. The West Virginia Health Alert Network has published two health advisories recently regarding detection of high-potency opioids that have contributed to increasing overdose mortality trends across the state (12, 13). Persons who use opioids, especially PWID, are at increased risk for drug-related morbidity and mortality. PWID who experience an overdose event should seek treatment immediately for substance use disorder. In order to identify and intervene in opioid-related overdose outbreaks, an integrated surveillance system following and reporting on overdose trends must be established, including confirmatory opioid testing for opioids not readily identified in toxicology screening when an overdose outbreak is suspected. Ongoing collaboration between local stakeholders, such EDs with law enforcement for confirmatory testing and with harm reduction clinics for referral, is essential to developing a community-specific response to opioid overdose. Collaborative information sharing of public health surveillance information between public safety (fire and law enforcement personnel), healthcare facilities, and community coalitions and organizations may be required to identify illicit high-potency opioid compounds in the community, and to protect first responders and the public from exposure. Community-specific recommendations are needed.

## RECOMMENDATIONS

Opioid overdose is a public health crisis in Cabell County. This outbreak highlights three potential interventions: surveillance, healthcare system response, and community response.

### Surveillance

A state-wide system of investigation and surveillance of nonfatal opioid overdose should be developed. Such as system does not yet exist in West Virginia, but is needed to produce actionable data in a timely manner for prevention of death from opioid overdose outbreaks. The following recommendations address public health investigation and surveillance opportunities:

- Consider declaring of a state of public health emergency for Cabell County regarding opioid-related overdose. Identify resources so that state and local health departments can develop a plan to gather actionable and timely public health data to respond to the crisis. As a part of the response, surveillance, prevention, and control objectives should be clearly delineated.
- An opioid-related overdose outbreak investigation toolkit that is customizable to unique outbreak events should be developed, and should include a case definition, a chart abstraction instrument and database, a line list template, and a resource guide for engaging community stakeholders to promote timely responses to future outbreaks.
- Identify components of first responder records in which documentation optimization could improve the case definition of opioid-related overdose. Increase collaboration with agencies such as local and state law enforcement as well as WVPC to unify lines of effort that improve data collection and data sharing from prehospital identification of overdose trends. Promote use of existing systems of data collection (e.g., OEMS and WVPC) to disseminate overdose data to appropriate stakeholders such as hospitals and recovery support services (RSS).

- Identify components of the medical record at each hospital where documentation should be improved to adequately characterize a case of drug overdose. The sensitivity of a drug overdose surveillance system that incorporates medical records data depends on consistent documentation of suspected opioid abuse. Consider collaborative development of facility-specific medical record documentation standards for suspected opioid-related overdose to maximize opportunities to learn about overdose patterns in high-incidence communities.
- Identify barriers to inter-operability of electronic prehospital records and electronic medical records so that a comprehensively linked surveillance system can be established to provide real-time data on suspected overdose outbreaks. Incorporate existing networks of drug poisoning surveillance such as the National Poison Data System and sentinel laboratory surveillance efforts to identify trends in use of synthetic opioid prevalence within the state and in surrounding states.
- Individuals identified through surveillance of EMS, WVPC, and ED records as having recurrent healthcare encounters related to opioid overdose should be considered for priority placement on waiting lists for state-funded RSS.
- Geographic patterns of drug use and overdose identified by surveillance should be disseminated systematically in real time among first responders and community partners in harm reduction programs and RSS to focus outreach efforts and resources.
- Consider collaboration with academic institutions to continue to study this public health problem with a longitudinal case-control research design to further characterize risks for morbidity and mortality from opioid-related overdose in Cabell County.

**Healthcare System Response**

The continuum of care for opioid overdose response and treatment should not stop at the point of resuscitation by first responders. Overdose survivors are at increased risk of drug-related death, especially after experiencing withdrawal. Referral services are available in Cabell

County for substance use disorder and for medically assisted therapy (MAT). Healthcare systems could potentially do more to capitalize on opportunities for intervention at each encounter with a victim of opioid overdose. The following recommendations highlight these opportunities:

- Establish a working group with public health and healthcare practitioner representation to review guidelines regarding prehospital and ED practices in response to suspected opioid overdose. Consider developing a standard for evaluation and treatment across community medical facilities and emergency responders. Establish sentinel laboratory surveillance of detailed toxicological analysis within communities that have high numbers of overdoses.
- Improve utilization of on-call recovery coaches and peer coaches at EDs to ensure no opportunities for education and treatment referral are missed after an opioid overdose. A standardized strategy for persons presenting for care might include:
    - Screening, brief intervention, and referral to treatment (SBIRT)
    - SBIRT-directed referral to a harm reduction program, MAT, or other RSS
- Identify barriers that prevent persons who experience opioid overdose and PWID from being diagnosed and treated for substance use disorder, addiction, and/or withdrawal syndrome. Consider conducting a survey of first responders and ED providers for knowledge, attitudes, and practices regarding overdose treatment and follow-up to provide insight into opportunities for additional educational intervention. Compassion fatigue on the part of medical staff who frequently care for opioid-related overdose patients might be contributing to lack of documentation of opioid withdrawal syndrome and absence of referrals for recommended treatments for substance misuse disorders. A comprehensive evaluation of this hypothesis should be explored with a goal to provide recommendations for intervention. Consider requesting assistance from national partners in the form of an Epi Aid.

**Community Response**

Substance abuse interventions through community coalitions with community-specific resources and solutions is an evidence-based practice endorsed by the Surgeon General's Report on Alcohol, Drugs, and Health. Community intervention and education efforts focused on a common site of overdose outbreaks should be an extension of community efforts targeting treatment and prevention of substance use disorders. The following recommendations address these opportunities:

- Provide direct outreach using community workers targeting neighborhoods at risk for opioid overdose based on surveillance system mapping. Network community action groups with resources such as the CHHD Harm Reduction Program and RSS.
- Provide education to the community of persons who use opioids about risks associated with overdose and methods to avoid risks. The CHHD Harm Reduction Program offers both an avenue to receive information from the community of PWID and opioid users, as well as a potential partner in effective messaging campaigns targeting this community.
- Explore partnerships between BPH, CHHD, community healthcare resources, academic institutions, and public health training programs to provide continuing education for health professionals on evidence-based practices effective at identifying and treating substance use disorders such as SBIRT and MAT.
- Primary prevention of substance use disorders through faith-based programs, school-based programs and community coalitions that offer education and resiliency training should target geographic areas that experience high rates of opioid overdose. Guidance from the Surgeon General's Report on Alcohol, Drugs, and Health may be especially helpful in this regard.

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## TABLES AND FIGURES

**Table 1**. Age, race, ethnicity, and sex of cases of opioid-related overdose by case status — Cabell County, August 14–16, 2016 (N = 20)

| Case Status | Probable (n = 12) | Confirmed (n = 8) | Frequency (%) |
|---|---|---|---|
| Age (years) | | | |
| 18-20* | 1 | 0 | 1 (5.0) |
| 21–25 | 1 | 2 | 3 (15.0) |
| 26–30 | 3 | 2 | 5 (25.0) |
| 31–35 | 3 | 2 | 5 (25.0) |
| 36–40 | 2 | 0 | 2 (10.0) |
| 41–45 | 0 | 0 | 0 (0) |
| 46–50 | 1 | 1 | 2 (10.0) |
| 50–55 | 0 | 1 | 1 (5.0) |
| 56–60 | 1 | 0 | 1 (5.0) |
| Race | | | |
| White | 10 | 8 | 18 (90.0) |
| Black | 1 | 0 | 1 (5.0) |
| Other | 1 | 0 | 1 (5.0) |
| Ethnicity | | | |
| Hispanic | 0 | 0 | 0 (0) |
| Non-Hispanic | 11 | 5 | 16 (80.0) |
| Missing | 1 | 3 | 4 (20.0) |
| Sex | | | |
| Male | 9 | 2 | 11 (55.0) |
| Female | 3 | 6 | 9 (45.0) |

*No records documented age less than 18 years

**Table 2**. Total number of naloxone administrations (prehospital and in ED) per case of opioid-related overdose (N = 20)

| Number of naloxone administrations | Frequency (%) |
|---|---|
| 0 doses | 4 (20.0) |
| 1 dose | 9 (45.0) |
| 2 doses | 3 (15.0) |
| 3 doses | 2 (10.0) |
| >3 doses* | 1 (5.0) |
| Not documented | 1 (5.0) |

*Patient received 5 doses of 0.4mg naloxone intravenously from EMS

**Table 3**. Frequencies of naloxone dose and route administered (prehospital or in ED) in opioid-related overdose (N = 27 doses)

| Naloxone dose and route | Frequency (%) |
|---|---|
| 0.4 mg (route not documented) | 1 (3.7) |
| 0.4 mg intramuscular | 2 (7.4) |
| 0.4 mg intravenous | 14 (51.9) |
| 2 mg (route not documented) | 1 (3.7) |
| 2 mg intranasal | 6 (22.2) |
| 2 mg intravenous | 2 (7.4) |
| Dose and route not documented | 1 (3.7) |

**Table 4**. Substances identified by toxicology screening in opioid-related overdose (N = 10)

| Toxicology screening | Frequency (%) |
|---|---|
| Substance identified* | |
| Opioid | 6 (60.0) |
| Cocaine | 5 (50.0) |
| Cannabinoids | 3 (30.0) |
| Benzodiazepines | 2 (20.0) |
| Number of substances identified per screening | |
| 0 substances | 2 (20.0) |
| 1 substance | 3 (30.0) |
| 2 or 3 substances | 5 (50.0) |

*Total >10 (100%) because more than one substance per screening was identified in some screenings

**Table 5**. Frequencies of first responder documented in opioid-related overdose (N = 20)

| Responder | Frequency (%)* |
|---|---|
| Not applicable (ED only) | 2 (10.0) |
| EMS | 18 (90.0) |
| Law enforcement | 7 (5.0) |
| Fire department | 2 (10.0) |
| Bystander | 1 (5.0) |

*Total >20 (100%) because more than one responder was documented in some cases

**Table 6**. Frequencies of reason for EMS call documented in opioid-related overdose (N = 20)

| Reason for EMS call | Frequency (%) |
|---|---|
| Drug or Overdose-Related | 12(60.0) |
| Medical-Related | 5(25.0) |
| Traffic Accident | 1 (5.0) |
| Not Applicable (ED only) | 2 (10.0) |

**Table 7**. Means of arrival and procedures and assessments performed in the ED documented in opioid-related overdose (N = 20)

| ED triage documentation | Frequency (%) |
|---|---|
| Means of arrival at the ED | |
| EMS | 18 (90.0) |
| Self-presenting | 2 (10.0) |
| Procedure or assessment | |
| Assisted ventilation | 1 (5.0) |
| Telemetry monitoring | 4 (20.0) |
| Initial vital signs | 11 (55.0) |
| Neurologic assessment | 10 (50.0) |
| Pain score | 0 (0.0) |
| Any medication administration | 7 (35.0) |

**Table 8**. Frequencies of hospital record documentation in opioid-related overdose (N = 20)

| Record component | Frequency (%) |
|---|---|
| Any medical history | 19 (95.0) |
| Chief complaint | |
| Overdose | 16 (80.0) |
| Heroin | 4 (20.0) |
| Apnea/bradypnea | 1 (5.0) |
| Klonopin/neurontin | 1 (5.0) |
| Opioid | 1 (5.0) |
| Loss of consciousness | 1 (5.0) |
| Son stated ingested heroin | 1 (5.0) |
| Suspect substance abuse | 1 (5.0) |
| Medical history | |
| Infection | 3 (15.0) |
| Mental illness | 6 (30.0) |
| No past medical history | 6 (30.0) |
| Social history | |
| Tobacco use | 10 (50.0) |
| Alcohol use | 2 (10.0) |
| Illicit drug use | 16 (80.0) |
| Heroin use | 10 (50.0) |
| Toxicology | |
| Positive | 8 (40.0) |
| Negative | 2 (10.0) |
| Did not receive | 10 (50.0) |

**Table 9**. Frequencies of final ED status documented in opioid-related overdose (N = 20)

| Final ED status documented | Frequency (%) |
|---|---|
| Refused triage evaluation and care | |
| Yes | 6 (30.0) |
| Diagnosis* | |
| Overdose | 15 (75) |
| Acute cystitis | 1 (5.0) |
| Addiction | 1 (5.0) |
| Bronchitis | 1 (5.0) |
| Cardiac arrest | 1 (5.0) |
| Hypertension, post-traumatic stress disorder, bipolar disorder | 1 (5.0) |
| Left against medical advice | 1 (5.0) |
| Lumbar pain, headache | 1 (5.0) |
| Polysubstance abuse | 1 (5.0) |
| Substance abuse, intravenous drug abuse, congestive obstructive pulmonary disease | 1 (5.0) |
| Suicidal ideation | 1 (5.0) |
| Hospital admission | |
| Intensive care unit | 2 (10.0) |
| Clinical decision unit | 1 (5.0) |
| Not admitted | 17 (85.0) |
| Discharge status | |
| Left against medical advice | 12 (60.0) |
| Home | 5 (25.0) |
| Transferred | 2 (10.0) |
| Jail | 1 (5.0) |

*Total >20 (100%) because more than one diagnosis was documented in some records

**Figure 1**. Inclusion criteria for case investigation — Cabell County, August 14–16, 2016

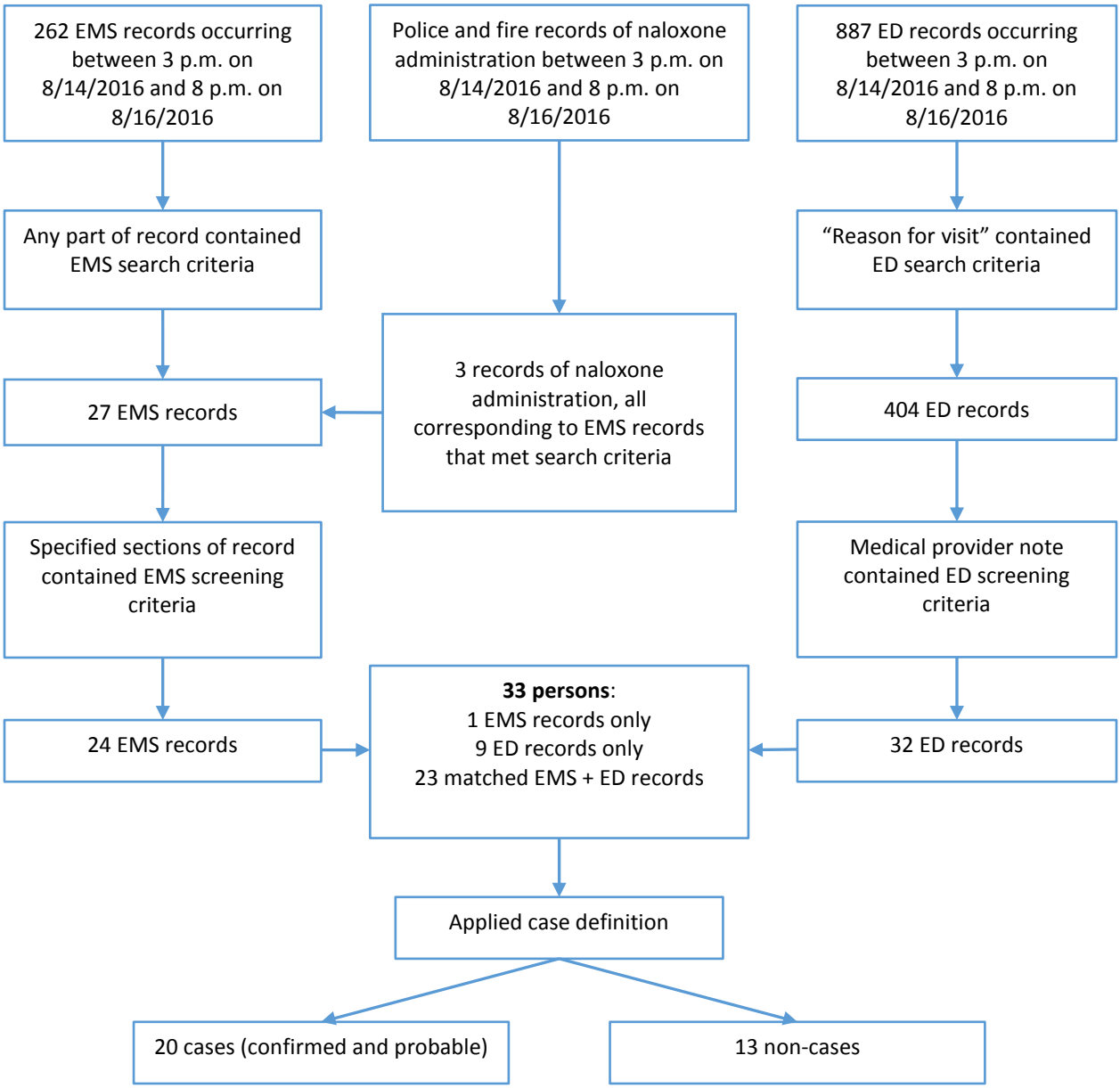


**Figure 2**. Number and age distribution of cases of opioid-related overdose by case classification — Cabell County, August 14–16, 2016 (N =20)

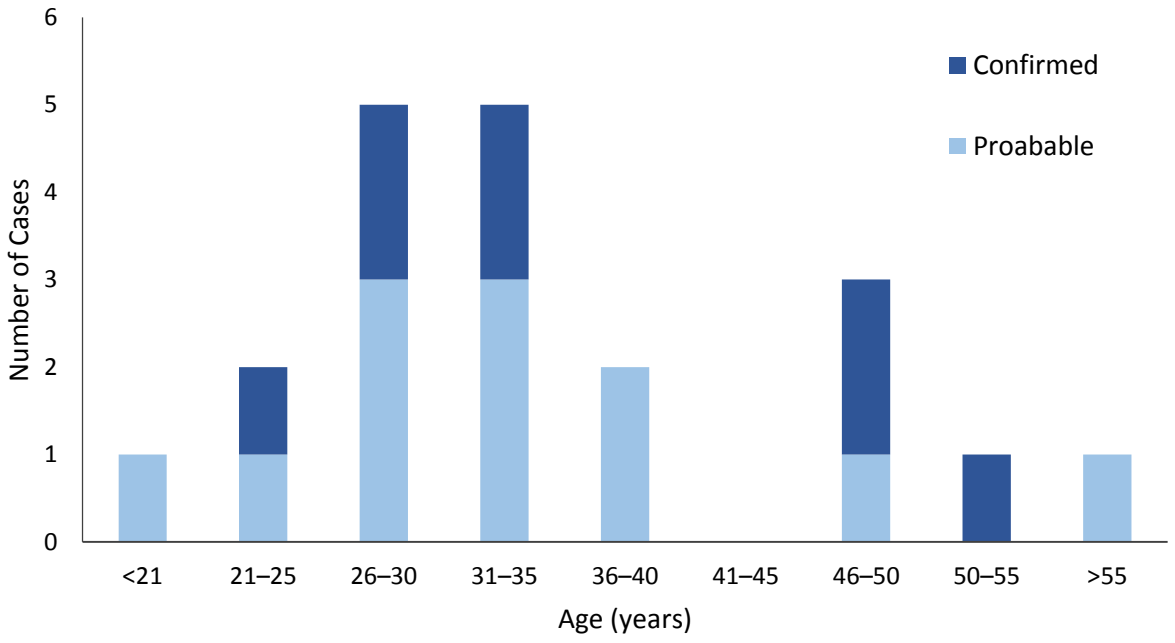



**Figure 3**. Persons suspected of opioid overdose by race and case classification — Cabell County, August 14–16, 2016 (N = 20)

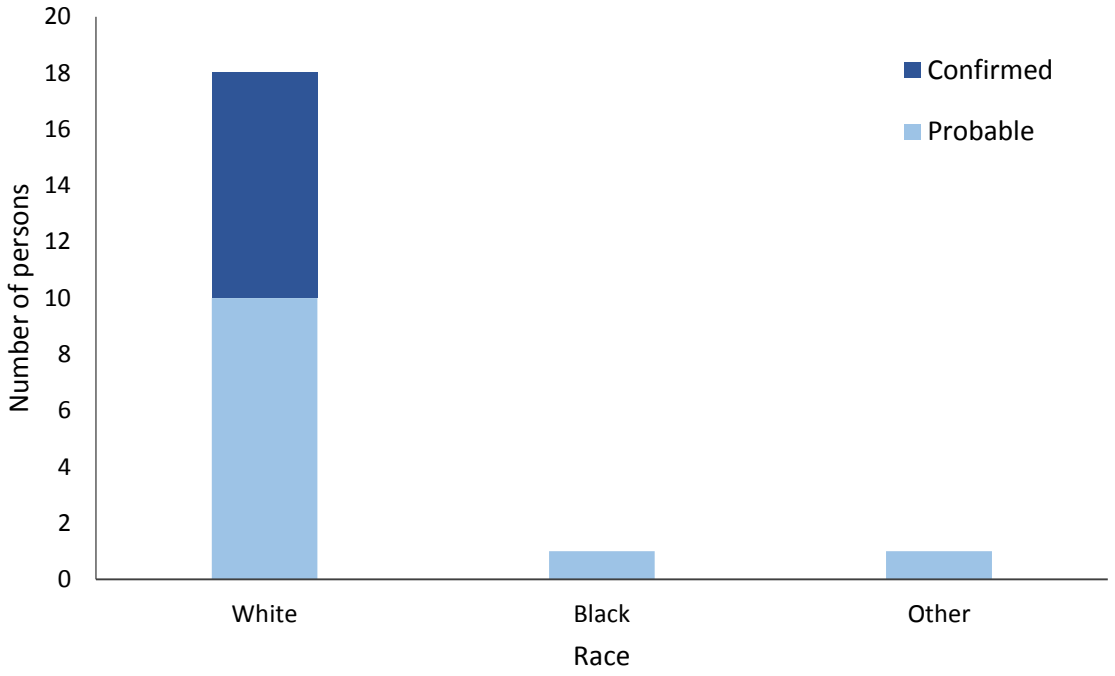


**Figure 4**. Persons suspected of opioid overdose by sex and case classification — Cabell County, August 14–16, 2016 (N = 20)

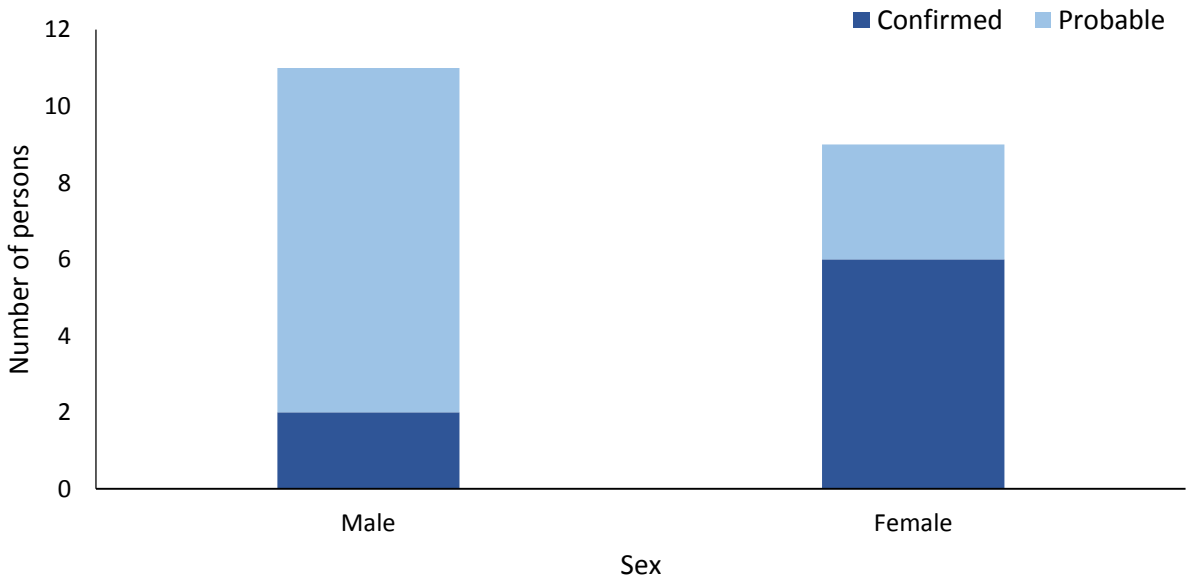


**Figure 5**. Number of cases of opioid-related overdose per hour of day by case classification — Cabell County, August 14–16, 2016 (N = 20)

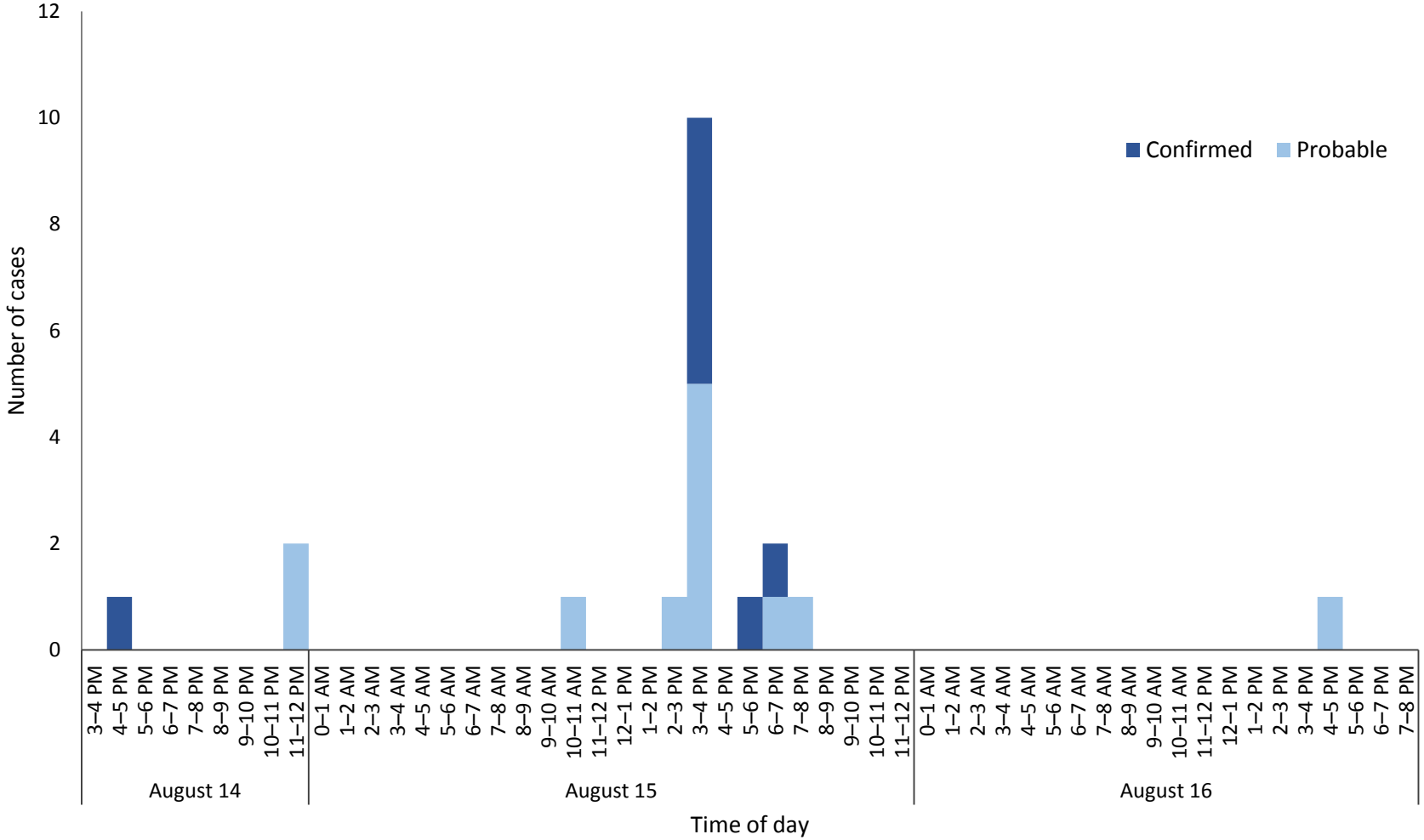


**Figure 6**. Geographic distribution of opioid overdose cases (probable and confirmed) — Cabell County, August 14–16, 2016 (N = 20)

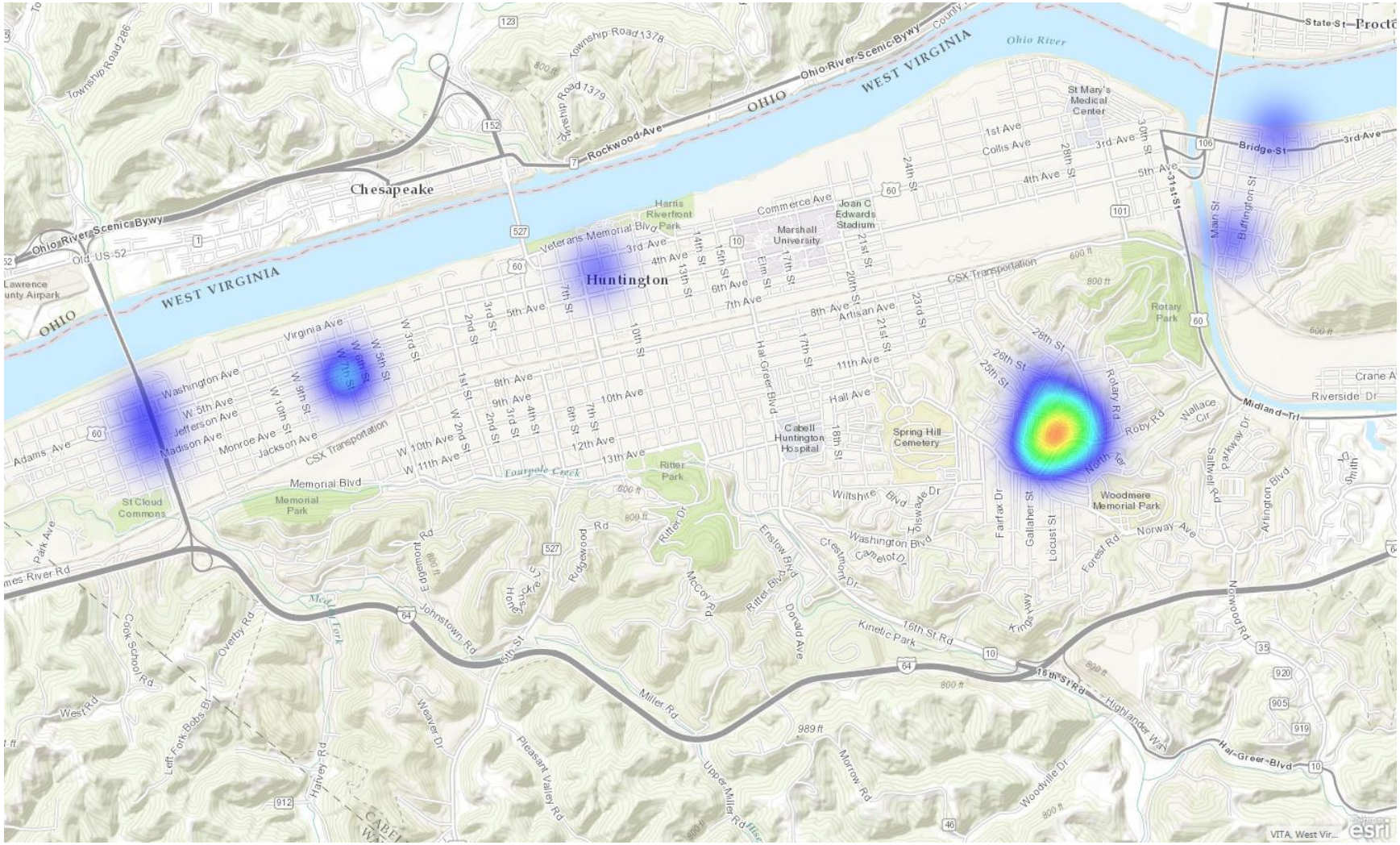


**Figure 7**. Proportion of persons suspected of opioid overdose by case classification for two hospital emergency departments — Cabell County, August 14–16, 2016 (N = 20)

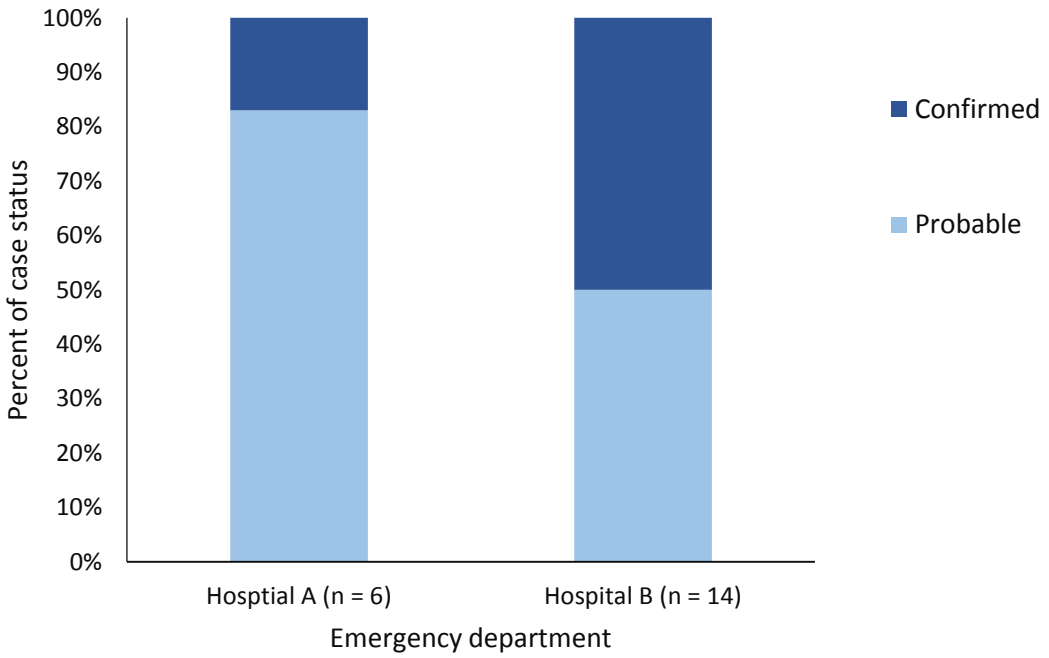
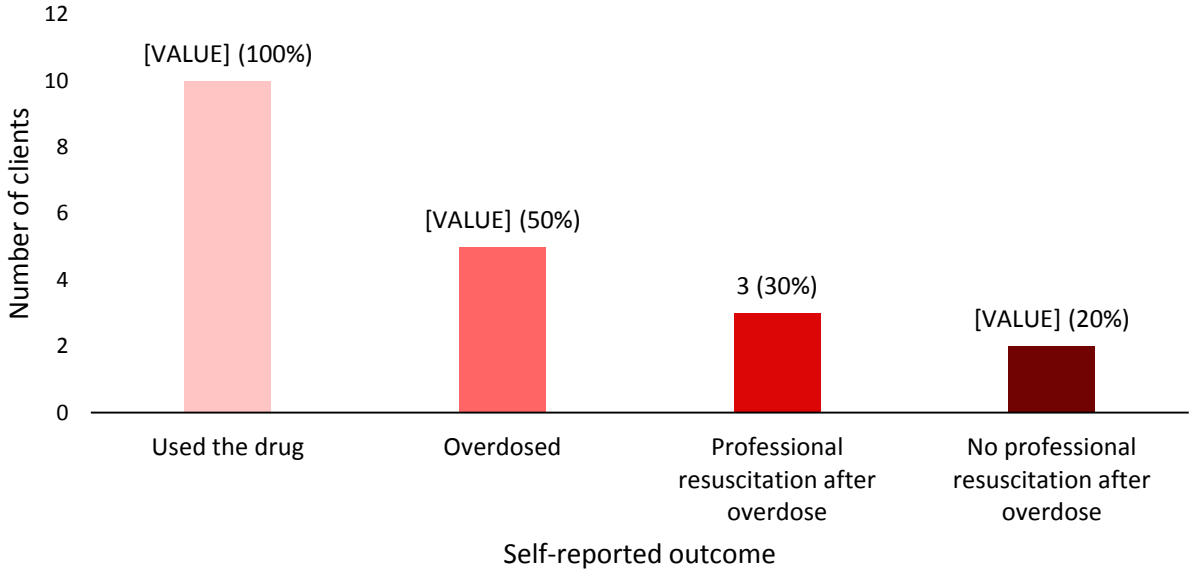



**Figure 8**. Self-reported behavior and outcomes among Harm Reduction Program clients associated with an overdose outbreak — Cabell County, 2016 (N = 10)



# APPENDIX A

# Overdose Chart Abstraction Form

Date of Review [ ] Medical Record Reviewer [ ]

Hospital [ ]

Demographics

Patient ID: [ ] Age [ ] Sex [ ]

Race [ ] If Other, please specify: [ ] Ethnicity [ ]

Street Address [ ]

City [ ] Zip Code [ ] County [ ]

Comments [ ]

## Pre-Emergency Department

Source of Information [ ] If Other, Specify [ ]

Date [ ] Time on Scene [ ]

Location Street Address [ ] Zip Code [ ] County [ ]

Reason for Call [ ] If other, specify [ ]

Drug paraphernalia at scene? [ ]

If yes, select all that apply

- [ ] Injection Needles/Syringes
- [ ] Pills
- [ ] Powder
- [ ] Tourniquet
- [ ] Other Other, Please Specify [ ]
- [ ] Paraphernalia Type Not Specified

Vital Signs Pre-ED

Time [ ]

Heart Rate [ ] Respiratory Rate [ ] [ ] Assisted [ ] Unassisted O2 Sat [ ]

Blood Pressure [ ] Temp [ ] Pain Score [ ] /10

Neurological Assessment Pre-ED

GCS [ ] Response to Stimulus [ ] Lethargy [ ]

Pupil Size [ ] Pupil Constriction [ ]

Airway Protection ☐ Ventilation ☐ Oxygen ☐

Naloxone ☐

If yes to Naloxone Pre-ED

☐ Naloxone Dose 1 Time ☐ Dose ☐ Route ☐

☐ Naloxone Dose 2 Time ☐ Dose ☐ Route ☐

☐ Naloxone Dose 3 Time ☐ Dose ☐ Route ☐

Response to Naloxone ☐

Follow-up Vital Signs ☐

Repeat Neuro Assessment ☐

Comments ☐

Any Healthcare Worker Exposure? ☐

## Emergency Department Treatment

Date ☐ Time of Arrival ☐

Method of Transport ☐ If other, specify ☐

Room Triaged To ☐

Vital Signs ED

Time ☐

Heart Rate ☐ Respiratory Rate ☐ ☐ Assisted ☐ Unassisted O2 Sat ☐

Blood Pressure ☐ Temperature ☐ Pain Score ☐ /10

Neurological Assessment ED

GCS ☐ Stimulus Response ☐ Lethargy ☐

Pupil Size ☐ Pupil Response ☐

Medications Give in ED

Medication 1 ☐ Dose ☐ Route ☐ Time ☐

Medication 2 ☐ Dose ☐ Route ☐ Time ☐

Medication 3 ☐ Dose ☐ Route ☐ Time ☐

Medication 4 ☐ Dose ☐ Route ☐ Time ☐

Airway Protection ☐ Ventilation ☐ Oxygen ☐

Gastric Decompression ☐ IV Fluids ☐

Follow Up Vital Signs ☐

Repeat Neuro Assessment ☐

Comments ☐

## Social/Behaviorial Risk Factors

Tobacco Use ☐ Alcohol Use ☐ Homelessness ☐

Neglect or Abuse ☐ ☐ Partner Violence ☐ Elder Abuse ☐ CPS Contacted ☐ Other

Poverty ☐ ☐ Medicaid Insurance ☐ Government Assistance ☐ Unemployment ☐ Other

Mental Health Diagnosis ☐ ☐ Depression ☐ Anxiety ☐ Personality Disorder ☐ Other

Motor Vehicle Collisions ☐ Frequent Fall or Injury ☐

Suicidal ☐ ☐ Ideation ☐ Gesture ☐ Other

Recent Drug Abstinence ☐

If yes, please list reason and date of last use ☐

History of Recent Incarceration ☐

If yes, please list reason and release date ☐

History of Violence/Crime ☐ Frequent Flier "Code" ☐

Drug Related Legal Problems ☐ Military Veteran ☐

Disability ☐ If yes, please specify ☐

Home Medications

☐

## Medical History

**Cheif Complaint**

- ☐ Overdose/OD
- ☐ Opioid/Opiate
- ☐ Heroin
- ☐ Drugs
- ☐ Naloxone/Narcan
- ☐ Arrest
- ☐ Paraphernalia
- ☐ Poisioning
- ☐ Ingestion/Poison
- ☐ Pain
- ☐ Seizure
- ☐ Loss of Conciousness/LOC
- ☐ Apnea/Bradypnea
- ☐ Bradicardia
- ☐ Fall
- ☐ Vehicle Accident/Crash
- ☐ Other

Other, please specify: _____

**Associated Drug Use**

Drug Used _____ Date _____ Time _____

Amount _____ Route _____

- ☐ Accidential
- ☐ Intentional

Timing of Overdose Onset _____

**History of Drug Use**

Reported by _____ Drug of Choice _____ Route _____

**Past Medical Diagnosis**

- ☐ Addiction
- ☐ Withdrawl
- ☐ Chronic Pain
- ☐ Overdose
- ☐ Drug Poisoning
- ☐ Self Inflicted Injury
- ☐ Intoxication
- ☐ Accidental Ingestion
- ☐ None

**Diagnosis of Infection**

- ☐ HBV
- ☐ HCV
- ☐ HIV
- ☐ Abscess/Cellulitis
- ☐ Phlebitis
- ☐ Endocarditis
- ☐ Staph/strep bacteremia
- ☐ Osteo
- ☐ CLABSI
- ☐ No Diagnosis of Infection

**Current Diagnosis**

- ☐ Overdose
- ☐ Addiction
- ☐ Withdrawl
- ☐ Chronic Pain
- ☐ Drug Poisoning
- ☐ Self Inflicted Injury
- ☐ Intoxication
- ☐ Accidental Ingestion
- ☐ Other

Specify Other: _____

## Laboratory/Radiologic Findings

Chemistry Done?

Chemistry Results

Sodium | Potassium | BUN | Creatinine

ALT | AST | Bili | Glucose

CBC Done?

CBC Results

WBC | Neutroph | Lymph | Band/Seg

RBC | HGB | HCT | PLT

Microbiology- Culture Done?

Culture Result

Specimen Type ☐ Blood ☐ Urine ☐ Other

Gram Stain Result | Culture Result

Toxicology Done? ☐ Toxicology Ordered but Results Not Available

Alcohol | PCP | Barbituates | Benzos

Cocaine | Cannabinoids | Amphet/Methamphetamines

Opioids/Methadone/Oxycodone | Other | Other, specify:

Pregnancy Test Done?

Chest X-Ray? | ECG? | Echocardiogram

## Admission Information

(Skip to Next Page if NOT Admitted)

Vital Signs Admission

Time

Heart Rate | Respiratory Rate | ☐ Assisted ☐ Unassisted | O2 Sat

Blood Pressure | Temp | Pain Score /10

Neurological Assessment Admission

GCS | Response to Stimulus | Lethargy

Pupil Size | Pupil Constriction

## Disposition

Refused Care?

Improved

Admitted to

Discharged to

Referrals Made?

☐ Rehabilitation ☐ Mental Health ☐ Infectious Disease ☐ Other Specify other:

Diagnosis Codes:

External Injury Codes:

ProcedureCodes:

Comments:

# APPENDIX B

## Opioid-related Overdose Case Definition

The cluster of suspected drug poisonings that were reported by news media to have occurred from 3–8 p.m. on August 15, 2016 in Huntington, West Virginia will be described using a case definition for investigation of medical and pre-hospital records. The case definition components include the following:

Time: 3 p.m. August 14, 2016 to 8 p.m. August 16, 2016

Place: Cabell County, West Virginia (place of occurrence, place of treatment, or home address in case record)

Clinical Description: Exposure to opioids resulting in overdose typically occurs through ingestion or injection but can also result from transdermal absorption or inhalation.

Indications of opioid-related drug exposure must include at least one of the following.

- Patient admission of drug use
- Drug paraphernalia or drug reversal agent found at the prehospital scene
- Documentation of immediate improvement in respiratory and CNS depression from drug reversal agent (e.g. naloxone)
- Current diagnosis of drug use
- Current diagnosis of drug poisoning

Opioid overdose results in acute onset of at least one of the following clinical signs of central nervous system (CNS) depression.

- Decreased respiratory rate, bradypnea, or apnea
- Altered level of consciousness (lethargy, coma, or GCS <13)
- Constricted pupils (myosis)

- Documentation of immediate improvement in respiratory and CNS depression from drug reversal agent (e.g. naloxone)
- Death

A clinically compatible case of drug overdose must include at least one indication of opioid-related drug exposure and at least one clinical sign of CNS depression.

Laboratory Criteria: Positive urine or serum toxicology screening for opioids, anesthetic agents (e.g. ketamine), barbiturates, benzodiazepines, or stimulants (e.g. amphetamines or cocaine).

A **probable case** meets time and place criteria as well as clinical description (at least one indication of drug exposure and at least one clinical sign of opioid-related overdose) but does not meet laboratory criteria.

A **confirmed case** meets time and place criteria as well as criteria for or clinical description (at least one indication of drug exposure and at least one clinical sign of opioid-related overdose) and also meets laboratory criteria.

**Not a case** is a determination for available information that does not meet one or more case investigation criteria of time, place or clinical description (at least one indication of drug exposure and at least one clinical sign of opioid-related overdose).

Note: this case definition was developed for a single outbreak. It might not apply to other outbreaks due to variance in community resources (such as laboratory testing capacity).

# APPENDIX C

**Harm Reduction Clinic Client Questionnaire**

We are asking a few questions today about drug overdose to get an idea how we can better serve our clients. You don't have to answer but we appreciate any response you can give us. We respect your privacy and will NOT ask your name or address or any other information that will identify you.

1. Did you use any of the "batch" of drugs that were associated with the overdoses on August 15, 2016 at [*apartment complex*]* in Huntington?

   _____YES _____NO (If NO, you can stop)

2. If YES, did you overdose from using this batch of drugs?

   _____YES _____NO (If NO, you can stop)

3. If YES, did someone have to give you (check one)

___ Rescue breathing ___ Rescue medication ___ I did not get these (stop)

4. If someone gave you rescue breathing or rescue medication, was that person a (check one)

___Medical professional/first responder ___non-professional bystander ___neither

***Location name redacted