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Characteristics of an Overdose Prevention, Response, and Naloxone Distribution Program in Pittsburgh and Allegheny County, Pennsylvania

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ABSTRACT *Prevention Point Pittsburgh (PPP) is a public health advocacy organization that operates Allegheny County's only needle exchange program. In 2002, PPP implemented an Overdose Prevention Program (OPP) in response to an increase in heroin-related and opioid-related overdose fatalities in the region. In 2005, the OPP augmented overdose prevention and response trainings to include naloxone training and prescription. The objective of our study is to describe the experiences of 426 individuals who participated in the OPP between July 1, 2005, and December 31, 2008. Of these, 89 individuals reported administering naloxone in response to an overdose in a total of 249 separate overdose episodes. Of these 249 overdose episodes in which naloxone was administered, participants reported 96% were reversed. The data support findings from a growing body of research on similar programs in other cities. Community-based OPPs that equip drug users with skills to identify and respond to an overdose and prescribe naloxone can help users and their peers prevent and reverse potentially fatal overdoses without significant adverse consequences.*

KEYWORDS *Opioids, Naloxone prescription, Overdose prevention, Harm reduction, Substance use, Pittsburgh*

INTRODUCTION

Accidental overdose fatalities are a serious public health concern. Since the late 1990s, overdose fatalities have increased across the USA and are now the second leading cause of accidental death in the USA.[1,2] In Allegheny County (Pittsburgh), Pennsylvania, drug overdoses are responsible for more deaths annually than homicides and traffic fatalities combined.[3] Between 1980 and 1990, there was an average of 58 overdose fatalities per year in Allegheny County. This number increased to 100 overdose fatalities reported in 1998 and has increased since, peaking in 2007 with 253 overdose fatalities before declining to 233 in 2008.[3]

In response to increasing overdose fatalities in the region, Prevention Point Pittsburgh (PPP) created an Overdose Prevention Program (OPP) in 2002 with the goal of developing and implementing practical strategies to reduce overdose deaths, complementing existing drug prevention and treatment efforts.[4] Since 1995, PPP has

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been a public health advocacy and needle exchange program providing safe injection equipment, HIV/hepatitis C virus (HCV) testing, educational materials, and counseling and case management services to drug users. Individuals who received services from the program frequently expressed concerns to PPP staff about their experience of overdose and that of their friends and associates. As a venue where drug users come to access supplies and other services, the needle exchange program offered ideal settings to reach those at risk of overdose and a logical location for the implementation of an overdose prevention program.

In 2005, PPP added a naloxone training and prescription component to the OPP. Naloxone is an opiate antagonist used by medical professionals in response to opioid overdose;[5,6] the effectiveness of its use by medical professionals and non-professionals who have received training on its administration is documented in other cities and regions.[7–11] The life-saving medication has no abuse potential and virtually no side effects; however, it can precipitate withdrawal for individuals who are physically dependant on opioids.

As overdose rates climbed across the USA and abroad in the mid-to-late 1990s through the 2000s, researchers examined the demographics and characteristics of overdose decedents and assessed measures that could be taken to prevent and respond to overdose.[10,12–14] Concurrently, community organizations servicing drug users initiated programs that provided education to drug users on overdose "myths," risk factors associated with overdose, and the best ways to respond to an overdose.[4–9] Programs operating in such cities as Chicago, Baltimore, San Francisco, New York, and Albuquerque also incorporated a naloxone prescription component targeting drug users, their families, and their peers.[5,7–9]

A recent evaluation of a naloxone distribution and administration program in New York City reported on the experiences of 122 participants who received training in overdose prevention and naloxone administration.[15] Of these program participants, 71 (58.2%) reported using naloxone in response to an overdose they had witnessed; 83% of the individuals who overdosed and received naloxone were successfully revived—the outcomes of the remaining 17.1% were unknown. The study authors concluded that "Naloxone administration by injection drug users (IDUs) is feasible as part of a comprehensive overdose prevention strategy and may be a practical way to reduce overdose death on a larger scale."[15] Among the salient findings of the study was that participants who received and used naloxone reported no serious adverse consequences following administration of the drug.[15] Another study examined increases in knowledge about overdose and naloxone administration among former and current opioid users in New Mexico, San Francisco, Chicago, New York, and Baltimore and found naloxone training programs to be effective in improving participants' overdose knowledge and skills to prevent overdose mortality.[16] Significant findings were that those trained in overdose prevention and naloxone administration were as skilled as medical experts in recognizing opioid overdose and responding to overdose with naloxone.[16]

Studies that indicate the effectiveness of naloxone distribution programs and overdose prevention education training are being complemented by research into the barriers and obstacles drug users and their peers face when responding to an overdose. In addition to some drug users' lack of knowledge of effective overdose prevention strategies or the necessary skills with which to respond to an overdose, studies are showing that persons involved in overdose situations are often reluctant to call 911 or otherwise seek medical attention due to fear of police arrest.[10,17]

However, the extent to which people involved in overdose situations seek medical attention varies widely across cities.[10,11,18–20]

The contribution of prior research on overdose prevention and naloxone distribution programs is significant. However, more still needs to be known about the characteristics of overdose training participants and those who used naloxone in an overdose situation, the outcomes of naloxone administration, and the barriers drug users face in overdose situations. The focus of this study is on an OPP with naloxone prescription in Pittsburgh, Pennsylvania, which has a population of 312,819.[21] We report on 426 individuals who participated in the OPP between July 1, 2005 and December 31, 2008. Of these, 89 individuals reported administering naloxone in response to an overdose in a total of 249 separate overdose episodes. We contribute data to a growing body of literature on the obstacles drug users face when responding to an overdose and provide more information on the outcomes of peer-delivered naloxone in a community setting. The aims of this paper are: (1) to document the characteristics, outcomes, and experiences of participants who were trained in overdose prevention and naloxone administration and (2) to illustrate the barriers drug users face when responding to overdose, including fear of police involvement and arrest.

METHODS

Intervention

In 2005, PPP volunteers and staff began conducting overdose prevention trainings with a naloxone prescription component, including specific instruction on naloxone administration. PPP staff and volunteers developed an overdose prevention and response training curriculum to target individuals at risk of heroin and opioid overdose and those likely to be present in an overdose situation. Trainings were initiated with participants of the needle exchange program's main site. The curriculum included information on how to prevent, identify, and respond to an overdose. Trainings provided clients with information on the factors that could heighten risk for overdose (mixing drugs, changes in tolerance and drug purity, and using alone), how to respond to an overdose (rescue breathing, calling 911), and specific instructions on how and when to administer naloxone to someone who is overdosing.

OPP trainings with naloxone prescription were conducted at PPP's main needle exchange site in the Oakland area of Pittsburgh on Sundays between the hours of 12 and 3 p.m. During their initial visit to the needle exchange program, PPP participants received verbal explanation of the overdose prevention trainings offered, as well as printed brochures explaining the naloxone prescription component. Participants were offered the OPP training and naloxone on each subsequent visit to the exchange. For those who chose to participate, PPP staff and qualified volunteers conducted all OPP trainings which lasted approximately 25 minutes. Volunteer physicians prescribed naloxone to individuals who completed the training, and naloxone was provided without cost, on site immediately following the training. A medical record was opened for each participant prior to the training in accordance with clinical practice care standards.

Study Population

We collected data between July 1, 2005 and December 31, 2008. Participants in the OPP were self-selected from the clients who utilize the needle exchange site. Needle

exchange clients primarily include active injection drug users who live in Allegheny County and the surrounding area. During the period of this study, 426 individuals participated in the OPP and received naloxone.

Measures and Analyses

Data presented here are collected from two sources: (1) a medical history form completed by participants prior to the OPP training and (2) a naloxone refill questionnaire completed by participants when they returned to refill their naloxone prescription.

Medical History Form. Immediately prior to the overdose prevention trainings, PPP staff required that all clients fill out a paper medical history form. Staff assisted participants with literacy or other cognitive impairments with completing medical history forms. Participants reported their age, race/ethnicity, and gender; current and past 6-month drug use (type of drugs, dosage, and frequency of use); number of times they have overdosed as well as number of overdoses they have witnessed in their lifetime. They were also asked to report the number of these overdoses for which 911 was called to respond and the number of overdoses witnessed that resulted in death. Other questions on the form include history of medical conditions, such as endocarditis or other problems resulting in emergency room or hospital admissions, regular use of other medications, and dates of testing for HIV and HCV. PPP staff subsequently entered data from the medical history form into an Excel spreadsheet and maintained the original hard copies as part of the medical record. Data from the Excel spreadsheet were subsequently exported into SPSS v. 17 (SPSS, Inc., Chicago) for analysis.

Naloxone Refill Questionnaire. Staff collected data from participants who used the previously prescribed naloxone and returned to the site for a refill. At the time of the initial training, staff encouraged all participants to return for a free refill of naloxone as soon as the medication was used, lost, expired, or confiscated by police. When participants returned for a refill, they were asked to respond to a set of questions describing their overdose experiences. Their responses were recorded on a paper questionnaire by staff. These data include whether naloxone was used on a person, as opposed to lost, stolen, or expired, the date of naloxone use, amount of naloxone used, body site of naloxone injection, whether 911 was called, whether rescue breathing was used, signs and symptoms witnessed, what drugs had been consumed by the person who overdosed, and the clinical disposition at the end of the situation (i.e., "person okay," "went to ER," "died," or other outcomes with comments). These data were entered into an Excel spreadsheet and subsequently exported to SPSS v. 17 for analysis. Data analysis consisted of calculating frequencies, percentages, and means with standard deviation.

RESULTS

Overdose Prevention and Naloxone Trainings

Between July 1, 2005 and December 31, 2008, 426 individuals were trained at the OPP to identify overdoses and overdose risk factors, perform rescue breathing, and safely administer naloxone. Of these 426 individuals, 50 were trained between July

and December 31, 2005, 125 in 2006, 124 in 2007, and 127 in 2008. Of the 426 participants in PPP's OPP, 90% identified themselves as Caucasian, 5.6% as African American, and the remainder as another race/ethnicity. The gender distribution of overdose prevention training clients was one-third female. Forty-two percent of OPP training attendees were between 25 and 44 years old; 33.6% were 24 years old or younger, and the remaining 24.1% were over 44 years old.

Of the 426 participants who attended the OPP, 71% (304) reported witnessing one or more overdoses at some point in their life prior to the training, totaling 1,875 overdoses. Twelve percent reported witnessing only one overdose in their lifetime; 40% had witnessed between two and five overdoses; 14% had witnessed between six and 10, and 5% had witnessed 11 or more overdoses. Responses indicate participants were often hesitant to call 911; individuals who had witnessed one or more overdoses reported that 911 was called for medical assistance in only one-third of the overdose instances prior to the OPP training.

Of the 426 participants, 40% reported they themselves had overdosed at least once prior to the training. A sizeable number of participants had overdosed multiple times prior to the OPP training: 20% reported that they had experienced between two and five overdoses, and 5% reported that they had experienced six or more overdoses prior to the training. In 43% of cases in which a participant reported that they themselves had overdosed, the most recent overdose had occurred in the 6 months prior to the OPP training. However, 33.5% of participants reported that it had been 2 years or more since they had last overdosed prior to attending the training.

Overdose training participants primarily reported using opioids, although not exclusively one kind of opioid. Ninety-two percent reported heroin use (69.5% daily), and 93.4% reported the use of other opioids, including Vicodin, OxyContin, codeine, methadone, and "other" opioids at least once a month for the past 6 months. Over half (55.4%) of the participants reported use of cocaine at least once a month over the past 6 months, and 44% reported use of benzodiazepines at least once a month over the past 6 months. The mean age of first use of drugs among participants was 19.5 (standard deviation=6.5). Eighty-four percent of participants began using drugs before their 25th birthday, and 15.3% were between the ages of 25 and 44 years old; the remainder or 0.8% were over 44 years old when they first used drugs.

Naloxone Use

Out of 141 individuals who returned to the needle exchange site after their initial OPP training between August 1, 2005, and December 31, 2008 for a naloxone refill, 89 (63%) reported being involved in one or more situations in which they used naloxone prescribed at the OPP to respond to an overdose. These 89 individuals collectively reported administering naloxone in 249 separate overdose situations. In the vast majority or 96% of cases, the person who overdosed was reported to be "okay." In two cases (0.8%), in which naloxone was administered to an overdose victim by a peer, the person who overdosed was not able to be resuscitated and subsequently died. The remaining 3.2% reported the outcome as "unknown" (e.g., the person who made the report did not know what happened, or the naloxone was used by someone else, and they were not present).

In addition to the 89 individuals who reported using the naloxone, 52 individuals returned for a refill where naloxone was not reported to have been used on a person. Among these 52 individuals, reasons given for the need for a refill

included naloxone being lost (48.1%), confiscated by police (12%), stolen (4%), expired, or other reasons (37%).

Participants who had witnessed one or more overdoses prior to the OPP training reported 911 was called for medical assistance in one-third of those cases. However, following the training and receipt of naloxone, participants reported calling 911 in only 10% of 249 overdose incidents. Of those who did not call 911, the majority (71%) reported "fear of police involvement" as the reason. Twenty percent reported that they felt it was unnecessary to call 911 because the person was "okay," the "Narcan worked," or the "person came out." Participants reported also performing rescue breathing in 61% of these 249 overdose situations, prior to administering naloxone.

In 92% of the 249 cases, the respondent reported that heroin (alone or in combination) was believed to have been used prior to the overdose. In 33.7% of the cases, benzodiazepines were involved in addition to heroin. Other opiates/opioids that participants believed the victim had used prior to overdose include fentanyl (5.6%) and methadone (0.4%). Cocaine was reported to be involved in 8% of these cases, and alcohol was reported to be involved in 6%.

On average, naloxone prescriptions were refilled 9.6 months after initial training and receipt of medication. We found that participants returned an average of just under 2 months after use of the medication (range, 0.03–13.2) for a refill.* OPP staff encouraged participants to refill their naloxone, free of charge, at the training site once the medication was used, lost, or expired. Close to 54% of participants refilled their naloxone prescription only once; 42.7% of participants returned for refills between two and nine times; 3.4% returned for refills 10 to 24 times.

DISCUSSION

Our data support the findings of other studies that have examined naloxone training and prescription programs in other regions, namely that these programs can be implemented to serve drug-using communities who report being able to use naloxone in overdose situations with few negative consequences, including death.[8,15,16] We found that the vast majority (96%) of participants reported positive outcomes (e.g., person lived, was not in a coma, and did not have brain damage) in the overdose situations where they administered naloxone to a peer. This indicates the feasibility of developing programs that equip active drug users with the skills to prevent, recognize, and respond to an overdose in community settings. Our analyses also suggest that training in the effective administration of naloxone can be provided to drug users in a community setting and can prevent overdose fatalities. Participants who used naloxone reported very few problems, and only two fatalities were recorded. Based on participant reports, it appears that these two fatalities could not have been prevented with the administration of naloxone. One reportedly involved a high dose of benzodiazepines, and the other involved cocaine, and the individual reportedly suffered a heart attack—neither of which could have been reversed with naloxone. However, in both cases, heroin was also involved, so administration of naloxone was the appropriate response. In both cases, witnesses also administered rescue breathing and called 911 in addition to administering naloxone.

*Because the OPP operates once a week, the earliest a participant can return for a refill is 7 days.

In addition to participants' reported success in the use of naloxone in reversing overdose, the finding that 61% of study participants also reported performing rescue breathing in an overdose situation indicates that the general knowledge and skills conveyed during trainings were being translated into action. This finding that a majority of persons involved in an overdose situation initially performed rescue breathing has emerged in studies of similar programs in other cities.[15,20] OPP staff encouraged individuals to begin rescue breathing immediately upon noticing that someone is having difficulty or has stopped breathing. This is based on the assumption that it may take time to prepare naloxone for use, that rescue breathing can be administered more immediately, and that often individuals may start breathing on their own with rescue breathing obviating the need for naloxone. Instruction is given that if a second person is available, ideally one should continue rescue breathing while the other prepares the naloxone. Also, there may be circumstances where the individual does not have access to their naloxone, in which case rescue breathing is the only prevention method proven to reduce likelihood of fatality.

The data also indicate that participants were reluctant to call 911. The reluctance of OPP training participants and drug users to call 911 for medical assistance in overdose situations has been observed in other cities and regions.[10,15,18–20] However, the percentage of incidents in which 911 was or was not called varies across study populations and cities. For example, one Baltimore study that focused on overdose experiences of 924 IDUs (without a naloxone component) found that 911 was called in roughly two-thirds of the incidents.[19] Another Baltimore study of 397 current or former drug users (without a naloxone component) who had witnessed an overdose reported that emergency services were called in 23% of the cases.[18] A recent New York City study looking at the responses of drug users who had participated in an overdose prevention training program (with naloxone prescription) to overdose events found emergency services were called in 74% of the incidents.[15] An earlier study examining drug users' response to overdose in New York City before overdose prevention training programs became widespread found that an ambulance was called in 40% of witnessed overdose events (although 67.7% reported that they had "called for outside medical help" which appears to have also included a variety of other responses, not just calling for professional emergency medical assistance through 911).[10] By contrast, in Pittsburgh, prior to participating in OPP, participants reported calling 911 in 34% of the overdose situations. Once they received naloxone, the number decreased to 10%. OPP staff encourage participants to seek medical attention following an overdose. The reduction of participants calling 911 for medical attention in overdose situations following participation in the OPP can be interpreted in several ways. On the one hand, if an individual has been given naloxone and is stable enough to be transported to a medical setting without the need for an ambulance, this can reduce the significant expense to the county and/or to the individual that a 911 call may incur. In 20% of incidents in which 911 was not called, participants reported the reason to be that the "person was okay," it was "unnecessary." On the other hand, seeking medical attention in an overdose situation can have positive benefits to the individual's health. In addition to the factors contributing to the overdose itself, medical professionals can assist those who overdose with other health issues such as untreated diabetes, asthma, or an abscess, as well as accessing substance abuse treatment and other services. The comparatively low number of cases in which medical help was called in Pittsburgh possibly suggests a more hostile climate of

police relations with drug users in Pittsburgh and Allegheny County, in comparison to New York City where overdose prevention trainings with a naloxone component appeared to increase the likelihood that emergency services would be called. It might also reflect a greater awareness of the legal status of take-home naloxone among naloxone program participants in New York City and other places in comparison to Pittsburgh. The dynamics of calling 911 may also be very different in large cities where there is more anonymity than in smaller cities, suburbs, or rural areas where there is less anonymity. There is some evidence from a New York City study that individuals who respond to a witnessed overdose who have themselves overdosed at some point were less likely to call 911, so the reduction in practice of calling 911 may also be related to the fact that participants who came for a naloxone refill have more experience with overdose.[10]

Of those participants who did not call 911, 71% cited "fear of arrest" as the reason for not making the call, a finding that has emerged in other studies.[10,15,17–20] In response to this information, representatives of OPP have participated in a local Overdose Prevention Task Force where representatives of the Pittsburgh Police Department explained their protocol when responding with Emergency Medical Services personnel to a 911 overdose call. They have indicated to OPP/PPP staff that the main focus of officers in this situation was not to make arrests, but to protect paramedics and address the medical emergency, and that they generally do not make arrests in this type of situation. However, there is no policy in place to protect those calling 911 from arrest if they are in possession of illegal drugs, and program participants report fear of arrest as a significant deterrent to calling 911 when they are with someone who overdoses. Indeed, noting that 12% of the 52 participants who did not use the naloxone returned for a refill because it was confiscated by police, despite the fact that they were in legal possession of a legitimately prescribed medication, provides some support for these fears of police involvement in overdose situations. It is also notable that regardless of whether the risk of arrest in an overdose situation is real or perceived, the perception alone can effectively reduce the likelihood that an individual will call 911 when they witness an overdose that involves any illicit drug use. Implementation of a policy such as the "911 Good Samaritan Law," enacted in Connecticut, New Mexico, Washington, and Illinois, could protect those present at an overdose from arrest and prosecution for drug possession. Such a legislative intervention might result in a more uniform implementation of police protocol in these situations, while also making it possible to publicize this policy to individuals who might be in a position to make the call to 911. Again, reducing the *perceived* risk of arrest and prosecution may be every bit as important in increasing calls to 911 as is reducing the actual likelihood of arrest. Offering additional training to police officers on overdose prevention and response might also be beneficial. Though participants are legally and legitimately prescribed naloxone by a licensed physician after attending a training and the prescription is clearly labeled on the vial of naloxone, the police nonetheless have occasionally confiscated naloxone obtained through OPP. Although OPP staff provide information to participants about the potential results of police encounters and their legal right to carry naloxone that is legitimately prescribed to them, "fear of arrest" continues and points to the need for increased efforts to reduce tensions between law enforcement and program participants.

Our finding that 3.4% of program participants returned for refills 10 to 24 times provides a glimpse into the social structure that is important to overdose prevention and health among the study population. This might point to the existence

of "hubs" or "nodes" of experience and knowledge within drug-using communities which appear to be recognized by users and their peers. We hypothesize that these individuals may serve as lay health care educators who are highly networked, as well as links between mainstream health resources and their peers. Our data are suggestive that maximizing opportunities and potential linkages afforded by such "indigenous public health workers" may help to reach a larger number of users who may not be seen by mainstream and community-based services.[22] Similar to models of secondary needle exchange which have been shown to be effective in reducing the spread of blood-borne disease by utilizing these types of informal networks, overdose prevention programs could build on these models by encouraging individuals to further disseminate knowledge they have gained to others who may be able to prevent and/or reverse overdose.[19,23]

It should be noted that this study's population is drawn only from needle exchange program participants and is therefore not reflective of the general drug-using population in Pittsburgh and the surrounding Allegheny County. The population studied is further limited to individuals who chose to participate in the OPP. Data presented in this study are self-reported by program participants. Information on "drugs involved in an overdose" when naloxone was administered was often provided by the person who administered naloxone, rather than the person who overdosed. Therefore, the person making the report did not always know with certainty what the person who overdosed had actually taken. Thus, the design of this study has limitations in accuracy in regard to drugs involved in an overdose.

The study demographics reflect the demographic makeup of the population who use this particular needle exchange site where overdose prevention trainings are offered (97% Caucasian). Therefore, the study demographics are also overwhelmingly Caucasian. Prevention Point has a second site in the primarily African American Hill District community, where 95% of needle exchange participants are African American. To provide some historical context, Prevention Point's needle exchange was founded in the Hill District in 1995, where it operated openly (though without legal sanction) without incident until 1999 when, due to pressure from a few residents, it was forced underground. Prevention Point finally became a legal, county-authorized program in 2002 with authorization to operate a single, fixed site in the Oakland section of town (PPPs main site). After several years of negotiations with Hill District residents who opposed increasing services to drug users as they tried to shed the image of a "drug neighborhood,"[24,25] PPP was able to gain acceptance for use of a small van to distribute clean needles in the Hill in 2007. In 2010, PPP introduced naloxone prescription on a limited basis in conjunction with the Hill site, and efforts are currently underway to expand naloxone distribution in this area to better serve the African American population of the County.

Although PPP's OPP was first targeted primarily to heroin users, during our study period, there was a significant increase in overdose deaths related to prescription opioids as well as cocaine. Therefore, in 2009, the curriculum was expanded to include information on overdose risks associated with pharmaceuticals including prescription opioids, benzodiazepines, as well as information on overdose related to crack/cocaine.

After several years of PPP's OPP being the only program explicitly addressing opioid overdoses in Allegheny County, a County-Wide Overdose Prevention Initiative was established in 2007. The initiative has developed a strategic plan to address overdose that includes elements from such programs as Project Lazarus in

North Carolina.[26] Project Lazarus establishes the prescription of naloxone as a part of routine medical practice when a patient is prescribed opioid medication. In collaboration with Allegheny County's Department of Health and Human Services, Bureau of Drug and Alcohol, the University of Pittsburgh's School of Pharmacy, and other stakeholders, the County-Wide Overdose Prevention Initiative is now working with the University of Pittsburgh Medical Center, Mercy Behavioral Health, the county jail, area methadone maintenance treatment programs, and local police departments to increase awareness of opioid overdose and the best practices to prevent overdose fatalities. A key component of the strategic plan developed by the Overdose Initiative is to increase venues where drug users can access naloxone. That overdose fatalities continue to be high in Allegheny County indicates a need for the expansion of the OPP.

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REFERENCES

1. Dasgupta N, Jonsson F, Brownstein JS. Comparing unintentional opioid poisoning mortality in metropolitan and non-metropolitan counties, United States 1999–2003. In: Thomas YE, Richardson D, Cheung I, eds. *Geography and Drug Addiction*. Netherlands: Springer; 2008: 175–192.
2. Warner M, Chen LH, Makuc DM. *Increase in fatal poisonings involving opioid analgesics in the United States, 1999–2006*. Hyattsville, MD: National Center for Health Statistics Data Brief No. 22; 2009.
3. Allegheny County of Pennsylvania Medical Examiner's Office. *Drug Overdose Deaths. 2000–2008. Annual Report*.
4. Galea S, Coffin PO. Drug overdose: new insights, innovative surveillance, and promising interventions. *J Urban Health*. 2003; 80: 186–188.
5. Sporer KA, Kral AH. Prescription naloxone: a novel approach to heroin overdose prevention. *Ann Emerg Med*. 2007; 49(2): 172–177.
6. Gaston RL, Best D, Manning V, Day E. Can we prevent drug related deaths by training opioid users to recognize and manage overdose? *HRJ*. 2009; 6(26): 1–8.
7. Heller D, Stancliff S. Providing naloxone to substance users for secondary administration to reduce overdose mortality in New York City. *Public Health Rep*. 2007; 122: 393–397.
8. Galea S, Worthington N, Piper TM, Nandi V, Curtis M, Rosenthal DM. Provision of naloxone to injection drug users as an overdose prevention strategy: early evidence from a pilot study in New York City. *Addict Behav*. 2006; 31(5): 907–912.
9. Maxwell S, Bigg D, Stanczykiewicz K, Carlberg-Racich S. Prescribing naloxone to actively injecting heroin users: a program to reduce heroin overdose deaths. *J Addict Dis*. 2006; 25: 89–86.
10. Tracy M, Piper TM, Ompad D, et al. Circumstances of witnessed drug overdose in New York City: implications for intervention. *Drug Alcohol Depend*. 2005; 79(2): 181–190.
11. Sherman S, Gann DS, Scott G, Carlberg S, Bigg D, Heimer R. A qualitative study of overdose responses among Chicago's IDUs. *HRJ*. 2008; 5(2): 1–5.

12. Darke S, Zador D. Fatal heroin 'overdose': a review. *Addiction*. 1996; 91(12): 1765–1772.
13. Darke S, Hall W. Heroin overdose: research and evidence-based intervention. *J Urban Health*. 2003; 80(2): 189–200.
14. Darke S, Hall W. The distribution of naloxone to heroin users. *Addiction*. 1997; 92: 1195–1199.
15. Piper TM, Stancliff S, Rudenstine S, et al. Evaluation of a naloxone distribution program in New York City. *Subst Use Misuse*. 2008; 43: 858–870.
16. Green T, Heimer R, Grau LE. Distinguishing signs of opioid overdose and indication for naloxone: an evaluation of six overdose training and naloxone distribution programs in the United States. *Addiction*. 2008; 103(6): 979–989.
17. Seal KH, Downing M, Kral AH, et al. Attitudes about prescribing take-home naloxone to injection drug users for the management of heroin overdose: a survey of street-recruited injectors in the San Francisco Bay Area. *J Urban Health*. 2003; 80(2): 291–301.
18. Tobin KE, Davey MA, Latkin CA. Calling emergency medical services during drug overdose: an examination of individual, social and setting correlates. *Addiction*. 2005; 100(3): 397–404.
19. Pollini RA, McCall L, Mehta S, et al. Response to overdose among injection drug users. *Am J Prev Med*. 2006; 31(3): 261–264.
20. Enteen L, Bauer J, McLean R, et al. Overdose prevention and naloxone prescription for opioid users in San Francisco. *J Urban Health*. 2010; 87(6): 931–941.
21. U.S. Census Bureau. *Census 2000; 2006 Population Estimate*. Washington, DC: US Census Bureau; 2010. http://quickfacts.census.gov/qfd/states/42/4261000.html. Accessed June 27, 2010.
22. Giblin P. Effective utilization and evaluation of indigenous health care workers. *Public Health Rep*. 1989; 104(4): 361–368.
23. Snead J, Downing M, Lorvick J. Secondary syringe exchange among injection drug users. *J Urban Health*. 2003; 80(2): 330–348.
24. Cohen K. *The Boundaries of Blackness: AIDS and the Breakdown of Black Politics*. Chicago, IL: University of Chicago Press; 1999.
25. Braine N, Acker C, Goldblatt C, Yi H, Friedman S, DesJarlais DC. Neighborhood history as a factor shaping syringe distribution networks among drug users at a U.S. syringe exchange. *Soc Networks*. 2008; 30: 235–246.
26. Dasgupta N, Sanford CK, Albert S, Brason FW. Opioid drug overdoses: a prescription for harm and potential for prevention. *Am J Lifestyle Med*. 2010; 4: 32–37.