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## Immediate impact of Hurricane Sandy on people who inject drugs in New York City

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### Abstract

Over the 8 months following Hurricane Sandy, of October 2012, we interviewed 300 people who inject drugs in New York City. During the week after the storm 28% rescued others or volunteered with aid groups; 60% experienced withdrawal; 27% shared drug injection or preparation equipment or injected with people they normally would not inject with; 70% of those in opioid maintenance therapy could not obtain sufficient doses; and 43% of HIV-positive participants missed HIV medication doses. Though relatively brief, a hurricane can be viewed as a Big Event that can alter drug environments and behaviors, and may have lasting impact. The study's limitations are noted and future needed research is suggested.

### Keywords

people who inject drugs; Hurricane Sandy; disasters; complex emergencies; HIV; Big Events

## INTRODUCTION

In late October 2012, the US National Hurricane Center began to issue warnings about a storm developing in the Caribbean Sea, later to be designated “Hurricane Sandy” (National Weather Service, 2013). After making landfall, the storm weakened in intensity, but grew dramatically in size. The storm that became known as “Superstorm Sandy” caused an estimated \$50 billion dollars in damages, left 8.5 million customers without electric power, and resulted in at least 147 direct deaths (Blake, 2013; National Weather Service, 2013; Nolan, 2012). In New York City, evacuation was ordered for low-lying areas, public transportation was suspended, and parts of the subway system were severely damaged by flooding (Barron, 2012; Flegenheimer, 2012).

Among the many people who were affected by the storm were people who inject drugs (PWID). As seen in the aftermath of Hurricane Katrina in Louisiana and Mississippi in 2005, PWID are particularly vulnerable to the effects of hurricanes (Bennett, Golub, & Dunlap, 2011; Mills, et al., 2009). Disruption of illicit drug markets can add to the

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### Declaration of interest

All authors declare that they have no conflicts of interest. All authors contributed to and have approved the final manuscript.

difficulties in evacuating and obtaining food and shelter for PWID, and can lead to increased risks of transmission of HIV and other blood-borne infections (Bennett, et al., 2011; Mills, et al., 2009). Unfortunately, with ongoing global warming, climactic events such as storms, floods and droughts have increasing potential to exacerbate HIV epidemics through population displacement, trauma, service disruption and economic instability (Ebi, Kovats, & Menne, 2006).

We have been developing a model of how “Big Events” (also referred to as “complex emergencies” (Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005; Strathdee, et al., 2006)), such as social, political and economic crises, can affect HIV epidemics (Friedman, Rossi, & Braine, 2009; Friedman, et al., 2013). PWID are especially vulnerable to the effects of Big Events because their needs are frequently overlooked among city planners and others, particularly during crises. Sandy hit New York while we were finalizing a survey of PWID, as part of a study to develop new measures of “upstream” social/structural environmental HIV risks (Friedman, et al., 2013). We wanted to investigate whether Hurricane Sandy affected PWID like we hypothesized other larger scale Big Events could. Below, we describe results from survey questions we added regarding the potential effects of Hurricane Sandy on living circumstances, injection drug use and helping behavior.

## Methods

### Sample

We interviewed PWID in the Lower East Side of Manhattan between November 29, 2012 and June 12, 2013, using referrals from a study of PWID in New York City that used respondent driven sampling and offered HIV counseling and testing. Interviews were conducted face-to-face by one of the authors (MS), and another staff member, both with extensive experience interviewing PWID. Eligibility criteria included: (1) having injected illicit drugs in the past 12 months, (2) age 18 or older, (3) residency in the New York City metropolitan area, and (4) fluency in English. After the interviewers described the study procedures and interview topics, and explained the risks and benefits, participants provided written informed consent. Participants were paid \$30 for their time and effort. Study methods and questionnaire items were approved by the authors’ Institutional Review Board. Interviews usually took approximately one and a half to two hours. Participants generally reported that they enjoyed the interview topics and felt respected.

### Measures

We added items regarding potential effects of Hurricane Sandy on injection drug use, living conditions and helping behaviors during the storm and in the subsequent week to a long questionnaire we had developed to study pathways between social or structural factors and HIV transmission risks (Friedman, et al., 2013). Subtopics of this questionnaire included group membership and influences, how participants spent their time, risk behavior norms, and agreement with altruistic, competitive, hostile and traditional attitudes. We collected data on sociodemographics, including race, ethnicity and gender in order to be able to assess potential effects of marginalization of PWID subgroups. We asked specifically if problems related to the storm altered their behaviors and circumstances. For example, the wording of

an item regarding receptive syringe sharing was: “Did you share a syringe that someone else had used previously to inject because problems related to Hurricane Sandy made it harder not to?” We tried to limit the burden on participants of adding questions to what was already a long interview. For example, we simplified questions about avoiding withdrawal. We asked: “In the week after Hurricane Sandy, on how many days were you able to get the street drugs you needed to avoid withdrawal?”

## RESULTS

### Sample characteristics

Selected data on participant characteristics and their drug-using behavior during the previous 30 days are presented in Table 1. The sample consisted of 300 adults 19–62 years of age (mean = 40.9). Slightly more than half were male (56.3%), and most reported being either black/African American (54.5%) or white (43.7%) race. Hispanic or Latino ethnicity was reported by 42.7%. The most frequent marital status was never married (43.7%), followed by married or living together (31.3%). The majority were unemployed (53.3%), and the most frequent educational level completed was 12<sup>th</sup> grade/GED (43.7%). Although the majority (62.1%) had incomes below \$10,000 per year, almost half (45.1%) had at least one dependent other than themselves. Of the 19.1% who were veterans of the US Armed Forces, 67.3% had received an honorable or general discharge. At the time of the hurricane, about half (49.8%) of participants were participating in prescribed methadone maintenance therapy (MMT) or buprenorphine maintenance therapy (BMT) for opioid dependence. Of the 20.8% who reported HIV-positive status, time since learning of their HIV infection ranged from 6 months to 23 years (mean = 7.5 years).

### HIV risk behaviors in the last 30 days

During the 30 days preceding the interview (we discuss immediate post-Sandy behavior below) the majority (55.3%) injected once a day or more, on average (Table 1). In addition, 27.9% shared syringes, 35.6% shared drug preparation equipment (drug cookers, rinse water or drug filters), and 17.4% “backloaded/piggy-backed” (used an individual syringe to withdraw drugs from a common syringe containing drugs prepared for more than one person). Finally, 14.0% reported exchanging sex for money, drugs or other goods.

### Living conditions and activities during Hurricane Sandy and the subsequent week

Selected data on experiences and activities during Hurricane Sandy and during the following week are presented in Table 2. Of the participants who reported that they had a place to live at the time of the storm (80.6%), 6.7% were forced from their homes due to the storm. Essential services were disrupted for some people. During the week following the storm, 26.5% of the participants who were living in a (non-shelter) residence lost electrical power, heat and/or running water for 1 or more days. Despite these hardships, 28.4% of the participants rescued other people from floods, accidents or other serious threats, or volunteered with Occupy Sandy or other aid groups. A majority (59.0%) reported helping others obtain food or other necessities. During the interviews, some participants told us about their experiences with the hurricane. One male participant said: “Me and my friends had to get together and help people get out of their apartments because of flooding. We even

bought them food.” Another (also male) said: “I lost all my shit because I was living on the streets. A few of the addicts that I hang out with took me into their apartment. If it wasn't for the help I would have probably been dead.”

Hurricane Sandy interfered with medical treatment. Of those in MMT/BMT programs, only 30.1% were able to obtain sufficient take-home doses of these medicines from their regular program or doctor to avoid withdrawal. An additional 22.9% were able to obtain some, but not sufficient doses, and had to use informal sources to avoid withdrawal; 23.5% more obtained drugs only from informal sources to avoid withdrawal, and 8.5% reported experiencing withdrawal because they were unable to obtain their regular doses. Among HIV-positive participants, 42.6% missed HIV medication doses in the week following the storm. Reflecting this common experience, one female participant told us: “The Sandy bitch hit us hard. We had to live in a shelter for 2 weeks and I couldn't get my HIV medication or my methadone.”

Almost all (96.9%) participants injected drugs in the week following the hurricane; however, in ways similar to what happened in New Orleans after Hurricane Katrina, (Bennett, et al., 2011) Hurricane Sandy appears to have altered the drug trade. We asked participants how many days during the week following the storm they were able to obtain street drugs they needed to avoid withdrawal. A total of 59.5% were unable to obtain street drugs to avoid withdrawal on one or more days. A slight majority (51.0%) reported more difficulty than usual obtaining injection drugs from drug dealers or other street sources, and close to a third (27.9%) reported that dealers raised prices during that time.

Problems related to the storm led to riskier injecting practices. One man said: “Oh man, the storm was crazy. We didn't believe that it was gonna' happen. I was out there helping my friends (PWID) look for our shit (heroin), and were sick as dogs. We had to share because they jacked up the price.” A total of 49.0% reported helping other drug users avoid withdrawal, and 33.3% reported helping others obtain sterile syringes. Only 4.1% injected drugs more frequently during the week following the hurricane, while 39.8% injected less frequently. Some had difficulty in obtaining sterile syringes. This was expressed clearly by one participant: “The closing of the needle exchange fucked us up. We didn't get new needles for over a week and took chances using dirty works. The workers couldn't get to work because of all the water and the train.” A total of 17.6% reported not having enough syringes during the week following the hurricane. Syringes were shared by 19.0%, drug preparation equipment was shared by 17.0%, and 12.3% “backloaded/piggy-backed” because problems related to the storm made it harder not to. In addition, the storm altered injection networks for some participants: 14.4% reported injecting drugs with people that they would not normally inject with due to problems caused by the storm.

Finally, the hurricane reduced the amount of sex exchange. Of those reporting exchanging sex for money, drugs or other goods, 65.1% exchanged sex less frequently, while 5.8% exchanged sex more frequently.

## DISCUSSION

Hurricane Sandy interfered with HIV- and drug user-related services, such as methadone maintenance treatment and syringe exchange. It was followed by increased behavioral (and perhaps network) risks of transmission of HIV and other blood-borne infections by PWID. It is unclear if these disruptions had lasting effects on drug use, HIV epidemiology, or other health outcomes.

Uncertainty regarding how severe the storm would be may have contributed to the lack of more complete preparation for HIV-infected PWID, resulting in HIV therapy interruption. The rain and lack of subway and public bus service made it difficult for participants to engage in their usual behaviors (Barron, 2012). Electrical service disruption made it difficult for businesses, including pharmacies, to reopen. Interrupted HIV medication therapy, as well as interrupted MMT, were previously observed following the terrorist attacks of September 11, 2001 (Frank, Dewart, Schmeidler, & Demirjian, 2006; Halkitis, Kutnick, Rosof, Slater, & Parsons, 2003), and following Hurricane Katrina (Clark, et al., 2006; Maxwell, Podus, & Walsh, 2009).

Most participants experienced symptoms of withdrawal because they were unable to obtain drugs from usual sources, and many of those in MMT/BMT were unable to obtain sufficient take-home doses. Interruption of MMT/BMT can decrease the effectiveness of MMT/BMT, as well as increase the risk of death from overdose and from traumatic and medical/somatic causes (Clausen, Waal, Thoresen, & Gossop, 2009). Many of our participants who were in MMT/BMT also used illicitly obtained opiates (data not shown). Although we did not ask about the use of illicit opiates as a replacement for insufficient MMT/BMT directly, it is likely that some MMT/BMT patients avoided withdrawal by using illicit opiates. In the context of the chaotic, potentially traumatic events surrounding the hurricane, the interruption of MMT/BMT may have contributed to the discontinuation of treatment for drug dependence for some PWID. Other studies have found that, while some PWID reduce their drug use immediately following disasters due to problems obtaining drugs, drug use often returns to prior levels over time (Factor, et al., 2002; Movaghar, et al., 2005; Weiss, et al., 2002).

PWID were more likely to share syringes and drug preparation equipment, and more likely to inject with people they would not normally inject with because of problems related to the storm. These behaviors increase risks of transmission of HIV and other blood-borne infections because they increase the likelihood that uninfected PWID will be exposed to trace amounts of infected blood in shared injections (Des Jarlais & Friedman, 1987). The experience of withdrawal can alter behavioral norms that would otherwise support using only sterile syringes and drug preparation equipment (Wagner, et al., 2010).

It should not be surprising that many PWID acted selflessly in helping other drug users and non-drug users, given plentiful prior evidence of altruistic behavior among PWID (Convey, Dickson-Gomez, Weeks, & Li, 2010; Friedman, et al., 2004; Mateu-Gelabert, et al., 2008). Nonetheless, it is important to note that the helping behaviors reported by PWID in this study contradict stereotypes of drug users as utterly self-centered and destructive. While the

participation of PWID in the immediate response to Hurricane Sandy both individually and as part of volunteer and community-based organizations (CBOs) is encouraging, it underscores the insufficiency of coordinated government response.

Disaster planning should take place between government agencies and volunteer organizations and CBOs (Schmeltz, et al., 2013), and mitigation plans, including those for PWID, should be formalized. Participation of PWID in the development of such plans could help make the plans more effective, and can also help PWID become temporary or ongoing agents of social change (Berkman, Garcia, Munoz-Laboy, Paiva, & Parker, 2005; Cepeda, Valdez, Kaplan, & Hill, 2010; Latkin & Friedman). Medical systems and street services like syringe exchange programs should be fully stocked and prepared for natural disasters (Costello, et al., 2009), as more such events are likely in New York City (Knowlton, et al., 2007) and in many parts of the world, and may increase in frequency as the climate warms (Frumkin, Hess, Luber, Malilay, & McGeehin, 2008).

### Study Limitations

The data in this study were retrospective and cross-sectional, and we did not directly compare reports of behaviors before and after the storm. Our design did not allow for the assessment of long-term effects. HIV status was determined solely by self-report; however, all participants reported either HIV-positive status, or testing negative for HIV within the past 2 years. We present results without multivariable analyses because the relatively small sample sizes (e.g., n = 149 enrolled in MMT/BMT therapy, n = 61 enrolled in HIV therapy) and incomplete control for confounding factors (e.g., syringe sharing immediately preceding the hurricane) made such analyses unreliable for most items. We did not assess the representativeness of our sample, and results may not be generalizable to the PWID population in New York.

### Future research needed

Research is needed on possible long-term effects of Hurricane Sandy and other natural disasters or Big Events/complex emergencies on PWID, and on HIV epidemiology (Ebi, et al., 2006; Friedman, et al., 2013; Rhodes, et al., 2005; Strathdee, et al., 2006). It is unclear if the short-term HIV therapy interruptions in this population had harmful long-term effects, such as treatment discontinuation. It is also unclear if the interruption of MMT/BMT led to the discontinuation of treatment for drug dependence. Studies are needed to improve planning, education, training and policy for individual drug users and for related service providers.

### Conclusions

Hurricane Sandy interfered with HIV and drug user treatment, and increased risks of transmission of HIV and other blood-borne infections for PWID. Despite hardships, PWID served as assets to their respective communities, helping other drug users and non-drug users in the wake of the storm. Big Events/complex emergencies, including natural disasters, can alter physical and social environments, affect risk behaviors and contexts, and contribute to shaping HIV epidemic dynamics. Studies are needed to better understand the potential



influence of these effects over time, and to improve education, training and policy for drug users and related service providers.

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## GLOSSARY

<b>Backloading/ piggybacking</b>	Using an individual syringe to withdraw drugs from a common syringe containing drugs prepared for more than one person
<b>PWID</b>	People who inject drugs
<b>Distributive (syringe or drug preparation equipment) sharing</b>	Another person injecting with a syringe, or using drug preparation equipment (such as a drug container, filter or rinse water) after it was used by the participant
<b>Receptive (syringe or drug preparation equipment) sharing</b>	Injecting with a syringe, or using drug preparation equipment previously used to inject or prepare drugs by another person

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**TABLE 1**

Selected participant characteristics and HIV risk-related behaviors in the last 30 days. N = 300 people who inject drugs.

Characteristic	% <sup>I</sup> (n)
Age	
19–29	17.6 (52)
30–39	28.5 (84)
40–49	33.6 (99)
50–62	20.3 (60)
Gender (% male)	56.3 (169)
Racial category	
White	43.7 (117)
Black/African American	54.5 (146)
Other <sup>2</sup>	1.8 (4)
Hispanic/Latino ethnicity	42.7 (128)
Marital status	
Never married	43.7 (131)
Married or living together	31.3 (94)
Divorced, separated or widowed	25.0 (75)
Educational achievement	
Less than high school graduation	37.7 (112)
High school graduate or GED	43.7 (131)
More than high school graduate	18.7 (56)
Employment status	
Employed full-time or part-time	20.0 (60)
Student	3.3 (10)
Unable to work due to disability or retired	16.6 (50)
Homemaker	4.7 (14)
Unemployed	53.3 (160)
Other, including illegal activities	2.0 (6)
Income category (per year)	
Less than \$10,000	62.1 (185)
\$10,000–\$19,999	35.9 (107)
\$20,000 or more	2.0 (6)
Homeless immediately preceding Hurricane Sandy	19.4 (56)
Veteran of US armed forces	19.1 (51)
Discharge status	
Honorable	38.8 (19)
General	28.6 (14)
Other than honorable/punitive	32.7 (16)
HIV infection status (% positive)	20.8 (60)
Taking prescribed methadone or buprenorphine immediately preceding	

Characteristic	% <sup>1</sup> (n)
Hurricane Sandy	49.8 (149)
HIV risk-related behavior during the last 30 days	
Frequency of illicit drug injecting	
One per week or less	5.7 (15)
Once per week	39.0 (103)
Once per day	25.0 (66)
Twice per day or more	30.3 (80)
Shared syringes	27.9 (83)
Receptively shared syringes	16.4 (49)
Distributively shared syringes	26.2 (78)
“Backloaded/piggybacked <sup>3</sup> ”	17.4 (52)
Shared drug preparation equipment	35.6 (106)
Exchanged sex for money, drugs or other goods	14.0 (42)

<sup>1</sup>, Effective sample sizes (n) for category percentages vary due to non-response for some items, and percentages may not add up to 100 due to rounding;

<sup>2</sup>, Other = American Indian/Alaskan Native, Asian, Native Hawaiian/Other Pacific islander, and multiple racial groups;

<sup>3</sup>, used an individual syringe to withdraw drugs from a common syringe containing drugs prepared for more than one person.

TABLE 2

Survey results regarding Hurricane Sandy and the week following the storm.

Item	% <sup>I</sup> (n)
<i>Housing Problems</i> <sup>2</sup>	
Forced from home	6.7 (20)
Lost electrical power	23.9 (62)
Lost heat	23.2 (60)
Lost running water	4.6 (12)
<i>Medication</i>	
Methadone or Buprenorphine dosage adequacy <sup>3</sup>	
Obtained sufficient take-home doses from formal sources	30.1 (46)
Forced to use informal sources in addition to take-home doses to avoid withdrawal	22.9 (35)
Used informal sources to avoid withdrawal	23.5 (36)
Experienced withdrawal	8.5 (13)
Missed HIV medication doses due to problems related to the storm <sup>4</sup>	42.6 (23)
<i>Drug Acquisition, Preparation and Use</i>	
Experienced more difficulty than usual obtaining drugs	51.0 (152)
Dealers raised drug prices	27.9 (83)
Unable to obtain drugs to avoid withdrawal one or more days	59.5 (176)
Frequency of drug injection	
Increased	4.1 (12)
Stayed the same	56.1 (165)
Decreased	39.8 (117)
Unable to obtain sufficient sterile syringes for injecting	17.6 (52)
Shared syringes	
Receptively shared syringes due to problems related to the storm	9.2 (27)
Distributively shared syringes due to problems related to the storm	16.0 (47)
“Backloaded/Piggybacked” <sup>5</sup>	12.3 (36)
Shared drug preparation equipment due to problems related to the storm	17.0 (50)
Injected with different people due to problems related to the storm	14.4 (42)
<i>Helping Behavior</i>	
Rescued others	19.7 (59)
Volunteered with aid groups	21.1 (63)
Helped others obtain food or other necessities	59.0 (177)
Helped relatives	25.7 (77)
Helped friends	44.0 (132)
Helped neighbors	18.7 (56)
Helped strangers	15.3 (46)
Helped other drug users avoid withdrawal	49.0 (147)
Helped other drug users obtain sterile syringes	33.3 (100)

<sup>1</sup>, Effective sample sizes (n) for category percentages vary due to non-response for some items, and percentages may not add up to 100 due to rounding;

<sup>2</sup>, among those domiciled at the outset of Hurricane Sandy;

<sup>3</sup>, among those taking prescribed methadone or buprenorphine;

<sup>4</sup>, among HIV-infected participants;

<sup>5</sup>, used an individual syringe to withdraw drugs from a common syringe used for preparing drugs for more than one person.

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