Sampling and Recruitment in Multilevel Studies among Marginalized Urban Populations: The IMPACT Studies

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ABSTRACT *Illicit drug use in urban settings is a major public health problem. A range of individual level factors are known to influence drug use and its consequences, and a number of recent studies have suggested that the neighborhood in which an individual lives may also play a role. However, studies seeking to identify neighborhood-level determinants of drug use, particularly among marginalized urban populations, need to overcome significant challenges, particularly in the area of sampling and recruitment. One key issue is defining functional neighborhoods that are relevant to local residents. Another arises from the need to sample a representative or even a diverse population when studying marginalized groups such as illicit drug users. These are common problems that raise particular challenges when both need to be addressed in the same study. For example, many sampling approaches for neighborhood-level studies have included some form of random sample of households, but this may systematically overlook marginalized populations. On the other hand, the sampling approaches commonly used in studies of hidden populations such as chain referral, snow ball, and more recently, respondent-driven sampling, typically expand beyond a geographic "neighborhood." We describe the organization and rationale for the IMPACT Studies in New York City as a case illustration on how such issues may be addressed.*

KEYWORDS *Drug users, Marginalized populations, Multilevel studies, Neighborhoods, Recruitment, Sampling.*

INTRODUCTION

Multi-level intra-urban studies are becoming widely used to investigate specific features of the urban environment that may be conducive to or detrimental to good health.[1–3] These studies typically consider neighborhoods as the relevant context in which people live and combine both neighborhood-level and individual-level data in analyses. Data collection for these studies then often includes archival data sources that characterize the relevant neighborhood unit (e.g., block group, census tract, zip code, community district) and individual-level data collection (for example, a questionnaire on behavior,

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outcomes, or a respondent's environment). Because the neighborhood unit chosen is essential for these analyses, much attention has been given to selecting units that capture the essence of neighborhood (e.g., block group, etc.).[4–6]

Illicit drug use in urban neighborhoods is a major public health problem.[3,7–9] Although research in the area is growing, neighborhood-level determinants of drug use and its consequences remain poorly understood. In particular, there is very little research about neighborhood-level factors and the health of marginalized populations such as habitual drug users.[10] While two recent studies examined self-reported measures of neighborhood social disorganization[11,12] and social capital[12] and found associations with drug use and dependence, as well as crack use, among men, this is an area of inquiry that needs more research. Considering the role that neighborhood-level factors play as determinants of drug use or the health of drug users stands to make a contribution to our understanding of the health of marginalized populations in general.

There are particular concerns that need to be considered when designing studies aimed at understanding neighborhood-level influences on the health of marginalized populations. Centrally, the issue of considering a relevant sampling frame encompassing meaningful neighborhood-level units of influence and then sampling marginalized populations within this sampling frame raises unique challenges. For example, sampling approaches that have often been employed for neighborhood-level studies include some form of random sample of households aimed at characterizing a particular urban sampling frame. However, this form of sampling may systematically exclude marginalized populations resulting in possible selection bias.[13,14] Conversely, the sampling approaches for studies of hidden populations have typically included recruitment methods such as chain referral, snow ball, and more recently, respondent-driven sampling.[15,16] However, these approaches typically can expand beyond defined neighborhoods and predetermined sampling frame. For example, the initial participant may be recruited from the target neighborhood, but they may refer friends from other neighborhoods.

In this paper, we describe one approach to study the design for multilevel intra-urban studies concerned with neighborhood-level influences on the health of marginalized populations. We focus on the organization and rationale for the sampling frame selection and recruitment approach. We present preliminary data from the first year of study recruitment including sociodemographic characteristics of the study population, as well as the mental health, HIV, and substance-use outcomes of interest. We offer an assessment of the suitability of the sampling and recruitment approaches used for identifying the targeted population.

METHODS

The Inner-City Mental Health Study Predicting HIV/AIDS, Club and Other Drug Transitions (IMPACT) studies are aimed at determining the association between neighborhood-level characteristics (as the main exposures of interest) and three health outcomes: (1) substance use, (2) HIV and other blood-borne pathogens, and (3) post-traumatic stress disorder (PTSD). These studies were designed to examine the independent and interactive effect of key features of neighborhoods (e.g., neighborhood-level sociodemographics, building quality, access to services, etc.) as they relate to the outcomes of interest. The IMPACT Studies began recruitment in January 2005 with a target sample size of 3,000. Recruitment is slated to continue through December 2008.

Sampling Frame

The sampling frame was designed to target the economically disadvantaged and the racially and ethnically diverse communities in New York City (NYC). We first identified 12 NYC Community Districts (CDs) in four of five NYC boroughs: Manhattan (East and Central Harlem, Chelsea, the Lower East Side), Brooklyn (Bushwick, Bedford–Stuyvesant), the Bronx (South Bronx, Tremont, Hunts Point), and Queens (Corona, Jamaica, Long Island City) by examining HIV and overdose rates. We aimed to identify CDs that experienced a high rate of HIV infection and overdose mortality. We defined three neighborhoods in or around each CD for a total of 36 neighborhoods. The process for identifying neighborhoods has been described in detail elsewhere.[17] Briefly, within the CDs, field staff identified areas where drug market activities could be observed. Neighborhood boundaries surrounding these areas were defined by an ethnographer, in consultation with other study investigators, and were constrained to block group and or census tract boundaries so that U.S. Census data could be used for contextual analyses.

Recruitment

Recruitment was conducted using random street-intercept techniques.[18] We aimed to systematically recruit a sample of drug users and non-drug users in the target neighborhoods. Starting at the southwest corner of a target block, outreach workers armed with hand counters and hand cards with study information walked clockwise around the block clicking hand counters when they passed an individual. Recruitment was conducted Monday through Friday during the day. Every fifth person passed was approached using a prepared script that described the study and invited people to be screened. Outreach staff made note of when they approached someone and when someone approached them, along with the outcome of each interaction (i.e., escorted to appointment, scheduled an appointment, had a conversation, refused to have conversation, ignored staff, walked away from staff). We also screened people who walked into our research storefront or onto the study recreational vehicle, making note that they were walk-ins rather than street-intercept recruits. Walk-ins either knew of our work through experience with our previous studies or through word-of-mouth from IMPACT Study participants.

Screening and Eligibility

Interested individuals were invited to be screened at our main research storefront in Central Harlem (easily accessible to residents in Upper Manhattan and the Bronx) or on a recreational vehicle (RV) parked in or near neighborhoods in Brooklyn, lower Manhattan, and Queens. Before screening, interviewers explained the purpose and procedures of the study. A 10-min face-to-face screening questionnaire was administered to assess sociodemographics and study inclusion and exclusion criteria. Supervisors evaluated screening questionnaires for eligibility.

Eligible participants were age 18 years or older, lived or spent at least half their time in a target neighborhood, and were willing to give a blood sample. We were specifically recruiting individuals meeting one of the following criteria: injection drug users (IDUs), non-injection drug users (non-IDUs), former drug users (former DUs), non-drug users, and club drug users (CDUs). IDUs must have injected at least once in the last 3 months. Eligible non-IDUs had to have used (by sniffing, ingesting, or smoking only) heroin, crack, cocaine, and/or methamphetamine at least once in the last 3 months but never have injected drugs in their lifetime. Former DUs must have used heroin, crack, cocaine, or methamphetamine (injecting, sniffing, or smoking)

at least once in their lifetime but not in the last 3 months. Non-drug users must not have used any drug in their lifetime, except alcohol or marijuana. CDUs must have used a club drug [lysergic acid diethylamide (LSD), phencyclidine (PCP), ecstasy, ketamine, gamma hydroxy butyrate (GHB), or rohypnol] in the last 3 months; CDUs could also be IDUs or Non-IDUs.

Cross-Sectional Interview

After informed consent, eligible participants completed a standardized, detailed risk behavior questionnaire administered by trained interviewers conducted over two separate visits. The follow-up rate for the second visit among people recruited in the first year was 94.3% (n=459); it was not different among drug use groups. Participants were reimbursed $20 for each interview. The study was reviewed and approved by the institutional review boards of the New York Academy of Medicine and the RAND Corporation.

The interview asked about the type, frequency, and duration of their drug use, sexual behaviors, and mental health. Prior drug use (or lack thereof) by injection was confirmed during the interviewing process and by phlebotomists' observations. Demographic data collected included age, race, gender, socioeconomic status (SES; e.g., education, housing, main income source, income level, and food insufficiency). Homelessness was determined with the following questions: "Have you ever been homeless?" and "have you been homeless in the past 6 months?"

Outcome data included substance-use type and route of administration, HIV risk, and PTSD. The questionnaire included items on heroin, crack, cocaine, meth-amphetamines, and club drug (defined as LSD, PCP, ecstasy, ketamine, GHB, or rohypnol) use. HIV risk assessment included route of drug administration (injection, sniffing, or oral), number and type of sex partners, and condom use. Symptoms consistent with PTSD were measured using the relevant section of Diagnostic Interview Schedule (DIS).[19] The list of qualifying traumas was modified to include items on disasters,[20] assault,[21] and sexual abuse. If an individual reported experiencing any symptoms in relation to specific traumas, they were queried about specific symptoms based on the DSM-IV criteria for PTSD: reexperiencing the event, avoidance, arousal, and significant impairment of functioning. Individuals with simultaneous occurrence of the four specific DSM-IV symptoms (each lasting at least 1 month or longer) at any time in their life were considered to have lifetime history of PTSD. Those who reported experiencing all four symptoms in the last 6 months were also considered to have current PTSD.

Pre- and Post-Test Counseling and Serological Testing

After completion of the interview, all participants were counseled about hepatitis B (HBV), hepatitis C (HCV), HIV infection, and sexually transmitted diseases (STDs), and had a blood specimen drawn for serologic testing on the first day. Serology samples were tested for HBV, HCV, and HIV. HBV testing consisted of the detection of hepatitis B surface antigen (HBsAg, Abbott Laboratories, Abbott Park, IL, U.S.A.) and antibodies to hepatitis B surface and core antigens (anti-HBs and anti-HBc, Ortho Clinical Diagnostics, Inc., Raritan, NJ, U.S.A.) HCV antibodies were detected by enzyme-linked immunosorbant assay (ELISA; Ortho HCV version 2.0 ELISA). Sera that were reactive on the first testing were retested. Repeatedly reactive samples were confirmed by strip immunoblot assay (Chiron RIBA HCV 3.0 SIA). HIV antibodies were detected using enzyme-linked immunosorbant assay for HIV types 1 and 2 (Abbott Laboratories) with a confirmatory Western for HIV type 1

(Calypte Biomedical Corporation, Alameda, CA, U.S.A.). Participants returned 2 to 3 weeks later to learn their test results, receive risk reduction counseling, and receive referrals for medical care and other health and social services. Those who returned for results ($n=423$, 86.9%) received a $10 remuneration. Follow-up was not differential among drug use groups. Participants who were found to be HBV susceptible were informed that they were HBV negative and received referrals for HBV vaccination.

PRELIMINARY RESULTS

The 36 target neighborhoods included 58 census tracts, 124 block groups, and represented a sampling frame of 193,273 people. U.S. Census 2000 data[22] shows that, in these neighborhoods, there were slightly more women than men (54.3% vs 45.7%, respectively), and almost 69.9% were over the age of 18, 42.3% identified as Hispanic, 37.2% as black non-Hispanic, 9.1% as white non-Hispanic, and 11.4% as some other race. The median household income in 1999 was $22,438; 37.9% of residents were below the poverty level. Approximately 44.7% did not have a high school diploma or equivalent. There were statistical differences between the census and IMPACT datasets with respect to race, gender, and age (data not shown). However, there were no significant differences in terms of education. Income and poverty level could not be compared because those data are not available in the IMPACT dataset.

During the first year of recruitment (January–December 2005), outreach workers logged 3,374 approaches in the field. Field approach outcomes varied, for example, 8.9% walked away, 29.3% refused to talk, 5.0% ignored the outreach workers, 24.8% talked to an outreach worker, and 25.6% made an appointment (categories not mutually exclusive). Outreach workers spoke with 832 people, made appointments for 864 people, and escorted 20 people to the storefront or van for screening.

We present preliminary data from the first year of recruitment. Of 633 people screened in the first year, 487 (76.9%) were eligible for enrollment. Overall, the mean age was 36.5 years, 48.5% identified as Hispanic/Latino, 40.0% black, 6.0% white, and 5.5% as some other race (other race included 2.9% mixed race/ethnicity, 1.4% both black and Hispanic; Asian/Pacific Islanders, Native Americans/Alaskans/ Aleutians, and other racial/ethnic groups each comprised 0.4%, respectively). There were more men than women (69.2% vs 30.4%) and two individuals identified as transgendered or transsexual. The majority of participants (87.3%) identified as heterosexual, followed by lesbian or bisexual women (8.0%), homosexual or bisexual men (4.3%) or other (0.4%). Most (78.4%) had been homeless at some time in their lives, and 40.9% had been homeless in the last 6 months. More than half (51.1%) had a high school diploma or equivalent. In terms of income source, 39.3% had been employed (e.g., had a full or part time job, owned a business, or had been employed "off the books") in the last 6 months, and 72.3% had received public assistance in the last 3 months. More than half (54.6%) reported that they were unable to afford food at least once in the past year. More than half (61.2%) had been to jail or prison in their lifetime. In terms of target recruitment groups, 156 (32.0%) were IDUs, 159 (32.6%) were non-IDUs, 112 (23.0%) were former DUs, and 59 (12.1%) were non-drug users.

We examined sociodemographic characteristics stratified by drug use group (Table 1). Bivariate analysis for Tables 1 and 2 included calculations of means for continuous variables and frequencies for categorical variables. Differences between drug-using groups were evaluated with analysis of variance for continuous variables

TABLE 1 Sociodemographic characteristics of 487 IMPACT participants, New York City 2005, by drug use

	Number of participants	Injection drug users (%), N=156	Non-injection drug users (%) N=159	Former[a] drug users (%) N=112	Non-drug users (%) N=59	p Value[b]
Mean age (SD)	487	34.4 (9.0)	39.0 (8.0)	41.7 (8.9)	26.2 (10.4)	<0.001
Race/ethnicity						
Hispanic/Latino	236	46.6	24.3	23.0	6.0	<0.001
Black	195	12.3	45.1	24.1	18.5	<0.001
White	29	55.2	13.8	24.1	6.9	0.027[c]
Other	27	22.2	37.0	14.8	25.9	0.120[c]
Gender						
Men	337	33.8	28.5	24.3	13.1	0.023 [c]
Women	148	22.7	42.6	20.3	9.5	
Transgender/transsexual	2	50.0	0	0	50.0	
Sexual identity						
Heterosexual	425	30.4	32.7	23.5	13.2	0.522 [c]
Homosexual or bisexual men	21	42.9	33.3	19	4.8	
Lesbian or bisexual women	39	43.6	33.3	17.9	5.1	
Other	2	50.0	0	50.0	0	
Ever been homeless	382	37.4	34.3	20.9	7.3	<0.001
Homeless in the last 6 months	199	44.7	34.7	14.1	6.5	<0.001
High school education or equivalent	249	32.5	32.1	24.5	10.4	0.682
Employed[d] in last 6 months	191	26.2	33.5	23.0	17.3	0.016
Public assistance in last 6 months	352	32.4	37.8	24.4	5.4	<0.001
Could not afford food in last year	266	43.6	30.5	17.7	8.3	<0.001
Ever been to jail or prison	298	35.9	31.5	22.8	9.4	0.036

[a]*Former* Used heroin, crack, cocaine or methamphetamine by any route at least once in lifetime, but not in the last 3 months

[b]Pearson chi-square unless otherwise indicated

[c]Fisher's exact test

[d]*Employed* Had a full or part-time job, owned a business, or had been employed "off the books"

and Pearson chi-square statistics or Fisher's exact tests (when cells had less than five people) for categorical variables. Because CDUs were not mutually exclusive from IDUs and non-IDUs, they were excluded from this comparison. There were significant differences for all sociodemographic characteristics except sexual identity and education. Non-drug users were the youngest group followed by IDUs, non-IDUs, and former DUs. IDUs were more likely to be Hispanic/Latino, non-IDUs and non-drug users were more likely to be black, and former DUs were almost equally Hispanic/Latino and black. IDUs were more likely to report lifetime and recent homelessness, followed by non-IDUs, former DUs, and non-drug users. Non-drug users were more likely to report having a full or part-time job and less likely to have been on public assistance in the last 6 months. Non-drug users were also less likely to have spent time in jail or prison as compared to the drug using groups.

Table 2 presents data on the main study outcomes: drug use, sexual risk behaviors, infectious disease serology, and mental health. With respect to drug use in the last 6 months, cocaine was the most frequently reported drug (84.6%), followed by crack (69.6%), heroin (68.2%), PCP (10.1%), ecstasy (6.0%), LSD (3.5%), methamphetamine (3.1%), ketamine (0.8%), and GHB (0.2%). IDUs were more likely to report using each drug compared to non-IDUs and former DUs.

In terms of risk for HIV and other bloodborne pathogens, we focused on sexual risk behaviors and serology. Approximately two thirds (68.6%) reported having had any unprotected vaginal, anal, or oral sex in the last 6 months; however, there were no significant differences by drug use group. However, 39.0% overall reported sex with a high-risk partner (partners that had other sex partners, injected drugs, paid or been paid for sex, or were HIV seropositive), with IDUs being more likely to report sex with a high-risk partner ($p<0.001$). The overall prevalence of HIV, HBV, and HCV was 12.1%, 32.0%, and 34.7%, respectively. We observed significant differences in infection prevalence between drug groups. Former DUs had the highest prevalence of HIV and non-drug users the lowest; prevalence was similar between IDUs and non-IDUs. IDUs had the highest prevalence of HBV and HCV, and non-drug users the lowest.

We also estimated the prevalence of symptoms consistent with lifetime and current PTSD. Lifetime and current (last 6 months) PTSD prevalence was approximately 10.7% and 7.0%, respectively; IDUs had the highest prevalence of both lifetime and current PTSD ($p=0.032$ and 0.045, respectively).

Table 3 summarizes differences between participants recruited through street intercept sampling and those who walked into a study site. Bivariate analysis included calculations of means for continuous variables and frequencies for categorical variables. Differences between drug using groups were evaluated with t tests for continuous variables and Pearson chi-square statistics or Fisher's exact tests (when cells had less than five people) for categorical variables. Street-intercept-recruited participants were more likely to be black or white, employed, and a former DU compared to walk-ins; they were significantly less likely to be Hispanic, homeless, incarcerated in their lifetime and a club drug user. Street-intercept-recruited participants were also less likely to have been on public assistance, have experienced food insufficiency and be a non-IDU.

DISCUSSION

This paper highlights two key challenges we experienced in designing this multi-level intra-urban study: determining the sampling frame and recruitment strategy. We discuss the rationale for our approaches below.

TABLE 2 Drug use, infectious disease serology and PTSD among 487 IMPACT participants, New York City 2005, by drug use

	Number of paticipants	Injection drug users (%), N=156	Non-injection drug users (%), N=159	Former[a] drug users (%), N=112	Non-drug users (%), N=59	p Value[b]
Drug use[c,d]						
Any drug	428	36.4	37.1	26.2	—	<0.00[e]
Heroin	332	46.7	32.2	21.1	—	<0.001[e]
Crack	339	41.3	38.3	20.4	—	<0.001
Cocaine	412	37.4	37.4	25.2	—	<0.001[e]
Methamphetamine	15	66.7	26.7	6.7	—	0.033[e]
LSD	17	82.4	17.6	0	—	<0.001[e]
PCP	49	49.0	40.8	8.2	—	<0.001[e]
Ecstasy (MDMA)	29	62.1	37.9	0	—	<0.001[e]
Ketamine	4	75.0	25.0	0	—	0.462[e]
GHB	1	100.0	0	0	—	0.673[e]
Any unprotected oral, anal or vaginal sex[c]	334	34.7	32.6	21.0	11.4	0.186
Sex with a high-risk partner[c,f]	190	43.2	27.9	18.4	10.0	<0.001
Infectious disease serology						
HIV seropositive	59	25.4	25.4	45.8	3.4	<0.001[e]
HBV seropositive	156	46.2	24.4	27.6	1.9	<0.001[e]
HCV seropositive	169	68.0	7.1	24.3	0.6	<0.001[e]
PTSD						
Lifetime	52	50.0	26.9	15.4	7.7	0.032[e]
Current	34	50.0	35.3	8.8	5.9	0.045[e]

[a]*Former* Used heroin, crack, cocaine or methamphetamine by any route at least once in lifetime, but not in the last 3 months
[b]Pearson chi-square unless otherwise indicated
[c]In last 6 months
[d]p Value excludes non-drug users
[e]Fisher's exact test
[f]High-risk partners include partners that had other sex partners, injected drugs, paid or been paid for sex, or were HIV seropositive

TABLE 3   Comparison of street intercept recruit and walk-ins, New York City 2005

	Street intercept recruits, $N=207$	Walk-ins, $N=279$	p Value[a]
Mean age (SD)	37.6 (10.0)	35.8 (10.1)	0.059
Race/ethnicity			
Hispanic/Latino	35.6	64.0	<0.001[b]
Black	44.1	55.9	
White	86.2	13.8	
Other	44.4	55.6	
Gender			
Men	41.8	57.9	0.849[b]
Women	43.9	56.1	
Transgender/transsexual	50.0	50.0	
Sexual identity			
Heterosexual	42.6	57.2	0.514[b]
Homosexual or bisexual men	33.3	66.7	
Lesbian or bisexual women	48.7	51.3	
Other	0	100.0	
Ever been homeless	41.1	58.9	0.238
Homeless in the last 6 months	36.7	63.3	0.031
High school education or equivalent	43.7	55.8	0.563
Employed[c] in last 6 months	50.3	49.2	0.005
Public assistance in last 6 months	40.3	59.7	0.104
Could not afford food in last year	40.6	59.4	0.069
Ever been to jail or prison	38.3	61.4	0.019
Target recruitment group			
Injection drug user	39.1	60.3	0.323
Non-injection drug user	36.5	63.5	0.057
Former[d] drug user	50.9	49.1	0.043
Club drug user	24.1	75.9	<0.001
Non-drug user	50.8	49.2	0.171

[a]High-risk partners include partners that had other sex partners, injected drugs, paid or been paid for sex, or were HIV seropositive.

[b]Fisher's exact test

[c]*Employed* Had a full or part-time job, owned a business, or had been employed "off the books"

[d]*Former* Used heroin, crack, cocaine, or methamphetamine by any route at least once in lifetime but not in the last 3 months

    We made the strategic decision not to randomly sample all neighborhoods in NYC. Rather, we focused on specific community districts (CDs) and selected smaller neighborhoods in or around those CDs. We made this decision for several reasons. First, illicit use of heroin, crack, and cocaine is not evenly or even randomly distributed throughout a city. Thus, a random sample of CDs and neighborhoods within CDs would have been inefficient. Second, to randomly select neighborhoods, we would have been required to define the full universe of neighborhoods; we did not want to assume that census boundaries were consistent with neighborhoods. Thus, we do not have a representative sample of NYC neighborhoods for this study but rather a purposive sample of neighborhoods that experience some level of HIV infection, overdose mortality, and morbidity because of PTSD. We aimed to identify generally lower income neighborhoods that evidenced some diversity in terms of SES

and race. In this way, we could begin to explore the extent to which features of neighborhoods play roles in health behaviors and disease outcomes.

To use U.S. Census data effectively, we had to limit our selection to neighborhoods that could logically be constrained to census tracts and/or block groups. We did not assume that all census boundaries (either for tracts or block groups) could be used on their own to identify distinct neighborhoods. Street-level observation confirmed this assumption. For example, some census tracts were bisected by a major transportation artery that effectively created separate neighborhoods. Others were divided by socioeconomic characteristics, reflecting significant differences in housing types. Using a combination of systematic street-level observations by an ethnographer and reviews of published land use and census data, we identified our neighborhoods based on the following five guidelines: census block group boundaries, potential for efficient recruitment, evidence of homogeneity, connectivity/segregation from adjacent blocks, and heterogeneity of social and physical characteristics of neighborhoods across the study neighborhoods.[17]

There is clearly a trade-off between the boundaries social networks observed versus census tracts. For example, residents, drug users, and drug dealers are not constrained by (and are likely unaware of) census tract boundaries. Furthermore, each social network may observe different boundaries. The use of less constrained boundaries would provide a sampling frame that would be more likely to reflect the "true" neighborhood. On the other hand, if the neighborhoods are not constrained to block group or census tract boundaries, using archival data becomes challenging (i.e., the need to impute if partial block groups or census tracts are used).

When conducting neighborhood studies, there is a need to consider whether a convenience sample, a sample of the neighborhood residents, a sample of neighborhood foot traffic, or some other type of sample is appropriate. For the IMPACT Studies, it was impractical to recruit a representative sample of all neighborhood residents for several reasons. First, the study outcomes (i.e., drug use, sexual behaviors, and traumatic events) dealt with highly sensitive issues including illegal behaviors that might have deterred individuals from participating or resulted in socially desirable responses when approached at their home. Second, the cost of conducting door-to-door interviews would have been prohibitive when considering the likelihood of a low response rate and the staff time needed to recruit the target sample size. Furthermore, based on our previous experiences in conducting door-to-door sampling in these and similar neighborhoods,[23] access to apartment buildings can be challenging in NYC, where building security personnel and locked front entrances can be significant barriers. Thus, we sought to systematically recruit a sample of the street traffic in the target neighborhoods during daylight hours from Monday to Friday. Through this method, we are able to include both neighborhood residents, as well as individuals who work, play, shop, or otherwise spend significant amounts of time in the neighborhoods and are likely to be influenced by the neighborhood environments. Thus, while we have a purposive sample of neighborhoods, recruitment within neighborhoods was random. The limitation of this method, of course, is that those who spend their time inside (e.g., taking care of dependents, working, etc.) will be less likely to be recruited. However, the challenges in conducting this type of research with a household sample were mentioned above.

Our preliminary data suggest that our sample is similar to other residents of their neighborhoods with respect to race/ethnicity and education. As is typical of previous studies[24–26] in similar neighborhoods, we recruited more men than women. We were able to recruit individuals from all of our target groups, although recruitment

of non-drug users was slower and resulted in a younger group. Our sample also experienced significant economic disadvantage as evidenced by the high prevalence of homelessness, unemployment, use of public assistance, and food insufficiency. It is likely that our sample is more economically disadvantaged than the sampling frame as a whole. This may be because non-drug users and, specifically, older non-drug users are more likely to be working during our recruitment times and may be less motivated to participate in the study. We have since added Saturday and evening hours to attempt to address this potential differential recruitment after reviewing data from the first year of recruitment.

We sought to evaluate our street-intercept sampling protocol by comparing those recruited through that method to those who walked in to a study site. Street-intercept-recruited participants were more likely to be black, white, or a former DU and less likely to be Hispanic, to have been incarcerated, or to be a CDU. Street-intercept-recruited participants were also less economically disadvantaged than walk-ins. People may have walked into a study site for a variety of reasons including word-of-mouth or previous experience with our research group through another project. These data suggest that street-intercept sampling may provide more variability in terms of demographics, SES, and risk behaviors. This may, in turn, reflect the variability of the target neighborhoods and provide a broader understanding of HIV risk in these settings.

Reflective of our sampling criteria, IMPACT participants reported substantial drug use and sexual risk. Cocaine, crack, and heroin were the most frequently reported drugs used in the last 6 months. As with our previous study,[26] PCP, LSD, and ecstasy were the most frequently reported club drugs. All former drug users reported some type of drug use in the last 6 months. This is reflective of our somewhat loose definition of former drug user (i.e., at least 3 months with no drug use). More than half of those surveyed reported recent unprotected sex, and almost 40% reported sex with a high-risk partner. This analysis did not distinguish between sex with a main partner versus another type of partner (e.g., casual, paid, paying, etc.) and should, thus, be considered with that caveat in mind.

The Centers for Disease Control and Prevention (CDC) estimated that the prevalence of HIV in the U.S.A. was 0.4% at the end of 2003.[27] Our HIV prevalence estimates for the first year sample as a whole, as well as each drug use subgroup, were above CDC general population estimates and similar to those reported by Des Jarlais et al.[28] for IDUs and non-IDUs. We also observed high HBV and HCV prevalence, especially among the drug using groups, which is consistent with other studies of drug users in NYC.[29–31] The CDC estimated that 4.9% and 1.6% of the U.S. population have ever been infected with HBV and HCV, respectively.[32,33] The prevalence of HBV and HCV in the non-drug using group was 5.1% and 1.7%, respectively, suggesting that this group is (1) likely to be comprised of non-drug users (e.g., higher rates of HBV or HCV would have suggested potential information bias) and (2) that risk for these hepatitides in the non-drug user sample was comparable to the U.S. population. Prevalence of both HBV and HCV among the non-IDU group was relatively high (23.9% and 7.5%, respectively). This finding is consistent with other studies of non-IDUs that have reported elevated rates of both infections.[24,25]

This paper serves to highlight sampling and recruitment as important methodological challenges in designing multilevel intra-urban studies. Our approach achieved two key study goals: recruiting an adequate sample of participants who could be linked to a neighborhood unit and recruiting a sample of participants from marginalized populations. Similar studies should consider the advantages and

disadvantages of specific sampling approaches as they relate to the research question.

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