



## Research methods

## Interdisciplinary mixed methods research with structurally vulnerable populations: Case studies of injection drug users in San Francisco

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## ABSTRACT

Research with injection drug users (IDUs) benefits from interdisciplinary theoretical and methodological innovation because drug use is illegal, socially sanctioned and often hidden. Despite the increasing visibility of interdisciplinary, mixed methods research projects with IDUs, qualitative components are often subordinated to quantitative approaches and page restrictions in top addiction journals limit detailed reports of complex data collection and analysis logistics, thus minimizing the fuller scientific potential of genuine mixed methods. We present the methodological logistics and conceptual approaches of four mixed-methods research projects that our interdisciplinary team conducted in San Francisco with IDUs over the past two decades. These projects include combinations of participant-observation ethnography, in-depth qualitative interviewing, epidemiological surveys, photo-documentation, and geographic mapping. We adapted Greene et al.'s framework for combining methods in a single research project through: data triangulation, methodological complementarity, methodological initiation, and methodological expansion. We argue that: (1) flexible and self-reflexive methodological procedures allowed us to seize strategic opportunities to document unexpected and sometimes contradictory findings as they emerged to generate new research questions, (2) iteratively mixing methods increased the scope, reliability, and generalizability of our data, and (3) interdisciplinary collaboration contributed to a scientific "value added" that allowed for more robust theoretical and practical findings about drug use and risk-taking.

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## Introduction

Since the emergence of HIV/AIDS in the 1980s, injection drug users (IDUs) have been the object of countless epidemiological, social, and behavioral research studies. Research on IDUs, however, presents a unique set of methodological, theoretical, and ethical challenges because the legal sanctions and cultural stigmas surrounding injection drug use can limit access to reliable data and can bias analyses. The historic mistrust of researchers and outsiders by many urban poor populations has prompted epidemiology and other disciplines to develop a variety of methods to improve the documentation of inner-city drug users who are often

labeled as "hidden" or "hard-to-reach" populations (NIDA Research Monograph, 1990). Because addiction is also a contested social problem shaped by political, economic and cultural forces, research with IDUs benefits from methodological, disciplinary, and theoretical innovation. Historically, approaches to IDU research have often employed a single method of inquiry or a rudimentary sequential combination of qualitative and quantitative methods. This has usually consisted of a short exploratory qualitative probe followed by a longer epidemiological study, where qualitative methods are subordinated and (1) used to generate language for quantitative surveys or (2) used to generate preliminary hypotheses whose validity is tested through exclusively quantitative means. Organically integrated cross-methodological dialogue in public health is surprisingly rare.

In our body of research with IDUs in San Francisco, we have explored several iterative interdisciplinary, multi-methodological social research logistics, experimenting with combinations of participant-observation ethnography, in-depth

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qualitative interviews, epidemiological surveys, photo documentation, and geographic mapping. Our team has brought epidemiologists, social scientists and clinicians into collaborative methodological dialogue. This has forced us to recognize how distinct disciplinary scientific paradigms gravitate towards specific research questions and how methodologies that collect different kinds of data define knowledge, facts, causality and certainty in often conflicting ways. These epistemological concerns may seem esoteric or philosophical to many applied public health researchers, but they have profound consequences for what kind of data are collected and how they are analyzed. Mixed methods data can be compelling for their triangulated robustness, but they can often appear to be, at first sight, incompatible or simply contradictory. Wagner et al. (2012) demonstrate the challenges, yet ultimately, the value of attempting to merge contradictory findings generated by multiple methods.

This paper presents four case studies of multi-methodological research collaborations in San Francisco over the last two decades. We argue that multi-methodological approaches to research with IDUs is artisanal and must be flexible, pragmatic, and self-reflexively critical to allow particular methods to be adapted and implemented as the research needs of a project come more sharply into focus during the course of an investigation. The inevitable challenges of the logistics of data collection often create unexpected opportunities to document the highly stigmatized behaviors and profound social vulnerabilities that characterize the lives of most street-based IDUs. Consequently, in each case we describe the specific research logistics that increased the scope, reliability and generalizability of the data we collected. Our goal is to show how utilizing multiple methods on each one of our projects contributed to a scientific “value added,” that had both practical and theoretical implications for improving the documentation and analysis of risk-taking among IDUs.

## Background

Early calls for mixed methods research designs with IDUs critiqued the dominant epidemiological framework that privileged individualized psychological decision-making models of knowledge/practice risk behavior and stressed the importance of cross-methodological dialogue in understanding social and cultural contexts of HIV risk (Bourgois, 1998, 1999). More recently there has been growing momentum for an epistemological reorientation towards social epidemiology in IDU research (Rhodes et al., 2012). Arguments that HIV risk behaviors are produced by socio-structural forces (Rhodes & Treloar, 2008; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005; Roberts et al., 2010) have opened up spaces for discussion about what methods best document the interplay of social, cultural, economic and political forces that shape drug user experience (Fairbairn, Small, Van Borek, Wood, & Kerr, 2010; Rhodes et al., 1999) and specifically, how to examine structural vulnerability and structural violence (Rhodes et al., 2012). The risk environment framework seeks to examine contextual environmental, meso-level, and large-scale structural variables as primary health determinants (Rhodes, 2002). Built into this theoretical orientation is a consideration of how multi-level variables can best be explored through different methodological and disciplinary approaches. These range from epidemiology, qualitative meaning-centered surveys, political economy and structural vulnerability analysis (Quesada, Hart, & Bourgois, 2011; Rhodes, 2009), policy (Borris et al., 2004), and subjective experiences of space and place (Fast, Small, Wood, & Kerr, 2009; Fast, Showeller, Shannon, & Kerr, 2010; Tempalski & McQuie, 2009). Approximately a quarter of epidemiological studies of IDUs over the past decade have used a risk

environment framework to understand the propagation of injection risk factors (Strathdee et al., 2010).

Mixed methods study designs are increasingly common in drug user research, and regularly, federal government funding agencies commission studies documenting the under-utilized potential for mixed methods research in the health sciences (Creswell, Klassen, Plano Clark, & Clegg Smith, 2011). Unfortunately the practice of mixing methods in IDU research remains inconsistent and poorly documented despite acknowledgement that work with drug users requires innovative theoretical and methodological combinations to enable more complex understandings of the social determinants of risk-taking. Beyond the very real challenges of epistemological differences between methodologies, there is also an institutionalized inertia reflected in limited funding for qualitative research and the low rate at which high impact addiction journals publish qualitative findings (Rhodes, Stimson, Moore, & Bourgois, 2010). The hierarchy between quantitative and qualitative data creates barriers to innovative methodological collaboration and to publication of mixed methods results. Even the National Institutes of Health (NIH) grant review committees dedicated to the social and behavioral sciences do not have regular or substantial representation by qualitative researchers on their panels. The barriers are also eminently practical: research that does not subordinate the qualitative methods to the quantitative research is rarely funded by the NIH and most addiction journals have strict page limits for manuscripts, making it impossible to describe the necessarily complex procedural logistics for mixed-methods data collection.

Nevertheless, many published examples of mixed methods approaches to drug and syringe sharing exist in both international and national contexts (Chakrapani, Newman, Shunmugam, & Dubrow, 2011; Koester, Glanz, & Baron, 2005). These have focused on injection practices among needle exchange clients (Gibson et al., 2011), syringe access (Pollini et al., 2010; Singer et al., 2000), IDU drug treatment experiences (Syvertsen et al., 2010), and IDU social vulnerability (Mayhew et al., 2009). Mixed methods have been used to examine the HIV risk of severely mentally ill women who use drugs (Loue, Sajatovic, & Mendez, 2011), differential HIV risk of primary partners of IDUs (Parsons, Missildine, Van Ora, Purcell, & Gomez, 2004; Solomon, Mehta, Latimore, Srikrishnan, & Celentano, 2010), and the effects of gendered violence and social power relations on sero-conversion among young IDUs (Bourgois, Prince, & Moss, 2004; Fast et al., 2010). Mixed methods approaches have also been used to examine research questions concerning broader trends in illicit drug use and injection-related health outcomes, such as an emerging wave of crack use in one community (Clatts, Welle, Goldsamt, & Lankenau, 2002), an emerging HIV epidemic associated with drug injection (Barcal, Schumacher, Dumchev, & Moroz, 2005), and relationships between patterns of illicit drug trade and IDU health outcomes (Ciccarone & Bourgois, 2003; Roy et al., 2012; Wood, Stoltz, Li, Montaner, & Kerr, 2006). Despite this developing body of mixed methods IDU research, few studies describe in great detail the logistics of the actual mixed methods procedures used, with the exception of Rhodes et al. (2012) who explore mixing methods and utilizing social science theory as a way to examine structural vulnerability and HIV risk and Wagner et al. (2012) who closely examine incongruent findings in mixed methods research. The current paper focuses solely on the details of our methodological procedures and scientific “value-added” when mixing methods in IDU research.

## Case studies

To guide our understanding of the case studies discussed in this paper, we have adapted a mixed methods conceptual framework (Greene, Caracelli, & Graham, 1989), which outlines five general

purposes for using multiple methods in a single research project: (1) *data triangulation*, or corroborating results through multiple methods; (2) *complementarity*, or using one method to enhance results of the other; (3) *development*, where use of one method guides the development of another method; (4) *initiation*, where multiple methods are used in an iterative fashion to follow research questions and results as they emerge; and (5) *expansion*, or using multiple methods to pursue multiple related lines of inquiry simultaneously. Examples of each as applied to our research with IDUs are deployed in each case study below. We then demonstrate how these strategies of dynamic mix-method dialogue enhance the explanatory power of our data. Our research team has included public health researchers, epidemiologists, sociologists, psychologists, anthropologists, photographers, social workers and clinicians, among others.

*Case 1: Methodological triangulation, complementarity, and initiation – analysis of ethnic patterns of heroin injection using an ethnographic–epidemiological interface (Bourgois & Schonberg, 2009; Bourgois et al., 2006)*

This project brought data from two long-term ethnographic and epidemiological studies and generated a third clinical ethnographic survey to foment an intensive dialogue about the problematic usage of the variable “race” to categorize ethnic patterns of IDU risk-taking. We examined differences between African American and white IDUs with respect to drug use and drug administration preferences, sexual and bodily practices, and engagement with state services and institutions. We began with a social science-based theoretical framework on the racialization of cultural distinctions to: (1) parse already existing epidemiological variables into social categories that we found qualitatively and were therefore more conceptually relevant for analysis; (2) generate a new set of quantifiable clinical data on the health outcomes relevant to culturally distinct injection practices; and (3) collect new participant-observation data on IDUs’ racialized understandings of drug use practices. This enabled us to place individual drug user behaviors within their broader socio-cultural, institutional, and historical contexts. Collaborators included an anthropologist, a photographer, an epidemiologist, a sociologist, and two physicians.

The ethnographic data were drawn from a decade-long participant-observation study of a network of homeless heroin injectors. The ethnographers followed IDUs in street environments and examined their navigation of socio-structural institutional environments, such as law enforcement, social services, medical care, and documented their income-generating activities. The qualitative database consisted of nearly 4000 pages of participant-observation field notes and transcripts of conversational interviews as well as over 600 digitized photos of injection practices. The epidemiological database consisted of over 30,000 observations with IDUs between 1986 and 2005 (Kral et al., 2001, 2003). The clinical component consisted of observational and self-report quantitative data at community-based health service sites where IDUs sought care.

Initial analysis of the ethnographic data in isolation revealed sharply distinct ethnic and generational patterns of drug consumption and administration preferences. These ethnographic findings led the study team to hypothesize that polarized race relations in the United States generated stereotypes among street-based IDUs of “white” versus “black” behaviors that resulted in differential risk-taking across ethnicities. For example, African-American IDUs were observed to be more likely than whites to persist in pursuing intravenous injections rather than “muscling” or injecting into fatty tissue, an injection practice which can lead to soft tissue infections. We identified 14 epidemiological and clinical variables on the epidemiological questionnaire that might be

capable of measuring the ethnographic hypothesis of the racialization of distinct ethnic “techniques of the body” and stratified them by age (Bourdieu, 2002; Mauss, 1936). These variables were capable of testing ethnographic findings quantitatively. Of those 14 variables, 9 corroborated the ethnographic hypotheses and associated, as expected, with the categories of African American and white. However, the remaining five variables did not fully corroborate the ethnographic results either through a lack of a statistically significant difference or a smaller than anticipated magnitude of difference. For example, the clinical data revealed that African-Americans were less likely to have a recent soft tissue infection than white injectors, yet the differential between ethnicities for soft tissue infections (44% versus 55%) was much smaller than the ethnographic data suggested (Bourgois et al., 2006).

To investigate the partial incongruities between the ethnographic and epidemiological findings, the study team initiated more collaborative ethnographic data collection by strategically targeting select individuals prospectively identified by the epidemiological interviewers as contravening the ethnographically generated hypothesis. For example, we wanted to learn more about African Americans who injected into fatty tissue or had recent soft-tissue infections and older whites who persisted in seeking to inject directly in a vein or had no history of soft-tissue infection. These individuals were introduced to the ethnographer by the quantitative interviewer directly after the quantitative survey. The ethnographer then conducted a conversational, in-depth interview with them to explore the logics for their seemingly anomalous behavior, and continued to follow the participant in the field. In these strategic follow-up interviews, all the participants specifically recognized themselves to be “ethnic exceptions” who self-consciously violated what they considered to be universally recognized racialized practices. For example, in one case a man who had been identified in the epidemiological survey as an African American who regularly injected into his fatty tissue, explained during the ethnographic follow-up that he was “actually Puerto Rican” and was a gay man with a “white boyfriend”. Another African American man, who had just been treated for an abscess, explained that the abscess had been caused by missing a cocaine injection and not by purposefully injecting heroin into fatty tissue. He insisted defensively that this was the first abscess he had ever had in his injection career (Bourgois et al., 2006).

Nonetheless, the fact that relatively large numbers of whites engaged in practices that violated ethnic patterns identified as relatively absolute by the ethnographic data demonstrates the importance of considering ethnic crossover behaviors at the larger population level. Therefore, the cross methodological dialogue revealed important limitations of each method when conducted alone. The ‘anomalous’ ethnic drug administration practices were initially harder to observe ethnographically until they were identified by the epidemiology and we were able to target them, precisely because many white IDUs denied these practices during ethnographic data collection. They were either ashamed or proud of “acting black” and vice versa for the ‘anomalous’ African-American IDUs. Yet at the same time, the ethnography also revealed nuances in ethnic identity and important subcategories of IDUs (by age, neighborhood and cross-cultural identity) not necessarily separated out in the quantitative data. The consequence of not separating out these subcategories is potentially preventing the identification of hidden risk populations with alternative self-identifications. This alerts us to the pitfalls of relying on broad epidemiological categorizations of race/ethnicity, which can act as a confusing proxy for social networks with structurally imposed, but highly culturally visible, risk practices. Racialized variables often mask important sub-categories of risk-takers, and may not

be complex enough to document the needs of underserved populations. In short, this methodological and analytical dialogue offered insights into developing a theory of the socio-cultural processes that generate racialized stereotypes that may affect or mask vulnerability to risk-taking. It enabled us to develop a more dynamic understanding of the embodiment of ethnic tensions in a society polarized around a phenotypically racialized definition of cultural identity and logics for practices.

On the most immediate practical level of collecting accurate, reliable and generalizable data, the multiple methods employed in this project allowed for iterative triangulation between ethnographic and self-reported epidemiological data. Once again, this can be especially valuable when data is based on self-reporting by populations such as IDUs who engage in illicit behavior that is highly stigmatized and who generate income through sex work, shoplifting, burglary, and street-level drug dealing.

The additional methodological procedures conducted for this project (complementarity and initiation) were mutually informing. No methodological orientation was given primacy, but rather study procedures were developed through cross methodological dialogue: (1) ethnography led to quantifiable research questions and new clinical observations; and (2) epidemiological data prompted further follow-up qualitative interviews.

*Case 2: Methodological complementarity, initiation, triangulation, and expansion – quantitative and qualitative approaches with women who use methamphetamine (Lorvick et al., 2012)*

This study was designed to assess the prevalence of HIV and STI infection and sexual risk among women who use methamphetamine in San Francisco. We adapted the social ecological framework (DiClemente, Crosby, & Kegler, 2002) to pursue the epidemiological aim of determining what gendered factors, ranging from interpersonal to structural, were associated with sexual risk as well as STI and HIV outcomes. Previous research (Logan, Cole, & Leukefeld, 2002) suggested that sex and sexual risk are highly contextual analytic arenas and this prompted us to believe that the nuances of women's experiences – especially those related to violence and sexual subjectivity – could not be captured solely through a quantitative survey. Therefore, we designed the study to include a qualitative component to be administered to a subsample of women ( $n=34$ ) recruited from the quantitative survey study. The initial purpose for using mixed methods was *complementarity* (Greene et al., 1989), with qualitative findings serving to enhance and clarify findings from the quantitative survey. Over the course of the study, we also discovered that mixing methods led to analytic *initiation* (Greene et al., 1989) provoking new insights and new lines of inquiry.

Women were recruited through respondent driven sampling (Heckathorn, 1997, 2002; Kral, Malekinejad, et al., 2010) into a cross-sectional quantitative survey that was administered to women who reported methamphetamine use in the past 30 days and at least 1 male sexual partner in the last 6 months ( $N=322$ ). Participants for the qualitative component were purposefully sampled based on heightened risk for STIs as operationalized by self-reporting anal sex, marathon sex, sex work, and/or sex with bisexual male partners in the quantitative survey. Semi-structured qualitative interviews were then conducted exploring these key domains of interest, although interviewers also followed unanticipated emergent themes, such as women's use of methamphetamine for sexual disinhibition and/or pleasure (Lorvick et al., 2012).

While the qualitative component was, by design, open-ended and exploratory in nature, it was assumed that these additional data would function to elucidate epidemiological findings through providing data on the real-world contexts and meaning

associated with women's sexual risk, experiences of violence, and methamphetamine use. This assumption was guided by an epidemiological framework concerned with examining prevalence and risk factors at the individual, community, and structural levels (DiClemente et al., 2002) that are associated with particular HIV and STI outcomes. Yet, the qualitative interviews and narratives elicited were not disease outcome-oriented, but instead explored women's subjective experiences with methamphetamine use and the relationships between methamphetamine use, sex, pleasure, sexual trauma, and women's social and structural vulnerabilities. Not surprisingly, women's narratives, which included data on their everyday experiences with drug use, poverty, and extreme levels of violence, were not measured by the epidemiological framework of sexual risk. In fact, the qualitative component of the study produced data that diverged in important ways from the risk factor framework employed in the epidemiological component. Notably, we found qualitatively that several women conceived of methamphetamine as a strategic tool for the enhancement of sexual pleasure, to make them feel powerful and/or safe, or to assist with reduction of sexual dysphoria while engaging in sex work. Using both quantitative and qualitative data and interdisciplinary analysis, we were able to reflect on the multivalent and situational role that methamphetamine use takes in a population with high rates of sexual assault, childhood sexual abuse, and violence throughout the life course. Motivations for and subjective experiences of methamphetamine use from our meaning-centered semi-structured qualitative interviews were only indirectly linked to the sexual risk variables we measured epidemiologically: high rates of multiple partnerships and low prevalence of condom use. Our use of open-ended qualitative methods consequently allowed study participants to alert our epidemiologic research agenda to the necessity of including documentation of variables and processual dynamics that were more relevant to the everyday experiences of street-based drug use and sex work. It was not possible to capture these complex nuances of women's relationships to methamphetamine in the quantitative survey simply because they were beyond the purview of the original individual variable-based, risk-factor framework.

The entire investigative team, including both the quantitative and qualitative research staff met on a monthly basis to discuss preliminary findings and to adapt the interview guides. These logistical and analytical research strategy sessions allowed for ongoing methodological experimentation and initiation. For example, the interviewers on the quantitative instrument noted that many of the respondents demonstrated a dramatic change in affect when they administered the trauma scale consisting of questions documenting current and lifetime experiences of violence. So, we added an observational measure to the questionnaire for the interviewers to record changes in body language or emotional disposition (i.e., whether respondents became noticeably agitated, withdrawn or otherwise emotional). Because this observational variable was added early enough in the timeline to the quantitative instrument, we were able to quantify an observational variable on change of affect and see if there were associations between it and one's score on the trauma scale. This methodology was highly experimental, yet demonstrates the potential for merging qualitative interviewer observations into the logistics of self-reported survey instruments, a blending of methodological triangulation and expansion. The interviewers were also provided with extra paid time to write field notes immediately after each quantitative survey to record further qualitative details on change of affect or meaningful interactions that were not captured in the survey responses.

These supplemental data generated broader ethical questions regarding the implications of working with populations highly

vulnerable to extreme levels of violence and past trauma. On the one hand, it is scientifically and ethically important to document the prevalence of gendered violence in order to identify an urgent need for services for women. On the other hand, care must be taken not to inflict emotional harm on research participants. Finally, the prevalence of high levels of observable signs of distress (agitation or withdrawal) during the administration of a survey raises questions about the validity of recall data on emotionally sensitive questions. In our case, consequently, it was important to triangulate interviewer observations with participant self-reports and we found a statistically significant relationship between the observational variable of change of affect and a higher mean score on the sexual trauma scale.

For all participants, we were able to provide two consecutive post-test counseling and referral sessions at one-week intervals because of the complicated logistics of sero-testing for sexually transmitted infections (STIs). The sero-test results for *Herpes Simplex Virus 2* took one week longer to process than the results of the other STI tests. Initially, these sessions were introduced solely for their ethical and health service value. Additional feedback, however, from the counselor/interviewers on the differential ability of the participants in the study to engage with referral services alerted us to the opportunity of generating additional qualitative data. The counselor/interviewers began systematically recording field notes immediately following their iterative contacts. This unexpected innovative multi-methods data-gathering strategy allowed us to document in real time the “everyday emergency” (Benjamin, 1968) of survival, violence, and addiction among street-based chronic users. We simultaneously fulfilled our medical-ethical service responsibilities and collected valuable time-series processual qualitative data. We also obtained a practical perspective on the barriers women face in accessing referral services in the context of routinized trauma. We actively discussed and strategized how to incorporate this additional qualitative component while preserving the therapeutic function of the post-test counseling sessions. Interviewers did not alter their standard post-test counseling and referral methods, nor probe participants unnecessarily in order to generate qualitative data. Interviewers simply recorded field notes after their sessions, documenting the important issues that participants voiced. This important data on how vulnerability affects access to services would otherwise have been lost to the project.

Our monthly full-team research strategy sessions were crucial to the flexible implementation of cost-effective mixed-method triangulation and for reflecting on collecting data in an ethical manner about traumatic experiences of gendered violence. Most importantly, these strategy sessions created an institutional space for timely integration of the feedback of the administrators of both the quantitative survey and qualitative interview guide. Most large-scale epidemiological infrastructures lose the opportunity to harness the valuable practical and often critical feedback from their front-line research staff. Our experience with methodological initiation has demonstrated that the supplemental perspective of interviewers is especially time-sensitive for a project, as it can lead to alterations of questions on an epidemiological instrument or a qualitative interview guide. These changes must be introduced as early as possible to allow for the collection of these data on a sufficiently large sample to allow for meaningful statistical comparisons. Over the course of our study, for example, preliminary qualitative findings raised dozens of new themes of interest that we had not initially considered measuring epidemiologically. Unfortunately, many of these subjects for further exploration were determined at too late a date to make it possible for us to add them to the quantitative instrument with sufficient statistical power for precise assessment. It was possible, however, to introduce two new focused themes to the qualitative interviews effectively through the end of the project. In fact, the addition of strategically targeted

qualitative interview themes proved to be most productive during the second half – and even during the very final phase of our project. For example, it was through strategic qualitative follow-up that we were able to delve into the contradictory but potentially protective effects of the empowered sense of sexual agency and pleasure that motivated some women to use methamphetamine (Lorvick et al., 2012). Thus, we were able to explore the practicalities of risk-reduction and also critique the analytical limitations of the social science concept of agency, empowerment and rational-choice knowledge-based behavior change. Some of the women considered it to be empowering and personally fulfilling to pursue sexual pleasure through methamphetamine use, despite the fact that it increased their sexual risk-taking.

Our initial research design was intended to foster methodological complementarity, but the flexibility built into the study also allowed for methodological triangulation, initiation, and expansion. Specifically, the qualitative data did not merely deepen our understanding of the quantitative data, but instead challenged us to critically examine the epidemiological risk framework and reorient our analytic lens to account for entirely new lines of inquiry with regard to drug use and sexual agency. We also were able to document the nuances of women’s experiences of gendered violence and the everyday barriers they experienced in accessing services, which had not been an initial aim of the study.

*Case 3: Methodological triangulation, complementarity, and development – quantitative and qualitative approaches to low frequency heroin injection (Harris et al., 2012)*

During the large epidemiological data collection described in Case 1, we encountered a significant number of heroin users who reported injecting heroin less than 30 times in the past 30 days, implying that they were not using heroin every day. Our epidemiological data showed that 18% of heroin injectors, who have injected for over five years and are not in drug treatment, inject heroin ten or fewer times per month (Harris et al., 2012). These unexpected data piqued our interest in individuals who defy the dominant paradigm that heroin users are so physically dependent that they need to use heroin every day (Eddy, Halbach, Isbell, & Seevers, 1965; Zinberg & Jacobson, 1976). This prompted the development of a study to examine the experiences of low frequency heroin users (those who inject 1–10 times a month) in comparison to high frequency heroin users (those who inject at least 30 times a month). Because low frequency heroin use was a previously under-researched area, the study was designed as a longitudinal qualitative cohort with several unique supplemental methods, which would allow us to be exploratory via multiple data collection techniques and allow for the emergence of findings that the team could not anticipate based on existing frameworks.

To begin, we developed a quantitative screener and recruited 602 IDUs through targeted sampling methods (Kral, Malekinejad, et al., 2010; Watters & Biernacki, 1989). This 20 min-long quantitative screener was administered for two purposes: (1) to screen for low and high frequency heroin injectors, while concealing eligibility criteria for the qualitative study and (2) as an opportunity to collect additional data on general areas of interest related to IDUs, which might serve to incite new areas of inquiry. With these supplemental data we were able to explore two controversial local issues related to injection drug use in San Francisco – syringe disposal (Wenger et al., 2011) and the feasibility of new public health programs for IDUs, such as safe injection facilities (Kral, Wenger, et al., 2010). Next, a purposeful subset of those screened was chosen for the qualitative cohort ( $n = 63$ ), which included low-frequency heroin injectors and a comparison group of high frequency heroin injectors. This sequence of methods was atypical, in that a quantitative screener was developed in service of a longitudinal qualitative

study, yet still provided data that we were able to analyze on their own. The eligibility for the low frequency qualitative cohort was: minimum of 5 years of injection drug use, injection of heroin or a heroin combination 10 or less times in the last 30 days, and not enrolled in a methadone or buprenorphine program in the last 30 days. We excluded those who were recent initiates into injection drug use, because their use may be infrequent because of their recent initiation. We also excluded people enrolled in opioid replacement treatment programs because we did not want to capture those who might be using infrequently because they are using heroin occasionally on top of their buprenorphine or methadone doses (Hartel et al., 1995). Eligibility for the high frequency cohort was injection of heroin or a heroin combination 30 or more times in the last 30 days. Enrolled participants participated in (a) baseline qualitative interview, (b) 1-year follow-up qualitative interview, (c) 2-year follow-up qualitative interview, (d) monthly check-ins with some quantitative questions, and (e) “change of status” qualitative interviews.

Over the course of the two-year study, participants met monthly with staff for a check-in at a community-based field site. At each check-in, staff administered a 5-min quantitative questionnaire examining the following: alcohol use, non-injection and injection drug use (including what drug was used and the frequency). In addition, a monthly life event survey was conducted, which examined physical and mental health, arrest and jail time, health care, housing and relationship status, drug treatment status, income generating techniques, and whether any major life-changing events had occurred. If major events had occurred or if a participant transitioned between low and high frequency heroin use, then the participant was asked to do an open-ended qualitative “change of status” interview immediately following the check-in. The rationale for these interviews was to capture the context of transitions between low-frequency status to high-frequency status (and vice versa). This enabled us to explore the relevant life events that had occurred in the last month while they were still fresh in the participant’s mind.

In preparation for the 1-year and 2-year follow-up qualitative interviews, study staff created an output of data collected at the monthly check-ins and reviewed any change of status interviews. An individually tailored qualitative interview guide was then designed for each participant based on these data, which allowed us to explore the potential interface of institutional, social structural, psychodynamic, interpersonal, and lifecycle forces with shifts in heroin use and risk-taking. In essence, through the monthly check-ins, we had documented a skeleton timeline of noteworthy events in each participant’s life. We could then construct an interview guide linked to the participants’ actual life events, which both helped with recall and allowed for in-depth, non-generic data to be collected from each participant. For instance, if a participant reported an increase of heroin use in a particular month and also reported a new partner in that month, the interviewer could probe into the specific details regarding both the increased drug use and the new partner and contextualize them within events that the participant had reported before and after at check-ins. The monthly check-ins combined with the follow-up interviews produced a unique temporalized set of data that might otherwise have been lost given issues of recall after a year and they also reinforced relationships with study staff, which contributed to higher retention rates. The same generative process was followed at the 2-year follow-up interviews. Study staff also compiled detailed field notes of the interview interaction after baseline, 1-year, 2-year, and any change of status interviews. Different methods were used at various points in the research based on their ability to generate the appropriate data in that phase of the project, a methodological process that was organic and mutually informing as quantitative and qualitative methods folded over each other during interviews and

check-ins through methodological complementarity and development.

The methodological configuration produced new insights into our previous epidemiological data that had prompted the study. The in-depth qualitative interviews with identified low frequency injectors revealed three types of low frequency heroin users among the original 18% prevalence finding from the original epidemiological study. About a third of the low frequency injectors we screened represented IDUs who had self-reported using less than 10 times during a month because during the time the survey was administered he or she was transitioning out of or into high frequency heroin use. Initially, we thought this group was of less interest as they were not people who maintained their heroin use at a low level for a long period of time. However, as we contextualized people’s frequency of use over the course of the 2-year study period, it became clear that this group was, in fact, quite revelatory. During screening these individuals were classified as “low frequency” users because our initial methods captured them at a moment in time when they were either transitioning away from high frequency use (e.g., tapering their use as a harm reduction strategy or moving towards stopping altogether) or transitioning back into high frequency use (e.g., getting out of prison after a long period of not using and starting again gradually). Our study design, using cross-sectional epidemiological and longitudinal qualitative methods, was therefore capable of capturing the ways in which people’s drug use fluctuates over time. This allowed us to critically examine initial cross-sectional data and analyze them in conjunction with the temporal realities of drug use we found qualitatively. Thus, we were able to reflect on the specific ability and utility of each methodological approach at different phases of the project to generate data regarding frequency of use. Another third of the low frequency injectors were poly-drug-users who we initially thought might be outliers, but over the course of the study we found that they were circumstantial heroin users. Some people were simply too unstable to consistently inject heroin, some had other drugs of choice like crack or methamphetamine or were heavy alcohol drinkers, and some used heroin only in certain social situations or when they had access. Among the remaining one-third, we found that some people were indeed able to maintain low frequency heroin injection over time as a way to manage their chronic pain, mental health, or over-amping on stimulants.

Through our various methods we found, contrary to the original hypothesis generated by the first epidemiological dataset, that effectively practicing low frequency heroin injection was a practical rarity and not a feasible risk reduction practice on the part of most injectors, despite frequent reference by users to purposeful attempts to limit the risk practices associated with rapid physical addiction. In short, low frequency heroin injection appears largely to be a street ideal that can be achieved temporarily given certain circumstances, but is rarely sustained over long periods of time perhaps because of the exceptional physically addictive pharmacology of heroin.

In this study, we used methodological development and complementarity – that is, we designed a qualitative project to explore an unusual phenomenon that we had previously discovered through quantitative data. We continued those mixed-methods procedures over the course of the study, and were also able to triangulate the original self-reported frequency of injection with our longitudinal qualitative findings. In this case, mixing methods facilitated a more fine-grained analysis of the epidemiological cross sectional quantitative data from both the dataset that prompted the study and the quantitative screener. Our study design problematized the static epidemiological category of “low frequency heroin injector.” In concert, our multiple methods captured the dynamic poly-drug-use patterns that are a reality for indigent urban IDUs. There is theoretical and

practical public health value to understanding qualitatively the nuances of low-frequency injection because this strategy may signal unique points of intervention, where IDUs either strategically or pragmatically alter the patterns of their drug use in manners consistent with public health risk-reduction priorities.

*Case 4: Methodological triangulation – GIS mapping and epidemiology of syringe disposal in San Francisco (Wenger et al., 2011)*

In 2007, syringe disposal among injection drug users was a hotly debated issue in San Francisco. An article ran in the *San Francisco Chronicle* with anecdotal reports and photos of improperly disposed syringes throughout parks and city streets (Neivus, 2007, August 2). Some residents charged that syringe access resulted in widespread improper disposal of syringes, which was a threat to community well-being. Syringe access advocates argued that improper disposal was not as widespread as the articles had suggested. In this case, our research question was generated externally because syringe disposal became a potential policy priority for the San Francisco Department of Public Health (SFDPH), which funded the study (1) to assess the prevalence of improperly discarded syringes in San Francisco, (2) to examine syringe disposal practices of IDUs, and (3) to assess IDUs' acceptability of public syringe disposal drop boxes, a potential strategy to help reduce the prevalence of improperly disposed syringes.

We utilized three data sources in this study: existing secondary quantitative datasets, observations from structured visual inspections, and quantitative survey responses from IDUs (Wenger et al., 2011). First, using drug treatment and drug-related arrest data from the City and County of San Francisco, we determined which neighborhoods had the highest concentrations of IDUs. Then, we selected 25% of San Francisco's 44 neighborhoods ( $N=11$ ) with the highest concentration of drug treatment entrants and/or drug-related arrests. Using geographic information system (GIS) software (2008) we mapped all 2114 city blocks in the 11 neighborhoods with the highest concentrations of IDUs. 1000 blocks (out of 2114) were randomly selected for examination. We also conducted visual inspection in 50 randomly selected sections of Golden Gate Park (out of 100 sections), because it was a site at the center of the city's controversy about syringe disposal. All 20 "self-cleaning" public toilets in San Francisco were also inspected. A research assistant conducted structured daytime visual inspections by walking all 1000 blocks over a 3 month period. The geographic locations of all improperly discarded syringes that were clearly visible and accessible (rather than hidden under dumpsters or other places not visible to those walking by) were recorded. When a syringe was found in plain view, the research assistant wrote an observational field note according to a rubric associated with the risk of a needle stick by the syringe, such as its location (which was then plotted using GIS software), its condition (e.g., whether the needle was broken off or the syringe was capped), and its accessibility (e.g., whether the syringe was behind a gated area inaccessible to passersby). The geographic locations of all found syringes ( $N=20$ ) were geocoded using GIS software and thematic maps were created to display the point data.

In addition, we collected survey data about specific syringe disposal practices and the acceptability of public syringe disposal sites from 602 quantitative interviews with IDUs. These interviews were part of the screening process for the qualitative study of low-frequency heroin injectors discussed in the previous section. Complete findings from this survey are discussed elsewhere (Wenger et al., 2011). These data showed that 67% of IDUs in the sample self-reported unsafe disposal practices, defined as disposal

on a street, sidewalk, park, parking lot, trash receptacle, toilet, sewer, or manhole. We were initially surprised by the seemingly divergent findings between the visual inspection data (only 20 found syringes) and the survey data, which suggested that improper disposal was widespread (67%). This prompted us to take a closer look at these quantitative data to understand the incongruities between findings. We found that even though a large percentage of IDUs reported unsafe disposal of syringes, a very small proportion of actual syringes were disposed of unsafely. Of the total 66,409 syringes that were disposed of by IDUs, 13% were reported to have been disposed of unsafely. The initial results from the GIS mapping alerted us to the need to push for greater specificity in the epidemiological analysis (i.e., number of syringes disposed not just number of IDUs who dispose of syringes unsafely). With this greater specificity we found that when IDUs dispose of syringes unsafely, they dispose of few syringes, and many are disposed of in ways that do not produce syringes in street settings.

By triangulating geographic and behavioral data, we arrived at a more nuanced picture of syringe disposal, with important policy implications for such findings. Specifically, we were able to analyze both geographic and acceptability data to report to the SFDPH where syringe drop boxes might be most appropriate for installation in order to address both the public health need and public concern over improperly disposed syringes.

## Discussion

These case studies demonstrate the processes and possibilities for utilizing multiple methodological approaches during various phases of a study to best meet research objectives and to expand both the practical and theoretical purview of substance use research. In some cases the mixed methods approach was pre-planned, in others it emerged organically in order to appropriately address emerging research questions. This approach challenges the quantitative/qualitative methodological divide and reveals the value added when multiple approaches are combined in IDU research.

In Case 1 the study was designed at the outset with an explicit use of a critical social science paradigm to be generative. It began with anthropological participant observation in multiple community and institutional settings to allow research questions to emerge, which were tested in later epidemiological analyses. Through methodological triangulation, complementarity, and initiation, the epidemiological collaboration provided a unique opportunity to test an ethnographically generated hypothesis. The methodological significance reaches far beyond the ability to triangulate self-reported behavior with ethnographic observations of actual behavior. We were able to examine the results of each methodological approach through the other and see pitfalls of presumably firm ethnographic patterns and epidemiological categories surrounding race, culture, and ethnicity and the power of internalized stereotypes to affect risk practices.

Case 2 began with a more straightforward approach of methodological complementarity. The study employed an epidemiological risk factor framework for assessing sexual risk for HIV and other STIs among women who use methamphetamine. But, because of the nature of the research topic – that is, the taboo and complicated topics of sex and violence – a qualitative component was used to capture what the survey suggested, but was incapable of elucidating: women's meaning-centered accounts of sex and the prevalence of trauma related to gendered patterns of intimate violence. Qualitative accounts expanded the epidemiological risk framework findings. Here,

the methodological choices and divergent findings forced the research team to grapple with the implicit scientific paradigms at play in data collection and in the production of scientific knowledge regarding IDU women's sexuality. In our iterative methodological initiation, we introduced a novel quantifiable observational variable and found new sites for qualitative documentation, which have potential implications in terms of the ethics of research, data validity, and access to institutional services.

Case 3 was a study of the little-known phenomenon of low-frequency heroin use. Because there was not much scientific precedent for this topic, we cast a wide methodological net to capture both qualitative and quantitative data about drug use practices, life events, and other contextual factors potentially related to frequency of use. To best address the research questions, we wove quantitative and qualitative approaches together, using methodological triangulation, complementarity, and development at various points in the project to improve recall, contextualize important events, and eventually uncover temporal relationships that ultimately proved meaningful in study participants' drug use patterns. Our longitudinal study design revealed the value of mixing methods to complicate categories in otherwise valuable cross-sectional epidemiological data to reveal the shifting patterns of drug use over time and the practical public health value of uncovering those nuances qualitatively.

Finally, Case 4 investigated an important policy challenge, prompted by the health department and a media-driven moral panic about improperly disposed syringes. We employed structured visual inspections, GIS mapping, and a quantitative survey to document the problem. Initial findings were divergent and facilitated more fine-grained analysis of the quantitative data. The immediate policy implications gave a multi-methodological triangulation of data special impact to assess syringe disposal and by using geographic and behavioral data, we were able to provide timely policy recommendations to SFDPH.

In each of these cases, using mixed methods contributed to findings that would have been inaccessible had we limited ourselves to a single method. As an interdisciplinary team, we were able to assess characteristics of a research question and proactively pool methodological approaches. This commitment to flexible research designs that can be adapted as needed also brings with it practical concerns in terms of managing necessary modifications of human subjects protocols. Institutional Review Boards may require ongoing justification of the "minimal risk" involved in the flexible logistics required by qualitative methods and research teams need to take into account and budget time for these frequent modifications. Furthermore, we acknowledge that our projects benefit from a well-established research infrastructure and that different research environments may limit the amount of methodological and disciplinary flexibility that can be practically implemented once a project is initiated. Our research team also benefits from nearly two decades of presence in the communities we study, improving our recruitment and retention of research participants when we add or modify components to our studies. Teams with long-term collaborative relationships learn to be sympathetic to each other's distinct disciplinary approaches. But on a practical level, because fundamental differences exist across disciplines in formulating questions, recognizing data, and interpreting results, it is important to commit substantial time to iterative interdisciplinary meetings and conference calls to preempt inevitable epistemological conflicts. This analytical effort needs to be taken seriously as it can be time consuming. It requires simultaneously trusting and granting autonomy when necessary to the team's multiple disciplinary perspectives. Qualitative researchers must not allow themselves to be threatened by their historically "subjugated"

status as drug use researchers on mixed-methods public health projects. They need to at times embrace epidemiological priorities and learn to see through the eyes of their quantitative colleagues in order to contribute to improving the language and logistics of questionnaires, identifying proxy variables, suggesting stratifications for statistical analyses, etc. This initial type of collaboration can then lay the groundwork for engaging in creative and mutually beneficial social science theoretical dialogue. But reciprocally, this social science theoretical dialogue must also be recognized by epidemiological colleagues as equally integral to the process of executing mixed methods projects and to the broader terrain of drug use and public health research.

For each case of the cases discussed, mixing methods contributed to a scientific value-added that ranged from novel findings, clarifications of divergent findings, triangulation of sensitive data, documenting bias, increasing specificity and meaning of analytical categories, and augmenting the theoretical and applied policy parameters of public health science. Our multiple experiments with methodological dialogue only scratched the surface of the longer-term scientific potential for mixed-methods approaches to researching illicit drug use. We hope these case studies can serve as the starting point for more robust mixed-methods research with IDUs. In fact we are surprised at the lost opportunities for valuable additional data collection and for more subtle analysis through mixed methods on most studies of IDUs. Finally, mixed-methods generate an especially cost-effective scientific value-added for public health drug research.

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## References

- ArcGIS. (2008). *ArcGIS (Version 9.9)*. Redlands, CA: ESRI.
- Barcal, K., Schumacher, J. E., Dumchev, K., & Moroz, L. V. (2005). A situational picture of HIV/AIDS and injection drug use in Vinnitsya, Ukraine. *Harm Reduction Journal*, 2(16).
- Benjamin, W. (1968). *Illuminations*. Boston: Houghton Mifflin Harcourt.
- Bourdieu, P. (2002). *Le bal des célibataires: Crise de la société paysanne en Béarn*. Paris: Éditions du Seuil.
- Bourgois, P. (1998). The moral economies of homeless heroin addicts: Confronting ethnography, HIV risk, and everyday violence in San Francisco shooting encampments. *Substance Use and Misuse*, 33(11), 2323–2351.
- Bourgois, P. (1999). Theory, method, and power in drug and HIV-prevention research: A participant-observer's critique. *Substance Use and Misuse*, 34(14), 2155–2172.
- Bourgois, P., Martinez, A., Kral, A., Edlin, B. R., Schonberg, J., & Ciccarone, D. (2006). Reinterpreting ethnic patterns among white and African American men who inject heroin: A social science of medicine approach. *PLoS Medicine*, 3(10), e452.
- Bourgois, P., Prince, B., & Moss, A. (2004). The everyday violence of hepatitis C among young women who inject drugs in San Francisco. *Human Organization*, 63(3), 253–264.
- Bourgois, P., & Schonberg, J. (2009). *Righteous dopefiend*. Berkeley: University of California Press.
- Burris, S., Blankenship, K. M., Donoghoe, M., Sherman, S., Vernick, J. S., Case, P., et al. (2004). Addressing the risk environment for injection drug users: The mysterious case of the missing cop. *Milbank Quarterly*, 82(1), 125–156.
- Chakrapani, V., Newman, P. A., Shunmugam, M., & Dubrow, R. (2011). Social-structural contexts of needle and syringe sharing behaviours of HIV-positive injecting drug users in Manipur, India: A mixed methods investigation. *Harm Reduction Journal*, 8(9).
- Ciccarone, D., & Bourgois, P. (2003). Explaining the geographical variation of HIV among injection drug users in the United States. *Substance Use and Misuse*, 38(14), 2049–2063.
- Clatts, M. C., Welle, D. L., Goldsamt, L. A., & Lanckenau, S. E. (2002). An ethno-epidemiological model for the study of trends in illicit drug use: Reflections on the 'emergence' of crack injection. *International Journal of Drug Policy*, 13(4), 285–296.

- Creswell, J., Klassen, A., Plano Clark, V., & Clegg Smith, K. (2011). Best practices for mixed methods research in the health sciences. *Office of Behavioral and Social Sciences Research*, [http://obssr.od.nih.gov/mixed\\_methods\\_research/](http://obssr.od.nih.gov/mixed_methods_research/)
- DiClemente, R., Crosby, R., & Kegler, M. (Eds.). (2002). *Emerging theories in health promotion research and practice: Strategies for enhancing public health*. San Francisco: Jossey-Bass, Inc.
- Eddy, N. B., Halbach, H., Isbell, H., & Seevers, M. (1965). Drug dependence: Its significance and characteristics. *Bulletin of the World Health Organization*, 32(5), 721–733.
- Fairbairn, N., Small, W., Van Borek, N., Wood, E., & Kerr, T. (2010). Social structural factors that shape assisted injecting practices among injection drug users in Vancouver, Canada: A qualitative study. *Harm Reduction Journal*, 7, 20.
- Fast, D., Shoveller, J., Shannon, K., & Kerr, T. (2010). Safety and danger in downtown Vancouver: Understandings of place among young people entrenched in an urban drug scene. *Health & Place*, 16(1), 51–60.
- Fast, D., Small, W., Wood, E., & Kerr, T. (2009). Coming 'down here': Young people's reflections on becoming entrenched in a local drug scene. *Social Science & Medicine*, 69(8), 1204–1210.
- Gibson, E. K., Exner, H., Stone, R., Lindquist, J., Cowen, L., & Roth, E. A. (2011). A mixed methods approach to delineating and understanding injection practices among clientele of a Victoria, British Columbia needle exchange program. *Drug and Alcohol Review*, 30(4), 360–365.
- Greene, J., Caracelli, V., & Graham, W. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 11(3), 255–274.
- Harris, J. L., Lorvick, J., Wenger, L., Wilkins, T., Iguchi, M. Y., Bourgois, P., et al. (2012). Low-frequency heroin injection among out-of-treatment, street-recruited injection drug users. *Journal of Urban Health*.
- Hartel, D. M., Schoenbaum, E. E., Selwyn, P. A., Kline, J., Davenny, K., Klein, R. S., et al. (1995). Heroin use during methadone maintenance treatment: The importance of methadone dose and cocaine use. *American Journal of Public Health*, 85(1), 83–88.
- Heckathorn, D. (1997). Respondent-driven sampling: A new approach to the study of hidden populations. *Social Problems*, 44(2), 174–199.
- Heckathorn, D. (2002). Respondent-driven sampling II: Deriving valid population estimates from chain-referral samples of hidden populations. *Social Problems*, 49(1), 11–34.
- Koester, S., Glanz, J., & Baron, A. (2005). Drug sharing among heroin networks: Implications for HIV and hepatitis B and C prevention. *AIDS and Behavior*, 9(1), 27–39.
- Kral, A. H., Bluthenthal, R. N., Lorvick, J., Gee, L., Bacchetti, P., & Edlin, B. R. (2001). Sexual transmission of HIV-1 among injection drug users in San Francisco, USA: Risk-factor analysis. *Lancet*, 357(9266), 1397–1401.
- Kral, A. H., Lorvick, J., Gee, L., Bacchetti, P., Rawal, B., Busch, M., et al. (2003). Trends in human immunodeficiency virus seroincidence among street-recruited injection drug users in San Francisco, 1987–1998. *American Journal of Epidemiology*, 157(10), 915–922.
- Kral, A. H., Malekinejad, M., Vaudrey, J., Martinez, A. N., Lorvick, J., McFarland, W., et al. (2010). Comparing respondent-driven sampling and targeted sampling methods of recruiting injection drug users in San Francisco. *Journal of Urban Health*, 87(5), 839–850.
- Kral, A. H., Wenger, L., Carpenter, L., Wood, E., Kerr, T., & Bourgois, P. (2010). Acceptability of a safer injection facility among injection drug users in San Francisco. *Drug and Alcohol Dependence*, 110(1–2), 160–163.
- Logan, T. K., Cole, J., & Leukefeld, C. (2002). Women, sex, and HIV: Social and contextual factors, meta-analysis of published interventions, and implications for practice and research. *Psychological Bulletin*, 128(6), 851–885.
- Lorvick, J., Bourgois, P., Wenger, L. D., Arreola, S. G., Lutnick, A., Wechsberg, W. M., et al. (2012). Sexual pleasure and sexual risk among women who use methamphetamine: A mixed methods study. *International Journal of Drug Policy*, 23(5), 385–392.
- Loue, S., Sajatovic, M., & Mendez, N. (2011). Substance use and HIV risk in a sample of severely mentally ill Puerto Rican women. *Journal of Immigrant and Minority Health*, 13(4), 681–689.
- Mauss, M. (1936). Les techniques du corps. *Journal de Psychologie*, 32(3–4), 365–386.
- Mayhew, S., Collumbien, M., Qureshi, A., Platt, L., Rafiq, N., Faisal, A., et al. (2009). Protecting the unprotected: Mixed-method research on drug use, sex work and rights in Pakistan's fight against HIV/AIDS. *Sexually Transmitted Infections*, 85(Suppl. 2), ii31–ii36.
- Nevius, C. W. (2007). Golden gate park sweep – Can the city make it stick?/'March of Junkies': Haight's residents fume over needles. *San Francisco Chronicle*.
- NIDA Research Monograph. (1990). (Vol. 98). Rockville: U.S. Department of Health and Human Services: Public Health Service – Alcohol, Drug Abuse, and Mental Health Administration.
- Parsons, J. T., Missildine, W., Van Ora, J., Purcell, D. W., & Gomez, C. A. (2004). HIV serostatus disclosure to sexual partners among HIV-positive injection drug users. *AIDS Patient Care and STDs*, 18(8), 457–469.
- Pollini, R. A., Lozada, R., Gallardo, M., Rosen, P., Vera, A., Macias, A., et al. (2010). Barriers to pharmacy-based syringe purchase among injection drug users in Tijuana, Mexico: A mixed methods study. *AIDS and Behavior*, 14(3), 679–687.
- Quesada, J., Hart, L. K., & Bourgois, P. (2011). Structural vulnerability and health: Latino migrant laborers in the United States. *Medical Anthropology*, 30(4), 339–362.
- Rhodes, T. (2002). The 'risk environment': A framework for understanding and reducing drug-related harm. *International Journal of Drug Policy*, 13, 85–94.
- Rhodes, T. (2009). Risk environments and drug harms: A social science for harm reduction approach. *International Journal of Drug Policy*, 20(3), 193–201.
- Rhodes, T., Ball, A., Stimson, G. V., Kobyschka, Y., Fitch, C., Pokrovsky, V., et al. (1999). HIV infection associated with drug injecting in the newly independent states, eastern Europe: The social and economic context of epidemics. *Addiction*, 94(9), 1323–1336.
- Rhodes, T., Singer, M., Bourgois, P., Friedman, S. R., & Strathdee, S. A. (2005). The social structural production of HIV risk among injecting drug users. *Social Science & Medicine*, 61(5), 1026–1044.
- Rhodes, T., Stimson, G. V., Moore, D., & Bourgois, P. (2010). Qualitative social research in addictions publishing: Creating an enabling journal environment. *International Journal of Drug Policy*, 21(6), 441–444.
- Rhodes, T., & Treloar, C. (2008). The social production of hepatitis C risk among injecting drug users: A qualitative synthesis. *Addiction*, 103(10), 1593–1603.
- Rhodes, T., Wagner, K., Strathdee, S. A., Shannon, K., Davidson, P., & Bourgois, P. (2012). Structural violence and structural vulnerability within the risk environment: Theoretical and methodological perspectives for a social epidemiology of HIV risk among injection drug users and sex workers. In P. O'Campo, & J. R. Dunn (Eds.), *Rethinking social epidemiology: Towards a science of change* (pp. 205–230). New York: Springer Science+Business Media.
- Roberts, E. T., Friedman, S. R., Brady, J. E., Pouget, E. R., Tempalski, B., & Galea, S. (2010). Environmental conditions, political economy, and rates of injection drug use in large US metropolitan areas 1992–2002. *Drug and Alcohol Dependence*, 106(2–3), 142–153.
- Roy, E., Arruda, N., Vaillancourt, E., Boivin, J. F., Morissette, C., Leclerc, P., et al. (2012). Drug use patterns in the presence of crack in downtown Montreal. *Drug and Alcohol Review*, 31(1), 72–80.
- Singer, M., Stopka, T., Siano, C., Springer, K., Barton, G., Khoshnood, K., et al. (2000). The social geography of AIDS and hepatitis risk: Qualitative approaches for assessing local differences in sterile-syringe access among injection drug users. *American Journal of Public Health*, 90(7), 1049–1056.
- Solomon, S. S., Mehta, S. H., Latimore, A., Srikrishnan, A. K., & Celentano, D. D. (2010). The impact of HIV and high-risk behaviours on the wives of married men who have sex with men and injection drug users: Implications for HIV prevention. *Journal of the International AIDS Society*, 13(Suppl. 2), S7.
- Strathdee, S. A., Hallett, T. B., Bobrova, N., Rhodes, T., Booth, R., Abdool, R., et al. (2010). HIV and risk environment for injecting drug users: The past, present, and future. *Lancet*, 376(9737), 268–284.
- Syvrtsen, J., Pollini, R. A., Lozada, R., Vera, A., Rangel, G., & Strathdee, S. A. (2010). Managing la malilla: Exploring drug treatment experiences among injection drug users in Tijuana, Mexico, and their implications for drug law reform. *International Journal of Drug Policy*, 21(6), 459–465.
- Tempalski, B., & McQuie, H. (2009). Druggscapes and the role of place and space in injection drug use-related HIV risk environments. *International Journal of Drug Policy*, 20(1), 4–13.
- Wagner, K. D., Davidson, P. J., Pollini, R. A., Strathdee, S. A., Washburn, R., & Palinkas, L. A. (2012). Reconciling incongruous qualitative and quantitative findings in mixed methods research: Exemplars from research with drug using populations. *International Journal of Drug Policy*, 23(1), 54–61.
- Watters, J. K., & Biernacki, P. (1989). Targeted sampling: Options for the study of hidden populations. *Social Problems*, 36(4), 416–430.
- Wenger, L. D., Martinez, A. N., Carpenter, L., Geckeler, D., Colfax, G., & Kral, A. H. (2011). Syringe disposal among injection drug users in San Francisco. *American Journal of Public Health*, 101(3), 484–486.
- Wood, E., Stoltz, J. A., Li, K., Montaner, J. S., & Kerr, T. (2006). Changes in Canadian heroin supply coinciding with the Australian heroin shortage. *Addiction*, 101(5), 689–695.
- Zinberg, N. E., & Jacobson, R. C. (1976). The natural history of chipping. *American Journal of Psychiatry*, 133(1), 37–40.