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HIV among injecting drug users: current epidemiology, biologic markers, respondent-driven sampling, and supervised-injection facilities

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Abstract

Purpose of review—To describe recent research done primarily during the past 12 months (i.e., primarily in 2008) on the epidemiology of HIV infection among injecting drug users (IDUs).

Recent findings—Major research developments include a global assessment of HIV infection among IDUs and evidence of a transition from epidemics concentrated among IDUs to generalized, heterosexual epidemics in eastern Europe and Asia. Intervention research also includes several studies of supervised-injecting facilities. Methodological research includes respondent-driven sampling and the use of hepatitis C virus and herpes simplex virus-2 as biomarkers for injecting and sexual risk.

Summary—There have been important advances in research during the past year, but HIV infection continues to spread rapidly across many areas of the world among IDUs and their nondrug-using sex partners.

Keywords

AIDS; epidemiology; HIV; injecting drug use; respondent-driven sampling; supervised-injecting facilities

Introduction

There have been important advances in the epidemiology of HIV infection among injecting drug users (IDUs) during the past year (i.e., 2008), but there has been no breakthrough. In this review of recent research, we focus on potential transitions from IDU-concentrated epidemics to generalized heterosexual epidemics; developments in research methods, including respondent-driven sampling (RDS) and the use of hepatitis C virus (HCV) and herpes simplex virus-2 (HSV-2) as biomarkers; and supervised injection facilities (SIFs). We conclude with a discussion of selected considerations about the future spread of HIV among IDUs.

Global epidemiology of HIV among injecting drug users and progression from concentrated to generalized epidemic

New findings show that injecting drug use has been escalating globally and is an increasingly important cause of HIV transmission worldwide. A recent report of the global epidemiology of injecting drug use identifies the presence of injecting drug use in 148 countries [1•] and documents the worrisome extent to which it is spreading throughout the world. A high number of IDUs are now being reported in countries with previously unknown or low rates of injecting drug use. Among the former Soviet Republics, previous estimates were 20 000 IDUs in Azerbaijan and 12 000 IDUs in Georgia [2], and current estimates, based on more systematic methods, are 300 000 and 127 000, respectively [1•]. A large number of IDUs are a cause for concern because risky injection and sexual practices can rapidly transmit HIV between IDUs and the general population. A high prevalence of HIV and a large population of IDUs make it much more difficult to contain the HIV epidemic.

Several countries in eastern Europe are experiencing severe HIV epidemics among IDUs [3]. At the end of 2007, Ukraine accounted for 58% of new HIV infections in 14 eastern European countries [3]. The most recent reports indicate that 42% of IDUs in the Ukraine are infected with HIV [1•]. Although the proportion of new HIV infections in the Ukraine that are associated with injecting drug use has been decreasing recently [4], HIV prevalence among IDUs is still increasing [5•]. From 2006 to 2007, the number of new HIV infections reported in the Ukraine increased by 10% [6•]. An estimated 375 000 IDUs [1•] and their 487 000 sex partners [6•] represent 64% of people living with HIV in the Ukraine. The large population of HIV-positive IDUs and the increasing proportion of new HIV infections transmitted through heterosexual exposure indicate a progression to a substantial generalized HIV epidemic in the Ukraine. The latest estimate of HIV prevalence among Ukrainian adults is greater than 1% [6•]. Self-sustaining heterosexual transmission, independent of transmission from IDUs to their nondrug-injecting sexual partners, is a necessary component of a generalized HIV epidemic. Surveillance systems do not capture the needed data with precision, and additional studies are needed to determine whether such self-sustained heterosexual transmission is occurring. Critical factors for such a transition are likely to include the number of HIV-seropositive IDUs; the extent of commercial sex work in the area and participation by IDUs in commercial sex work, both as providers and as clients; and the prevalence of other sexually transmitted infections (STIs) that facilitate sexual transmission of HIV.

Russia is also experiencing a fast-growing HIV epidemic. New findings show 1.8 million IDUs and a high HIV prevalence (37%, midpoint estimate) [1•]. Several factors increase the likelihood of HIV spreading to the general population. First, there is a great overlap between injecting drug use and sex work. In various Russian studies, more than 30% of sex workers have reported histories of injecting drug use [7•]. Second, Russian IDUs are young and sexually active [8,9]. Third, a large proportion of IDUs engage in HIV-related sexual risk behaviors with noninjecting sex partners. A study of IDUs in St Petersburg [8] reported that more than 80% of IDUs had sex without using condoms and that 44% of IDUs had sex with

a partner who did not inject drugs. This pattern of heterosexual HIV transmission may become more important. A recent study [9] found that having a sex partner who injects drugs was associated with recent HIV infection among individuals reporting no injecting drug use in the previous year. The authors estimated that 31% of the excess infections that were acquired through heterosexual exposure could be attributed to having a sex partner who injects drugs.

A study of perinatal women who did not have an HIV test during pregnancy and who were admitted to maternity hospitals in St Petersburg [10] showed a 6.5% HIV prevalence. Although the epidemic in Russia has not reached the point where HIV could be transmitted independently of IDUs and sex workers, these recent findings suggest a real threat that the current, concentrated HIV epidemic might spread to the general population.

Outside eastern Europe, the country with the most alarming potential for a transition to a generalized HIV epidemic is China, which (at 2.4 million) has the largest population of IDUs in the world [1••]. HIV prevalence among IDUs in China has been estimated at 12% [1••]. However, in some regions, HIV prevalence among IDUs is very high. For example, in Dehong Prefecture, in Yunnan Province, HIV prevalence among IDUs is estimated to be 54% and IDUs make up the majority of the people living with HIV and AIDS [11]. The high rate of HIV infection among IDUs and the high percentage of injecting drug use (i.e., 1.4% of the adult population) make Dehong one of the hardest hit areas in China. Moreover, the percentage of HIV infections in Dehong due to sexual transmission has been increasing from 39%, in 2005, 47%, in 2006, to 52%, in 2007 [12].

The trend in transmission mode (i.e., a decreasing percentage of HIV patients who are IDUs and an increasing percentage of cases of HIV infection acquired through heterosexual exposure) is similar to that in other countries where concentrated HIV epidemics have spread to the general population [13]. Although the prevalence of HIV in the Chinese general population remains low (0.04–0.07%)[13], it would be disastrous for China if the epidemic in Yunnan Province were mirrored in other provinces.

Hepatitis C virus, herpes simplex virus-2, and HIV among injecting drug users

IDUs are at risk for both injecting-related and sexual transmission of HIV. In the early rapid transmission stages of an HIV epidemic among IDUs, injecting-related transmission predominates. Des Jarlais *et al.* [14••] recently examined the use of HCV as a biomarker for injection risk and HSV-2 as a biomarker for sexual risk among IDUs in New York City. Among IDUs who began injecting drugs before the large-scale expansion of syringe exchange programs in the city, HIV prevalence was 28%, HCV infection was strongly associated with HIV infection (adjusted odds ratio (AOR = 8.96)), and HSV-2 infection was not associated with HIV infection. Among IDUs who began injecting drugs after the large-scale expansion of syringe exchange programs, HIV prevalence was 6%, HCV infection was not associated with HIV infection, and HSV-2 infection was strongly related to HIV infection (AOR = 10.71). The use of HCV and HSV-2 as biomarkers for injection risk and sexual risk needs to be examined in other locations, but these two viruses appear to offer a

potential means for assessing the relative importance of injecting-related and sexual transmission of HIV among IDUs, as well as for adapting local prevention programs to changes in modes of HIV transmission.

Respondent-driven sampling

Recent publications on RDS advance its use in HIV surveillance and research from its introduction 12 years ago [15,16]. The new literature validates RDS for selecting representative samples of marginalized populations and for providing population-based estimates of relevant variables [17]. RDS has been used in 40 or more countries across five continents [18,19••,20••]. To ensure that RDS reaches its goals of a diverse and representative sample and to limit selection biases in a time-efficient and cost-effective manner, it is important to train project staff (and institutional and ethics review boards) on how to implement RDS [21,22].

The importance of the operational guidelines for RDS is highlighted in a systematic review of 123 HIV surveillance activities of marginalized populations in 28 countries [19••]. The review emphasizes several operational procedures (e.g., defining eligibility criteria, assessing social network sizes, designating appropriate incentives), design procedures (e.g., characterizing the extent and nature of social networks), and analytic procedures (e.g., using appropriate design effect, assessing equilibrium, adjusting data for differential network sizes and recruitment patterns) [23]. Coupons with expiration dates are associated with a 12% increase in achieving the desired sample size [23]. Surveillance projects of IDUs compared with those of men who have sex with men and sex workers have been marginally more likely to achieve the desired sample size [23].

When designing, implementing, and reporting about RDS, it is relevant to consider several key factors [19••]. These factors include formative research; eligibility criteria; initial and replacement seeds; number of allowable recruits by each participant; recruiter–recruit relationship; coupon management system; design effect for calculating the sample size; desired and achieved sample size; number of waves; duration of data collection; equilibrium status and attainment; social network size of participants; and use of statistical software to control for differential network size and recruitment patterns.

The theoretical basis and operational procedures of RDS are important to ensure its success as a sampling method and to protect the rights and welfare of participants. Concerns about the rights and welfare of participants have been raised about a surveillance activity in Chicago [24]. In response, several investigators highlighted the importance of informed consent, the coupon management system, and the responsibility of investigators and institutional and ethics review boards to protect participants [25–29]. Semaan *et al.* [20••] discuss two ethical and regulatory considerations in RDS studies with drug users: remuneration for participant-driven recruitment and investigators responsibility to inform participants of their HIV serodiscordant partnerships.

Variables related to remuneration for participant-driven recruitment include motivation for recruitment; motivation for study participation; assessment of coercion or undue influence;

amount of payment for each recruit; amount of payment for study participation; methods to determine remuneration payments; return rates to collect remuneration payments; and differential effects of monetary versus nonmonetary payments [20••].

Variables that are related to the investigator's potential responsibility to disclose HIV serodiscordant partnerships to participants include: procedures to protect privacy and personal information; information provided to participants about disclosure options; procedures to protect relationships; and beliefs and behaviors of participants regarding their responsibility to disclose to their partners their HIV status and to adopt safer behaviors [20••].

Clear knowledge of the coexisting ethical and regulatory issues and the separate, yet related, scientific literature can help investigators apply RDS and protect participants of surveillance and research projects. The issues relate to: marginalization of drug users and other populations; stigma of HIV and AIDS; stigma of HIV testing and receiving test results; surveillance and research as domains influenced by different regulations and policies; and RDS as a sampling method [30–32]. This clarity is important for training investigators (and institutional and ethics review boards) in the use of relevant safeguards to protect participants, the integrity of projects, and the application of RDS. Categorizing the issues and related concerns into these groups helps investigators use the right strategy to enhance scientific, operational, and ethical considerations and to abide by relevant regulations and policies for protecting participants.

Supervised-injecting facilities

SIFs are sanctioned spaces where IDUs can inject pre-obtained illicit drugs under medical supervision [33]. Although the services of SIFs vary considerably, they typically provide IDUs with sterile syringes, emergency care in the event of an overdose, primary care services, and referral to addiction treatment [34]. SIFs have existed in more than two dozen European cities and more recently in Sydney, Australia, and Vancouver, Canada [34]. The literature on the effects of SIFs has been summarized previously [33], and the following section focuses mostly on SIFs in Vancouver, Canada.

Much of the research on the effects of SIFs has been gathered from a research program in Vancouver, Canada [35]. One study [36] examined the education the IDUs receive from the SIFs from the perspectives of the IDUs. In this study, the narratives of Vancouver IDUs showed that they had significant knowledge gaps about safe injecting practices. However, the SIF allowed clients to identify and address these knowledge gaps through a number of training opportunities unique to this facility (e.g., nurse-delivered education). These findings were supported by a recent quantitative study of Vancouver SIF users: approximately one-third of the participants reported receiving safe injecting education from the SIF [37].

A second study that used semi-structured qualitative interviews of 50 IDUs recruited from the Vancouver SIF [38] examined their perspectives on the effect of SIFs for access to care and treatment of injection-related infections. This study concluded that the SIF enabled contact with the healthcare system and helped manage injection-related infections. In

addition, two quantitative studies conducted among SIF users in Sydney and Vancouver showed high rates of cutaneous and injection-related infections, and the researchers reviewed the potential role of SIFs to address these infections [39].

A recent qualitative study of female SIF users in Vancouver [40] showed how the SIF may lessen the risk of violence among this population. The perspectives of women participating in this study suggested that the SIF was a unique controlled environment in which women who inject drugs found refuge from violence and gendered norms that shape drug preparation and consumption practices. In addition, a separate study [41•] examined the effective partnership between local police and the SIF operators, as well as the rate police referred people found injecting in public to the SIF.

Four studies specifically examined potential harms of the Vancouver SIF. The first study [42] examined whether SIF users were less likely to be employed and found that the Vancouver SIF did not have an adverse effect on efforts to seek employment. A second study [43] refuted the suggestion that the Vancouver SIF may increase the likelihood of a nonfatal overdose. A modeling study [44] showed that from 2004 to 2006, the Vancouver SIF may have prevented 8–51 overdose deaths, compared with the overdose events happening outside the SIF. These estimates are impressive because a fourth study from Vancouver [45] showed that a high proportion of IDUs continue to inject in public largely because of capacity limitations at the SIF.

Although SIF use has been associated with reductions in syringe sharing [46], there has been little evaluation of the potential effect that SIFs have on unsafe sexual behavior. Marshall *et al.* [47] performed a longitudinal analysis of the factors associated with consistent condom use among IDUs recruited from within the Vancouver SIF and found a significant increase in condom use. Similarly, a study from Australia [48] found that more frequent use of the Sydney SIF was associated with increased use of addiction treatment.

However, full evaluation of SIF's potential role in HIV prevention continues to be hampered by political opposition [49]. The Canadian federal government's efforts to close the Vancouver SIF have been described previously [50]. This effort to close the Vancouver SIF persists despite a recent cost-effectiveness study that suggested that the Vancouver's SIF was associated with improved health and cost savings [51]. In the context of these political challenges, a recent evaluation by US legal experts suggested that although states and some municipalities have the power to authorize SIFs under state law, federal authorities could still restrict these facilities under the Controlled Substances Act [52].

Conclusion

From the beginning, the worldwide epidemic of HIV infection among IDUs has been greatly influenced by economic developments. In particular, the increased flow of people, goods, and money that has globalized the world economy has also contributed to the spread of illicit drugs. HIV infection has often followed the new drug distribution pathways. The world economy has recently entered a recession that is expected to be both severe and long. It is difficult to predict how this recession might affect drug use and the spread of HIV infection

among IDUs. Unfortunately, the safest prediction is that the recession will reduce the resources available for monitoring the spread of HIV infection among IDUs and for implementing interventions to reduce the spread of HIV among IDUs. Despite worsening economic conditions, it is important to continue to prevent HIV infection among IDUs and their sexual partners.

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References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 340).

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