Drug Use Careers and Blood-borne Pathogen Risk Behavior in Male and Female Tanzanian Heroin Injectors

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Abstract. Injection drug use in sub-Saharan Africa is a relatively new phenomenon that expands the repertoire of human immunodeficiency virus (HIV)–associated risk behaviors in Africa. We carried out a study of 537 injection drug users (56% men and 44% women) in Dar es Salaam, Tanzania, to examine their HIV risk behaviors and their drug-using careers that had culminated in injecting heroin. Data were collected in 2005–2006 using the Swahili version of the Tanzanian AIDS Prevention Project questionnaire. Marijuana, alcohol, and heroin were the first drugs reported for both men and women. Most drug milestones appeared in a similar order for men and women. Mandrax, khat, and injecting appeared close to one another in chronological time for both men and women, suggesting they were introduced into the country and appeared on the drug scene at about the same (real) time. Drug careers for women were shorter than for men, and time from first use of heroin to first injection was shorter for women. Years of injecting suggested that injecting had increased in males approximately five years prior to data collection, with males injecting earlier, but females being increasingly introduced to injecting in the previous two years. Injecting appears at a mean of five years (men) and three years (women) into their heroin-using career. Heroin use appears to occur in binges, with women being more likely to have sex during a binge. In this sample, more than 90% of women but only 2% of men reported ever trading sex for money. More than 90% of men and women reported using new needles for injection. These data confirm that heroin injecting is well established in large cities in east Africa, and that HIV prevention in the region must now include drug injectors and other drug users.

INTRODUCTION

Drug use and associated risks infection with human immunodeficiency virus (HIV) in sub-Saharan Africa has received little attention but is a growing problem. Until recently, illicit drug use in sub-Saharan Africa was not seen as a major issue. Affinnih reported that up to 1980, marijuana use was the only drug issue in the region, but by the mid-1980s and early 1990s, sub-Saharan Africa had become a staging point for drugs in transit from Asia and the Middle East to the United States and Europe, and that some of these drugs found their way onto local markets through marijuana trade channels. These drugs included heroin, Mandrax (methaqualone), Valium (diazepam), and amphetaamines.

Air links between India and Pakistan were widely used by drug traffickers and Dar es Salaam, Tanzania, was a prominent entrance route for these staging operations to the United States and Europe. Local production of Mandrax in Zambia, khat (chewed leaves of Catha edulis, which contain the stimulant cathinone), and dagga (marijuana) in southern Africa also developed. Drug use is now well-established and increasing in sub-Saharan Africa; however, little is known about the development of drug use temporally and in the drug-using careers of what is an early generation of drug users in Africa generally and east Africa specifically.

Affinnih notes that by the mid-1990s, heroin and Mandrax began progressively penetrating Kenyan society. Beckerleg and others conducted a rapid assessment of heroin use in Mombasa, Kenya, and reported that brown heroin had been a street drug for more than 25 years and was replaced by white injectible heroin from southeast Asia, which lead to a move toward injecting. Most of the nearly 500 heroin users (95%) interviewed by Beckerleg and others were men. More than 15% of their respondents reported they had ever injected and 7% (which Beckerleg and others consider an underestimate) indicated they were current injectors.

Kenya shares language, culture, and a long border with Tanzania. Drug use in urban centers paralleled the rapid population growth and spread of urbanization, and associated high unemployment. Much of this drug use occurred along the trafficking routes. Recently, Beckerleg and Beckerleg and Hundt have reported that injecting of drugs has emerged as a new phenomenon in coastal Kenya.

McCurdy and others report that social workers in Dar es Salaam, Tanzania, estimate that there are approximately 200,000–250,000 illicit drug users in a city of approximately 3 million. Traditionally, Kilonzo and Kaaaya reported that cannabis has been used in Tanzania since the early 20th century, with mirungi (khat) being used by people who needed to stay awake, such as drivers and night watchmen. These investigators suggested that breakdown in traditional family structures was also associated with recent increases in drug use, and that these were highest among marginalized people on the fringes of society. New trends in drug use (Mandrax, heroin, Valium) appear to target a different population.

More recently, McCurdy and others carried out a qualitative study of 87 male and female injection heroin users in Dar es Salaam, and their data suggested that injecting was introduced in approximately 1998–1999 into the main market and red light district of Dar es Salaam. For the two previous decades, heroin had been smoked, sniffed, or inhaled. In 2000 when white (refined) heroin became more readily available, its ease of use facilitated a change from smoking to injection (it is not necessary to cook white heroin before injecting). McCurdy and others suggested that heroin use follows a regular progression pattern from smoking to sniffing or inhaling (chase) to injecting and to injecting with sedatives. The inhaling period may last six months to two years, and
sniffing or snorting is often short-lived because of the undesirability of the bloody nose that accompanies it and loss of sense of smell. Some persons go straight from smoking to injecting. McCurdy and others reported that 57% of testable syringes collected by heroin users in Dar es Salaam tested positive for HIV in early 2004, with the highest proportion in the city center and proportions decreasing with geographic distance. Clearly, injecting drug use has also become a major HIV risk behavior in Dar es Salaam, where rates are reported from the 2003–2004 Tanzanian HIV/AIDS Indicator Survey as being 10.9% in urban areas. Heroin was the only drug that was reported injected.

However, there is a dearth of systematic studies on both drug use patterns and injecting drug careers in east Africa, and on the HIV-related risk behaviors of drug injectors. We report on a study of drug use careers in male and female heroin injectors, and their injecting risk behaviors for HIV and other blood-borne diseases, in Dar es Salaam, Tanzania. We compare findings by sex.

METHODS

Procedures. Data were collected from May 2005 through September 2006 in Dar es Salaam, Tanzania. Persons were recruited for the study using community-based sampling that was developed on the basis of information provided by key informants knowledgeable about illicit drug use in Dar es Salaam and on the basis of the experience of one of the Tanzanian investigators who has worked extensively with drug users in the city. Neighborhoods targeted for sampling were confirmed by interviews with drug users residing in the neighborhoods and by direct observation of injection drug use. An outreach worker contacted injection drug users (IDUs) and referred them to be screened for the study. In turn, those referred were asked to refer other IDUs. Chain referral methods are commonly used in IDU studies, but because they may miss persons who are not part of networks, time-location sampling may also be used to obtain additional estimates of prevalence. However, studies where respondent-driven sampling was compared with recruitment by indigenous field workers found no significant differences in demographic or risk characteristics between samples. Although there may be biases inherent in chain referral, these biases probably only occur where there are large numbers of IDUs in separated networks, which appears not to be the case in the nascent IDU culture of Dar es Salaam.

Persons contacted by or referred to the study were asked to complete a brief screening questionnaire to determine eligibility. Eligibility criteria required that participants were at least 18 years of age, had injected an illicit drug in the past 48 hours before being screened, and because this was a study on HIV risk behaviors, had had sex at least once in the 30 days before screening. Reports of injection drug use were confirmed by observable needle track marking. Parts of the body covered by clothing, other than arms, lower legs, or necks, were not examined. Of the 559 individuals screened, 537 met eligibility criteria. Of those who did not meet eligibility criteria, 18 had not had sex in the past 30 days, six had not injected drugs in the past 48 hours, and one was unwilling to provide a blood specimen.

Individuals matching eligibility criteria were immediately given complete information about the study and asked to provide verbal informed consent. Once consent was given, participants were immediately interviewed and a blood specimen was collected. Data were collected in a rented duplex located in a neighborhood near the center of the city. Respondents were interviewed by trained research assistants. The interview took approximately one hour. Participants were paid 5,000 Tanzanian shillings, approximately $4 US, for their time and travel expenses.

All procedures and data collection forms were reviewed and approved by university committees for the protection of human subjects in Tanzania and the United States. In addition, procedures and forms were reviewed and approved by the Tanzania Commission for Science and Technology and the Tanzanian National Institute for Medical Research.

Measures. Data were collected using the Swahili version of the Tanzanian AIDS Prevention Project Questionnaire. Items included in the questionnaire were developed by the investigators using items similar to those used in studies with drug users in the United States. Questionnaire items were translated from English into Swahili and then independently back-translated from Swahili into English. Inconsistencies in translations were resolved through discussion among the investigators and the translators. Culturally specific meanings of words were taken into consideration as part of the translation. Studies conducted in the United States and elsewhere have found that questionnaire items identical or similar to those in the questionnaire produce valid and reliable responses.

Socioeconomic characteristics. Sociodemographic characteristics were measured by asking respondents their age, marital status, living arrangements, current work situation, and income. Age and education were recorded in years. Marital status was recorded by asking participants to choose the response that best fit their circumstances at the time of the interview. The choices were single, married or living as married, and separated, widowed, and divorced. Respondents were asked to describe their living arrangements by choosing one of the following terms: one’s own home, living with parents, someone else’s home, a short-term rented room, and living on the streets or in a vacant building. Homelessness was determined by asking respondents if they considered themselves to be homeless. Length of time living in Dar es Salaam was recorded in years.

Income was measured as money earned in the 30 days before the interview and recorded in Tanzanian shillings. Primary source of income was measured as a job, family or friends, spouse or sex partner, and trading sex for money or other illegal activity. Employment was measured as working at a full- or part-time job, working at a part-time job or as occasional labor, and being a homemaker, student, disabled, or in some other income-generating activity. Work status was clarified by asking participants how many days they had worked in the previous 30 days. Major source of income was measured by asking respondents to characterize the most important source of income. Choices were job/odd jobs, spouse, sex partners, family or friends, trading sex for money, and illegal sources. Sexual behaviors were measured ever and in the past 30 days, and questions were asked for both regular and casual partners.

Drug use. Non-injection illicit drug use was measured by first asking respondents if they had ever used marijuana, khat, Mandrax, or Valium. If the response was yes, respondents
were asked if they had used the drug in the 30 days before the interview and, if they had, how many times they had used the drug. Respondents were also asked about alcohol use. To measure injection drug use, participants were asked how many times they had injected in the 30 days before the interview. Using a list of drugs, respondents were asked which drug they injected most often. Heroin was the only drug reported injected. The list was constructed based on the results of iterative studies conducted in Dar es Salaam and included heroin, Valium, Mandrax, and opiates other than heroin.

Needle risk. To measure needle risk, respondents were asked if they had injected with used needles, shared needles, or injected with injectors who had also shared needles in the 30 days prior to the interview. If the response to was yes to any question, they were asked how many times they had engaged in the behavior. To measure needle use risk situations, respondents were asked if they had pooled money with someone in the previous month to buy drugs or had injected with others.

Statistical analyses. Data from 537 participants were available. Incomplete data from three participants were excluded from the analyses. Frequencies for drug use variables were calculated. Comparisons of sex were based on the t-test (separate variance estimates) for continuous data, and chi-square test (with Yates correction for discontinuity where appropriate) for categorical data. Analyses were conducted using SPSS version 15 (SPSS Inc., Chicago, IL) and all tests were two-tailed with significance level at $P < 0.05$. All continuous data are described in the form of means ± SD.

RESULTS

Sample. The sample was composed of 315 men and 219 women ranging in age from 18 to 59 years (mean age = 27.9 years, median = 27 years); 38% were ≤ 25 years of age. A total of 25% was married or living as married at the time of the interview. Most (83%) had completed ≤ 7 years of schooling (mean = 6.7 years, median = 7 years). Most participants (61%) had lived in Dar es Salaam for ≥ 21 years, but 20% had resided in the city ≤ 10 years. Most (59%) were living in their parents’ home at the time of the interview. A total of 17% was living in their own home: a small number (4%) was living on the streets or in a vacant building and 25% perceived themselves to be homeless. Approximately half (46%) had a monthly income ≥ 200,000 Tanzanian shillings (approximately $152 US). Almost half of the participants had earned income in the past month by engaging in commercial sex work (33%) or other illegal activities (16%). A sizable group (44%) had earned income by working at a job of some type. Most (90%) had earned income by working at a job of some type. Most (59%) were living in their parents’ home at the time of the interview. A total of 17% was living in their own home: a small number (4%) was living on the streets or in a vacant building and 25% perceived themselves to be homeless. Approximately half (46%) had a monthly income ≥ 200,000 Tanzanian shillings (approximately $152 US). Almost half of the participants had earned income in the past month by engaging in commercial sex work (33%) or other illegal activities (16%). A sizable group (44%) had earned income by working at a job of some type.

All participants reported they were injecting heroin and were sexually active at the time of interview (inclusion criteria). A total of 35% had used alcohol, but were not heavy users (mean = 8.5 times, median = 4 times in the past 30 days). Most (60%) smoked marijuana on average twice a day (mean = 74%, median = 90% in the past 30 days). Use of other drugs was negligible. The number of years participants reported they had been injecting ranged from 1 to 18 years. However, more than half (56%) had started injecting in the past three years (mean = 3.7 years, median = 3 years) and 18% in the past 12 months. Participants injected 14–300 times in the month before data collection (mean = 97.1, median = 90 in the past 30 days), with most (60%) injecting, on average, three times per day. A total of 31% injected with used needles at least once in the past 30 days.

There were significant mean differences in the data by sex. Women were younger than men (25.7 years versus 29.4 years; $t = 7.11, P < 0.0005$), less likely to be married (19% versus 29%; $P < 0.008$) have less schooling (6.2 years versus 7.0 years; $t = 3.42, P < 0.001$), and to have resided in Dar es Salaam fewer years (18.1 years versus 25.6 years; $t = 7.97, P < 0.001$). Women were less likely to be living with their parents (36% versus 76%; $\chi^2 = 106.63, P < 0.0001$) and more likely to consider themselves homeless (36% versus 17%, $\chi^2 = 24.64, P < 0.0001$) than men. Women were less likely to have procured more than 200,000 shillings in the prior 30 days (39% versus 51%; $\chi^2 = 24.78, P < 0.0005$) and were more likely to receive income from trading sex for money or other illegal activities (82% versus 27%; $\chi^2 = 450.73, P < 0.0005$). Although all men and women were injecting heroin, women had been injecting for less time (3.1 years versus 4.2 years; $t = 4.80, P < 0.0005$) and injected less frequently (92.4 times versus 100.8 times in the past 30 days; $t = 3.72, P < 0.0005$). For the past month, women also had greater numbers of sex partners (61.2 partners versus 2.4; $t = -18.21, P < 0.0005$), and had vaginal sex more frequently (78.8 partners versus 6.4 partners; $t = -20.02, P < 0.0005$). They were also more likely to have a history of ever trading sex for money (90.4% versus 1.9%; $\chi^2 = 450.73, P < 0.0005$).

Data on drug use are presented in Figures 1 and 2 and Tables 1 and 2. Table 1 illustrates drug use of heroin injectors in the past 30 days. It is apparent that the main drugs of abuse are heroin (and marijuana), but that apart from these two drugs, use of other drugs is represented by small percentages of the sample with the exception of Valium, which is used by 50% of the men but less 25% of the women. Men used significantly more commonly used drugs (heroin, marijuana, Valium) than women. Heroin is typically binge injected by almost all men and women, with a typical binge involving on average 6 injections and lasting 1–2 days (significantly shorter for women). It is apparent that sex is common on binges for 67% of women, who report an average of nearly 3 sexual partners on a typical binge, but only for less 20% of the men. Men would inject with 2–3 others persons on a typical binge, whereas for women, there was typically only one other person present.

Figure 1 illustrates drug-related timelines as careers for men and women and as temporal trends. The careers are measured backwards from the interview point to give the age at which drugs were first used. Because the mean ages of men and women differed by approximately four years, to look at temporal trends, the two career paths can be aligned at the time of interview like scales on a slide rule to give the real time in which drug use occurred. In this way, we can determine if first drug use for any particular classes of drugs occurred nearly simultaneously because of the new introduction of a drug into this population. It can be seen that first Mandrax, first khat, and first injection each occurred in both men and women at approximately the same point in chronologic time.

Human immunodeficiency virus and other blood-borne pathogen (hepatitis B and C) risk behaviors in this sample of heroin injectors are low (Table 2). More than 95% of men and women used a new needle the last time they injected, and only a few percent (more men than women) reused rinse water.
This occurred despite pooling drug money or giving used needles to others. Of those who do reuse equipment, men are significantly more likely than women to have shared injection equipment and reused the contaminated rinse water, although the numbers are small for using contaminated equipment. Injecting in a geto (shooting gallery) was reported by only approximately one in six with small proportions reporting leaving needles in a geto or injecting flashblood (blood just withdrawn from another heroin injector who had just injected). Interestingly, all but one of the flashblood injectors were women.

Figure 2 shows the years of injecting reported. It is apparent that most of the injection commenced in the past 5 years, with men (mean = 4.18 ± 2.83 years) more likely to have injected longer than women (mean = 2.99 ± 2.12 years). There is a tail of a small number of long-term injectors, mostly men.

**DISCUSSION**

These data report on IDUs in east Africa, specifically in Dar es Salaam, Tanzania, in terms of drug use and risk behaviors for acquiring blood-borne viruses such as HIV and HIV.

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**TABLE 1**

Number of times drugs used in the past 30 days and heroin binge use characteristics in the study population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean ± SD</th>
<th>No. (%)</th>
<th>T (degrees of freedom)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heroin</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Men</td>
<td>100.92 ± 28.57</td>
<td>318 (100)</td>
<td>4.21 (564.9)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Women</td>
<td>91.87 ± 22.61</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marijuana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>50.35 ± 49.93</td>
<td>315 (99.1)</td>
<td>3.02 (546.1)</td>
<td>0.003</td>
</tr>
<tr>
<td>Women</td>
<td>38.60 ± 41.44</td>
<td>238 (95.6)</td>
<td></td>
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<tr>
<td>Valium</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Men</td>
<td>2.52 ± 11.95</td>
<td>179 (56.3)</td>
<td>2.46 (186.7)</td>
<td>0.015</td>
</tr>
<tr>
<td>Women</td>
<td>0.30 ± 1.07</td>
<td>57 (22.9)</td>
<td></td>
<td></td>
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<tr>
<td>Mandrax</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0.63 ± 1.77</td>
<td>8 (2.5)</td>
<td>1.00 (7.0)</td>
<td>0.35</td>
</tr>
<tr>
<td>Women</td>
<td>0.00 ± 0.00</td>
<td>2 (0.8)</td>
<td></td>
<td></td>
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<tr>
<td>Mirungi (khat)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>3.30 ± 11.50</td>
<td>33 (10.4)</td>
<td>1.59 (32.2)</td>
<td>0.12</td>
</tr>
<tr>
<td>Women</td>
<td>0.11 ± 0.47</td>
<td>18 (7.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heroin binge use</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>No. injections on typical binge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>6.10 ± 1.72</td>
<td>316 (99.4)</td>
<td>4.05 (551.0)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Women</td>
<td>5.54 ± 1.52</td>
<td>247 (99.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. days on heroin binge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.82 ± 1.31</td>
<td>316 (99.4)</td>
<td>6.07 (480.6)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Women</td>
<td>1.30 ± 0.65</td>
<td>316 (99.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women had sex with on last heroin binge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.02 ± 0.23</td>
<td>57 (17.9)</td>
<td>33.29 (56.0)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Women</td>
<td>0.00 ± 0.00</td>
<td>164 (65.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men had sex with on last heroin binge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0.18 ± 1.33</td>
<td>57 (17.9)</td>
<td>12.88 (107.6)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Women</td>
<td>2.88 ± 1.47</td>
<td>164 (65.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. people around on last heroin binge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.89 ± 2.70</td>
<td>57 (17.9)</td>
<td>4.35 (65.6)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Women</td>
<td>1.27 ± 1.33</td>
<td>164 (65.9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Drug use risk behaviors in the past 30 days in the study population

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mean ± SD</th>
<th>No. (%)</th>
<th>T (df)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Times used new needle: last injection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>96.40 ± 10.39</td>
<td>318 (100)</td>
<td>0.86 (450.8)</td>
<td>0.388</td>
</tr>
<tr>
<td>Women</td>
<td>95.50 ± 13.67</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. times used old needle: total yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>3.66 ± 9.09</td>
<td>318 (100)</td>
<td>0.11 (467.6)</td>
<td>0.912</td>
</tr>
<tr>
<td>Women</td>
<td>3.76 ± 11.34</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. times reused used rinse water: total yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>5.85 ± 15.61</td>
<td>318 (100)</td>
<td>2.16 (558.5)</td>
<td>0.032</td>
</tr>
<tr>
<td>Women</td>
<td>3.44 ± 10.94</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. times pooled money to buy drugs: total yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.35 ± 7.44</td>
<td>318 (100)</td>
<td>1.06 (564.8)</td>
<td>0.291</td>
</tr>
<tr>
<td>Women</td>
<td>1.76 ± 5.70</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. times shared or begged drugs: total yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0.48 ± 2.21</td>
<td>318 (100)</td>
<td>0.702 (294.7)</td>
<td>0.483</td>
</tr>
<tr>
<td>Women</td>
<td>0.78 ± 6.39</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. people you shared works with total yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.10 ± 2.65</td>
<td>318 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>0.65 ± 1.72</td>
<td>249 (100)</td>
<td>2.46 (547.8)</td>
<td>0.014</td>
</tr>
<tr>
<td>Gave used needles to others: total yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.69 ± 5.33</td>
<td>318 (100)</td>
<td>2.22 (559.7)</td>
<td>0.270</td>
</tr>
<tr>
<td>Women</td>
<td>1.76 ± 4.60</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injected in a Geto: total yes</td>
<td>96.40 ± 10.39</td>
<td>318 (100)</td>
<td>2.22 (559.7)</td>
<td>0.270</td>
</tr>
<tr>
<td>Injected flashblood: total yes</td>
<td>1.76 ± 4.60</td>
<td>249 (100)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* df = degrees of freedom.

The drug career path (Figure 1) shows some interesting trends. First, marijuana is a traditional drug in Tanzania and appears to be the first illicit drug used by men and women. The drug-using career milestones between men and women suggest that drug-using careers are faster in women than in men in this population, with time from first marijuana to injecting being 5.38 years in women and 8.99 years in men. However, with few exceptions, the milestones appear to be similar in order. The exceptions appear to be Mandrax and Valium. Valium came after first heroin injection in women by approximately one year and before heroin injection in men by approximately one year. The fact that men lead in drug-use timing is an indication that men usually lead in drug-use adoption, and women follow, often being introduced to drug use by male partners.

However, Mandrax and injecting appear to be real time-linked events. When the two time scales in Figure 1 are aligned at the present point of the survey (midpoint of data collection at the beginning of 2006) when mean age of men was 29.35 years and the mean age of women was 25.58 years, the drug milestones can be seen in real time. It is apparent that Mandrax use occurred at about the same point of time in men and women and this point coincides with the reported introduction of Mandrax into Tanzania from southern Africa as noted by Affinnih. Second, the introduction of injection also coincides with the reported introduction of white heroin into Dar es Salaam in approximately 2000 and the subsequent introduction of the practice of injecting. The difference of 1.37 years (approximately 6 months) in real time for first injection between men and women is well within 30% of one standard deviation for both samples, although it implies that men were earlier adopters. Thus, for Mandrax and injecting, real-time events may have superimposed on the drug-use career. Figure 2 illustrates the overlap between drug injecting curves for men and women and the negative skew of the distributions. It can be seen that men were the earliest adopters of injecting, and women have come to the practice more recently.

Data indicate that for these heroin injectors, heroin and marijuana are the drugs of choice, with use of other drugs in the past 30 days low. This group is essentially a population of bi-drug users, with the focus on heroin and its use coalescing in binges of approximately two days (and six injections) in men and closer to one day (and 5.5 injections) in women. These binges continue until money and drug run out. Although binges in women are significantly shorter than in men, women are much more likely to have sex during a binge. Timpson and others reported that 33% of male heroin users in Tanzania are not sexually active, probably because of the effect of opiates on sexual interest. However, McCurdy and others reported that clean needles and syringes can be easily and cheaply purchased. There is a small but minimal amount of sharing. Injecting in a geto was low, with only one in six respondents sharing. However, risk behaviors for blood-borne infections are low. More than 90% of men and women reported using new needles the last time they inject, and McCurdy and others reported that clean needles and syringes can be easily and cheaply purchased. There is a small but minimal amount of sharing of rinse water and sharing of injecting works was low in the past 30 days: approximately once with men and 0.65 times with women. Men gave used needles to others more frequently than women. These data may be consistent with men going first and then giving their female partner the works, but more data are needed to confirm the pattern of sharing. Injecting in a geto was low, with only one in six respondents sharing.
spondents reporting this in the past 30 days. It is of interest that 28 women (and only 1 man) reported ever injecting flash-
blood, a practice in which blood is drawn back into the sy-
ringe and the full needle and syringe passed to a companion
to inject, supposedly to escape the pangs of withdrawal.

Data on length of time injecting are consistent with the
diminishing high from smoking, as well as the qualitative evi-
dence that the technology of injection and the culture of in-
jection arrived in Dar es Salaam in the early 2000s. This
finding is consistent with the finding of Beckerleg and others that arrival of white heroin in Mombasa (approximately 200
miles north of Dar es Salaam) dated from the end of the
1990s.

These data are subject to several limitations. The sampling
was not random and was convenience-based in neighbor-
hoods with known drug-using subcultures, although the
sample is one of the largest IDU samples obtained so far in
sub-Saharan Africa. Furthermore, the sample was cross-
sectional and thus we cannot attribute causality to relations-
ships between variables. Chain referral studies may bias to-
ward sampling IDUs who are linked as part of a network,
although we obtained evidence of only one network operating
in Dar es Salaam, and achieved a large sample. Although the
data are self-reported, there was extensive cross-checking for
reliability in the responses. Drug and other risk behaviors
were self-reported, and as Beckerleg and others reported,
such self-reports are likely to be underestimates. The inclu-
sion requirement of having had sex in the past 30 days may
have over-sampled sex workers among the female partici-
pants.

Our data are among the first, after the pioneering work of
Beckerleg and others, to describe heroin injectors in east
Africa. In our report, we specifically examine the drug careers
of injectors, introduction of novel drugs (Mandrax, white
heroin), and technologies for drug delivery (injecting) in real
time into the drug-using population. This population appears
to be largely bi-drug (heroin and marijuana) and binge-
heroin-using, and to have reported a high level of safety for
blood-borne pathogen transmission. Injecting appears to be
the outcome of a mean of three (for women) or five (for men) years of heroin use. It is apparent, as contended by Affinnih and McCurdy and others, confirmed by
Beckerleg and others, that drug injecting has become well
established in Dar es Salaam and other large east African port
cities that are drug transit points in the past few years.

These data suggest that real-time events, such as the intro-
duction of a new drug or a new technology such as injecting, may superimpose on drug-using careers and lead to rapid
adoption. Drug-monitoring authorities need to be alert to new
drugs and technologies that may rapidly introduce trans-
mission risks for blood-borne pathogens such as HIV and
hepatitis B and C, and also to increases in sex work associated
with a need to purchase new drugs, which may also be
associated with disease transmission. The rapid introduction
and uptake of injecting in Tanzania appears to be typical of
other large east African cities and emphasizes the need for
equivalent speed in adopting programs for the provision of
new needles and syringes to IDU populations in this re-
region.

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