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Measurement of self-reported HIV risk behaviors in injection drug users: Comparison of standard versus timeline, follow-back administration procedures

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Abstract

The present study compares the frequencies of retrospective self-reported HIV high risk drug use and sexual behaviors in 127 out-of-treatment injection drug users using the HIV Risk Questionnaire (HRQ) across two administration methods: 1) a brief standard quantity-frequency approach covering the past 30-days, and 2) a lengthier timeline followback (TLFB) procedure for improving recall. The two procedures produced similar frequencies of risk behavior across most items (80%) and good intra- and interclass correlation coefficients. The TLFB, however, resulted in higher frequencies for two risk behavior questions - sharing of any drug injection equipment and having any type of unprotected sex. The TLFB is a well-established procedure for retrospective assessment of HIV risk behavior and a good choice when precision in measuring these behaviors is a primary focus of the work. In contrast, the brief HRQ-Standard interview procedure appears to be a reasonable choice for clinical, research and health related surveys where the primary focus is broader than HIV risk behavior.

Keywords

HIV risk behavior; injection drug use; sexual behavior; assessment; timeline follow-back

1.0 Introduction

Injection drug use (IDU) and several unprotected sexual behaviors confer a high risk of transmission of HIV and other blood borne infections, including hepatitis B and C. Early in the HIV/AIDS epidemic, IDU alone was directly or indirectly associated with more than a third of AIDS cases in the United States (Centers for Disease Control and Prevention - CDC,

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2001). While the rate of HIV transmission among injection drug users has declined about 19% between 2002 through 2006 (CDC, 2008), many injection drug users remain at risk for HIV through both IDU and sexual risk behavior (SRB)(CDC, 2008). Sustained efforts to identify and reduce ongoing risk behavior in this population, therefore, remains vitally important. Prevention strategies include substance abuse treatment, HIV prevention education and behavioral risk reduction interventions, and access to sterile needles and syringes (CDC, 2005). In all of this work, evaluation of the benefits and shortcomings of these strategies rests upon accurate measurement of both IDU **and specific sexual behaviors**.

For ethical and practical reasons, self-report remains the current standard for assessing IDU and SRB. Standard questionnaires typically ask respondents to estimate how frequently they engaged in a specific behavior over a specified period of time. Self-report data are inherently limited by an individual's level of motivation, comprehension, concentration and memory, and concern for social desirability. However, questionnaire design and administration methods can improve self-report accuracy (NIDA, 1992; Schwarz & Oyserman, 2001). The Timeline Followback (TLFB) is an assessment method that was developed to facilitate recall of a variety of behaviors, including substance use and sexual activities (Sobell & Sobell, 1992).

The TLFB interview procedure facilitates recollection of behaviors via three general techniques: (1) construction of an event history calendar, (2) use of item “deconstruction” strategies, and (3) extrapolation. Construction of an event history calendar is an interactive process whereby the interviewer and respondent identify landmark or sentinel events. This provides memory cues for the respondent and reference points to which the interviewer can refer back. Item “deconstruction” focuses and restricts the respondent's memory search to shorter reference periods. Interviewers then extrapolate data obtained for the more immediate and shorter reference periods to more remote and larger reference periods. Reliability and validity of the TLFB for assessment of substance use (Fals-Stewart et al., 2000; Greenfield et al., 1995; Hersh et al., 1999) and sexual behaviors is high (Carey et al., 2001; Weinhardt et al., 1998). The TLFB **approach** is commonly used to assess the frequencies of substance use in clinical trials and other research protocols but much less used in the assessment of HIV risk behavior. While TLFB approaches to the collection of retrospective self-report data can provide more accurate information, it requires additional time and resources for interviewer training, administration time, and scoring. The increased demand on staff resources (time and effort) associated with this approach is likely one of the reasons why the most commonly used measures of HIV risk behavior – the HIV Risk-Taking Behavior Scale (Ward et al., 1990), the Risk Assessment Battery (Metzger et al., 1993), and the Risk Behavior Assessment (NIDA, 1991) – do not use a TLFB interview procedure.

The present study compares self-reported IDU and sexual behaviors collected via two versions of the HIV Risk Questionnaire (HRQ): the standard questionnaire (HRQ-Standard) versus HRQ-TLFB (Brooner et al., 1993). Studies have established that the HRQ-TLFB has sound psychometric properties (Brooner et al., 1993; Greenfield et al., 1995), but the utility of the HRQ-Standard has not been directly compared to the HRQ-TLFB. The present study compares IDU and SRB data collected via these two versions (i.e., standard administration versus TLFB) of the HRQ in a sample of injection drug users. This report also includes a discussion of the relative costs and benefits of each method in measuring HIV risk behaviors, and presents several circumstances for selecting one versus the other administration approach in clinical and research settings.

2.0 Materials and Methods

2.1 Participants

Participants were a convenience sample of 127 active injection drug users not currently in treatment who were enrolled in a variety of residential-based clinical pharmacology studies related to substance use and abuse at the Johns Hopkins Behavioral Pharmacology Research Unit in Baltimore. All participants were recruited for their respective primary study using community newspaper advertisements and chain-referral techniques, and agreed to enroll in the present sub-study prior to discharge from the residential unit. Participants ranged in age from 19 to 49 years ($M = 37 + 6.2$), were predominantly male (81%), African-American (86%), unemployed (80%), and never married (68%). They reported spending approximately \$32 per month on alcohol and \$350 per month on drugs. On average, this out-of-treatment drug using sample reported fewer than two lifetime episodes of alcohol treatment ($M = 1.6 \pm 2.4$) and less than one lifetime episode of drug treatment ($M = 0.2 \pm 0.7$). Drug use characteristics for the sample are reported in Table 1. All participants provided a medical history and received a physical examination required by their enrollment in the parent study. The eligibility criteria for enrollment in the parent studies included: a history of regular drug use, no major medical or psychiatric illnesses, and no prescribed medications. The present study was approved by the Institutional Review Board and each participant provided informed written consent.

2.2 Measures

HIV Risk Questionnaire (HRQ)—The HRQ -Standard is an individually administered, eight-item structured interview that measures self-reported HIV risk behaviors within the past 30 days in two domains: 1) IDU and needle sharing, and 2) sexual behaviors (Brooner et al., 1993; Greenfield et al., 1995). Specifically, the risk behaviors items measure: intravenous drug use, sharing of injection equipment, sharing of needles/syringes, number of people with whom the participants shared any injection equipment or had any sexual activity, including anal intercourse, number of sex partners, and percent of condom use. The HRQ-Standard interview asked participants to report the frequencies of each of the high risk behaviors over the past 30-days, without the aid of any of the recall enhancing procedures employed in the time-line procedure. The HRQ-TLFB version of the assessment included the same risk behavior items but incorporated a structured time-line follow-back administration procedure to improve recall of the frequencies of the behaviors.

Addiction Severity Index, 5th Edition (ASI)—The ASI (McLellan et al., 1992) was used in the present study to obtain basic demographic characteristics of the sample and supplemental baseline data on lifetime and past-month use of alcohol and drugs, money spent on alcohol and drugs in the past 30 day, and lifetime alcohol and drug treatment episodes.

2.3 Procedure

Study enrollment and data collection began on day four following their admission to the residential research unit. The two HRQ's employed different administration procedures (Standard versus TLFB). The HRQ-Standard administration procedure involved interviewers reading each item to participants and asking them to report the *total* number of times, different people, or percentages included in the specific risk behavior question(s) "over the past 30-days" (the 30-days prior to the interview). In contrast, the HRQ-TLFB version of the HRQ employed a highly structured interview that included standard timeline followback strategies and event probes to improve the recall of retrospective self-reported events (i.e., risk behaviors). The HRQ-TLFB version of this risk behavior assessment has been described in previous reports (Greenfield et al., 1995; King et al., 1994) and is summarized here.

The two versions of the HIV Risk Questionnaire (HRQ-Standard and HRQ-TLFB) and the ASI were administered by one of four trained interviewers. All participants completed the assessments in the same order: 1) the HRQ-Standard assessment, 2) the ASI, and 3) the HRQ-TLFB assessment. The HRQ-Standard was always administered first to minimize carry-over effects of one to the other risk behavior interview. The Addiction Severity Index administered following the HRQ-Standard interview in order to provide a minimum of a 35 to 45 minute interval between the first and second administration of the risk questionnaires. Several scheduling limitations increased the time interval between the first and second administration of the HIV risk behavior interviews. A total of eight cases had more than a one hour interval between the first and second administration of the HIV risk measures: 1 day for five cases, 2 days for two cases, and 3 days in one case (n=8). Data were initially analyzed both with and without these 8 cases and had no discernable effect on the pattern of findings. For this reason, analyses utilizing the full sample (including the 8 cases) are presented.

The different administration strategies produced a modest difference (2-days) in the number of days that data were collected and analyzed (HRQ-Standard: always 30-days; the HRQ-TLFB: always 28-days, the sum of the 4 standard weeks). The number of days data was collected in the HRQ-Standard procedure was always the 30-days prior to the interview. For TLFB version, the number of days included in the analyses was always 28-days (the 4 standard weeks prior to the interview). The HRQ-TLFB collected data beginning with the day prior to the interview and used the timeline followback procedures and calendar-linked event probes to work backward in time, on a day-by-day basis, until data was obtained for the *first standard week* (Monday through Sunday). Data for this standard week was summarized and used by interviewers to collect data for the second, third, and fourth standard weeks, always moving back in time. Using this timeline approach, some data collected in determining the first time period to summarize the standard week were excluded from data analyses in this report (Range: 0 to 6, Mean Days: 3.3, SD = 2.1). For example, if participants were initially interviewed on a Friday, the data collected for the first Saturday and Sunday were excluded from the first standard week, leaving data constituting the standard week (Monday through Sunday).

2.4 Data Analysis

Both versions of the HRQ provided data for each of the eight HIV risk behaviors. A base 10 logarithmic transformation of the HRQ scores was performed to normalize the distribution of data and improve detection of small differences. All parametric analyses were performed on the log-transformed data. Exact agreement in reported frequency between the two versions of the HRQ was calculated as a percent for each answer pair. To correct for chance agreement, the intraclass correlation coefficient (ICC) was calculated to compare frequencies reported with both measures. The ICC does not make specific assumptions regarding the distribution of data. For two of the items (IDU and any sex), there was adequate variance in score distributions to use parametric measures. For these items, Pearson product-moment correlations were used to calculate the simple bivariate relationship between HRQ-TLFB and HRQ-Standard scores, and paired-sample t-tests were used to determine whether these scores differed significantly. For all other items, Spearman-rank correlations and Wilcoxon matched-pairs signed-ranks tests were calculated.

3.0 Results

3.1 Comparison of Mean Scores on Risk Questionnaires

Mean scores for each item on both versions of the HRQ are presented in Table 2. Overall, participants reported more HIV risk behavior on the HRQ-TLFB than the HRQ-Standard. Two of the items (20%) were significantly different at the $p < .05$ level (number of times sharing any injection equipment and frequency of condom use during any sexual activity, with the

TLFB procedure producing higher frequencies of these retrospectively self-reported behaviors. For example, participants reported approximately three times more episodes of injection equipment sharing on the HRQ-TLFB than on the HRQ-Standard (4.6 ± 19.5 vs. 1.5 ± 6.2 ; $T(126) = 2.15, p < .05$). For all other items, participants reported similar frequencies of HIV risk behaviors on each version of the HRQ.

3.2 Agreement between Risk Assessment Measures

Exact agreement between HRQ administrations ranged from 35% to 95% across the eight HRQ answer pairs, with a mean of 79% agreement (Table 2). Intraclass correlations were also broad in range (from .20 to .95). Despite a significant difference in the frequency of condom use reported via the two methods, responses generated by either method were highly correlated ($ICC = .95, p < .01$). Conversely, “Number of times shared IDU equipment” and “Number of times shared needles/syringes” were weakly and nonsignificantly correlated with ICCs of .30 and .20 respectively ($.05 < ps < .10$). Intraclass correlations for the remaining answer pairs were all statistically significant. Further, all interclass correlations (with subject effects random and test effects fixed) were strong, ranging from .65 to .98 (all $p < .001$), indicating a high level of shared variance between the HRQ-TLFB and HRQ-Standard.

Due to a high rate of zero-occurrence reporting, a positive response analysis (with zero responses omitted) was conducted to reassess the level of agreement and magnitude of differences between HRQ-TLFB and HRQ-Standard. There was no difference in the pattern of results. Data were also reanalyzed to assess if there was any effect of interviewer on the HRQ scores. Again, no significant differences were observed across the four interviewers (thus interclass correlations presented in Table 2 ignore rater effects).

4.0 Discussion

The present study produced important and somewhat divergent findings. Overall, the two administration procedure of the HRQ produced largely comparable data with good to excellent inter- and intraclass correlation coefficients. At the same time, the TLFB procedure was associated with significantly greater self-reported risk behavior for two of the items (sharing any drug injection equipment and frequency of condom use during sexual activity), both of which constitute basic and important behavioral indexes of HIV transmission risks. Reliable and valid assessment of injection drug use and sexual behaviors is central to estimating the transmission risk of HIV and other blood-borne infectious diseases, and to evaluating the efficacy of substance abuse treatment and other more specific HIV prevention interventions. Findings from the study and its major implications for the field are discussed below.

4.1 Similarities and Differences in Frequencies of Self-Reported Risk Behaviors

The fact that the HRQ-Standard assessment method produced estimates of risk behavior very similar to those obtained using the more time consuming TLFB administration procedure deserves comment. It is impressive that the briefer interview approach produced data comparable to the TLFB method on most (80%) of the risk behavior domains. In general, this finding is consistent with prior research showing that other brief measures of cigarette, alcohol, and drug use correlate highly with estimates of the same behaviors collected using TLFB assessment procedures (Fals-Stewart et al., 2000; Gariti et al., 1998; Sobell et al., 2003).

While the differences between administration procedures favoring the TLFB approach were modest in number (only 2 items), each of these behaviors are important summary indexes of HIV transmission risks (sharing of any drug injection equipment and frequency of condom use). For this reason, these differences are likewise worthy of some discussion. The modest findings favoring the TLFB approach are consistent with the view that this approach is

associated with improved recall of retrospective self-reported behavior, including drug use and sexual activity (Carey et al., 2001; Greenfield et al., 1995; Hersh et al., 1999; Weinhardt et al., 1998; Maisto et al., 2008). Also noteworthy is the fact that some studies have reported findings opposite to ours. For example, two studies (Carey et al., 2001; Midanik et al., 1998) found that more participants reported *lower* frequencies of sexual behaviors using a TLFB assessment procedure compared to brief single item measures that did not use a timeline or event probes to facilitate recall of past behavior. Both of these studies, however, varied considerably from the present report with respect to sample, setting, and outcomes measures; differences that individually or combined might contribute to the discrepant findings.

4.2 Implications of Findings

These findings have both practical and important implications for treatment providers and programs, epidemiological and treatment researchers, and both local and national household surveys. Foremost among these is the fact that the present findings argue that a choice can be made for using one or the other assessment procedures depending on purpose for collecting the data. The importance of this choice is best revealed by the notable difference in the amount of time and effort each procedure requires to collect the information (staff training, administration time). The HRQ-Standard assessment procedure required substantially less interviewer training time and effort, and took an average of 6 minutes to administer, compared to about 30 minutes for the HRQ-TLFB approach.

While the HRQ-TLFB version was associated with increased reporting rates of one drug use and one sexual risk behavior category, this benefit must be weighed against the additional costs in staff training and instrument administration time incurred in using the TLFB version. The increased detection of risk behavior associated with the more time-intensive approach might be particularly valuable when HIV risk behavior is a central focus, for example, in studies specifically designed to determine the magnitude of risk behavior in a population and the extent of risk behavior change in response to one or more interventions. An additional advantage of the HRQ-TLFB version is that it provides more detail about the frequency of different types of drugs injected, types of sexual behaviors performed, and condom use during each type of sexual behavior. This information might be valuable in future studies designed to improve our understanding of the patterns of drug use and SRB, including event-level analyses examining the concordance of these behaviors.

In contrast, the HRQ-Standard measure might provide sufficient data when the goal is to obtain a good estimate of risk behavior as part of a broader focus on one or more other measures. For example, it could be useful as a screening tool for selecting persons for HIV risk reduction programs, when research in HIV risk behavior is not the primary outcome of interest, but possibly a predictor variable or covariate, as a brief index of risk behavior in substance abuse treatment settings, and an efficient and effective way to broaden coverage of this issue in national household surveys of health-related practices and problems.

4.3 Study Limitations

The results of this study must be interpreted in the context of some limitations. First, results relied on participants' self-report, a type of data that are inherently vulnerable to reporting errors and biases. However, self-report data is a standard measure for assessing HIV risk behavior. Another potential limitation results from the decision to always administer the TLFB assessment first rather than the HRQ Standard measure, or alternatively, counterbalancing their order of administration. This decision was based on the concern that the much more structured and detailed TLFB assessment would lead to greater carryover to the HRQ Standard assessment than the opposite order, and that this effect would not be offset by counterbalancing the

administration of the two assessment methods. The absence of any pilot data supporting this concern is a weakness in the report.

The generalizability of these findings may also be somewhat limited by the characteristics of the sample – an urban, low-income, and out-of-treatment injection drug users volunteering for participation in residential-based behavioral pharmacology studies. For example, results from this study may not generalize well to injection drug users seeking substance abuse treatment. However, a prior study that compared the characteristics of opioid-dependent treatment seeking patients to non-treatment seeking drug users enrolling in behavioral pharmacology studies in BPRU, where the present study was conducted, reported far more similarities than difference between the two samples on a wide range of demographic clinical variables and personality traits; hence, the generalizability of the present findings to samples of opioid users seeking treatment may be within acceptable limits.

4.4 Conclusion

The present study reveals important similarities and differences in the interview procedure used in the collection of HIV risk behavior. While the briefer and more commonly used interview approach in the collection of HIV risk behavior produced data more similar than different to the timeline followback interview procedures, important differences were observed on two basic indexes of drug use and sexual risk behavior risk that favored the TLFB interview method. The overall pattern of findings suggests that each of these interview approaches are reasonable choices, depending on the primary reason(s) for obtaining estimates of behavior associated with transmission of HIV and other blood-borne infectious diseases. The TLFB is a well-established methodology for the retrospective assessment of HIV risk behavior and is a good choice when quantitative precision and accuracy in the measurement of these behaviors is the primary focus of investigation. In situations where the major focus of work is on something other than HIV risk behavior, the HRQ-Standard measure appears to be a good choice.

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Table 1

Lifetime and past month estimates of self-reported drug use

Mean Days of Use by Categories of Substances *	M ± SD
Days of Alcohol use in past 30 days	7.28 ± 8.19
Alcohol lifetime regular use (months)	97.23 ± 90.87
Days of Heroin use in past 30 days	8.07 ± 10.07
Heroin lifetime regular use (months)	69.32 ± 83.95
Days of Benzodiazepine use in past 30 days	1.13 ± 3.71
Benzodiazepine lifetime regular use (months)	13.17 ± 35.76
Days of Cocaine use in past 30 days	13.77 ± 10.20
Cocaine lifetime regular use (months)	78.03 ± 57.84
Days of Polysubstance use in past 30 days	11.21 ± 9.03
Polysubstance lifetime regular use (months)	118.86 ± 78.58

* Data from ASI (fifth edition) drug use matrix. Total days of drug use in past month cannot be determined from this matrix because days of use reported in any one category can overlap with the days of use reported in one or more of the other categories.

Table 2

Comparison of frequencies estimates of risk behavior using the standard versus the time-line, follow-back administration procedure of the HIV Risk Questionnaire (N=127)

HIV risk behavior item	HRQ-TLFB	HRQ-Standard	Group comparisons ^I	Exact agreement	Intraclass correlation	Interclass correlation
Number of times (M ± SD):						
Injected any drug	15.45 ± 29.60	15.61 ± 32.24	$a_T = -0.26$	56%	ICC = .68**	$c_T = .97^{***}$
Shared IDU equipment	4.59 ± 19.46	1.50 ± 6.18	$b_T = -2.15^*$	85%	ICC = .30	$d_{TS} = .84^{***}$
Shared needles/syringes	1.81 ± 13.48	0.73 ± 5.47	$b_T = -0.14$	94%	ICC = .20	$d_{TS} = .73^{***}$
Had any sex	12.03 ± 17.82	8.56 ± 10.13	$a_T = 1.73$	35%	ICC = .61**	$c_T = .92^{***}$
Had anal sex	0.19 ± 1.08	0.17 ± 1.01	$b_T = -0.32$	95%	ICC = .59*	$d_{TS} = .65^{***}$
Number of people (M ± SD):						
Shared IDU equipment	0.31 ± 0.83	0.25 ± 0.73	$b_T = -1.34$	92%	ICC = .43*	$d_{TS} = .86^{***}$
Had sex	1.16 ± 1.23	1.19 ± 1.06	$b_T = -0.66$	86%	ICC = .81**	$d_{TS} = .96^{***}$
Had any unprotected sex (%):	57	53	$b_T = -2.50^*$	87%	ICC = .95**	$d_{TS} = .98^{***}$
Condom use (%):						
N/A (abstinent)	25	24	--	--	--	--
All the time	18	23	--	--	--	--
More than half the time	12	10	--	--	--	--
Less than half the time	11	11	--	--	--	--
None of the time	34	32	--	--	--	--

* $p < .05$,

** $p < .01$

^I Group comparisons assessed differences between measures with respect to frequency of behavior reported, number of persons with whom participant engaged in HIV high-risk behavior, and the proportion of the time condoms were used during sexual activity.

^a Paired-sample t-test (t)

^b Wilcoxon matched-pairs signed-ranks test (T)

^c Pearson product-moment correlation (r)

^d Spearman correlation (r_s)