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A single question to examine the prevalence and protective effect of seroadaptive strategies among men who have sex with men

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Abstract

Background—Seroadaptive behaviors among men who have sex with men (MSM) are common but ascertaining behavioral information is challenging in clinical settings. To address this, we developed a single seroadaptive behaviors question.

Methods—MSM aged ≥18 attending an STD clinic in Seattle, Washington, 2013–2015 were eligible for this cross-sectional study. Respondents completed a comprehensive seroadaptive behaviors questionnaire which included a single question that asked HIV-negative MSM to indicate which of 12 strategies they used in the past year to reduce their HIV risk. HIV testing was performed per routine clinical care. We used the kappa statistic to examine agreement between the comprehensive questionnaire and the single question.

Results—We enrolled HIV-negative MSM at 3,341 (55%) of 6,105 eligible visits. The agreement between the full questionnaire and single question for five behaviors was fair to moderate (kappa values of 0.34 to 0.59). From the single question, the most commonly reported behaviors were: avoiding sex with HIV-positive (66%) or unknown-status (52%) men and using condoms with unknown-status partners (53%); 8% of men reported no seroadaptive behavior. Men tested newly HIV positive at 38 (1.4%) of 2,741 visits. HIV test positivity for the most commonly reported behaviors ranged from 0.8%–1.3%. Men reporting no seroadaptive strategy had a significantly higher HIV test positivity (3.5%) compared to men who reported at least one strategy (1.3%; P=0.02).

Conclusions—The single question performed relatively well against a comprehensive seroadaptive behaviors assessment and may be useful in clinical settings to identify men at greatest risk of HIV.

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CONFLICTS OF INTEREST

All other authors declare that they have no conflict of interest.

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Keywords

men who have sex with men; risk factors; sexual behavior; surveys and questionnaires; condoms; HIV

INTRODUCTION

For at least the last 25 years, many men who have sex with men (MSM) have adopted sexual behaviors based on their partners' perceived HIV status to reduce the risk of HIV acquisition or transmission. These "seroadaptive behaviors", such as serosorting (i.e., selecting partners based on HIV status), are associated with a lower risk of HIV than condomless anal intercourse (CAI) with HIV-positive/unknown-status partners but a higher risk of HIV than consistent condom use.[1–5]

Over the last decade, as part of routine medical care in the Public Health – Seattle & King County (PHSKC) STD clinic, we have collected information from MSM on partner HIV status, condom use and sexual role, and used those data to infer seroadaptive behaviors. However, this approach does not capture information about the intentionality of behaviors or incorporate information about partner pre-exposure prophylaxis (PrEP) or antiretroviral therapy (ART) use, new factors that may influence sexual decision-making among MSM. Similar data collection to ours, which is relatively complex and somewhat time consuming, has not been widely adopted in other clinical settings. As a result, most seroadaptive behavior data have been obtained in the context of research studies that employed detailed sexual behavior questionnaires. These assessments, though informative, are often too long to incorporate into a routine clinical care or HIV testing visit or as part of standard HIV/STD partner services interviews. The National HIV Behavioral Surveillance (NHBS) survey has provided national estimates of seroadaptive behaviors[6] but data from NHBS are limited to MSM from large metropolitan statistical areas with a high burden of AIDS. Consequently, we do not have reliable estimates of the prevalence of seroadaptive behaviors or their association with HIV from diverse clinical or population-based samples of MSM.

To address this, we developed a single, seroadaptive behaviors question to ascertain which strategies HIV-negative MSM employ to reduce their risk of HIV. The goal of this single-question assessment was to develop a standard seroadaptive behaviors measurement tool to be implemented in a variety of settings, which could serve as a screening tool to identify men at highest risk for HIV. There were two objectives for this study. First, we compared the agreement of the single question to a full seroadaptive behaviors survey to ascertain the reliability of the single question. Second, using data from the single question, we assessed the prevalence of seroadaptive behaviors and their association with testing newly HIV positive.

MATERIALS AND METHODS

Study design and population

We conducted a cross-sectional study of MSM attending the PHSKC STD clinic from February 2013 – June 2015. We have previously described the recruitment and enrollment

procedures for this study.[7] Briefly, all patients presenting to the PHSKC STD clinic for a new problem visit are asked to complete a clinical computer-assisted self-interview (clinical CASI) which includes information on sexual behaviors. Men who reported in the clinical CASI that they had ≥1 male sex partner in the past 12 months were eligible. Participants completed a 10-minute research CASI that asked which seroadaptive behaviors they employed in the prior 12 months. Men enrolled during the first 6 weeks of recruitment were paid $5 for their participation; this increased to $10 thereafter. Men could participate in the study more than once. Study procedures were reviewed and approved by the University of Washington Institutional Review Board. All men provided informed consent prior to their participation.

Data collection and measures

The HIV status that men self-reported in the routine non-research clinical CASI was used to determine which questions men were asked in the research CASI. Men who did not know their HIV status were considered to be HIV-negative for this study.

In the research CASI, we asked men if their decision to select partners, use condoms, or adopt a sexual role was based on their partners' HIV status. The preamble to the survey indicated that all questions referred to behaviors adopted by the respondent to reduce his risk of acquiring or transmitting HIV. Questions were stratified by partnership type (main versus casual) and partner HIV status. For example, "*In the past 12 months, how often did you top an HIV-positive casual partner instead of bottom him* ***because*** *he was HIV-positive?*" This survey, henceforth referred to as the "full battery" of seroadaptive behaviors, has been previously described.[8]

The single seroadaptive behavior question was the final question of the research CASI and was asked of HIV-negative respondents only. We asked, "Which of the following best describes what you did in the last 12 months to reduce your risk of getting HIV?" There were 13 response options (including "None of these"), which are delineated in Table 3. The two behaviors related to PrEP or partner ART use were not included as response options until February 2015. This was a "check all that apply" question so men could report engaging in more than one behavior in the past 12 months.

HIV testing

HIV testing for research participants was performed if clinically indicated. This testing occurred during the participant's clinic visit, which occurred after the participant completed the research survey. We extracted this HIV test result from participants' clinic records to determine which participants tested newly HIV positive. Our clinic recommends both rapid and laboratory HIV testing for MSM. Clinic staff performed rapid tests using the INSTI HIV-1/HIV2 Antibody Test on whole blood (bioLytical Laboratories, Richmond, British Columbia) and our laboratory tested for HIV using a third-generation enzyme-linked immunosorbent assay (EIA) (Genetic Systems HIV1/2 Plus O EIA, Biorad Laboratories, Redmond, Washington). MSM with a negative HIV EIA were tested using pooled HIV RNA testing.[9]

Statistical analysis

The study sample includes only HIV-negative MSM and the unit of analysis is the clinic visit.

Comparison of full battery and single question—We compared the full battery of seroadaptive behaviors and the single question for five behaviors: (1) avoiding HIV-positive/unknown-status partners; (2) using condoms with HIV-positive/unknown-status partners; (3) having only insertive anal sex with HIV-positive/unknown-status partners; (4) having only oral sex or engaging in mutual masturbation (no anal sex) with HIV-positive/unknown-status partners; and (5) using condoms with all partners. This analysis was limited to men who had complete data for each behavior from both the full battery and single question. To directly compare the full battery and single question we collapsed partnership-type data from the full battery (i.e., if a respondent engaged in a behavior with a main or casual partner, they were considered to have engaged in the behavior). For both the full battery and the single question, we combined behaviors with HIV-positive and unknown-status partners into single categories. For example, men who reported in the full questionnaire that they topped an HIV-positive and/or an unknown-status partner and who reported in the single question that they topped an HIV-positive partner and/or an unknown-status partner (i.e., they checked both boxes in the single question) would be in agreement for that specific behavior. We used Cohen's kappa statistic to measure the agreement between the two assessments and qualitatively classified agreement as slight (0.0–0.20), fair (0.21–0.40), moderate (0.41–0.60), substantial (0.61–0.80) and almost perfect (0.81–1.00).[10]

Prevalence and HIV test positivity of behaviors reported in single question—We present the prevalence of seroadaptive behaviors from the single question and the proportion of men testing newly HIV positive by behavior. We used Fisher's exact test to compare the HIV test positivity of men who reported no seroadaptive behavior to men who reported at least one. We used chi-square tests for categorical variables and t-tests for continuous variables to compare characteristics of men who reported no serodapative behaviors to men who reported at least one.

In additional analyses, we excluded from our analytic sample visits where men reported only one partner in the past 12 months, since those men may report different seroadaptive behaviors than men with at least 2 partners within 12 months. All analyses were completed using StataSE Version 13.0 (College Station, Texas).

RESULTS

From February 2013 to June 2015, we enrolled HIV-negative MSM at 3,341 (55%) of 6,105 eligible visits, representing 1,997 unique men. Of 3,341 visits, 59 (1.8%) were by men who reported their HIV status as unknown. Approximately half of visits were by men who were <30 years old and nearly two-thirds were by white, non-Hispanic men (Table 1). At 91% of visits, men reported that they had ≥1 male sex partner in the past year. The percent of men testing newly HIV positive was 1.4%.

Comparison of full battery and single question

The prevalence of behaviors in the full battery versus the single question is presented in Table 2. Based on kappa values, the agreement between the fully battery and single question was highest for consistent condom use (moderate agreement) and lowest for using condoms with HIV-positive/unknown-status partners (fair agreement).

Prevalence and HIV test positivity of behaviors reported in single question

Men provided data for the single question at 99.9% of visits (3,336 of 3,341). The median number of strategies reported in the past 12 months was 3 (interquartile range: 2–4), with 79.4% (2,650 of 3,336) reporting more than one strategy.

The most commonly endorsed strategy to reduce HIV risk was avoiding sex with HIV-positive men (Table 3). Approximately half of respondents reported that they avoided sex with unknown-status men or that they used condoms for anal sex with their unknown-status partners. At only 8% of visits men reported that they did not engage in any of the behaviors to reduce their HIV risk.

The percent of men testing newly HIV positive (of behaviors that were asked during the entire study period) ranged from 0.3% for exclusively oral sex or mutual masturbation with HIV-positive partners to 1.3% for avoiding sex with unknown-status men (Table 3). There were no men who reporting ART/PrEP-related behaviors who tested newly HIV positive, though the sample size for those categories was small. Men who reported no seroadaptive behavior had the highest risk of testing newly HIV positive (3.5%) which was a statistically significantly higher risk than men who reported at least one behavior (1.3%; P=0.02).

Our additional analyses limiting the analytic sample to the 2,888 visits where men reported at least two partners in the past 12 months did not differ appreciably from our primary findings.

Compared to men who reported at least one seroadaptive strategy (N=3,084), men who reported no seroadaptive strategy (N=252) were slightly less likely to be white, non-Hispanic (59.1% vs. 64.1%; P=0.02) but were of similar age (mean age 33.3 vs. 34.0; P=0.32). These men were significantly more likely to report methamphetamine use in the past 12 months (23.8% vs. 10.0%; P<0.001) and reported a slightly higher median number of sex partners (6 vs. 5) compared to men who reported at least one seroadaptive behavior, but were similarly likely to be tested for HIV in the past year (80.0% vs. 81.4%; P=0.60).

DISCUSSION

In this clinic-based population of HIV-negative MSM, we found that our single seroadaptive behaviors question performed relatively well against a longer and more comprehensive seroadaptive behaviors assessment. Results from the single question suggest that a variety of seroadaptive behaviors are common and that most men engage in several behaviors to reduce their risk of HIV. Though the HIV test positivity for the most commonly reported behaviors did not vary greatly (from 0.9% to 1.3%), the HIV test positivity was nearly three times higher (3.5%) for the subset of men who reported no seroadaptive behaviors in the past 12

months. These findings suggest that this single-question assessment is a reliable tool that could be employed in a variety of settings to identify men at greatest risk for HIV.

The single question may be an appropriate replacement for larger seroadaptive behavior assessments in settings where the implementation of long behavioral surveys is not feasible. In our comparison of five seroadaptive behaviors, the prevalence of behaviors varied only somewhat between the full battery and single question and the agreement was fair to moderate, with kappa values ranging from 0.34 to 0.59. Due to the absence of a gold standard seroadaptive behaviors assessment, it is unclear whether the full battery or single question is more accurate, and thus the motivation for implementing a seroadaptive behaviors assessment should drive which one is used. On the one hand, a full battery of seroadaptive behavior questions has the benefit of querying men about behaviors by partner type (main vs. casual) and other partner characteristics (e.g., age, race, etc). Given that seroadaptive strategies may differ by partnership type, the collection of detailed partner data does have value.[11] On the other hand, collection of this detailed partner information is time consuming and may not be feasible or readily interpretable in some settings. In particular, in clinical settings a single question may be easier for clinicians to use as a source of information relevant to gauging patient risk, counseling, and prioritizing PrEP. Therefore, longer and more detailed surveys should still be considered in settings where they are feasible and appropriate to implement. But short assessments may be equally suitable in situations where brevity is paramount.

Considering that the HIV test positivity in our study population did not vary greatly for behaviors reported by more than a quarter of our study population (from 0.8% to 1.3%), it is striking that men who reported no seroadaptive behaviors in the past 12 months had an HIV test positivity that was three times higher than any other behavior. It is possible that these men used other HIV prevention strategies not listed in the single question or there were other factors that put these men at high risk for HIV. Notably, nearly one-quarter of these men reported methamphetamine use in the past year compared to 10% among men who reported at least one seroadaptive behavior. There are two important implications for this finding. First, this brief assessment could be used as a screening tool to identify men who are at greatest risk for HIV and may be ideal candidates for PrEP. Health jurisdictions working to develop local PrEP implementation guidelines may consider including (as a criterion) men who do not report any seroadaptive strategies. Second, at least in our population, engaging in any seroadaptive behavior is preferable to engaging in none. We believe that clinicians and others working in prevention should continue to emphasize that condoms are the best low cost, broadly protective HIV prevention strategy for persons outside of long-term, mutually monogamous relationships. However, for persons who do not consistently use condoms, a more flexible and often more realistic approach is to encourage men to adopt an HIV prevention strategy that includes any one of a number of behaviors.

Based on our findings, we recognize two opportunities where a brief seroadaptive behaviors assessment may be particularly useful. First, this tool can be employed for sentinel behavioral surveillance. Data from the U.S., Australia and Canada suggest that partner viral load and PrEP use may impact sexual decision-making among MSM[12–14], but the trends in these behaviors have not been routinely monitored. Use of a brief behavioral assessment in

the same population over time will help to understand what behaviors these newer ones (i.e., behaviors while on PrEP) are replacing and may also help explain changes in population-level HIV and STI rates. Second, brief seroadaptive behavior assessments may be most valuable in geographically- and racially-diverse settings of MSM where estimates of the prevalence and protective effect of seroadaptive behaviors are limited. Black MSM and MSM residing in the Southern U.S. represent those at greatest risk for HIV infection[15,16] but only a handful of studies have measured seroadaptive behaviors among black MSM[17–21], the majority of which did not include black men residing in the South. Although racial disparities in HIV risk[22,23] have not been attributed to individual risk behaviors[24–27], it is possible that black MSM in the South do not engage in seroadaptive behaviors at the same frequency as white MSM and/or that seroadaptive behaviors do not confer the same protective efficacy for black MSM as they do for white MSM. This may be true of serosorting[17,25], though it is unclear if this is the case for other seroadaptive behaviors or, if differences do exist, whether they factor into racial disparities in HIV incidence. The dearth of information on the topic motivates the use of an easily-implementable behavioral assessment to explore this hypothesis.

This study has a number of strengths. We developed a short, easily-modifiable, seroadaptive behaviors assessment that can be used in clinical and population-based settings. We enrolled a large sample of MSM to examine the question's reliability and to estimate the prevalence and protective effect of a variety of behaviors. There are also several important limitations. First, the single question appeared at the end of the full battery and it is possible that men were "primed" to answer it (i.e., after having been asked a series of seroadaptive behavior questions). It is unclear how our results would differ if the single question was asked first or in isolation of the full battery. Second, there is no gold standard seroadaptive behaviors measurement, so an examination of the validity of our single question is not possible. However, the fact that persons reporting no seroadaptive behavior were at highest risk for HIV argues that our question had some validity. Third, these data are subject to recall bias since participants were asked about behaviors in the past year. However, the same recall period was used for both the full battery and single question so any potential recall bias would not likely have affected the agreement analysis, though it may have affected the prevalence estimates. Fourth, the absolute number of men who tested newly HIV positive was small and thus estimates of the proportion of men testing newly HIV positivity by behavior were often based on <10 events. Finally, this was a population of clinic-based, predominately white, frequently HIV-tested MSM in Seattle where HIV status disclosure was high. As noted above, seroadaptive behavior estimates from more geographically- and racially/ethnically diverse populations may differ greatly from those obtained here.

In conclusion, using a single-question seroadaptive behaviors assessment, we found that a variety of seroadaptive behaviors were common and that men who reported no seroadaptive behavior were at high risk for HIV. The simplicity of the single question facilitates its use in a variety of settings to gather more comprehensive seroadaptive behaviors data from populations that have historically been excluded from previous behavioral estimates. Our single-question assessment has already been used in clinical settings and as part of population-based surveys of MSM. Expanding the use of this assessment will allow us to gather a defined core set of behavioral indicators among a variety of MSM populations over

time and in different geographic regions. This information can be used to identify the evolving behaviors MSM use to protect themselves and to assess the utility of this information in promoting HIV/STI prevention interventions.

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Table 1

Demographic and behavioral characteristics of HIV-negative MSM STD clinic respondents in a cross-sectional seroadaptive behaviors study 2013–2015, (N=3,341 visits)*

Characteristic	N	%
Age		
18–24	773	23.2
25–29	871	26.1
30–34	589	17.7
35–39	307	9.2
≥ 40	798	23.9
Race/ethnicity		
White, NH	2,122	63.7
Black, NH	247	7.4
Asian, Pacific Islander or Hawaiian, NH	290	8.7
Native American/Alaskan Native, NH	37	1.1
Other, NH	224	6.7
Hispanic	409	12.3
Had HIV test, past 12 months	2,423	81.5
Ever discloses HIV status to partner	3,105	96.2
Asks partner to disclose his HIV status	3,108	96.5
Methamphetamine use, past 12 months	370	11.1
Number of MSP past 12 months, median and IQR	6	3–12
Had >1 MSP, past 12 months	2,888	91.3
Tested newly HIV positive†	39	1.4

Abbreviations: IQR, interquartile range; MSP, male sex partner; NH, non-Hispanic

*Column values are number and percentage of visits by men with each characteristic. Column numbers may not sum to total due to missing values; proportions are calculated from a denominator that does not include missing data

†Of the 2,741 visits (82% of total) during which men tested for HIV

Table 2

Prevalence of behaviors and agreement between single summary question and full battery at STD clinic visits by HIV-negative MSM respondents, 2013–2015

Behavior[†]	Full battery: Prevalence	Single Question: Prevalence	Agreement	Kappa
	N (%)	N (%)	%	
Avoid HIV-positive or unknown status partners (N = 3,317)	2,987 (89.8)	2,468 (74.4)	79.7	0.34
Condoms with HIV-positive or unknown-status partners (N = 1,544)	1,155 (74.8)	971 (62.9)	72.0	0.36
Insertive sex with HIV-positive or unknown status partner (N = 1,532)	483 (31.5)	622 (40.6)	78.8	0.54
Only oral sex or mutual masturbation with HIV-positive or unknown status partner (N = 3,123)	806 (25.8)	960 (30.7)	77.4	0.44
Condoms with all partners (N = 2,909)	502 (17.3)	815 (28.0)	85.3	0.59

[†]Sample sizes vary for each behavior due to missing data

Table 3

Prevalence and HIV test positivity of behaviors at STD clinic visits by HIV-negative MSM patients as reported in the single summary question (N=3,336), 2013–2015

	Prevalence of behavior	Tested newly HIV positive
Behavior	**N (%)**	**n/N (%)***
Choosing Partners		
Avoided sex with HIV-positive men	2,188 (65.6)	18/1,822 (1.0)
Avoided sex with men of unknown HIV status	1,732 (51.9)	18/1,429 (1.3)
Condom Use		
Used condoms for anal sex with unknown-status partners	1,741 (52.2)	15/1,435 (1.1)
Use condoms for anal sex with HIV-positive partners	1,380 (41.4)	12/1,123 (1.1)
Used condoms for anal sex with all partners	966 (29.0)	6/795 (0.8)
Sexual Repertoire		
Topped unknown-status partners	915 (27.4)	6/765 (0.8)
Topped HIV-positive partners	899 (27.0)	7/748 (0.9)
Only had oral sex or mutual masturbation (no anal sex) with unknown-status partners	874 (26.2)	7/708 (1.0)
Topped all partners	646 (19.4)	2/544 (0.4)
Only had oral sex or mutual masturbation (no anal sex) with HIV-positive partners	411 (12.3)	1/343 (0.3)
ART/PrEP-related behaviors†		
Only had anal sex with HIV-positive partner if partners was taking HIV medicines and/or had undetectable viral load	74 (14.8)	0/57 (0.0)
Took PrEP	67 (13.4)	0/45 (0.0)
None of these	252 (7.6)	7/199 (3.5)

Abbreviations: ART, antiretroviral therapy; PrEP, pre-exposure prophylaxis

*n/N = number testing HIV positive (n) out of the number who tested for HIV (N)

†Data for these 2 categories were only collected for 5 months (categories were added in February 2015)