Disclosure of HIV serostatus and condomless sex among men living with HIV/AIDS in Florida

Christa L. Cook 1*, Stephanie A. S. Staras 2*, Zhi Zhou 3*, Natalie Chichetto 4*, Robert L. Cook 5*

1 Department of Nursing Systems, College of Nursing, University of Central Florida, Orlando, FL, United States of America, 2 Department of Health Outcomes and Biomedical Informatics, College of Medicine, University of Florida, Gainesville, FL, United States of America, 3 Department of Epidemiology, College of Medicine and College of Public Health and Health Professions, University of Florida, Gainesville, FL, United States of America, 4 Division of General Internal Medicine and Public Health, Vanderbilt University Medical Center, Nashville, TN, United States of America, 5 Department of Epidemiology, College of Medicine and College of Public Health and Health Professions, University of Florida, Gainesville, FL, United States of America

* These authors contributed equally to this work.
* christa.cook@ucf.edu

Abstract

Despite campaigns to increase safer sex practices, there are people living with HIV/AIDS (PLWH) who do not disclose their HIV status to sexual partners and engage in condomless sex. The purpose of this research was to: 1) describe factors associated with disclosure of HIV status to sexual partners; and 2) determine if disclosure and/or receipt of prevention counseling are independently associated with condomless sex. We used the Florida Medical Monitoring Project to analyze data from 376 HIV positive men with more than one sexual partner. Results indicated that 55% consistently disclosed their HIV status to sexual partners, 30% inconsistently disclosed, 15% did not disclose, and 48% reported any condomless sex. The odds of having condomless sex was 3.3 (CI = 1.5, 7.3) times greater in men who disclosed to all partners. Results suggest that men who disclose are also those who are more likely to have condomless sex. More research is needed to better understand the complex nature of disclosure and sexual risk behaviors and how disclosure impacts sexual risk.

Introduction

Despite worldwide campaigns to increase safer sex practices, some people living with HIV/AIDS (PLWH) fail to disclose their HIV status and engage in condomless sex with partners who are HIV negative, potentially leading to increased rates of disease transmission. In recent years, 24 states have made failure to disclose a positive HIV status to a sexual partner a criminal offense.[1] There is a general agreement these laws should be re-evaluated since there insufficient evidence that they are effective, they may lead to increased stigma, and they potentially interfere with prevention efforts such as partner notification.[1] In Florida specifically, it is a third-degree felony with up to 5 years in prison and/or a $5000 fine if someone living with HIV does not disclose their status to sexual partners.[2] For the potential partner, knowledge of the person’s HIV status could play a critical role in making informed decisions about sexual
practices, such as the use of condoms or pre-exposure prophylaxis [PrEP] that can drastically reduce the rate of transmission in serodiscordant relationships.[3] Furthermore, mathematical modeling indicates a 38% to 61% reduced risk of HIV transmission when PLWH disclose their status to potential sexual partners.[4] Even though disclosure brings about the potential to decrease the risk of disease transmission through increasing protective measures, the social consequences are less straightforward, and researchers have reported inconsistent findings on the factors associated with disclosure, or the effects of disclosure on rates of risky sexual behavior and disease transmission.[5–18]

Many PLWH state that they fail to disclose their positive HIV status because they fear rejection and stigmatization by others.[19] This fear may explain the wide variation in the proportion of PLWH who disclose their HIV status: disclosure to all partners ranges from 23%-93%, disclosure to some partners and not others ranges from 31%-38%, and disclosure to no partners ranges from 22%-47%.[4–7,11,13,15,20–22] However, other, less studied factors that may be associated with disclosure include HIV clinical status (time living with HIV, CD4+ T-cell count, HIV viral load), sociodemographic factors (race, poverty, education), substance abuse and mental health symptoms, HIV knowledge, and counseling programs.[6,16,18,20,22–31]

Significantly, several predictors of disclosure are modifiable and can be targeted by public health researchers who seek to develop risk prevention interventions.

Most studies of disclosure have focused on populations recruited from clinical trials. Surveillance data may be more representative of the general population. Thus, in this study, we use supplementary surveillance data, which can provide a representative population-based sample, to understand the contextual factors that may be associated with the relationship between disclosure and condomless sex. Therefore, the purpose of this research is to: 1) describe factors, including sociodemographic characteristics, clinical and health status factors, sexual risk behaviors, and receipt of prevention counseling, that are associated with disclosure of HIV status to sexual partners; and 2) determine if disclosure and/or receipt of prevention counseling are independently associated with condomless sex among sexually active men living with HIV.

Methods

Study sample and data collection
The Centers for Disease Control and Prevention fund and coordinate the Medical Monitoring Project (MMP), a national supplemental surveillance project for PLWH. The MMP uses a multi-stage sampling design with the goal of selecting a sample with equal probabilities of selection to the entire HIV/AIDS population receiving care in the United States.[32] MMP participants recruited for surveillance are diagnosed with HIV, 18 years old or older, and enrolled in care at a sampled facility. For this study, we used 5-years of data (2009–2013) from the MMP completed in Florida, which ranks second in the nation in newly diagnosed HIV cases and first in age-adjusted mortality from HIV/AIDS.[33,34] We limited the analytic sample to men who were sexually active in the past year and had 2 or more sexual partners because the US epidemic has disproportionately impacted men,[35] and previous research has shown that men with multiple sexual partners are less likely to disclose their HIV status.[20,36] Furthermore, including persons with only one partner could bias our analyses because they would have a different number of possible “disclosure” category options than those with multiple partners, as noted below. Participants who were newly diagnosed in the past year were excluded. Of the 2078 MMP participants, 791 (38%) were sexually active in the past 12 months, and 430 (21%) had multiple sexual partners. After excluding participants identifying as women or transgender and participants who were diagnosed in the same year as the data were collected, data from a total of 376 men were analyzed. This analysis of the Florida MMP data
received approval from the University of Florida Institutional Review Board prior to study commencement.

**Measures**

**Condomless sex.** The primary dependent variable was the report of having anal or vaginal sex without a condom with at least one sexual partner in the past 12 months.

**Disclosure of HIV status to sexual partners.** Participants were asked “During the past 12 months, did you discuss your HIV status with either your causal and/or your main partners”. The disclosure of HIV status was organized into three categories: disclose to none (participants answered no for all casual and main partners), disclose to some (participants answered yes to some, but not all casual or main partners), or disclose to all sexual partners (participants answered yes to all casual and main partners).

**HIV prevention counseling.** Participants were asked if they had participated in a one-on-one conversation with an outreach worker, counselor, prevention program worker, doctor, nurse, or other health care worker about ways to protect themselves or others from transmitting HIV during the 12 months prior to the survey.

**Covariates.** Covariates were chosen based on previous associations with HIV infections and sexual-risk taking identified in the literature and described in the introduction. Socio-demographic variables were self-reported and included age, race/ethnicity, education and poverty level. Poverty level was calculated by dividing the participants’ reported income by the number of dependents and classified using Department of Health and Human Services Poverty Guidelines, based on year of interview. Sexual behavior was grouped into two categories: 1) men who have sex with men (MSM), including those men who had sex with both men and women (MSMW), or 2) men who have sex with women exclusively (MSW). We chose to combine MSM and MSMW due to small numbers of MSMW in this sample. Years of HIV infection was defined as the time since the first positive test for HIV. HIV viral load results in the past 12 months were determined by medical record abstraction, and durable viral suppression was defined as having a suppressed viral load (≤ 200 copies/mL) at each time of testing in the last 12 months. A Patient Health Questionnaire depression scale (PHQ-8) score of ≥ 10 was used to define current depression. Other covariates included substance use before or during sex in the past 12 months, (“during the past 12 months, did you use any alcohol, non-injection, or injection drugs before or during sex”) and total number of sexual partners in the previous year (“in the past 12 months, with how many different men/women have you had oral, vaginal, or anal sex”).

**Analysis**

We used weighted bivariate analysis to describe the factors associated with disclosure of HIV status to sexual partners, using specific recommendations from the MMP analytical guidelines for subsamples. We chose the modified Rao-Scott Chi-square test, which is appropriate when analyzing categorical variables from complex survey data, such as the MMP, and statistical significance was defined at the p-value level of ≤ .05. Weighted multivariable logistic regression analysis was conducted to assess the association between disclosure of HIV status and having condomless sex. Covariates were included in the multivariable model if the covariates were significantly associated with having condomless sex in the bivariate analysis (p ≤ .05). No collinearity was found between covariates. Crude and adjusted odds ratios with 95% confidence limits were estimated. All data analyses were performed in SAS version 9.4 (SAS Institute, Carry, NC, USA). Although all analyses were conducted using the weights assigned
by the Centers for Disease Control [40], we report the actual number of participants in the results.

**Results**

Characteristics of sexually active men living with HIV who had more than one sexual partner are summarized in Table 1. Participants in the sample (n = 376) were generally older than 35 years of age (84%), having sex with men (83%), lived above the poverty level (71%), had been diagnosed with HIV for 3 or more years (86%), were receiving ART (93%), and had a consistently-suppressed HIV viral load (71%). Although 48% of participants engaged in condomless sex, 52% of participants reported that they used a condom during all sexual encounters.

**Bivariate analysis**

**Factors associated with disclosure.** Of the sexually active men living with HIV, 55% disclosed their HIV status to all partners, 30% disclosed their HIV status to some of their partners and 15% did not disclose their HIV status to any partners (Table 1). As shown in Table 1, four factors were significantly associated with disclosure: race/ethnicity, sexual behavior, number of partners, and use of a condom. In terms of race and ethnicity, on average, the proportion of participants who disclosed to none of their partners was greater in white participants than black participants. In terms of sexual behavior, a greater proportion of MSW disclosed to none of their partners (Table 1). In terms of number of sexual partners, there was an inverse relationship between the proportion of men who disclosed to all partners and the total number of sexual partners. Finally, persons who had condomless sex tended to be more likely to disclose to some or all of their partners, whereas those who always used condoms (no condomless sex) were more likely to disclose to none of their sexual partners. Factors not significantly associated with disclosure included age, education, poverty level, depression, years with HIV, taking ART, HIV viral load, and receipt of prevention counseling.

**Factors associated with condomless sex.** Condomless sex (Table 2) was reported by 48% of the sample. Six variables were associated with having higher than expected condomless sex: white race and ethnicity, greater than high school education, above the poverty level, sex with men, a greater number of partners, and using alcohol or drugs before sex.

**Multivariable logistic regression**

**Disclosure and condomless sex.** In multivariable analysis, when compared to men who did not disclose to any partners, the odds of having condomless sex was 3.3 (95% confidence interval = 1.5, 7.3) times greater in men who disclosed to all partners and, while not statistically significant, 1.5 (95% confidence interval = 0.7, 3.2) times greater in men who disclosed their HIV status to some of their partners. Other factors that were strongly associated with condomless sex included sex with women exclusively (aOR 7.16, 95% confidence interval = 3.25, 15.75), alcohol or drug use before sex (aOR 2.30, 95% confidence interval = 1.32, 4.02), and more than 5 sexual partners in the past year (aOR 3.24, 95% confidence interval = 1.53, 6.86) (Table 3).

**Discussion**

In this population-based sample of HIV positive men who had multiple sexual partners in the past year, we found that about half of the participants consistently disclosed their HIV status and almost half engaged in condomless sex. We also found men who disclosed their HIV status to all sexual partners were 3.3 times more likely to engage in condomless sex than men who
did not disclose their HIV status to any partners. Compared to prior studies in men that separated disclosure into three categories (disclosure to none, some, or all), in our study the proportion of men who disclosed their HIV status to all of their sexual partners was higher (55% vs. 23–39%) and the proportion of men who disclosed their HIV status to none of their sexual partners was lower (15% vs. 23–39%).

| Table 1. Factors associated with disclosure of HIV status in 376 men with multiple sexual partners living with HIV. |
|---------------------------------------------------------------|
| **Total** | **Disclosure to none** | **Disclosure to some** | **Disclosure to all** | **p-value** |
| n (%) | 56 (15%) | 112 (30%) | 206 (55%) |
| **Age** | | | | |
| 18–34 yrs. | 61 (16) | 10 (16.2) | 24 (39.1) | 27 (42.8) | 0.53 |
| 35–44 yrs. | 94 (25) | 15 (15.3) | 28 (29.6) | 51 (53.8) |
| 45–54 yrs. | 157 (42) | 19 (10.8) | 39 (24.8) | 97 (61.4) |
| > = 55 yrs. | 64 (17) | 12 (16.9) | 21 (30.7) | 31 (52.4) |
| **Race and ethnicity** | | | | |
| White | 170 (46) | 14 (8.2) | 58 (36.7) | 97 (55.1) | 0.03 |
| Black | 110 (30) | 24 (20.4) | 38 (34.4) | 48 (45.1) |
| Hispanic or Latino | 87 (24) | 15 (14.3) | 14 (23.6) | 57 (62.1) |
| **Education** | | | | |
| <High School | 40 (11) | 10 (25.0) | 7 (17.5) | 23 (56.4) | 0.27 |
| High School diploma | 82 (22) | 12 (14.6) | 25 (30.0) | 45 (51.4) |
| >High School | 254 (67) | 34 (13.3) | 80 (31.6) | 138 (53.9) |
| **Poverty level** | | | | |
| Above | 256 (71) | 36 (14.3) | 81 (31.9) | 137 (52.2) | 0.48 |
| At or below | 106 (29) | 17 (16.0) | 27 (25.4) | 62 (57.8) |
| **Sexual behavior** | | | | |
| MSM | 311 (83) | 35 (11.3) | 102 (32.9) | 172 (54.8) | < 0.01 |
| MSW | 65 (17) | 21 (31.8) | 10 (15.4) | 34 (53.2) |
| **Depression** | | | | |
| No depression | 309 (83) | 48 (15.5) | 96 (31.4) | 163 (53.1) | 0.16 |
| Major Depression | 65 (17) | 8 (12.3) | 15 (23.1) | 42 (64.0) |
| **Years with HIV** | | | | |
| <= 3 years | 53 (14) | 7 (13.2) | 21 (40.8) | 25 (47.2) | 0.13 |
| >3 years | 323 (86) | 49 (15.2) | 91 (28.3) | 181 (55.6) |
| **Currently taking ART** | | | | |
| No | 28 (7) | 7 (25.0) | 8 (28.6) | 13 (46.4) | 0.49 |
| Yes | 348 (93) | 49 (14.4) | 104 (30.0) | 193 (54.2) |
| **HIV viral load** | | | | |
| All undetectable | 247 (71) | 37 (15.2) | 78 (31.3) | 130 (52.9) | 0.96 |
| Detectable | 101 (29) | 14 (13.9) | 28 (27.7) | 59 (58.3) |
| **Prevention counseling** | | | | |
| No | 144 (39) | 25 (17.1) | 40 (27.8) | 78 (54.3) | 0.51 |
| Yes | 230 (61) | 31 (13.0) | 71 (30.9) | 127 (54.2) |
| **Number of partners** | | | | |
| 2–3 | 192 (51) | 31 (16.2) | 29 (15.1) | 132 (71.9) | < 0.01 |
| 4–5 | 73 (20) | 12 (16.4) | 24 (32.9) | 37 (49.7) |
| >5 | 109 (29) | 13 (11.9) | 59 (54.1) | 37 (39.0) |
| **Alcohol/drug before sex** | | | | |
| No | 137 (37) | 26 (17.7) | 32 (23.5) | 79 (57.8) | 0.12 |
| Yes | 237 (63) | 29 (11.9) | 80 (33.6) | 126 (52.4) |

https://doi.org/10.1371/journal.pone.0207838.t001
Table 2. Factors associated with having condomless sex in 376 men with multiple partners in previous year.

|                  | No condomless sex | Having condomless sex | p-value |
|------------------|-------------------|-----------------------|---------|
|                  | 186 (52%)         | 169 (48%)             |         |
| Age              |                   |                       |         |
| 18–34 yrs.       | 26 (43.5)         | 31 (56.5)             | 0.24    |
| 35–44 yrs.       | 45 (49.4)         | 45 (50.6)             |         |
| 45–54 yrs.       | 75 (47.9)         | 70 (52.1)             |         |
| > = 55 yrs.      | 40 (60.3)         | 23 (39.7)             |         |
| Race and ethnicity |                 |                       |         |
| White            | 66 (39.3)         | 99 (60.7)             | < 0.01  |
| Black            | 69 (62.8)         | 33 (37.2)             |         |
| Hispanic or Latino | 44 (51.9)       | 35 (48.1)             |         |
| Education        |                   |                       |         |
| < High School    | 28 (71.8)         | 10 (28.2)             | < 0.01  |
| High School diploma | 48 (55.8)     | 30 (44.2)             |         |
| > High School    | 110 (44.2)        | 129 (55.8)            |         |
| Poverty level    |                   |                       |         |
| Above            | 113 (44.0)        | 128 (56.0)            | < 0.01  |
| At or below      | 65 (64.9)         | 36 (35.1)             |         |
| Sexual behavior  |                   |                       |         |
| MSM              | 130 (43.1)        | 163 (56.9)            | < 0.01  |
| MSW              | 56 (88.7)         | 6 (11.3)              |         |
| Depression       |                   |                       | 0.88    |
| No depression    | 156 (49.8)        | 137 (50.2)            |         |
| Major Depression | 30 (51.0)         | 30 (49.0)             |         |
| Years with HIV   |                   |                       | 0.67    |
| < = 3 years      | 25 (46.9)         | 25 (53.1)             |         |
| > 3 years        | 161 (50.2)        | 144 (49.8)            |         |
| Currently taking ART |           |                       | 0.55    |
| No               | 15 (55.6)         | 12 (44.4)             |         |
| Yes              | 171 (49.3)        | 157 (50.7)            |         |
| HIV viral load   |                   |                       | 0.20    |
| All undetectable | 121 (48.6)        | 112 (51.4)            |         |
| Detectable       | 53 (56.0)         | 42 (44.0)             |         |
| Prevention counseling |           |                       | 0.59    |
| No               | 76 (51.6)         | 60 (48.4)             |         |
| Yes              | 110 (48.9)        | 108 (51.1)            |         |
| Number of partners |                 |                       | < 0.01  |
| 2–3              | 117 (61.3)        | 62 (38.7)             |         |
| 4–5              | 33 (48.7)         | 35 (51.3)             |         |
| > 5              | 36 (34.2)         | 72 (65.8)             |         |
| Alcohol/drug before sex |          |                       | < 0.01  |
| No               | 85 (64.9)         | 44 (35.1)             |         |
| Yes              | 99 (40.9)         | 125 (59.1)            |         |
| Disclosure of HIV status |         |                       |         |
| To none          | 42 (79.1)         | 10 (20.9)             | < 0.01  |
| To some          | 49 (44.4)         | 60 (55.6)             |         |
| To all           | 94 (45.5)         | 98 (54.5)             |         |

Note: there are only 355 men included in this table because 21 participants did not report sexual behavior.

https://doi.org/10.1371/journal.pone.0207838.t002
partners was lower (15% vs. 30–33%).[6,22] Sampling differences are one possible reason for differences in our results and previous studies, some of which were done exclusively in urban areas and others in which disclosure laws differed.[1,6,22] Another possible reason for differences from other samples is that our analysis only included men with multiple sexual partners.

In this analysis, having an undetectable viral load was not associated with disclosure of HIV status or having condomless sex, potentially indicating that participants were unaware of the reduced transmission of HIV with undetectable viral loads. The MMP data was collected between 2009–2013, before and immediately following the publication of results from the HTN 052 in 2011 demonstrating treatment as prevention [42]. Some previous studies have indicated that those who are on ART or who are virally suppressed are less likely to disclose their HIV status to partners, possibly because they believe they are not capable of disease transmission.[6,43,44] Future research is needed in this area to assess if the population based sample vs. the clinical trial sample can account for these differences and whether there were changes in disclosure after treatment as prevention was implemented.

It is noteworthy that in this sample, prevention counseling was not significantly associated with rates of disclosure or condomless sex. Thus, our findings support those of other studies, which have found similar results. For example, in an analysis of national 2009 MMP data, 61% of those receiving risk reduction counseling still engaged in condomless sex.[45] Other research has also found no long-term differences in disclosure or condom use among those

Table 3. Factors associated with condomless sex in 376 men with HIV and multiple sex partners in the past year: multivariable analysis.

|                          | Adjusted Odds Ratio | 95% Wald Confidence Limits |
|--------------------------|---------------------|---------------------------|
| Disclosure of HIV status |                      |                           |
| Disclose to none (ref)   |                     |                           |
| Disclose to some         | 1.48                | 0.68                      | 3.19                      |
| Disclose to all          | 3.33                | 1.51                      | 7.33                      |
| Race and ethnicity       |                      |                           |
| White (ref)              |                     |                           |
| Black                    | 0.85                | 0.53                      | 1.37                      |
| Hispanic or Latino       | 0.74                | 0.41                      | 1.34                      |
| Poverty level            |                      |                           |
| Above (ref)              |                     |                           |
| At or below              | 1.29                | 0.47                      | 3.53                      |
| Education                |                      |                           |
| <High School (ref)       |                     |                           |
| High School diploma      | 1.10                | 0.39                      | 3.08                      |
| >High School             | 1.61                | 0.53                      | 4.84                      |
| Sexual behavior          |                      |                           |
| MSM (ref)                |                     |                           |
| MSW                      | 7.16                | 3.25                      | 15.75                     |
| Alcohol/drug before sex  |                      |                           |
| No (ref)                 |                     |                           |
| Yes                      | 2.30                | 1.32                      | 4.02                      |
| Number of partners       |                      |                           |
| 2–3 (ref)                |                     |                           |
| 4–5                      | 1.84                | 0.85                      | 3.95                      |
| >5                       | 3.24                | 1.53                      | 6.86                      |

https://doi.org/10.1371/journal.pone.0207838.t003
receiving a risk reduction counseling intervention.\[46\] The failure to find an association between risk reduction counseling and disclosure of HIV status may be due to the variety of counseling approaches. Notably, successful interventions promoting disclosure involved repeated sessions of prevention counseling targeted specifically towards disclosure of HIV status.\[36\] Furthermore, recent research suggests non-disclosure and engagement in condomless sex may be associated with decreased self-efficacy to disclose.\[43\] Because approximately 76\% of providers report providing risk reduction counseling, \[47\] it is imperative that public health researchers evaluate the use of these interventions.

Our results suggest that men who disclose are also those who are more likely to have condomless sex. Our findings of increased disclosure associated with decreased condom use are not consistent with most other studies, perhaps because they included different samples (e.g., clinical trial participants or population based), differences in how the outcomes were measured (dichotomous or 3-levels), recruitment areas (urban/rural), and whether the research was conducted in areas that have disclosure laws.\[1,4–16,21–23\]. It also could be that the association between disclosure and condom use differs by partner type (e.g. main or casual), but we were not able to clearly link disclosure and condom use by individual partner type in these analyses. An increased understanding of the role of seroadaptation (i.e. serosorting and seropositioning), a harm reduction approach of choosing partners and sexual positions based on HIV status \[48\] is needed to broaden the interpretation of these results and evaluate accurate counseling strategies.

There are several limitations to this study. First, we only examined the association of disclosure of HIV status and use of a condom with sex from the perspective of MMP participants and thus we were unaware of their partners' HIV status or use of PrEP.\[18,21\] Second, the sample was recruited from those in care in the State of Florida and decisions regarding disclosure and condomless sex may differ for those who are not receiving care or who reside in other areas of the United States. With Florida criminal laws for non-disclosure, it is also possible MMP participants underreported non-disclosure. Finally, condom use is usually lower with primary partners and relationship status was not included as a covariate. However, a strength of this study is the use of the MMP data that yields representative population estimates of PLWH who are receiving care.

This study highlights the need for further research on the effect of prevention counseling on rates of disclosure and condomless sex. Specifically, we need to understand whether or not disclosure leads to more condomless sex, or how disclosure may influence discussions about prevention. Furthermore, as pre-exposure prophylaxis (PrEP) becomes more of an HIV prevention option, \[3\] we need to understand how disclosure may impact discussions about PrEP. Criminalization of HIV non-disclosure complicates both the individual decision and the relationship between the provider and client, and clinical guidelines emphasize the legal aspects of disclosure more than the prevention aspects.\[18,49\] Qualitative methods, especially grounded theory, may help us further understand the processes and contextual factors that influence the relationship between disclosure and condomless sex.

**Acknowledgments**

We want to thank the Florida Department of Health HIV/AIDS Section for collaborating on this project and Debra McDonald for providing editorial support.

**Author Contributions**

**Conceptualization:** Christa L. Cook, Stephanie A. S. Staras.

**Data curation:** Zhi Zhou.
Formal analysis: Zhi Zhou.

Funding acquisition: Robert L. Cook.

Writing – original draft: Christa L. Cook.

Writing – review & editing: Stephanie A. S. Staras, Zhi Zhou, Natalie Chichetto, Robert L. Cook.

References

1. Lehman JS, Carr MH, Nichol AJ, Ruisanchez A, Knight DW, Langford AE, et al. Prevalence and Public Health Implications of State Laws that Criminalize Potential HIV Exposure in the United States. AIDS Behav. 2014; 18: 997–1006. https://doi.org/10.1007/s10461-014-0724-0 PMID: 24633716

2. The Center for HIV Law and Policy. HIV Criminalization in the United States: A Sourcebook on State and Federal HIV Criminal Law and Practice [Internet]. 2017 [cited 24 Sep 2018]. Available: http://www.hivlawandpolicy.org/sourcebook

3. Donnell D, Baeten JM, Bumpus NN, Brantley J, Bangsberg DR, Haberer JE, et al. HIV protective efficacy and correlates of tenofovir blood concentrations in a clinical trial of pre-exposure prophylaxis for HIV prevention. J Acquir Immune Defic Syndr. 2014; 66: 340–348. https://doi.org/10.1097/QAI.0000000000000172 PMID: 24784763

4. O’Connell AA, Reed SJ, Serovich JA. The efficacy of serostatus disclosure for HIV transmission risk reduction. AIDS Behav. 2015; 19: 283–290. https://doi.org/10.1007/s10461-014-0848-2 PMID: 25164375

5. Przybyla S, Golin C, Widman L, Grodensky C, Earp JA, Suchindran C. Examining the Role of Serostatus Disclosure on Unprotected Sex Among People Living with HIV. AIDS Patient Care STDS. 2014; 28: 677–684. https://doi.org/10.1089/apc.2014.0203 PMID: 25397358

6. Rosser BRS, Horvath KJ, Hattfield LA, Peterson JL, Jacoby S, Stately A. Predictors of HIV disclosure to secondary partners and sexual risk behavior among a high-risk sample of HIV-positive MSM: results from six epicenters in the US. AIDS Care. 2006; 20: 925–930. https://doi.org/10.1080/09540120701767263 PMID: 18777221

7. Crepaz N, Marks G. Serostatus disclosure, sexual communication and safer sex in HIV-positive men. AIDS Care. 2003; 15: 379–387. https://doi.org/10.1080/0954012031000105432 PMID: 12745398

8. Serovich JM, Reed S, Grapsky EL, Andrist D. An intervention to assist men who have sex with men disclose their serostatus to casual sex partners: results from a pilot study. AIDS Educ Prev Off Publ Int Soc AIDS Educ. 2008; 21: 207–219. https://doi.org/10.1521/aeap.2008.21.3.207 PMID: 19519236

9. Weintrob A, Mellins CA, Warne P, Dolezal C, Bucek A, et al. Patterns and Correlates of Serostatus Disclosure to Sexual Partners by Perinatally-Infected Adolescents and Young Adults. AIDS Behav. 2016; https://doi.org/10.1007/s10461-016-1337-6 PMID: 26874846

10. Simoni JM, Pantalone DW. Secrets and safety in the age of AIDS: does HIV disclosure lead to safer sex? Top HIV Med Publ Int AIDS Soc USA. 2004; 12: 109–118.

11. Stein MD, Freedberg KA, Sullivan LM, Savetsky J, Levenson SM, Hingson R, et al. Sexual ethics. Disclosure of HIV-positive status to partners. Arch Intern Med. 1998; 158: 253–257. PMID: 9472205

12. Simbayi LC, Zungu N, Evans M, Mehlomakulu V, Kupamupindi T, Mafoko G, et al. HIV Serostatus Disclosure to Sexual Partners Among Sexually Active People Living with HIV in South Africa: Results from the 2012 National Population-Based Household Survey. AIDS Behav. 2017; 21: 82–92. https://doi.org/10.1007/s10461-016-1337-6 PMID: 26767538

13. Cook SH, Valera P, Wilson PA. HIV status disclosure, depressive symptoms, and sexual risk behavior among HIV-positive young men who have sex with men. J Behav Med. 2015; 38: 507–517. https://doi.org/10.1007/s10865-015-9624-7 PMID: 25773478

14. Mattson C, Freedman M, Beer L, Sullivan P, Skarbinski J. Prevalence and Predictors of HIV Disclosure Among Adults Receiving Care in the United States. Boston, MA: Available: http://www.croiconference.org/sessions/prevalence-and-predictors-hiv-disclosure-among-adults-receiving-care-united-states

15. Hightow-Weidman LB, Phillips G, Outlaw AY, Wohl AR, Fields S, Hildalgo J, et al. Patterns of HIV Disclosure and Condom Use Among HIV-Infected Young Racial/Ethnic Minority Men Who Have Sex with Men. AIDS Behav. 2012; 17: 360–368. https://doi.org/10.1007/s10461-012-0331-x PMID: 23054043

16. St De Lore J, Thiede H, Cheadle A, Goldbaum G, Carey JW, Hutcshon RE, et al. HIV disclosure and subsequent sexual behaviors among men who have sex with men who meet online. J Homosex. 2012; 59: 592–609. https://doi.org/10.1080/00918369.2012.665704 PMID: 22300995
17. Chaudoir SR, Fisher JD. The disclosure processes model: Understanding disclosure decision-making and post-disclosure outcomes among people living with a concealable stigmatized identity. Psychol Bull. 2010; 136: 236–256. https://doi.org/10.1037/a0018193 PMID: 20192562

18. O’Byrne P, Holmes D, Roy M. Counselling about HIV serological status disclosure: nursing practice or law enforcement? a Foucauldian reflection. Nurs Inq. 2015; 22: 134–146. https://doi.org/10.1111/nin.12075 PMID: 25053169

19. Derlega VJ, Winstead BA, Greene K, Serovich J, Elwood WN. Perceived HIV-related Stigma and HIV Disclosure to Relationship Partners after Finding Out about the Seropositive Diagnosis. J Health Psychol. 2002; 7: 415–432. https://doi.org/10.1177/1359105302007004330 PMID: 22112752

20. Dempsey AG, MacDonell KE, King SN, Lau C-Y. Patterns of Disclosure among Youth who are HIV Positive: A Multisite Study. J Adolesc Health. 2012; 50: 315–317. https://doi.org/10.1016/j.jadohealth.2011.06.003 PMID: 22325140

21. Marks G, Crepaz N. HIV-positive men's sexual practices in the context of self-disclosure of HIV status. J Acquir Immune Defic Syndr 1999. 2001; 27: 79–85.

22. Parsons JT, Schrimshaw EW, Bimbi DS, Wolitski RJ, Gómez CA, Halkitis PN. Consistent, inconsistent, and non-disclosure to casual sexual partners among HIV-seropositive gay and bisexual men. AIDS Lond Engl. 2005; 19 Suppl 1: S87–97.

23. Sullivan KM. Male Self-Disclosure of HIV-Positive Serostatus to Sex Partners: A Review of the Literature. J Assoc Nurses AIDS Care. 2005; 16: 33–47. https://doi.org/10.1016/j.jana.2005.09.005 PMID: 16536263

24. Sullivan KM. Disclosure of serostatus to sex partners among HIV-positive men and women in Hawaii. Issues Ment Health Nurs. 2009; 30: 687–701. PMID: 19874097

25. Chaudoir SR, Fisher JD, Simoni JM. Understanding HIV disclosure: A review and application of the Disclosure Processes Model. Soc Sci Med 1982. 2011; 72: 1618–1629. https://doi.org/10.1016/j.socscimed.2011.03.028 PMID: 21514708

26. Poppen PJ, Reisen CA, Zea MC, Bianchi FT, Echeverry JJ. Serostatus disclosure, serocordance, partner relationship, and unprotected anal intercourse among HIV-positive Latino men who have sex with men. AIDS Educ Prev Off Publ Int Soc AIDS Educ. 2005; 17: 227–237. https://doi.org/10.1521/aeap.17.4.227.66530 PMID: 16006209

27. Welcome to CDC Stacks | Recommendations for HIV prevention with adults and adolescents with HIV in the United States, 2014 E44064 | Guidelines and Recommendations [Internet]. [cited 10 Mar 2017]. Available: https://stacks.cdc.gov/view/cdc/44064

28. Fisher JD, Fisher WA, Cormann DH, Amico RK, Bryan A, Friedland GH. Clinician-delivered intervention during routine clinical care reduces unprotected sexual behavior among HIV-infected patients. J Acquir Immune Defic Syndr 1999. 2006; 41: 44–52.

29. Richardson JL, Milam J, McCutchan A, Stoyanoff S, Bolan R, Weiss J, et al. Effect of brief safer-sex counseling by medical providers to HIV-1 seropositive patients: a multi-clinic assessment. AIDS Lond Engl. 2004; 18: 1179–1186.

30. Metsch LR, Feaster DJ, Gooden L, Schackman BR, Matheson T, Das M, et al. Effect of risk-reduction counseling with rapid HIV testing on risk of acquiring sexually transmitted infections: the AWARE randomized clinical trial. JAMA. 2013; 310: 1701–1710. https://doi.org/10.1001/jama.2013.280034 PMID: 24150466

31. Gilbert P, Ciccarone D, Gansky SA, Bangsberg DR, Clanon K, McPhee SJ, et al. Interactive “Video Doctor” counseling reduces drug and sexual risk behaviors among HIV-positive patients in diverse outpatient settings. PloS One. 2008; 3: e1988. https://doi.org/10.1371/journal.pone.0001988 PMID: 18431475

32. Committee to Review Data Systems for Monitoring HIV Care, Board on Population Health and Public Health Practice, Institute of Medicine. Monitoring HIV Care in the United States: A Strategy for Generating National Estimates of HIV Care and Coverage. National Academies Press; 2013.

33. Boscoe FP, Pradhan E. The Most Distinctive Causes of Death by State, 2001–2010. Prev Chronic Dis. 2015; 12. https://doi.org/10.5888/pcd12.140395 PMID: 25974145

34. Maddox L, Poschman K. Cascade: The Continuum of HIV Care—Florida 2014. HIV/AIDS Prevention Coordinators Meeting, Florida Department of Health; 2015.

35. Florida Department of Health HIV/AIDS Section. Epidemiology of HIV Infection Trends in Florida Diagnosed through 2014 [Internet]. Florida Department of Health; 2016 Mar. Available: http://www.floridahealth.gov/diseases-and-conditions/aids/surveillance/_documents/hiv-aids-slide-sets/2014/state_trends_2014b.pdf
36. Conserve DF, Groves AK, Maman S. Effectiveness of Interventions Promoting HIV Serostatus Disclosure to Sexual Partners: A Systematic Review. AIDS Behav. 2015; 19: 1763–1772. https://doi.org/10.1007/s10461-015-1006-1 PMID: 25645328

37. U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. Prior HHS Poverty Guidelines and Federal Register References. In: Prior HHS Poverty Guidelines and Federal Register References [Internet]. 23 Nov 2015 [cited 21 Nov 2016]. Available: https://aspe.hhs.gov/prior-hhs-poverty-guidelines-and-federal-register-resources

38. DHHS Panel on Antiretroviral Guidelines for Adults and Adolescents—A Working Group of the Office of AIDS Research Advisory Council (OARAC). Virologic Failure | Adult and Adolescent ARV Guidelines. In: AIDSinfo [Internet]. 2015 [cited 5 Dec 2016]. Available: https://aidsinfo.nih.gov/

39. Kroenke K, Strine TW, Spitzer RL, Williams JBW, Berry JT, Mokdad AH. The PHQ-8 as a measure of current depression in the general population. J Affect Disord. 2009; 114: 163–173. https://doi.org/10.1016/j.jad.2008.06.026 PMID: 18752852

40. ICF International. MMP 2014 Analytical Training. 2014 May 1; Atlanta, GA.

41. SAS for Windows, Version 9.4. Cary, NC; 2016.

42. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, et al. Prevention of HIV-1 infection with early antiretroviral therapy. N Engl J Med. 2011; 365: 493–505. https://doi.org/10.1056/NEJMoai1105243 PMID: 21767103

43. Kalichman SC, Kalichman MO, Cherry C, Grebler T. HIV Disclosure and Transmission Risks to Sex Partners Among HIV-Positive Men. AIDS Patient Care STDs. 2016; 30: 221–228. https://doi.org/10.1089/apc.2015.0333 PMID: 27158850

44. Hart TA, Wollitski RJ, Purcell DW, Parsons JT, Gómez CA. Seropositive Urban Men’s Study Team. Partner awareness of the serostatus of HIV-seropositive men who have sex with men: impact on unprotected sexual behavior. AIDS Behav. 2005; 9: 155–166. https://doi.org/10.1007/s10461-005-3897-8 PMID: 15933835

45. Mizuno Y, Zhu J, Crepaz N, Beer L, Purcell DW, Johnson CH, et al. Receipt of HIV/STD prevention counseling by HIV-infected adults receiving medical care in the United States. AIDS. 2014; 28: 407–15. https://doi.org/10.1097/QAD.000000000000057 PMID: 24056066

46. Wollitski RJ, Gómez CA, Parsons JT. Effects of a peer-led behavioral intervention to reduce HIV transmission and promote serostatus disclosure among HIV-seropositive gay and bisexual men. AIDS Lond Engl. 2005; 19 Suppl 1: S99–109.

47. Valverde E, Beer L, Johnson C, Blair JM, Mattson CL, Sanders C, et al. Prevention counseling practices of HIV care providers with patients new to HIV medical care: medical monitoring project provider survey, 2009. J Int Assoc Provid AIDS Care. 2014; 13: 127–34. https://doi.org/10.1177/2325957413516496 PMID: 24429103

48. Cassels S, Katz DA. Seroadapation among Men Who Have Sex with Men: Emerging Research Themes. Curr HIV/AIDS Rep. 2013; 10: 305–313. https://doi.org/10.1007/s11904-013-0188-2 PMID: 24234889

49. DHHS Panel on Antiretroviral Guidelines for Adults and Adolescents. Virologic Failure | Adult and Adolescent ARV Guidelines. In: AIDSinfo [Internet]. 2015 [cited 5 Dec 2016]. Available: https://aidsinfo.nih.gov/