

ORIGINAL RESEARCH: EMPIRICAL RESEARCH –
QUANTITATIVESexual transmission-risk behaviour among HIV-positive persons:
a multisite study using social action theory

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Abstract

Aim. Sexual risk behaviour was explored and described using Social Action Theory.

Background. The sexual transmission of HIV is complex and multi-factorial. Social Action Theory provides a framework for viewing self-regulation of modifiable behaviour such as condom use. Condom use is viewed within the context of social interaction and interdependence.

Design. Cross-sectional survey.

Methods. Self-report questionnaire administered to adults living with HIV/AIDS, recruited from clinics, service organizations and by active outreach, between 2010 – 2011.

Findings. Having multiple sex partners with inconsistent condom use during a 3-month recall period was associated with being male, younger age, having more years of education, substance use frequency and men having sex with men being a mode of acquiring HIV. In addition, lower self-efficacy for condom use scores were associated with having multiple sex partners and inconsistent condom use.

Conclusion. Social Action Theory provided a framework for organizing data from an international sample of seropositive persons. Interventions for sexually active, younger, HIV positive men who have sex with men, that strengthen perceived efficacy for condom use, and reduce the frequency of substance use, may contribute to reducing HIV-transmission risk.

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Keywords: condom use, HIV prevention, HIV self-management, HIV-positive adults, HIV-transmission risk, nursing, self-efficacy, sexual behaviour, Social Action Theory

Why is this research needed?

- The greatest number of new HIV infections in the USA and Puerto Rico result from sexual transmission of the virus.
- HIV transmission-risk behaviour is multi-factorial, and needs to be viewed in light of contextual, cognitive and environmental influences.
- Testing a theoretical model for its utility in understanding HIV-transmission risk behaviour provides rigour to the scientific process of evidence-based nursing practice.

What are the key findings?

- Having multiple sex partners without consistent condom use was associated with being male, college educated, of younger age and having acquired HIV through sexual contact with men.
- Lower self-efficacy for condom use scores, and frequency of substance use were associated with HIV transmission-risk behaviour.

How should the findings be used to influence policy/practice/research/education?

- Healthcare practitioners should routinely address condom use behaviour and offer strategies to enhance intentions to use condoms.
- Education programs should provide avenues for students to strengthen interviewing skills that address HIV-transmission risk and condom use behaviours.
- Research exploring the influence of group support for HIV-transmission risk reduction among persons living with HIV is needed.

Introduction

Both nationally and globally, most HIV transmission among adults has occurred through sexual activity with a partner living with the virus who has (Centers for Disease Control and Prevention [CDC], 2016, Kaiser Family Foundation, 2016). Consistent use of condoms results in an estimated 80% reduction in HIV incidence (Patel *et al.* 2014, Weller & Davis 2002). Many persons find condom use challenging for a variety of contextual, psychosocial and intrapersonal reasons. Reports indicate that up to two-thirds of sexually active persons living with HIV (PLWH) engage in HIV-transmission risk behaviour, including not

using condoms consistently (Reece *et al.* 2010, Reilly *et al.* 2010). As the incidence of new cases of HIV has not abated, there is a need to identify factors influencing transmission-risk behaviours among seropositive persons. One aim of our research was to explore factors influencing sexual risk behaviours in a sample of PLWH in the USA and Puerto Rico.

Background

Sexual risk behaviour among HIV-positive persons is multifactorial and complex. Contextual, psychosocial and intrapersonal factors can moderate personal perceptions and beliefs about condom use (CU) and subsequent CU behaviour. Social Action Theory (SAT) has been identified as a pragmatic model to use when exploring transmission-risk behaviour among PLWH (Traube *et al.* 2011). SAT was developed as a health promotion theory for behavioural medicine (Ewart 1991). Using this theory, we propose that consistent condom use is a client-initiated health-protective action/behaviour resulting from interactions among three

domains (Figure 1). The domain of 'contextual influences' includes biologic/background factors, and social/environmental influences that affect mood and arousal that may contribute to perceptions or motivations to behave. The 'self-change processes' domain includes motivational and generative capabilities that are self-regulated and modifiable. The domain of 'action states' incorporates influences of social interdependence on the maintenance of health-related behaviours (Ewart 1991, Gore-Felton *et al.* 2005). Individual action includes the self-regulation of modifiable health promoting and endangering behaviours, such as condom use, that occur within a context of social interaction and interdependence. Self-regulating behaviours are of interest in disease prevention because they are amenable to change. SAT allows for multidimensional targeting of behaviour and has been useful for exploring influences on health behaviours including: identifying correlates of medication non-adherence (Johnson *et al.* 2008); exploring condom use among substance users in treatment (Reynolds *et al.* 2010); and, HIV-testing and condom use for commercial sex workers (Chiao *et al.* 2009). Traube *et al.* (2011) completed a

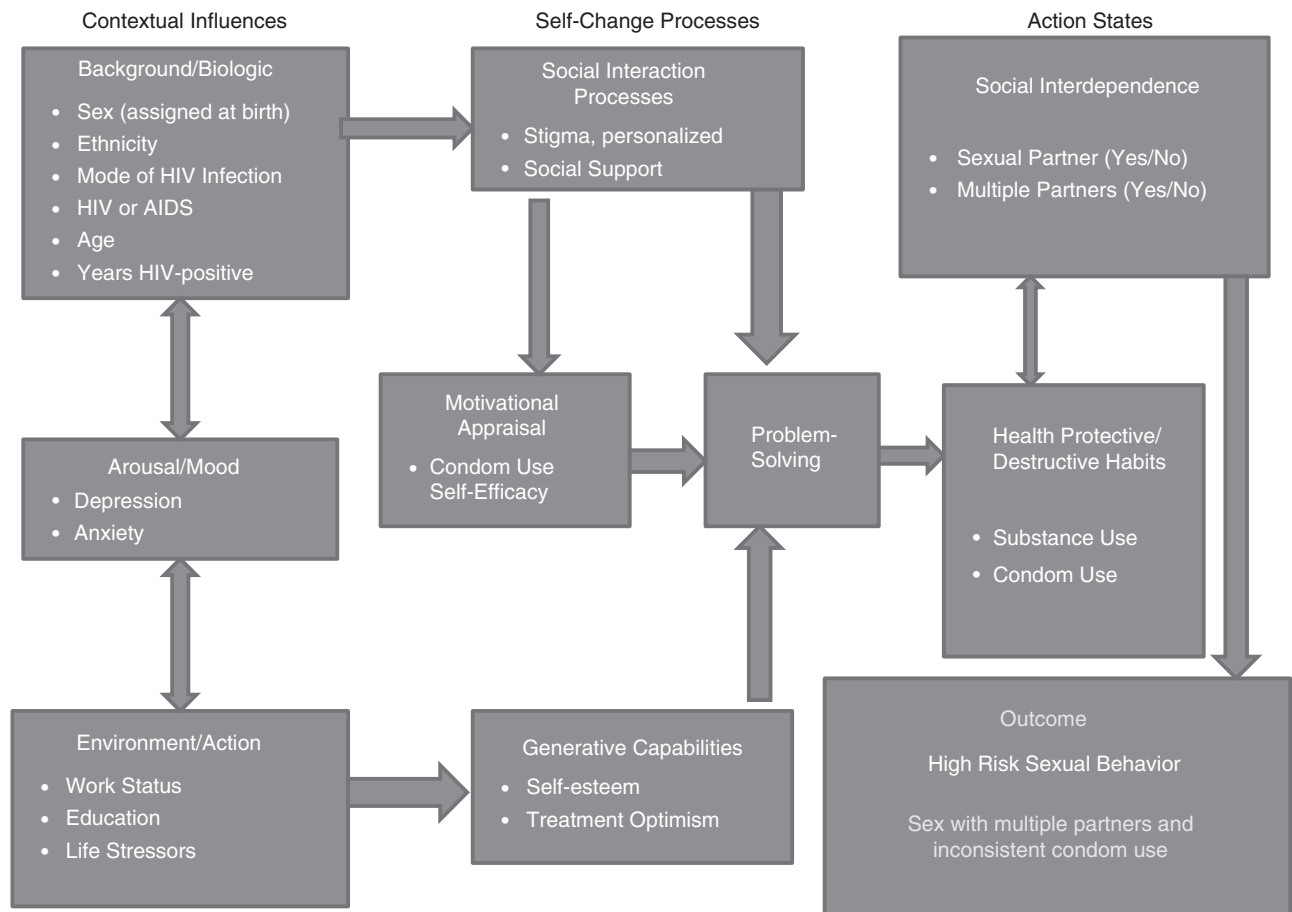


Figure 1 Social Action Theory model for HIV-transmission risk behaviors (adapted from Ewart 1991).

thorough exploration and analysis of several health-promotion models that operationalize constructs and pathways for predicting behavioural health outcomes, and concluded that SAT was a useful framework to address HIV transmission-risk behaviour. This study used SAT to address the need to further explain contextual and social processes influencing HIV transmission-risk behaviour.

Contextual influences in HIV risk

The role of contextual influences in predicting HIV sexual transmission-risk behaviour has garnered interest in the research arena, including research to understand background factors (gender, age, ethnicity), biological indicators (HIV disease progression), arousal/mood (anxiety and depression) and environmental contexts (life stressors, education).

Background factors. Gender is of particular interest in HIV transmission research. In a multisite study that included seropositive men and women ($n = 3723$), nearly one quarter of the women (21.2%) and heterosexual men (27.5%) and nearly 60% (59.4%) of the men who have sex with men (MSM) reported having multiple sex partners (Weinhardt *et al.* 2004). HIV prevalence is increasing rapidly among young people between the ages of 13 and 29 years, and particularly among MSM in this age group (Centers for Disease Control and Prevention 2014). However, many older PLWH also engage in HIV risk behaviours (Illa *et al.* 2008, Onen 2010). When comparing self-reports of younger and older adult PLWH from Washington state ($n = 541$), rates of recent sexual activity decreased with age, but sexually transmitted diseases were evident among all age groups in this mostly African American and Caucasian sample (Onen 2010). Overall, about one-third of participants reported inconsistent condom use (CU) that did not differ by age group. The HIV-disease indicator of time since testing positive was not a statistically significant predictor of CU in that sample. A lower frequency (20%) of inconsistent CU was reported in a sample of older sexually active PLWH from Florida (Illa *et al.* 2008). In addition, negative mood and perceived HIV stigma were associated with inconsistent (82%) CU in this group of mostly (60%) African American men. Among a sample of HIV-positive older African American men, having fewer HIV symptoms and being single were perceived barriers to condom use (Coleman & Ball 2007).

Arousal/moods. Aspects of mental health involving mood and arousal have been explored among PLWH related to sexual transmission risk behaviours (Kalichman & Weinhardt 2001, Comulada *et al.* 2010). Negative affective

states including social anxiety and depression have been identified as behavioural risk factors associated with unprotected sex among MSM (Beck *et al.* 2003, Mills *et al.* 2004). However, such findings have been equivocal across studies, where associations between sexual risk behaviour and negative emotional states were not robust (Crepaz & Marks 2001), and where, on the other hand, depression was associated with sexual risk behaviour (Kalichman 2000), and sexual compulsivity correlated with depression and anxiety (Kalichman *et al.* 2001). In a clinic sample of mostly unemployed African American MSM ($n = 2009$), a strong association between social anxiety and unprotected insertive anal intercourse with sero-discordant partners was reported (Hart *et al.* 2008). Further examination of mechanisms by which anxiety is associated with sexual risk among seropositive MSM was recommended.

Environment/action contexts. SAT expands upon social cognitive theories (Bandura 1994) to target contextual and environmental influences as they relate to health protective/endangering behaviours (Moore & Oppong 2007, Traube *et al.* 2011). Life stressors have been considered when exploring sexual risk behaviour. In a longitudinal study among PLWH ($n = 611$) in the Southeastern US associations between stressful life events and unprotected sex was explored and each additional moderately stressful event an individual experienced above his/her norm, was associated with increased odds (24–27%) of engaging in unprotected sex (Pence *et al.* 2010). Stressful life events have also been associated with antiretroviral adherence (Corless *et al.* 2013). Allen *et al.* (2010) observed that CU at last sexual encounter was positively associated with education level. Higher education was also associated with female CU in a study that included African American and Latina women in Connecticut ($n = 461$) (Weeks *et al.* 2010). Having enough income was independently associated with CU among PLWH in the Caribbean (Allen *et al.* 2010).

Self-change processes

Self-change processes include the domains of social interaction processes, motivational appraisals and generative capabilities.

Social interaction processes. The influences of stigma and social support have frequently been explored with sexual risk behaviour among MSM (Mahajan *et al.* 2008). In two MSM samples, higher stigma scores were related to low self-esteem and increased risk-taking behaviour (Stokes & Peterson 1998, Preston *et al.* 2007). Perceived stigma has also been correlated with depression (Vyavaharkar *et al.*

2010). HIV-related stigma has also been negatively correlated with self-esteem and positively correlated with social support (Adam *et al.* 2005, Rosario *et al.* 2006).

Motivational appraisals. Self-efficacy is an important motivational process highlighted in SAT, and a central construct in other explanatory models for health behaviour (Kalichman *et al.* 2001, Sullivan 2009, Sullivan *et al.* 2010). Self-efficacy is a self-evaluative belief that one can effectively perform a specific behaviour (e.g. use condoms) under specific conditions (e.g. a new partner, substance use). Behaviour change is optimized when beliefs are strengthened about one's capability for performing a recommended action. Self-efficacy for condom use differed significantly by gender in a sample of HIV-positive injection drug users ($n = 348$) and lower condom use self-efficacy and more episodes of partner violence were associated with negative beliefs about condoms among women (Mizuno *et al.* 2007). Knipper *et al.* (2007) explored CU efficacy measures (e.g. impulse control, partner resistance, communication about condoms) among heterosexual Latino men ($n = 222$) in rural North Carolina and observed that higher CU self-efficacy was associated with more frequent CU. These findings highlight the importance of using context-specific measures of efficacy for condom use (Kalichman *et al.* 2001, Mizuno *et al.* 2007).

Generative capabilities. In contrast to the above findings, Moskowitz and Seal (2011) reported no relationship between self-esteem and CU behaviour among mostly white MSM ($n = 1468$) from Chicago and Wisconsin. With these equivocal findings for CU among MSM, further research is needed to determine if self-esteem, social support and stigma are self-change processes related to transmission-risk behaviours, that clinicians can address through treatment interventions. Optimism about treatments that reduce HIV viral load has led to scientific inquiry about the role optimism plays in HIV-transmission risk behaviour (Abelson *et al.* 2006, Peterson *et al.* 2012, Prestage *et al.* 2012, Vanable *et al.* 2012). Research thus far exploring this link among MSM has been inconclusive (Abelson *et al.* 2006, Peterson *et al.* 2012). A meta-analysis of treatment optimism reported no increase in transmission-risk among PLWH receiving treatment, compared to those who were not (Crepaz *et al.* 2004). However, use of different measures may contribute to divergent findings (Brennan *et al.* 2009).

Action states

Action state outcomes include social-interdependence, and health protective/destructive behaviours.

Social interdependence. Sexual transmission of HIV is dependent on the interchange between two sexually active persons. Relationship status is frequently measured in sexual risk behaviour research (Wilson *et al.* 2007, Sullivan *et al.* 2010). HIV-positive women recruited from five US cities ($n = 1090$) used condoms less frequently in established partnerships as compared with newer partnerships (Wilson *et al.* 2007). Similar results were observed among women ($n = 84$) from Hawaii and Seattle, Washington who reported 133 total most recent partners (Sullivan *et al.* 2010).

Health protective/destructive behaviours. For this SAT model, the health protective action of condom use is included in the outcome measure under study. Consistent condom use by PLWH is essential to reduce HIV transmission. Multiple factors may influence condom use including the aforementioned variables in the SAT model. From this SAT framework, substance use is viewed as a habit that can moderate sexual risk behaviour. Sexual risk-taking increases in the context of substance use, as indicated by the association of drug use and having multiple sex partners (Simoni *et al.* 2000, Duru *et al.* 2006) and alcohol and/or drugs before engaging in unsafe sex (Marks & Crepaz 2001).

Outcomes

Based on a thorough review of the literature grounded in SAT, sexual risk behaviour is considered multi-factorial and influenced by contextual factors; arousal and mood states; and social, motivational, and interaction processes. Coupled with inconsistent findings about contextual, social and self-change processes predicting sexual risk behaviour, this review suggests that further investigation is needed. The aims of this study were to explore factors associated with sexual behaviour that increase HIV transmission-risk, including having multiple sex partners and inconsistent condom use over a short period of time (3 months). Framed in SAT, factors considered to influence HIV transmission risk behaviour are provided in Figure 2.

The study

Aims

The primary purpose of this multisite international study was to explore aspects of self- (efficacy, esteem) in relation to disease self-management, among PLWH. This study was a secondary data analysis of sexual risk behaviour from participants ($n = 1773$) at research sites across the USA ($n = 16$) and Puerto Rico ($n = 1$). The aims of this analysis were to:

Contextual Influence			Self-Change Processes		
Background/Biology					
Gender (Sex at birth) Age Race/Ethnicity	Male/Female Mean 6 Races	Race/Ethnicity Recoded: 5 categories (White, Asian/Pacific Islander, African American, Hispanic/Latino, Other)	Stigma: Personalized stigma subscale (PSS), Personalized stigma dimension (Berger <i>et al.</i> 2001; Holzemer <i>et al.</i> 1999)	PSS measured 4 stigma dimensions perceived by PLWH (only personalized dimension used).	Personalized stigma included 4-point Likert-type (strongly disagree - strongly agree). Cronbach's alpha 0.92.
HIV/AIDS: Ever told you had AIDS? Years HIV positive	Yes, No or Don't know Mean Years	Recoded: Yes/No, don't know	Social support	One item question measuring social support	Total score
Mode of transmission risk Most likely way became infected with HIV	6 categories: Sex with man (MSM), sex with women, shared needles; Blood transfusion/other procedure; Don't know; Other	Recoded: MSM (MSM and women); Other sexual risk (heterosexual or lesbian sex), non-sexual risk (shared needles, transfusion/other)	Condom use self-efficacy (Mizuno <i>et al.</i> 2007). Questions about perceived ability to use condoms with SPs in various situations	Modified from computerized self-report. 5-point scale. <i>How confident in ability to perform the behavior?</i> ('absolutely sure I cannot' - 'absolutely sure I can')	Cronbach's alpha 0.93, and 0.95 for men and women, respectively.
Arousal Moods					
Depression: Center for Epidemiology Studies Depression Scale (CES-D)	Non-diagnostic screening (Radloff 1977). "0" = rarely/none of the time to "3" = most/all of the time	Cronbach's alpha 0.90 ($n = 727$ PLWH CES-D total score)	Self-esteem (SE): (Rosenberg, 1989). Measure of global SE r/t to feelings of self-worth, self-acceptance	Self-report 10 items. 4-pt scale strongly agree - strongly disagree	Scores summed for Total score, Cronbach's alpha for total score 0.89
Anxiety: Designed to assess the degree of distress in subjects.	10 items: 5-pt scale 'How much' are you bothered by each anxiety-related symptom (1 = not at all; 5 = extremely).	Cronbach's alpha for Total score = 0.95	Treatment optimism 2 Questions: Yes/No Response	HIV is: 1) no longer a threat as it used to be; 2) now a controllable disease.	Mean response score Cronbach's alpha 0.69
Environmental/Action Contexts			Action States		
Education level:	7 categories	Recoded < high school (HS); HS or equivalent; some college	Substance use frequency (Lightfoot, <i>et al.</i> , 2005), with slight modifications. Times/week used alcohol, marijuana various drugst (3-month recall)	("Never" - "7 days/week") and >1 per day. Recoded: Substance Use Frequency: 1) abstinent; 2) occasional (alcohol ≤ 1 day/wk., other drug use > 4 times/week; no injection drugs; 3) frequent (alcohol > 1/week, a least one drug used > 4 times/week, or injection drugs use in past 3 months. Similar to addiction severity index (McLellan <i>et al.</i> 1980)	
Stressful life events: Measures incidences, experiences, illness, stigma, injury or death of a spouse or parent, unemployment	5 items	Cronbach's alpha 0.86	Condom use: Separate questions for: men only (MSM); and men and women	(3 different questions). "In the past 3 months, with how many different partners did you have: 1) insertive anal sex without a condom; 2) receptive anal sex without a condom; 3) vaginal sex without a condom. Recode: Had sex without a condom (Y/N); had sex without a condom with multiple SP (Y/N)	

Figure 2 Variables in the social action theory model for sexual risk behavior.

- 1) describe sexual risk behaviour among an ethnically diverse population of persons living with HIV in the USA and Puerto Rico.
- 2) explore relationships between the identified Social Action Theory indicators (Figure 2) and the HIV transmission risk behaviour of having multiple SPs in a 3-month period with inconsistent condom use.

Design

The study included a cross-sectional descriptive survey developed by the International Nursing Network for HIV/AIDS Research (Holzemer 2007, Dawson Rose *et al.* 2014). Convenience samples of adult PLWH were recruited from study sites. Sample size was determined by each site principal investigator contributing data sets with at least 100 participants (Dawson Rose *et al.* 2014).

Participants

Inclusion criteria consisted of: being 18 years of age or older; having an HIV-positive serostatus (self-report); being able to provide informed consent to participate; being literate based on the predominant site/country. Exclusion criteria consisted of an inability to provide informed consent as

evidenced by cognitive impairment, active psychosis or statistically significant confusion. Participants responded to advertisements and/or active outreach at HIV/AIDS health-care and social service sites, private practices, university-based clinics and public or private facilities (Dawson Rose *et al.* 2014).

Data collection

Data were collected using a hard-copy questionnaire. Participants could ask for assistance from survey administrators if needed to complete the survey. Data collection occurred between February 2010 - July 2011. Assessment measures were chosen based on the SAT framework and will be described using the model provided (Figure 1). Most assessment measures have previously been used and validated with HIV participants unless otherwise specified. A description of the scales used for these measures are presented (Figure 2).

Ethical considerations

The study was approved by Institutional Review Boards (IRB) at the universities and/or health agencies at each site (Dawson Rose *et al.* 2014).

Data analysis

Descriptive data included: frequencies by gender of categorical variables (Table 1); frequencies and means by sexual risk behaviours, including: (a) had sex; (b) had sex without a condom, and (c) had sex with more than one partner (Table 2 and Figure 3, respectively). Multivariate logistic regression modeling was used to identify variables in the SAT model that predicted four distinct outcomes: (1) had sex; (2) had sex without a condom; (3) had sex with multiple partners (Table 3), and; (4) had high-risk sex (multiple partners and inconsistent condom use) (Table 4). Background factors were initially entered, including sex, age, ethnicity, years HIV positive, HIV/AIDS status and transmission risk category. Then, using a forward step modeling

Table 1 Demographic characteristics by sex (assigned at birth).

Variables	Total (%)	Male	Female
Sex assigned at birth	100.0 (1773)	71.3 (1264)	27.7 (491)
Ethnicity			
African American	43.2 (752)	41.6 (522)	47.2 (230)
Caucasian	25.0 (436)	27.6 (346)	18.5 (90)
Hispanic	24.2 (421)	23.5 (295)	25.9 (126)
Asian/Pacific Islander	2.9 (50)	2.9 (36)	2.9 (14)
Other	4.8 (83)	4.5 (56)	5.5 (27)
Self-reported mode of HIV infection*			
Sex with HIV-positive man	72.6 (1181)	67.7 (787)	84.7 (394)
Sex with HIV-positive woman	25.0 (357)	33.3 (344)	3.3 (13)
Needles	27.3 (397)	27.2 (283)	27.6 (114)
Blood transfusion	8.0 (112)	7.3 (73)	9.8 (39)
Other	18.8 (255)	20.5 (196)	15.2 (59)
Diagnosed with AIDS	42.9 (742)	36.0 (174)	45.6 (568)
Education			
College (2-4 years degree or post graduate)	34.1 (597)	38.2 (482)	23.4 (115)
High school or GED	40.7 (713)	41.7 (526)	38.1 (187)
11th grade or less	25.2 (442)	20.2 (253)	38.5 (189)
Working for pay	19.6 (341)	21.1 (265)	15.5 (76)
Adequacy of income			
Adequate	20.9 (363)	22.1 (276)	10.8 (87)
Barely adequate	53.8 (933)	51.7 (647)	59.1 (286)
Totally inadequate	25.3 (439)	26.2 (328)	22.9 (111)
Mean values	Mean (SD)	Mean (SD) (Range)	Mean (SD) (Range)
Years of age	46.1 (9.3)	46.4 (9.3) (18-74)	45.2 (9.1) (20-70)
Years since HIV diagnosis	14.0 (7.5)	14.3 (7.6) (0-42)	13.0 (7.2) (1-35)

*Totals per cent greater than 100 as participants could choose more than one risk factor.

procedure the remaining variables in the SAT model were entered. Level of significance was determined to be values of $P \leq 0.05$.

Validity and reliability/rigour

The instruments and measures are categorized by the SAT model (Figure 2). Cronbach's alphas are provided for measures of reliability where indicated.

Results

Participant data from 1773 persons were included in this sub-analysis (Table 1). The majority of participants were male (71.9%, $n = 1264$), as fewer females ($n = 491$) from the USA and Puerto Rico were enrolled. Participants were mostly of African American (43.2%), Caucasian (25.0%) or Hispanic/Latino (24.2%) ethnicity. Over two-thirds of the men (67.7%, $n = 787$), and most of the women (84.7%, $n = 394$), reported that they contracted HIV by having sex with an HIV-positive man. Most participants reported having a diagnosis of HIV not AIDS (55.8% vs. 42.9% respectively). About one-quarter of the participants did not have a high school diploma or equivalency ($n = 442$), while over one-third had some college education (34.1%, $n = 597$). Less than one in five participants worked for pay (19.6%, $n = 341$), and the majority reported income as less than adequate (79.1%, $n = 1372$). The age range of the sample was 18-74 years old, with the mean age for men was 46 years old, which was slightly older than women participants. Mean number of years living with HIV/AIDS was slightly longer for men than women (14.3 and 13.0 years respectively).

Contextual influences and sexual risk behaviours

Table 2 presents data on frequencies including: (1) had sex; (2) had sex without a condom and (3) had sex with more than one partner. SAT factors are explored in light of these behaviours. Of the men and women who reported about sexual relationships ($n = 1557$), over half engaged in anal or vaginal sex during the previous 3 months (51.1%, $n = 896$). Nearly one quarter (24.7%) had sex without a condom, and 237 had multiple partners with most of those respondents being male ($n = 214$).

Within ethnic groups, over half of the participants of Asian/Pacific Islander, African American and Hispanic/Latino descent reported engaging in sex (56.0%, 54.2% and 53.9% respectively). However, the frequencies of engaging in sex without a condom were highest among

Table 2 Frequency of self-reported sexual risk behaviours.

	Had sex % (n)	Had sex without condom use % (n)	Had sex with more than one partner % (n)
Gender			
Male	52.0 (657)	26.1 (330)	16.9 (214)
Female	48.7 (239)	21.2 (104)	4.7 (23)
Ethnicity			
Caucasian	43.5 (190)	28.4 (124)	15.1 (66)
Asian Pacific Islander	56.0 (28)	30.0 (15)	12.0 (6)
African American	54.2 (408)	23.2 (175)	12.1 (91)
Hispanic Latino	53.9 (228)	22.2 (94)	13.7 (58)
Other	44.0 (37)	26.2 (22)	15.5 (13)
HIV-transmission risk			
Men who had sex with men	54.6 (430)	29.9 (235)	21.9 (172)
Other sexual behaviours	51.7 (314)	21.6 (116)	7.7 (44)
Other non-sexual behaviours	41.1 (92)	19.6 (44)	6.7 (15)
Education			
College experience	52.3 (313)	29.5 (177)	19.9 (119)
High school degree or equivalent	51.0 (364)	22.3 (159)	10.6 (76)
Less than high school degree	49.3 (219)	22.1 (98)	9.5 (42)
Work for pay			
Yes	60.4 (209)	30.6 (106)	19.1 (66)
No	48.5 (687)	23.1 (327)	12.1 (172)
Substance use frequency			
Frequent	54.0 (423)	28.6 (224)	16.2 (127)
Occasional	54.1 (240)	26.6 (118)	14.4 (64)
Abstinent	43.3 (213)	17.3 (85)	8.3 (41)

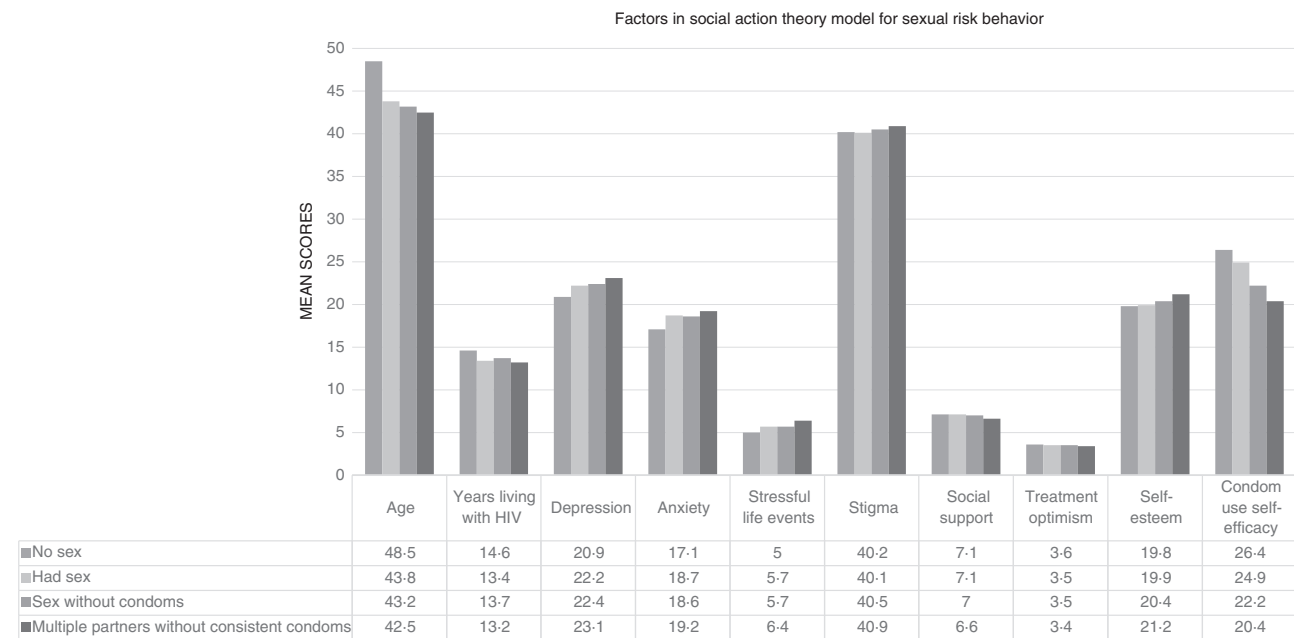
**Figure 3** Social Action Theory mean scores (no sex, had sex, sex without condoms and multiple partners without consistent condoms).

Table 3 Logistic regression models for three outcomes (Had sex, had sex without a condom, had sex with multiple partners ($n = 1338$)).

Model factors	Had sex		Sex without a condom		Multiple sex partners	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Gender (Female = Referent)		0.26		0.35	0.35 (0.19, 0.64)	0.00
Age	0.94 (0.92, 0.95)	0.00	0.95 (0.93, 0.97)	0.00	0.95 (0.93, 0.97)	0.00
Ethnicity (Caucasian = Referent)						
Asian/Pacific Islander	2.12 (0.99, 4.55)	0.05		0.70		0.97
African American	1.90 (1.39, 2.58)	0.00		0.77		0.20
Hispanic/Latino	1.47 (1.05, 2.07)	0.03		0.14		0.21
Other		0.84		0.85		0.48
HIV-transmission risk behaviour (MSM = Referent)						
Other sexual risk		0.33		0.92		0.18
Other non-sexual risk	0.64 (0.44, 0.95)	0.03		0.09	0.42 (0.22, 0.78)	0.01
Perceived Stigma	0.99 (0.98, 1.00)	0.00		0.73		0.40
Anxiety	1.02 (1.01, 1.03)	0.05		0.64		0.58
Education (High school diploma = Referent)						
College		0.07	1.48 (1.09, 2.01)	0.01	2.23 (1.54, 3.24)	0.00
Less than high school (or equivalent)		0.67		0.51		0.23
Work for pay	1.70 (1.25, 2.30)	0.00	1.52 (1.10, 2.10)	0.01	1.65 (1.13, 2.41)	0.01
Life stressors		0.25		0.80		0.10
Condom use self-efficacy	0.98 (0.97, 1.00)	0.01	0.95 (0.94, 0.96)	0.00		0.62
Substance use (Abstinent = Referent)						
Occasional user	1.60 (1.17, 2.18)	0.00	1.78 (1.23, 2.57)	0.00		0.45
Frequent user	1.83 (1.36, 2.45)	0.00	2.14 (1.52, 3.02)	0.00	1.90 (1.24, 2.91)	0.00

NS, not significant.

Table 4 Logistic regression for multiple sex partners without consistent condom use ($n = 1338$).

Predictor variable	β	Exp (B)	95% confidence interval	P
Sex (Male = Referent)	-1.06	0.34	(0.12, 0.99)	0.05
Age	-0.04	0.96	(0.94, 0.99)	0.01
Race/ethnicity				0.83
Years living with HIV				0.36
HIV Transmission risk behaviour (MSM = Referent)				0.03
Other sexual risk behaviour	-0.81	0.43	(0.19, 0.97)	0.04
Non-sexual transmission risk behaviour	-1.03	0.36	(0.14, 0.90)	0.03
Education (High school/equivalent = Referent)				0.01
Less than high school	0.08	1.08	(0.54, 2.14)	0.84
College experience	0.71	2.12	(1.27, 3.51)	0.00
Life stressors	0.04	1.04	(0.98, 1.10)	0.20
Condom use self-efficacy	-0.05	0.95	(0.93, 0.97)	0.00
Substance use (Abstinent = Referent)				
Occasional user	0.15	1.15	(0.55, 2.42)	0.71
Frequent user	0.98	2.62	(1.37, 5.01)	0.00

Pseudo R^2 value = 0.21.

Asian/Pacific Islanders (30%), and the reported frequency for having sex with more than one partner was highest among those of Caucasian ethnicity (15.1%). Participants who reported MSM as the transmission route for their HIV disease, more frequently reported having sex, inconsistently using condoms, and having multiple sexual partners, compared to participants who reported other modes of HIV transmission. For those who reported not having sex

(Figure 3), mean age and mean years HIV-positive were higher, compared to all other sex-behaviour categories reported.

Environment/action indicators

For level of education and sexual risk (Table 2), report frequencies for inconsistent condom use were higher among

participants with college experience (29.5%) compared to the two lower level education categories (22.3% and 22.1%, respectively). In addition, the reported frequency for having sex with more than one partner was tenfold higher among those with college experience (19.9%), compared to those with less than a high school diploma (9.5%). A majority of participants who worked for pay reported they had sex (60.4%), while a minority (48.5%) of those who did not work for pay had sex during the 3-month recall period. Report frequencies for having sex without consistent condom use, and for having sex with more than one partner, were higher among those who worked for pay (30.6% & 19.1%, respectively) compared to those who did not (23.1% and 12.1%, respectively).

Figure 3 presents mean scores for SAT model factors among participants who engaged in the behaviour categories of: no sex; had sex; had sex without a condom, and; had more than one sex partner without consistent condom use. For stressful life events, the highest mean number of events was reported among persons who had multiple partners without consistent condom use.

Arousal/mood and sexual risk behaviours

Mean scores for anxiety and depression were lower among persons who reported no sex. Higher mean scores for depression, anxiety and number of stressful life events were reported among persons who had multiple sex partners without consistent condom use.

Self-change processes and sexual risk behaviour

Mean scores for personalized HIV stigma, social support and treatment optimism, were similar across sexual behaviour categories (Figure 3). The lowest mean score for condom use self-efficacy was within the behaviour category of, having sex without consistent condom use. Self-esteem scores were highest for participants who reported having multiple partners.

Action states and sexual risk behaviour

Participants who abstained from substances reported lower frequencies of engaging in sexual risk behaviours (using condoms inconsistently, and/or having multiple partners). Participants who frequently used substances, also more frequently reported having sex without condom use, and having sex with multiple partners.

Predictors of sexual risk behaviours

Using binary logistic regression, all aforementioned factors were included in three-block modeling procedures for the outcome variables of: a) had sex; b) had sex without a

condom and c) had sex with multiple partners (Table 3). For race/ethnicity, the odds of having sex were higher among Asian/Pacific Islanders (OR 0.99–4.55, $P = 0.05$), African Americans (OR 1.39–2.58, $P = 0.0$) and Hispanic/Latinos (OR 1.05–2.07), compared to Caucasians. However, ethnicity was not significantly associated with inconsistent condom use or with having multiple partners. For HIV-transmission risk, odds ratios for the three outcome measures were not significantly different between MSM and other sexual behaviours (heterosexual or lesbian sex). For the mood/arousal domain, mean scores for personalized stigma were higher among those who did not report having sex (OR 0.98–1.00, $P = 0.00$), while scores for anxiety were higher among those who did report having sex (OR 1.01–1.03, $P = 0.05$).

Those who worked for pay were significantly more likely than their non-working counterparts to report having: had sex (OR 1.25–2.30, $P = 0.00$); used condoms inconsistently (OR 1.10–2.10, $P = 0.01$); and had multiple partners (OR 1.13–2.41, $P = 0.01$). Higher condom use self-efficacy scores were associated with fewer reports of inconsistent condom use (OR 0.94–0.96, $P = 0.00$). The following SAT factors were associated with having multiple sex partners: male gender, younger age, higher level of education and frequent substance use behaviour ($P = 0.00$ respectively) (Table 3).

High transmission-risk behaviour

A three-step regression modeling procedure (forward step) was used for the final outcome measure of, sex with multiple partners and with inconsistent condom use (Table 4). SAT indicators predictive of this outcome measure included: gender; age; mode of HIV-transmission; level of education; self-efficacy for condom use and substance use frequency. Females were less likely than men to engage in sex with multiple partners and without consistent condom use ($\beta = -1.06$, $P = 0.05$). Age was statistically significant, such that as age increased, the likelihood of having multiple partners and inconsistent condom use decreased ($\beta = -0.04$, $P = 0.01$). Mode of HIV-transmission was also statistically significant ($P = 0.03$): compared to the risk behaviour of MSM, the behaviours of heterosexual or lesbian sex, and injectable drug use were associated with fewer reports of multiple partners and inconsistent condom use ($\beta = -0.81$, $P = 0.04$ and $\beta = -1.02$, $P = 0.03$ respectively). Level of education was a predictor in the model as well. Compared to those with a high school diploma, participants with had college experience were significantly more likely to have multiple partners and inconsistent condom use ($\beta = 0.71$, $P = 0.00$).

The one self-change process variable significant in the SAT model was self-efficacy for condom use, and this was in a negative direction ($\beta = -0.05$, $P = 0.00$): those with higher scores for condom use self-efficacy were less likely to have multiple partners and inconsistent condom use. The substance use frequency indicator was a strong predictor in the model as well ($\beta = 0.98$): compared to those who were abstinent, frequent substance users were significantly more likely to engage in the high HIV-transmission risk behaviour ($P = 0.00$). This model predicted 21% of the observed model variance (pseudo $R^2 = 0.21$).

Discussion

The SAT framework offered by Traube *et al.* (2011) views condom use as a self-regulated, health protective behaviour occurring within an environmental context of social interaction and interdependence. Although SAT does not specify exactly what factors or measures to use for predicting sexual risk behaviour, it does suggest pathways to test hypothesized mediators and moderators of risk behaviour. Using the SAT approach does provide an exemplar for other researchers to test hypotheses on outcome behaviours using different contextual, self-change and health protective measures gleaned from the scientific literature.

Contextual influences

The findings support some research associated with age and frequency of HIV-transmission risk behaviours. This sample was multiethnic, yet ethnicity was not significant. Therefore, it is important to consider all ethnic groups when addressing sexual risk behaviour, and to include probability sampling for making inferences about ethnicity. As is frequently noted, MSM among this sample engaged in more transmission risk behaviours. The statistically significant association between higher education and less self-protective behaviour is a unique finding. Further research is needed to explore the association between education level and personalized stigma, because educated persons who contract HIV may be less likely to risk communication about their serostatus with sexual partners. In addition, reduced federal funding for HIV prevention may contribute to high schools and universities cutting back on HIV-prevention education activities that reach those entering the collegiate arena.

Self-change processes

Self-efficacy for condom use was the only self-change construct associated with the HIV-transmission risk behaviour

outcome in our model. None of the other intrapersonal constructs were associated with lower risk behaviour, giving additional credence to the importance of self-efficacy in the HIV-positive person's cognitive base. Coupled with the influence of education, it may be that some PLWH are knowledgeable about the requisite skills for using condoms but lack a sense of efficacy for managing condom use in their social environments. There is a difference between possessing knowledge and skills, and being able to use condoms under challenging circumstances (Bandura 1994). Using condoms consistently requires skillsets for problem-solving, affect regulation and harnessing motivation. Despite variations in measuring condom use efficacy (Kalichman *et al.* 2001) perceptions of efficaciousness appear to influence one's ability to negotiate condoms in a variety of contexts (Kalichman *et al.* 2001, Illa *et al.* 2008, Miner *et al.* 2009). These findings strengthen support for HIV transmission-risk reduction interventions focused on self-efficacy beliefs.

Action states/outcomes

Frequent drug users reported sexual risk behaviour significantly more than those categorized as drug abstinent. Alcohol and/or illicit drug use before sex may alter cognitive abilities needed for making sound decisions about condom use or for refusing unsafe sex. Sullivan (2009) reported that frequency of crack use was associated with less condom use in a sample of PLWH who were mostly MSM. Kalichman and Nachimson (1999) also reported that nearly one-quarter of women who had at least one occasion of unprotected sex without disclosing serostatus did not use condoms after having alcohol and/or other drugs before sex.

Limitations

The sample size was robust, and participants self-reported about their sexual risk and other behaviours. However, the number of persons who reported having multiple sexual partners without consistent condom use was comparatively small, limiting the ability to generalize findings, especially to women. To manage missing data, categories used for analyses included, engaged in the behaviour or, did not engage or did not report. It may be that some participants who did not report their risk behaviours actually engaged in them. However, with the inclusion of other transmission-risk behaviours (sex without condoms, multiple partners), comparative analyses by SAT domains were robust. While the sample was representative of the general distribution of

HIV/AIDS cases in the USA and Puerto Rico by gender and ethnicity, fewer male participants reported the HIV-transmission risk behaviour of having sex with a male (48.4%), compared to the rate of MSM transmission risk (61.0%) reported in larger US samples (Centers for Disease Control and Prevention 2014). It may be that MSM were under-represented in our sample or that the variable used to identify MSM was not sufficiently robust. The model was fairly robust, but did not explain the impact of all influences on condom use. For example, the CDC highlights that sexual HIV-transmission risk among seropositive adults is influenced by HIV prevalence, knowledge of HIV status, cultural issues (e.g. racism, homophobia) and social discrimination (Centers for Disease Control and Prevention 2014). These factors have been identified as important in HIV transmission risk research. Despite these limitations, the SAT is a broad health promotion model that was practical to use for exploring HIV-transmission risk behaviour.

Implications for practice

The HIV/AIDS epidemic continues, as evidenced by the recent outbreak in Indiana that has now involved 209 confirmed cases of HIV since early 2015 (Indiana State Department of Health [ISDH], 2016). While this outbreak is fueled by injectable drug use (CDC, 2015), HIV prevention efforts have expanded to reach travellers and truck drivers, with a key message to avoid risky sexual behaviours (ISDH 2015).

Most HIV infections occur through sexual contact among partners who may be unaware of their HIV status. Nurses are in key positions to address sexual and drug use behaviours that put clients at high risk for HIV. This paper provides a theoretical framework for nurses, health educators and researchers to use as a guide to formulate ideas about what factors are influencing the sexual transmission of HIV. This model can undergo continued testing, to identify cultural, environmental and interpersonal factors influencing the sexual transmission of HIV across the world.

Conclusion

Social Action theorists assert that to understand risk behaviour, one must focus on the factors that influence social interactions, the context in which interactions take place, and the social norms that regulate such actions. The testing of this sexual risk behaviour model raises the possibility of using SAT to frame a longitudinal group-based intervention with temporal indicators, to address self-efficacy beliefs about condom use among persons living with HIV/AIDS,

who are frequent substance users. Questions may be answered about the mediating effect of group support or about problem-solving approaches to curb sexual risk-taking behaviour. Using structural equation modeling would ensure that temporal causality can be inferred (Traube *et al.* 2011). SAT is useful as it is informative for healthcare providers and can be used to develop interventions for addressing other transmission risk behaviours including non-disclosure of serostatus to sex partners. In this way, additional high-risk behaviours for the seropositive client can be addressed (Ogden 2003). Healthcare personnel need to routinely discuss sexual transmission risk behaviours with seropositive clients, especially with younger, educated MSM. Interventions that offer strategies that can enhance behavioural intentions to use condoms, tailored specifically to young, educated men that focus on strengthening self-efficacy beliefs for condom use are needed.

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Author contributions

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- substantial contributions to conception and design, acquisition of data or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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