

ORIGINAL RESEARCH—PSYCHOLOGY

Curvilinear Relationship Between Depression and Unprotected Sexual Behaviors among Men Who Have Sex with Men

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ABSTRACT

Introduction. The relationship between depressive symptomatology and risky sexual behaviors has been controversial in literature.

Aim. The current study aims to reexamine the relationship between depression and sexual behaviors among men who have sex with men (MSM) using different sets of analytical assumption.

Methods. Six hundred twenty MSM were recruited in a lesbian, gay, bisexual, and transgender community center in Taiwan to participate in a cross-sectional survey. An additional variable of squared depressive symptomatology was used to detect nonlinearity between depressive symptomatology and logit-transformed unprotected anal intercourse (UAI) and unprotected oral sex (UOS). Multivariable logistic regression was applied to further estimate the relationship among the three variables.

Main Outcome Measures. Depressive symptomatology was measured by the Beck Depression Inventory (BDI), UAI, and UOS.

Results. Depressive symptomatology had a nonlinear relationship with unprotected anal and oral sex. While linear BDI scores of MSM were not associated with unprotected sexual behaviors in the logistic model, their scores were significantly associated with unprotected sexual behaviors in the model that included both the linear (UAI, odds ratio [OR] = 1.087; $P < 0.01$; UOS, OR = 1.099, $P < 0.01$) and quadratic BDI scores (UAI, OR = 0.998, $P < 0.01$; UOS, OR = 0.997, $P < 0.01$). The relationship between BDI scores and the probability of unprotected sexual behaviors corresponded to an inverted U-shaped curve, as opposed to a straight line.

Conclusions. Our findings suggest that depressive symptomatology has a significant curvilinear relationship with unprotected sexual behaviors. MSM with moderate levels of depression may be at elevated risk of engaging in unprotected sexual behaviors in comparison to their peers who exhibit either significantly higher or lower depression scores. **Shiu CS, Chen YC, Tseng PC, Chung AC, Wu MT, Hsu ST, and Ko NY. Curvilinear relationship between depression and unprotected sexual behaviors among men who have sex with men. J Sex Med 2014;11:2466–2473.**

Key Words. MSM; Depression; Risky Sexual Behaviors; Curvilinear Relationships

Introduction

Men who have sex with men (MSM) are a sub-population at significant risk of human immunodeficiency virus (HIV) infection in many

countries, both developing [1,2] and developed [3–5] countries alike, including Taiwan. Despite declines in infection among other at-risk groups, trends in transmission and infection have continued to surge upward among MSM. In the United

States, MSM accounted for 66% of the new infections and 57% of the overall HIV-positive population in 2010 [6]. Similarly between 2008 and 2009, the annual incidence rate of HIV among Taiwanese MSM increased by 15% and by 2012, MSM in Taiwan comprised 75% of all new HIV/AIDS diagnoses [7].

Negative affect, such as depressive symptomatology, has long been recognized as a risk factor for unprotected sex and HIV transmission among MSM. According to epidemiological data, an estimated 15–37% of MSM meet diagnostic criteria for major depression [8,9], and depression, among this population, has been linked to engagement in risky sexual behaviors [10–12]. Inconsistent findings, however, have undermined efforts to estimate the magnitude of this association. For example, a meta-analysis performed by Crepaz and Marks concluded that depressive symptomatology was not associated with risky sexual behaviors [13].

Insignificant findings have emerged more often in studies employing continuous depression scores based upon such scales as the Center for Epidemiologic Studies Depression and the Beck Depression Inventory (BDI). In these studies, the association between continuous depression scores and risky sexual behaviors was small to moderate in magnitude, and after controlling for confounding factors, it was insignificant [14,15]. Based upon this observation, Kalichman and Weinhardt argued that conflicting findings might be because of varying definitions of depressive mood and sexual risks, or potentially, the effects of a mediating variable [16].

Following Kalichman and Weinhardt's commentary, researchers have tried unpacking the relationship between mood and risky sexual behaviors in diverse ways. Some researchers, categorizing their samples by level of depressive symptomatology, concluded that clinically depressed individuals had a higher probability of practicing risky sexual behaviors [17–22]. Others, exploring different ways of defining and measuring sexual risk, linked depression scores to number of sexual partners but not unprotected sexual intercourse [23,24]. Finally, more recent studies have identified potential moderating and mediating mechanisms, including cognitive escape and self-efficacy, through which negative mood exerts its influence on sexual risk taking [25,26]. Despite these recent efforts, there is no general consensus regarding the relationship between depressive mood and risky sexual behaviors [18,22,27,28]. It is of great importance, however, to exanimate and more clearly establish the complex relationship

between depression and unprotected sexual behaviors among MSM. The knowledge may benefit to development of prevention and intervention programs targeting to promote both mental and sexual health among this vulnerable population.

The studies cited above share a general assumption, namely, that depression is linearly related to risky sexual behaviors. Even in studies utilizing logistic analyses, the assumption remains that, following the appropriate transformation procedures (typically logit transformation), depressive symptoms will have a linear relationship with the transformed outcome variable (i.e., unprotected sex). Up to 2013, two studies hinted that a nonlinear relationship might exist between depressive symptomatology and sexual transmission risk behaviors among MSM [11,28]. However, these authors did not explicitly test the presence of a nonlinear relationship between depressive symptomatology and risky sexual behaviors. The objective of this study, therefore, is to better estimate the relationship between depressive symptomatology and unprotected sexual behavior by directly testing the presence of nonlinearity.

Methods

Participants and Setting

This is an analysis of baseline data from a cross-sectional survey that assessed mental health, gay identity, and safer sex practices among MSM who visited lesbian, gay, bisexual, and transgender (LGBT) community centers. Data on participants' demographic characteristics and mental, physical, and behavioral health were collected from March 2011 to December 2012 at the Sunshine Queer Center (SQC). The SQC is one of the LGBT community health centers funded by Taiwan Centers for Disease Control (CDC) and located in five metropolitan areas.

Procedure

This study was approved by the Human Subjects Committee of National Cheng Kung University. Visitors to the SQC were randomly approached by trained male volunteers to participate in the survey. Trained volunteers explained the purpose of the study and assisted potential participants to comprehend and sign the research consent form. Volunteers also assured potential participants their rights to refuse research participation. After participants agreed to participate and signed the consent form, volunteers then provided partici-

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