



## Relationship between psychiatric disorders and sexually transmitted diseases in a nationally representative sample



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### ABSTRACT

**Objective:** Sexually transmitted diseases (STDs) are a significant public health concern. Numerous internalizing and externalizing psychiatric disorders have been found to be related to STD risk. However, to date, no studies have examined several psychiatric disorders simultaneously to account for STD risk. Given that psychiatric disorders often co-occur and can be explained by a limited number of latent dimensions of psychopathology, it is important to examine whether the relationship between STDs and psychiatric disorders is best explained by broad dimensions of psychopathology.

**Methods:** The current study examined the associations between a range of Axis I and II psychiatric disorders at baseline and rates of STDs at a three-year follow-up in a large, nationally representative sample of adults in the United States ( $n = 34,434$ ). A confirmatory factor analysis (CFA) was conducted to fit three factors, two internalizing and one externalizing. Structural equation modeling (SEM) was used to assess the relationships between and among the factors and STD status and to test for mediation.

**Results:** In bivariate analyses, most Axis I and Axis II disorders were associated with STD diagnosis at Wave 2, whereas the results of the structural model showed that only the externalizing factor was significantly associated with STD diagnosis at Wave 2. Further, the externalizing factor mediated the relationship between one of the internalizing factors and STD diagnosis.

**Conclusion:** Findings suggest the unique contribution of externalizing psychopathology to STD risk and the importance of examining latent dimensions of disorders when understanding this relationship between psychiatric disorders and STDs.

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### Introduction

Sexually transmitted diseases (STDs) are a significant public health and societal concern. When not detected or treated early, STDs (e.g., HPV, chlamydia, gonorrhea) have the potential to cause serious health problems (e.g., cervical cancer, chronic pelvic pain, ectopic pregnancy [1]). STDs can also increase an individual's susceptibility for HIV infection [2]. Although both men and women are significantly affected by STDs, women tend to face more serious long-term health consequences, including reproductive health problems and infertility; it is estimated that undiagnosed STDs contribute to infertility for approximately 24,000 women annually [2]. In addition to potentially serious health consequences for those infected, STDs also present a significant burden

to the health care system, with direct medical costs for STDs estimated to exceed \$16 billion in the United States alone [1].

Individuals with psychiatric disorders are at high risk for STDs [3–8]. This has been found for a range of internalizing and externalizing disorders, including mood disorders [9–11], anxiety disorders [9,11], substance use disorders [9,12,13], and antisocial personality disorder (ASPD; [14]). However, the literature in this area has been constrained by several limitations.

First, the majority of studies have narrowly focused on individual psychiatric disorders, rather than examining several psychiatric disorders simultaneously. Given that previous research has shown psychiatric disorders often co-occur and that their pattern of co-occurrence is well explained by a limited number of latent variables representing broad dimensions of psychopathology [15–17], it is important to examine the relationship between STDs and psychiatric disorders taking into account these latent factors. Furthermore, it is important to determine whether the relationship between psychiatric disorders and STDs is best explained by these broad dimensions of psychopathology or by the individual disorders.

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Prior work examining the relationship between psychiatric disorders and STD risk also has been constrained by the use of treatment-seeking samples (e.g., [9,11,14]), samples with restricted age ranges (e.g., younger populations; [10,12,13,18]) and geographical areas (e.g., [19]), or sample sizes with limited statistical power or that may not generalize to the larger U.S. population (e.g., [11,14]). Finally, most work in this area, particularly among adult populations, has used cross-sectional designs (e.g., [9–11,13,14]). It has been suggested that future research in this domain incorporate larger sample sizes, longitudinal designs, and models that include a range of Axis I and II psychiatric disorders simultaneously [3].

As such, the primary objective of the current study was to examine the associations between a broad range of Axis I and II psychiatric disorders and rates of STDs. We sought to build on prior work in this area by using a large, nationally representative sample in the U.S. and assessed psychiatric disorders and STDs over a 3-year period. To take into account broader dimensions of psychiatric disorders, we tested whether the identified associations could be explained by three latent factors identified in previous research [17] or were specific for each psychiatric disorder, and whether these associations were mediated by one or more latent factors.

## Method

### Participants and procedure

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) target population consisted of civilian, non-institutionalized adult individuals over 18 years of age residing in households and group quarters. The survey included individuals residing the continental U.S., District of Columbia, Alaska, and Hawaii. African Americans, Hispanics, and individuals aged 18 to 24 years of age were oversampled, and data were adjusted to reflect design characteristics of the NESARC survey and to account for oversampling and non-response. Face-to-face interviews were conducted by lay interviewers with extensive training and supervision [20,21]. In total, 43,093 respondents were interviewed in Wave 1 from 2001 to 2002.

The Wave 2 interview was conducted approximately three years later (mean interval: 36.6 months). Of respondents that continue to be eligible at Wave 2, the response rate was 86.7%, resulting in 34,653 completed interviews at Wave 2. Sample weights were also developed to adjust for Wave 2 non-response [21]. Participants in the current study were 34,434 respondents who participated in both Waves 1 and 2 of interviews and completed the STD assessment. Participants were 47.9% male, 71% White, mean age of 45.06 ( $S.E. = 0.17$ ), mean education years 13.80 ( $S.E. = 0.05$ ), mean individual income of \$30,120 ( $S.E. = 0.53$ ), 63.1% married, 16.4% widowed/separated/divorced, and 20.5% never married. At Wave 2, 0.54% had an STD in the past year ( $n = 194$ ), and 99.46% did not have an STD in the past year ( $n = 34,240$ ). Individuals ( $n = 219$ ) who had missing data for the STD assessment at Wave 2 were not included in this study. All procedures contributing to this work were in accordance with the Declaration of Helsinki for experiments involving humans.

### Assessment of DSM-IV Axis I and Axis II disorders at Wave 1

The Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV (AUDADIS-IV; [22]) Wave 1 version was used to assess DSM-IV Axis I and Axis II disorders. The AUDADIS-IV is a structured diagnostic interview designed for lay professional interviewers to measure substance use and mental disorders in large-scale surveys. Computer algorithms were used to diagnose all DSM-IV Axis I and Axis II disorders at Wave 1. Axis I diagnoses included substance use disorders (alcohol use disorder, drug use disorder, and nicotine dependence), mood disorders (major depressive disorder, dysthymic disorder, and bipolar disorder), anxiety disorders (panic disorder, social anxiety disorder, specific phobia,

and generalized anxiety disorder), and pathological gambling. For all Axis I disorders, diagnoses were made in the past 12 months prior to Wave 1. All diagnoses reported were “primary” such that they exclude disorders characterized as “substance-induced” or due to a general medical condition, and they all met the clinical significance criterion. Axis II disorders were assessed on a lifetime basis and required long-term patterns of social and occupational impairment [23]. Further, at least one symptom reported had to cause distress or social or occupational dysfunction. The AUDADIS-IV Wave 1 version included assessment of avoidant, dependent, obsessive-compulsive, paranoid, schizoid, histrionic, and antisocial personality disorders. Test-retest reliability and validity of the AUDADIS-IV measures of the DSM-IV disorders are adequate and have been reported in detail elsewhere; overall reliability is good for MDD ( $k = 0.65–0.73$ ), good to excellent for SUDs ( $k = 0.70–0.84$ ), and fair to good for other mood and anxiety disorders ( $k = 0.65–0.73$ ) and personality disorders ( $k = 0.40–0.67$ ) [20,21,23,24].

### Assessment of STD incidence at Wave 2

Rates of STD in the past 12 months was determined if the respondent indicated that they had an STD (e.g., gonorrhea, syphilis, chlamydia) diagnosed and confirmed by a health professional in 12 months prior to participation in the Wave 2 interview. This item was assessed separately from HIV status and asks specifically “In the last 12 months, did you have any other sexually transmitted diseases or venereal diseases [excluding HIV] like gonorrhea, syphilis, chlamydia, or herpes?”

### Statistical analyses

We first examined the bivariate relationships between Wave 1 psychiatric disorders and Wave 2 STD status adjusting for relevant sociodemographic characteristics that have been previously shown to be associated with STD risk, such as age [25], gender [26], race/ethnicity [27], education level [28], income [29], and marital status [30]. Weighted percentages and means were computed to derive past year prevalence of Axis I disorders and lifetime presence of select Axis II disorders at Wave 1 and STD status (yes/no) at Wave 2. A set of bivariate analyses yielded adjusted odds ratios (AORs) and 95% confidence intervals (CIs) indicating measures of association between Wave 1 diagnostic characteristics and STD status at Wave 2.

Next, we used confirmatory factor analysis (CFA) to identify latent factors underlying the individual psychiatric disorders assessed at Wave 1. This was done to more parsimoniously predict STD risk with disorder clusters by taking into account shared variance across disorders. We tested a three-factor model with two internalizing dimensions and one externalizing, which was based upon a previously tested three-factor model in this sample [17]. To determine model fit, we examined goodness-of-fit measures such as the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean squared error of approximation (RMSEA). CFI and TLI values greater than 0.95 and values of RMSEA less than 0.06 are commonly used to indicate good model fit [31].

Finally, we examined the relationship between the latent factors of the psychiatric disorders at Wave 1 and STD status at Wave 2. Structural equation modeling was used to regress STD status on the latent factors of psychiatric disorders identified in the CFA, adjusting for the demographic characteristics listed above. Initially a SEM was fit without specifying any causal relationships among the latent factors but simply allowing them to be mutually correlated. Standardized estimates of the relationship between STD status and each latent factor indicate how many standard deviations higher (or lower) the mean of the latent variable underlying the binary outcome are expected to be for each increase in an additional unit of that latent factor while controlling for the other factors and covariates. Modification indices (i.e. chi-square tests with 1 d.f.) were examined to test if any residuals associated with specific disorders are correlated with the STD outcome. If a residual

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