

# Gender Abuse, Depressive Symptoms, and Substance Use Among Transgender Women: A 3-Year Prospective Study

Larry Nuttbrock, PhD, Walter Bockting, PhD, Andrew Rosenblum, PhD, Sel Hwahng, PhD, Mona Mason, BA, Monica Macri, MPH, and Jeffrey Becker, MPH, MSW

Previous studies and reports have pointed to a high prevalence of substance use among transgender women.<sup>1,2</sup> In surveys of this population in large US cities, self-reports of alcohol, cannabis, cocaine, amphetamine, methamphetamine, and opiate use have been 4 to 10 times as high as corresponding reports in the general population.<sup>3-6</sup> A recent study of this population in the New York Metropolitan Area observed prevalence estimates of these substances that were, for the most part, marginally higher than previous reports (60.4% for heavy alcohol use, 40.0% for cannabis, 21.7% for cocaine, 3.9% for amphetamines and methamphetamines, and 3.5% for opiates).<sup>7</sup>

Early clinical studies of this population attributed such high percentages of substance use to a gender identity at odds with sexual anatomy,<sup>8</sup> with later reports emphasizing more socially based conflict described as “gender-variant living in an often hostile world.”<sup>9(p88)</sup> Following minority stress theory,<sup>10</sup> the use of alcohol and other drugs in lesbian, gay, bisexual, and transgender populations is now often understood as resulting from internalized stigma (including transgender phobia directed at oneself) or enacted stigma in the forms of discrimination or psychological or physical abuse by others.<sup>11-13</sup>

Enacted stigma and substance use have been described in a few studies of lesbian, gay, bisexual, and transgender populations,<sup>14-16</sup> but longitudinal investigations of these associations are rare,<sup>17</sup> the findings have not been consistent,<sup>18</sup> and no empirical research has focused on stigma and substance use among transgender women.<sup>19</sup>

Recent prospective studies of transgender women by our research team have pointed to gender abuse (enacted stigma) as a pervasive risk factor for a range of interrelated adverse health outcomes. In one study, gender abuse was associated with incident HIV and sexually transmitted infection in part because of the mediating effect of depressive symptoms.<sup>20</sup>

**Objectives.** We examined the effects of gender abuse (enacted stigma), depressive symptoms, and demographic, economic, and lifestyle factors on substance use among transgender women.

**Methods.** We conducted a 3-year prospective study (December 2004 to September 2007) of 230 transgender women aged 19 to 59 years from the New York Metropolitan Area. Statistical techniques included generalized estimating equations with logistic and linear regression links.

**Results.** Six-month prevalence of any substance use at baseline was 76.2%. Across assessment points, gender abuse was associated with alcohol, cannabis, cocaine, or any substance use during the previous 6 months, the number of days these substances were used during the previous month, and the number of substances used. Additional modeling associated changes in gender abuse with changes in substance use across time. Associations of gender abuse and substance use were mediated 55% by depressive symptoms. Positive associations of employment income, sex work, transgender identity, and hormone therapy with substance use were mediated 19% to 42% by gender abuse.

**Conclusions.** Gender abuse, in conjunction with depressive symptoms, is a pervasive and moderately strong risk factor for substance use among transgender women. Improved substance abuse treatment is sorely needed for this population. (*Am J Public Health.* 2014;104:2199-2206. doi:10.2105/AJPH.2014.302106)

A subsequent study showed moderately strong associations of psychological and physical gender abuse with incident major depression.<sup>21</sup>

In this study, we furthered this line of inquiry by systematically examining gender abuse, depressive symptoms, and demographic, economic, and lifestyle variables as interrelated risk factors for substance use. We hypothesized that psychological and physical gender abuse (enacted stigma) would be associated with substance use across time. We also hypothesized that these associations would be partially mediated by depressive symptoms (i.e., gender abuse causes depression, which then causes substance use). We have observed associations of gender abuse and depression in our previous studies, and depression, in turn, has been linked to substance use in numerous clinical and population studies.<sup>22</sup> One interpretation of the latter link, the self-medication hypothesis, suggests that depressed individuals use certain substances in an attempt to temporarily ameliorate their symptomatology.<sup>23</sup>

Against the background of the previous study,<sup>21</sup> which linked 4 background variables (employment income, sex work, social presentation of transgender identity, and hormone therapy) to depression in part because of the mediated effects of gender abuse, we hypothesized that these same background variables would likewise affect substance use in part because of the mediated effects of gender abuse. The link between employment income and gender abuse may reflect the social scrutiny of transgender women's behavior in a formal workplace environment. Sex work (especially in public venues), social presentation of transgender identity, and physical feminization associated with hormone therapy may increase the public visibility of gender nonconformity and increase the odds of gender abuse as a result.

## METHODS

Transgender or gender-variant individuals were actively involved in all aspects of this

project, including the design of the instrument, data collection, data analysis, and dissemination of the findings.

### Selection of Study Participants and Follow-Up Assessment Times

From the 571 study participants included in the baseline component of the New York Transgender Project, we selected 230 to participate in the prospective component described here. All participants were assigned as male at birth but subsequently did not regard themselves as completely male in all situations or roles (reflecting a male-to-female transgender spectrum). Eligibility criteria also included aged 19 years or older and the absence of psychotic ideation.

The study participants were initially recruited via transgender organizations in the New York Metropolitan Area (e.g., the Society for the Second Self, Crossdressers International, and the Mid-Hudson Valley Transgender Association), the Internet, newspaper advertisements, the streets, clubs, client referrals of other clients, and paid assistants from transgender communities who worked on a daily basis with the field staff.

Because one specific aim of this funded research was to identify incident cases of HIV, all of the individuals selected for the prospective component were initially HIV-negative. We also oversampled for younger age and high-risk sexual behavior for HIV.

Owing to the time constraints associated with this project, the number of years study participants could potentially be followed varied. The recruitment phase began in December 2004 and was extended to September 2007 so that all participants in the prospective study ( $n = 230$ ) could potentially be followed for at least 12 months (135 and 74 could potentially be followed for 24 and 36 months, respectively). The percentages of potentially available study participants who were actually interviewed were 149 of 230 (64.8%), 171 of 230 (74.3%), 92 of 135 (68.1%), and 56 of 74 (75.7%) at 6, 12, 24, and 36 months, respectively.

### Measurements

Study participants completed face-to-face interviews in conjunction with the Life Review of Transgender Experiences. Changes in

gender abuse, depressive symptoms, and other factors were ascertained at the follow-up assessment points. The English version of the Life Review of Transgender Experiences was fully translated to Spanish, and 19.1% (44 of 230) were interviewed in Spanish with a fluent interviewer. Study participants were compensated \$40 for completing all of the protocols associated with a specified assessment period.

*Background variables.* We included age 19 to 59 years as a continuous variable and scaled education as less than high school, high school graduate, some college, and college graduate or more. We measured ethnicity by means of preestablished census categories and protocols and analyzed it as White compared with non-White. We measured employment as working full or part time on any regular job during the previous 6 months. We scaled employment income—money received from employment (not sex work) during the previous 6 months—into 4 categories ranging from less than \$1000 to \$30 000 or more. Sex work was defined as having received money, drugs, or gifts in exchange for sex during the previous 6 months.

We assessed presentation of transgender identity at all time points as the disclosure of gender identity, feminine dressing, or both in conjunction with 6 potential relationships (mother, father, friend, fellow student, co-worker, and long-term sexual partner). This was assessed with 2 items: “Were you out with your (type of relationship)?” and were you “feminine dressing with your (type of relationship)?” We computed an index ranging from 0 to 12 by adding indications of identity disclosure and feminine dressing (scored separately) across the 6 relationships. Hormone therapy was determined at all time points as having used any type of female hormone supplement during the preceding 6 months, and we assessed it with a single item: “In the past 6 months, have you taken any estrogen products or undergone any type of hormonal therapy for either sexual reassignment or to enhance your gender presentation?”

*Gender abuse, depressive symptoms, and substance use.* At each assessment time, study participants were asked whether they had been verbally abused or harassed (psychological abuse) during the previous 6 months and thought it was because of their gender identity or presentation. A parallel item asked whether

they had been physically abused or beaten (physical abuse). We formed an index of psychological and physical gender abuse by adding psychological and physical dimensions of abuse (coded 0–2).

We measured depressive symptoms at all time points with the widely used 20-item Center for Epidemiologic Studies Depression scale, which assesses depressive symptoms experienced during the previous week and has a theoretical range of 0 to 60.<sup>24</sup> Scores higher than 20 have previously been associated with clinical depression in high-risk populations.<sup>25</sup> In this study,  $\alpha$  reliabilities of the scale items ranged from .92 at baseline to .97 at the 2-year assessment point.

Study participants were asked at all time points about the use of alcohol ( $\geq 5$  drinks on a specific occasion); cannabis (marijuana or hashish); cocaine (crack or powder); heroin; amphetamines or methamphetamines; downers or tranquilizers; phencyclidine; LSD or other hallucinogens; ecstasy; poppers, nitrates, or other inhalants; or any other drug (including misused prescription drugs) during the previous 6 months, during the preceding month, and, if used during the preceding month, the number of days used. We coded dichotomous measurements of substance use as negative or positive for heavy alcohol, cannabis, cocaine, or any drug (including alcohol, cannabis, or cocaine) during the previous 6 months.

We computed continuous measurements of substance use as the number of days on which heavy alcohol, cannabis, cocaine, or any drug was used during the previous month, the total number of substances used during the previous month, and the total number of substances used multiplied by the sum of the number of days across all substances. As a result of right skewing, these measurements were log transformed ( $\ln x + 0.5$ ). Finally, we should note that self-reports of substance use (such as those used in this study) are regarded as sufficiently valid for the analysis of risk factors.<sup>26</sup>

### Statistical Techniques and Modeling

We analyzed most of the data using generalized estimating equations (GEE)<sup>27,28</sup> as implemented with version 9 of Stata.<sup>29</sup> We used logistic regression (logit link with odds

ratios) for the analysis of dichotomously measured substance use, and we used linear regression (Gaussian link with unstandardized parameter estimates) for analysis with continuously measured substance use. We modeled clustering within individuals across time with an exchangeable working correlation structure.

**Basic longitudinal modeling.** Using GEE, we began the analysis by estimating longitudinal associations of the background variables with substance use. We assessed age, ethnicity, and education at baseline only; we assessed the other 5 background variables at all time points and included them in the analysis as time-varying covariates. All of the background variables were simultaneous and included in a multivariate analysis predicting substance use.

Following a previous study,<sup>21</sup> we expected that 4 of these variables (employment income, sex work, transgender presentation, and hormone therapy) would be associated with substance use, with all remaining background variables controlled. We then computed longitudinal associations of gender abuse and depressive symptoms with substance use. We expected that both of these variables would be associated with substance use.

**Longitudinal modeling with analysis of change coding.** To improve causal inference, we also analyzed the extent to which changes in gender abuse and depressive symptoms were associated with changes in substance use. Change coding in this context refers to measurements of gender abuse, depressive symptoms, and substance use at postbaseline time points (6, 12, 24, and 36 months) relative to the same measurements at the immediately preceding assessment points (0, 6, 12, and 24 months).

This coding produced difference scores across contiguous assessment points that were negative (reflecting decreases), zero (reflecting no change), or positive (reflecting increases). The distributions on these scores were roughly normal, and no transformations were needed. We then aggregated these measurements, obtained at specific time points, across post-baseline time points in conjunction with GEE. Predicted positive associations associated with the analysis of change would reflect increases in gender abuse or depressive symptoms with increased substance use or, alternatively,

decreases in gender abuse or depression with decreased substance use.

**Mediation analysis with generalized estimating equations.** Given our longitudinal research design, different options were available for the modeling of mediation. These options included a fully lagged analysis across specified time points, in which gender abuse at time 0 predicts depressive symptoms at time 1, with depressive symptoms then predicting substance use at time 2. Such modeling assumes that elapsed time (as determined by time between assessment points) is required for gender abuse to fully affect depressive symptoms and for depressive symptoms to fully affect substance abuse.

We instead adopted the typical modeling associated with GEE whereby variables are assessed during the same time frame and then aggregated across time frames to produce overall longitudinal associations. Such contemporaneous modeling assumes that abused individuals quickly (within measured time segments) become depressed and then quickly use drugs as a result. This is consistent with our previous analysis,<sup>21</sup> in which longitudinal associations of gender abuse and depression, measured at the same time points, were stronger than the corresponding associations of gender abuse and depression, with gender abuse measured at prior time points. It is also consistent with Leets's research,<sup>30</sup> which suggested that emotional dysregulation (and negative affect) is a short-term response to crises (including hate speech).

We estimated specific statistics for the mediation analysis following the analytic procedures suggested and illustrated by MacKinnon.<sup>31</sup> Following our previous work,<sup>21</sup> we computed these statistics using the overall associations produced by GEE. We calculated direct effects as the effects of gender abuse on substance use, controlling for depressive symptoms. We then calculated separate pathways for the effects of gender abuse on depressive symptoms, denoted as *a*, and the effects of depressive symptoms on substance use, denoted as *b*. The indirect effects of gender abuse on substance use via depressive symptoms were calculated as the products of *a* × *b*. We computed standard errors for the indirect effects using the formula provided by Sobel.<sup>32</sup> Also following Sobel, we summarized the

strength of the indirect effects as proportional comparisons of indirect to total effects (total effects = indirect + direct effects).

We similarly modeled the effects of background variables (employment income, sex work, transgender presentation, and hormone therapy) on substance use via gender abuse. Direct effects of background variables on substance use were estimated and compared with the indirect effects of these variables on substance use via gender abuse.

## RESULTS

We compared the subsets of study participants followed at years 1, 2, and 3 with those not followed with regard to baseline measurements of background variables, gender abuse, depressive symptoms, and substance use. Only older age with study completion at year 1 ( $r = .15$ ;  $P < .05$ ) and year 3 ( $r = .16$ ;  $P < .05$ ) was significant. Because study attrition was, for the most part, not predicted from variables included in the analysis, the data may be considered to be missing at random.

### Description of Study Variables

The 230 study participants were aged between 19 and 59 years (mean = 34.0; SD = 12.4). Ethnicity was as follows: 35.7% Hispanic; 35.2% non-Hispanic White; 17.4% non-Hispanic Black; and 11.7% other. Almost one half (42.2%) did not graduate from high school; 6.1% were college graduates or higher. More than one half (53.0%) were part- or full-time employed in a regular job (not sex work) at baseline. Reported income from such a job during the previous 6 months was less than \$1000 (33.0%), \$1000 to \$9000 (34.3%); \$10 000 to \$29 999 (15.2%); and \$30 000 or more (17.4%). At baseline, 39.1% reported sex work during the previous 6 months.

The prevalence of either psychological or physical gender abuse (score of 1 on gender abuse scale) ranged from 28.6% at 36 months to 46.5% at baseline. Both psychological and physical gender abuse (score of 2) ranged from 2.4% at 36 months to 8.8% at 24 months.

At baseline, 4.6% reported no transgender identity disclosure or feminine dressing in any of the 6 indicated relationships; 4.3% reported identity disclosure and feminine dressing in all

6 relationships (transgender identity presentation range of 0–12; mean = 4.82; SD = 2.42). At baseline, 52.2% reported hormone therapy during the previous 6 months. Mean values on the Center for Epidemiologic Studies Depression scale (range = 0–50) varied from 16.4 ( $\sigma = 10.9$ ) at 36 months to 19.6 ( $\sigma = 13.0$ ) at 24 months.

Examining all assessment points, heavy alcohol use ranged from 48.4% to 60.4%, cannabis varied from 29.1% to 40.0%, cocaine ranged from 20.7% to 25.3%, and any substance use varied from 72.8 to 78.2%. The prevalence of other substances, incorporated in measurements of number of drugs used and substance days, were other drugs (including misused prescription drugs), 5.8%; ecstasy, 5.2%; nitrates or other inhalants, 4.8%; downers or tranquilizers, 4.8%; heroin, 3.5%; methamphetamines, 3.0%; LSD, 1.3%; amphetamines (not including methamphetamines), 0.9%; and phencyclidine, 0.0%. Polysubstance use (2 or more drugs) ranged from 32.7% to 43.2%.

### Basic Longitudinal Modeling

Longitudinal associations (GEE) of background variables, gender abuse, and depressive symptoms with the dichotomous measurements of substance use are displayed in Table 1. Continuous measurements of age and

education and a dichotomous measurement of ethnicity (White vs non-White) were not associated with substance use. More refined measurements (e.g., a dummy-variable coding of 3 levels of education as compared with the lowest level) likewise resulted in no significant associations between the demographic variables and substance use.

Employment income (odds ratio [OR] = 2.29), sex work (OR = 4.65), transgender presentation (OR = 1.23), hormone therapy (OR = 1.33), gender abuse (OR = 3.70), and depressive symptoms (OR = 1.08) were associated with heavy alcohol use (Table 1). We observed similar associations for cannabis, cocaine, and any substance use.

Associations (GEE) of background variables, gender abuse, and depressive symptoms with the continuous measurements of substance use are displayed in Table 2. Age, education, and ethnicity were not associated with these substance use outcomes. Income ( $b = 0.38$ ), sex work ( $b = 0.74$ ), transgender presentation ( $b = 0.07$ ), gender abuse ( $b = 0.65$ ), and depressive symptoms ( $b = 0.04$ ) were associated with days of heavy alcohol use. We found similar associations for the days of cannabis, cocaine, and any substance use; number of substances used; and substance days.

### Longitudinal Modeling with Analysis-of-Change Coding

Data pertaining to the analysis of change are displayed in Table 3. Changes in gender abuse ( $b = 0.96$ ) and depressive symptoms ( $b = 0.08$ ) were strongly associated with changes in days of alcohol use. We found similar associations, for the most part, in the analyses of days using cannabis, cocaine, or any substance use; the number of substances used; and the total substance days during the prior month. The strength of these associations is best revealed with the analysis of changes in gender abuse and depressive symptoms as predictors of changes in substance days (last column of Table 3). A 1-unit change in gender abuse during a specific time segment was associated with a change of 6.79 in log substance days. A 1-unit change in depressive symptoms during a specific time segment was associated with a change of 0.48 in log of substance days.

### Mediation Analysis Using Generalized Estimating Equations

Results associated with the mediation analysis of gender abuse on substance use via depressive symptoms are shown in Table 4. Unstandardized parameter estimates for the direct effects of gender abuse on substance use ranged from 0.16 for days of cocaine use to 0.57 for substance days. Unstandardized parameter estimates for the indirect effects of gender abuse via depressive symptoms ranged from 0.18 for days of cocaine use to 0.71 for substance days. The percentage of indirect to total effects, averaged across the 5 measurements of substance use, was 55%.

Results associated with the mediation analysis of background variables on substance use via gender abuse are also shown in Table 4. We conducted this analysis for employment income, sex work, transgender presentation, and hormone therapy—variables that, as predicted, were associated with quantitatively measured substance use (Table 2). Unstandardized parameter estimates for the direct effects of employment income on substance use ranged from  $-0.02$  for days of cocaine use to 0.59 for substance days. Unstandardized parameter estimates for the indirect effects of income via gender abuse ranged from 0.05 for days of cocaine use to 0.16 for substance days.

**TABLE 1—Background Variables, Gender Abuse, and Depressive Symptoms With Dichotomous Measurements of Substance Use During Follow-Up: New York Metropolitan Area, December 2004–September 2007**

Predictor	Actual Range	Alcohol, OR (95% CI)	Cannabis, OR (95% CI)	Cocaine, OR (95% CI)	Any, OR (95% CI)
Background (multivariate) <sup>a</sup>					
Age	19–59	1.00 (0.97, 1.02)	0.98 (0.95, 1.00)	0.97 (0.94, 1.00)	1.00 (0.98, 1.03)
Ethnicity (non-White)	0–1	0.87 (0.50, 1.51)	1.02 (0.56, 1.88)	0.84 (0.40, 1.79)	1.13 (0.64, 2.00)
Education	1–4	1.06 (0.84, 1.35)	0.97 (0.75, 1.25)	1.11 (0.82, 1.50)	1.01 (0.78, 1.31)
Employment	0–1	1.22 (0.81, 1.86)	1.24 (0.83, 1.84)	1.24 (0.75, 2.03)	1.13 (0.70, 1.83)
Income	1–4	2.29 (1.85, 2.84)	1.69 (1.38, 2.09)	1.20 (0.92, 1.56)	2.34 (1.84, 2.98)
Sex work	0–1	4.65 (3.19, 6.79)	2.71 (1.91, 3.83)	7.27 (4.70, 11.23)	8.96 (5.61, 14.30)
Transgender presentation	0–10	1.23 (1.15, 1.31)	1.16 (1.09, 1.23)	1.06 (0.98, 1.15)	1.29 (1.20, 1.38)
Hormone therapy	0–1	1.33 (1.23, 1.43)	2.71 (1.96, 3.74)	1.55 (1.04, 2.33)	3.08 (2.10, 4.51)
Other variables (bivariate)					
Gender abuse	0–2	3.70 (2.92, 4.69)	3.32 (2.66, 4.15)	3.17 (2.44, 4.11)	8.24 (6.08, 11.19)
Depressive symptoms	0–50	1.08 (1.07, 1.09)	1.07 (1.06, 1.08)	1.07 (1.06, 1.08)	1.15 (1.13, 1.15)

Note. CI = confidence interval; OR = odds ratio. Generalized estimating equations with a logistic regression link. Base sample size of 230 with reduction across assessment points described in the text. Odds ratios with 95% CIs not containing 1.00 are statistically significant at  $P < .05$ .

<sup>a</sup>Multivariate analysis with all background variables included.



**TABLE 2—Background Variables, Gender Abuse, and Depressive Symptoms With Continuous Measurements of Substance Use During Follow-Up: New York Metropolitan Area, December 2004–September 2007**

Predictor	Days Used During Previous Month				
	Alcohol, b (95% CI)	Cannabis, b (95% CI)	Cocaine, b (95% CI)	No. of Substances, b (95% CI)	Substance Days, b (95% CI)
<b>Background variables (multivariate)<sup>a</sup></b>					
Age	0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)
Non-White ethnicity	0.17 (-0.40, 0.05)	-0.05 (-0.35, 0.28)	-0.01 (-0.16, 0.14)	-0.03 (-0.16, 0.10)	-0.03 (-0.16, 0.11)
Education	-0.02 (-0.12, 0.08)	-0.03 (-0.16, 0.10)	0.02 (-0.04, 0.09)	0.09 (-0.04, 0.07)	-0.03 (-0.16, 0.11)
Employment	0.08 (-0.11, 0.28)	0.07 (-0.12, 0.27)	-0.08 (-0.21, 0.05)	0.07 (-0.04, 0.17)	0.01 (-0.23, 0.25)
Income	0.38 (0.29, 0.48)	0.19 (0.10, 0.29)	0.02 (-0.04, 0.08)	0.21 (0.16, 0.36)	0.59 (0.34, 0.62)
Sex work	0.74 (0.57, 0.91)	0.46 (0.29, 0.64)	0.63 (0.52, 0.74)	0.63 (0.54, 0.72)	1.23 (1.02, 1.44)
Transgender presentation	0.07 (0.04, 0.10)	0.04 (0.01, 0.07)	0.01 (0.00, 0.03)	0.06 (0.04, 0.07)	0.11 (0.07, 0.14)
Hormone therapy	-0.15 (-0.31, 0.02)	0.42 (-0.88, 0.27)	0.04 (-0.07, 0.14)	0.27 (0.19, 0.35)	0.37 (0.17, 0.56)
<b>Other variables (bivariate)</b>					
Gender abuse	0.65 (0.53, 0.76)	0.64 (0.52, 0.75)	0.34 (0.27, 0.41)	0.64 (0.57, 0.71)	1.29 (1.14, 1.41)
Depressive symptoms	0.04 (0.03, 0.05)	0.03 (0.02, 0.04)	0.02 (0.01, 0.02)	0.04 (0.03, 0.05)	0.07 (0.06, 0.08)

Note. CI = confidence interval. Generalized estimating equations with a linear regression (Gaussian) link. Base sample size of 230 with reductions across assessment points described in the text. Unstandardized parameter estimates with 95% CIs not containing 0.00 are statistically significant at  $P < .05$ .

<sup>a</sup>Multivariate analysis with all background variables included.

The percentage of indirect to total effects averaged across the 5 measurements of substance use was 19%.

Unstandardized parameter estimates for the direct effects of sex work on substance use ranged from 0.48 for days of cannabis use to 1.20 for substance days (Table 4). The indirect effects of sex work via gender abuse ranged from 0.10 for days of cocaine use to 0.52 for substance days. The percentage of indirect to total effects averaged across the 5 measurements of substance use was 29%.

Unstandardized parameter estimates for the direct effects of transgender identity presentation on substance use ranged from 0.02 for

cocaine days to 0.20 for substance days (Table 4). Indirect effects of identity presentation via gender abuse ranged from 0.02 for cocaine days to 0.07 for substance days. The percentage of indirect to total effects averaged across the 5 measurements of substance use was 25%.

Unstandardized parameter estimates for the direct effects of hormone therapy on substance use ranged from 0.07 for days of cocaine use to 0.67 for days of cannabis use (Table 4). The indirect effects of hormone therapy via gender abuse ranged from 0.15 for days of cocaine use to 0.46 for log substance days. The percentage of indirect to total effects averaged across the 5 measurements of substance use was 42%.

## DISCUSSION

The prevalence of substance use in this prospective study of transgender women was extremely high. At all assessment points, more than three fourths of the study participants were using alcohol or some other substance, and about one third indicated polysubstance use. The estimates of substance use among transgender women were generally consistent with prior reports,<sup>1-7</sup> with this study providing drug-specific and overall estimates.

Following minority stress theory,<sup>10</sup> stigma associated with gender nonconformity was associated with substance use. Higher levels of enacted stigma in the form of psychological and physical gender abuse (coded from 0 to 2) were associated with 3- to 4-times higher odds of using alcohol, cannabis, or cocaine and an 8-fold increase in the odds of any drug use. On the basis of behavioral science norms, and on substantive grounds, these associations may be characterized as moderately strong to strong effect sizes.<sup>33</sup> The analysis of dichotomously measured substance use during the previous 6 months was mirrored by the analysis of continuously measured substance use during the previous month.

Change modeling of substance use across time points provided strong (albeit

**TABLE 3—Changed Gender Abuse and Depressive Symptoms With Changed Substance Use During Follow-Up: New York Metropolitan Area, December 2004–September 2007**

Changed Substance Use During Follow-Up	Gender Abuse, b (95% CI)	Depressive Symptoms, b (95% CI)
Alcohol days	0.96 (0.32, 1.59)	0.08 (0.05, 0.11)
Cannabis days	2.11 (1.37, 2.86)	0.12 (0.08, 0.15)
Cocaine days	0.78 (0.38, 1.18)	0.06 (0.04, 0.08)
No. of substances	0.58 (0.47, 0.70)	0.04 (0.03, 0.05)
Substance days	6.79 (5.34, 8.24)	0.48 (0.39, 0.50)

Note. CI = confidence interval. Generalized estimating equations with a linear regression (Gaussian) link. Base sample size of 230 with reductions across assessment points described in the text. Unstandardized parameter estimates with 95% CIs not containing 0.00 are statistically significant at  $P < .05$ .

**TABLE 4—Direct and Indirect Effects of Selected Variables With Quantitative Measurements of Substance Use During Follow-Up: New York Metropolitan Area, December 2004–September 2007**

Variable	Alcohol Use, Days, b (95% CI)	Cannabis Use, Days, b (95% CI)	Cocaine Use, Days, b (95% CI)	No. of Substances, b (95% CI)	Substance Use, Days, b (95% CI)
<b>Gender abuse</b>					
Direct effect	0.28 (0.15, 0.41)	0.29 (0.17, 0.42)	0.16 (0.08, 0.24)	0.27 (0.20, 0.34)	0.57 (0.42, 0.72)
Indirect effect via depression	0.37 (0.33, 0.41)	0.33 (0.29, 0.37)	0.18 (0.15, 0.21)	0.35 (0.31, 0.39)	0.71 (0.66, 0.76)
<b>Income</b>					
Direct effect	0.43 (0.36, 0.49)	0.28 (0.22, 0.35)	-0.02 (-0.06, 0.02)	0.30 (0.26, 0.34)	0.59 (0.50, 0.67)
Indirect effect via gender abuse	0.07 (0.04, 0.10)	0.10 (0.09, 0.11)	0.05 (0.04, 0.06)	0.08 (0.07, 0.09)	0.16 (0.14, 0.18)
<b>Transgender presentation</b>					
Direct effect	0.12 (0.10, 0.14)	0.10 (0.08, 0.12)	0.02 (0.01, 0.03)	0.11 (0.10, 0.12)	0.20 (0.17, 0.23)
Indirect effect via gender abuse	0.03 (0.02, 0.04)	0.03 (0.01, 0.05)	0.02 (0.00, 0.04)	0.03 (0.02, 0.09)	0.07 (0.06, 0.08)
<b>Hormone therapy</b>					
Direct effect	0.35 (0.20, 0.51)	0.67 (0.52, 0.81)	0.07 (-0.02, 0.17)	0.21 (0.19, 0.23)	0.46 (0.41, 0.51)
Indirect effect via gender abuse	0.25 (0.22, 0.28)	0.20 (0.17, 0.23)	0.15 (0.13, 0.17)	0.21 (0.19, 0.23)	0.46 (0.41, 0.51)
<b>Sex work</b>					
Direct effect	0.63 (0.46, 0.81)	0.48 (0.31, 0.66)	0.57 (0.47, 0.68)	0.64 (0.54, 0.75)	1.20 (0.98, 1.42)
Indirect effect via gender abuse	0.26 (0.22, 0.30)	0.27 (0.23, 0.31)	0.10 (0.08, 0.12)	0.26 (0.23, 0.29)	0.52 (0.46, 0.58)

Note. CI = confidence interval. Generalized estimating equations with a linear regression (Gaussian) link. Base sample size of 230 with reductions across assessment points described in the text. Unstandardized parameter estimates with 95% CIs not containing 0.00 are statistically significant at  $P < .05$ .

nondefinitive) evidence regarding causality. Changes in gender abuse were associated with changes in the days of alcohol, cannabis, cocaine, or any substance use; the number of substances used; and the total number of days different substances were used.

An important finding of this study was that the moderately strong associations among gender abuse and substance use largely reflected depressive symptoms. Depressive symptoms have been found to mediate the association between stress and substance use among sexual minority girls<sup>34</sup> and between bullying and substance use among female US adolescents.<sup>35</sup> Stressful or traumatic events may promote emotional dysregulation (including depressed affect), which then leads to impulsivity and ultimately to substance use.<sup>36</sup> Further research is needed to fully understand the processes, set in motion by gender abuse, that ultimately result in substance use among transgender women and broader populations.

The analysis of economic and lifestyle factors points to the pervasive and toxic effects of gender abuse in the lives of transgender women. Success in the legitimate economy, defined by regular employment and higher income, although advantageous in certain

respects, nonetheless also comes with costs of increased gender abuse,<sup>37–39</sup> elevated odds of depression,<sup>21</sup> and, largely as a result, increased odds of substance use. Earning a living as a sex worker, which may be prompted by barriers to legitimate employment,<sup>40</sup> likewise comes with costs of increased psychological and physical gender abuse, increased depression,<sup>21</sup> and, largely as a result, increased substance use.

Social presentations of gender identity in conjunction with hormone therapy or by disclosure of identity to others is a fundamental need running through the lives of transgender women.<sup>41</sup> Such affirmations of self also, however, come with costs of increased gender abuse and depression<sup>21</sup> and, ultimately, increased substance use.

The findings of this research have broad implications for substance abuse treatment, education and counseling, and transgender advocacy. The high prevalence of substance use in this population highlights the problem of inadequate substance abuse treatment options. Transgender women are misunderstood and poorly treated in many (perhaps most) mainstream substance abuse treatment programs.<sup>7</sup> Fewer than 7% of these facilities have made arrangements to accommodate sexual and gender

minorities, and the quality of even these specialized programs has been questioned.<sup>42</sup>

A limited number of facilities have the staff and expertise to understand the special needs and issues associated with transgenderism. A key ingredient of these programs is counteracting internalized negative attitudes associated with being a sexual or gender minority.<sup>13</sup> The findings of this study suggest that therapeutic strategies are also needed to confront enacted stigma. Cognitive-behavioral techniques should be devised to counteract situational triggers in the form of gender abuse that lead to substance use.<sup>43</sup> These protocols should be broadly framed to promote emotional regulation (less depression) in the face of threats to identity and enacted stigma in particular.

More available and improved counseling is needed to assist transgender women who choose to undergo hormone therapy. Transgender women are warned about potential drug interactions between feminizing hormones and psychoactive drugs, in particular alcohol.<sup>44</sup> Unfortunately, rather than abstaining from substance use, the hormone-using transgender women in this study were more likely to use alcohol heavily and much more likely to use illegal drugs. Hormone-using

transgender women are more likely to use alcohol and other drugs in large measure because of increased experiences with gender abuse. Better counseling is needed to assist hormone-using transgender women to cope with assaults to their identity in the form of gender abuse.

Finally, in light of the multiple interrelated adverse effects of gender abuse observed in this study, transgender advocates should continue to press for antibullying policies and broadly applied and improved gender sensitivity training and continue to lobby for better enforcement of hate crime statutes.

The findings of this study should be evaluated with a consideration of its limitations, which included a nonrandom selection of study participants and a failure to retain all study participants across follow-up assessment times. ■

### About the Authors

At the time of this research, Walter Bockting was with the Division of Gender, Sexuality and Health, New York State Psychiatric Institute/Columbia University, New York, NY. Larry Nuttbrock, Andrew Rosenblum, Mona Mason, Monica Macri, and Jeffrey Becker were with the National Development and Research Institutes, New York, NY. Sel Hwahng is with Columbia University.

Correspondence should be sent to Larry Nuttbrock, 91-06 Whitney Avenue, Apartment 7B, Elmhurst, NY 11373 (e-mail: lnuttbrock@gmail.com). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

This article was accepted May 25, 2014.

### Contributors

L. Nuttbrock had primary responsibility for the overall scientific integrity of the project. W. Bockting, A. Rosenblum, M. Mason, M. Macri, J. Becker, and S. Hwahng were significantly involved in all aspects of the study, including conceptualizing the research design, carrying out the project on a daily basis, and writing up the findings.

### Acknowledgments

This research was supported by a grant from the National Institute on Drug Abuse (NIDA; 1 R01 DA018080, L. N., principal investigator) and by a NIDA administrative research supplement to promote diversity in health-related research (S. H., investigator).

We thank the participants of this study for sharing their life stories. We also thank members of the online Stata support group for their assistance with programming and statistical matters.

### Human Participant Protection

All research protocols were approved and monitored by the National Development and Research Institutes institutional review board.

### References

1. Substance Abuse and Mental Health Services Administration. *A Provider's Introduction to Substance Abuse Treatment for Lesbian, Gay, Bisexual and Transgender Individuals*. Rockville, MD: Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment; 2001. DHHS Publication SMA01-3498.
2. Institute of Medicine. *The Health of Lesbian, Gay, Bisexual, and Transgender Persons: Building a Foundation for Understanding*. Washington, DC: National Academies Press; 2011.
3. Hughes TL, Elinson M. Substance use and abuse in lesbian, gay, bisexual, and transgender populations. *J Prim Prev*. 2002;22:263–298.
4. Lombardi EL, van Servellen G. Building culturally sensitive substance use programs for transgendered populations. *J Subst Abuse Treat*. 2000;19(3):291–296.
5. Ramirez-Valles J, Garcia D, Campbell A, Diaz RM, Heckathorn D. HIV infection, sexual risk behavior, and substance use among gay, bisexual, and transgender persons. *Am J Public Health*. 2008;98(6):1036–1042.
6. Reback C, Simon P, Bemis C, Gatson B. *The Los Angeles Transgender Health Study: Community Report*. Los Angeles, CA: UCLA Press; 2001.
7. Nuttbrock LA. Culturally competent substance abuse treatment with transgender persons. *J Addict Dis*. 2012;31(3):236–241.
8. Benjamin H. *The Transsexual Phenomenon*. New York, NY: Julian Press; 1966.
9. Cole SD, Denny D, Dyer EA, Samons S. Issues of transgender. In: Zuchman L, Moscarella F, eds. *Psychological Perspectives on Human Sexuality*. New York, NY: Wiley; 2000:80–101.
10. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay and bisexual populations: conceptual and research evidence. *Psychol Bull*. 2003;129(5):674–697.
11. Bockting WO, Miner MH, Swinburne Romine RE, Hamilton A, Coleman E. Stigma, mental health, and resilience in an online sample of the US transgender population. *Am J Public Health*. 2013;103(5):943–951.
12. Hendricks ML, Testa RJ. A conceptual framework for clinical work with transgender and gender nonconforming clients: an adaptation of the Minority Stress Model. *Prof Psychol Res Pr*. 2012;43(5):460–467.
13. Finnegan DG, McNally EB. *Counseling Lesbian, Gay, Bisexual and Transgender Substance Abusers*. New York, NY: Haworth Press; 2002.
14. Lehavot K, Simon JM. The impact of minority stress on mental health and substance use among sexual minority women. *J Consult Clin Psychol*. 2011;79(2):159–170.
15. McCabe SE, Bostwick WB, Hughes TC, West BT, Boyd CJ. The relationship between discrimination and substance use disorders among lesbian, gay, and bisexual adults in the United States. *Am J Public Health*. 2010;100(10):1946–1952.
16. Mereish EH, O'Leirigh C, Bradford JB. Interrelationships between LGBT-based victimization, suicide, and substance use problems in a diverse sample of sexual and gender minorities. *Psychol Health Med*. 2014;19(1):1–13.
17. Newcomb ME, Heinz AJ, Mustanki B. Examining risk and protective factors for alcohol use in lesbian, gay, bisexual and transgender youth: a longitudinal multilevel analysis. *J Stud Alcohol Drugs*. 2012;73(5):783–793.
18. Hatzenbuehler ML. How does sexual minority stigma "get under the skin"? A psychological mediation framework. *Psychol Bull*. 2009;135(5):707–730.
19. Wolf ECM, Dew BJ. Understanding risk factors contributing to substance use among MTF transgender persons. *J LGBT Issues Couns*. 2012;6(4):237–256.
20. Nuttbrock L, Bockting W, Rosenblum A, et al. Gender abuse, depressive symptoms and HIV and sexually transmitted infections among male-to-female transgender persons: a three year prospective study. *Am J Public Health*. 2013; 103(2):300–307.
21. Nuttbrock L, Bockting W, Rosenblum A, et al. Gender abuse and major depression among transgender women: a prospective study of vulnerability and resilience. *Am J Public Health*. 2013;Epub ahead of print.
22. Swendsen JD, Merikangas KR. The comorbidity of depression and substance use disorders. *Clin Psychol Rev*. 2000;20(2):173–189.
23. Khantzian EJ. The self-medication hypothesis of substance abuse disorders: a reconsideration and recent application. *Harv Rev Psychiatry*. 1997;4(5):231–244.
24. Radloff LS. The CES-D Scale: a self report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1(3):385–401.
25. Thomas JL, Jones GN, Scarinci RW, Mehan DJ, Brantley PJ. The utility of the CES-D as a depression screening measure among low-income women attending health care clinics. *Int J Psychiatry Med*. 2001;31(1):25–40.
26. Weatherby NL, Needle R, Cesari H, Booth R, McCoy CB, Watters JK. Validity of self-reported drug use among injection drug users and crack cocaine users recruited through street outreach. *Eval Program Plann*. 1994;17(4):347–355.
27. Hardin JR, Hilbe JM. *Generalized Estimating Equations*. 2nd ed. New York, NY: CRC Press; 2012.
28. Diggle PJ, Heagerty PJ, Liang KY, Seger SL. *Analysis of Longitudinal Data*. 2nd ed. New York, NY: Oxford University Press; 2002.
29. StataCorp. *Stata Statistical Software: Release 9*. College Station, TX: StataCorp LP; 2005.
30. Leets L. Experiencing hate speech: perceptions and responses to anti-Semitism and antigay speech. *J Soc Issues*. 2002;58(2):341–361.
31. MacKinnon DP. *Introduction to Statistical Mediation Analysis*. New York, NY: Taylor & Francis; 2008.
32. Sobel ME. Asymptotic confidence intervals for indirect effects in structural equation models. *Sociol Methodol*. 1982;13:290–312.
33. Valentine JC, Cooper H. *Effect Size Substantive Interpretation Guidelines: Issues in the Interpretation of Effect Sizes*. Washington, DC: What Works Clearinghouse; 2003.

34. Marshal MP, Burton CM, Chisolm DJ, Sucato GS, Friedman MS. Cross-sectional evidence for a stress-negative affect pathway to substance use among sexual minority girls. *Clin Transl Sci*. 2013;6(4):321–322.
35. Luk JW, Wang J, Simons-Morton BG. Bullying victimization and substance use among US adolescents: mediation by depression. *Prev Sci*. 2010;11(4):355–359.
36. Verdejo-García A, Bechara A, Recknor EC, Pérez-García M. Negative emotion impulsivity predicts substance dependence problems. *Drug Alcohol Depend*. 2007;91:213–219.
37. Grant JM, Mottet LA, Janis J, Harrison J, Herman JL, Keisling M. *Injustice at Every Turn: A Report of the National Transgender Discrimination Survey*. Washington, DC: National Center for Transgender Equality and National Gay and Lesbian Task Force; 2011.
38. Badgett ML, Lau H, Sears B, Ho D. *Bias in the Workplace: Consistent Evidence of Sexual Orientation and Gender Identity Discrimination*. San Francisco, CA: Williams Institute; 2007.
39. Smith NG, Ingram KM. Workplace heterosexism and adjustment among lesbian, gay, and bisexual individuals: the role of unsupportive social interactions. *J Couns Psychol*. 2004;51(1):57–67.
40. Sausa LA, Keatley J, Operario D. Perceived risks and benefits of sex work among transgender women of color in San Francisco. *Arch Sex Behav*. 2007;36(6):768–777.
41. Nuttbrock L, Bockting W, Rosenblum A, et al. Gender identity conflict/affirmation and major depression across the life course of transgender women. *Int J Transgend*. 2012;13(3):91–103.
42. Cochran BN, Peavy KM, Robohm JS. Do specialized services exist for LGBT individuals seeking treatment for substance misuse? A study of available treatment programs. *Subst Use Misuse*. 2007;42(1):161–176.
43. Safren SA, Rogers T. Cognitive-behavioral therapy for gay, lesbian, and bisexual clients. *J Clin Psychol*. 2001;57(5):629–643.
44. Kirk S. *Feminizing Hormonal Therapy for the Transgendered*. Pittsburgh, PA: Together LifeWorks; 1999.