

Example: For the first sample from the samples with $n = 5$, we had $s^2 = 166.41$.

Test whether or not $\sigma^2 = 200$.

1. *The hypothesis:* $H_0: \sigma^2 = 200$, vs $H_1: \sigma^2 \neq 200$
2. *The assumptions:* Independent observations
normal distribution
3. *The α -level:* $\alpha = 0.05$

4. *The test statistic:*

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

5. *The critical region:* Reject $H_0: \sigma^2 = 200$ if the value calculated for χ^2 is not between $\chi^2_{0.025}(4) = 0.484$, and $\chi^2_{0.975}(4) = 11.143$

6. *The Result:*

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{4(166.41)}{200} = 3.33$$

7. *The conclusion:*

Accept $H_0: \sigma^2 = 200$.

Prediction of Depressive Distress in a Community Sample of Women: The Role of Sexual Orientation

J. Alison R. Matthews, PhD, David E. Cragins, PhD, PhD, Timothy Johnson, PhD, Lisa A. Ressler, PhD, and Robert G. Seeley, MS, PhD

There has been considerable interest that rates of depression among women are higher as high as those among men.¹⁻³ Reported rates of lifetime risk for depression among women in the general US population range between 21% and 25%, with point prevalence rates in community samples ranging from 8% to 15%.⁴⁻⁶ Risk factors for depression include genetic, developmental, and hormonal factors,^{7,8} family history,^{9,10} personality characteristics (e.g., neuroticism),¹¹ chronic medical conditions,¹² personality style (e.g., coping strategies),¹³ negative life events associated with parents,¹⁴ psychological events or stressors,¹⁵ and substance dependence.¹⁶

Numerous studies suggest that risk factors unique to women contribute substantially to sex differences in depression.¹⁷ These factors include menstrual cycle and status,¹⁸ female sex role socialization,^{19,20} presence of dependent children,²¹ lower socioeconomic status relative to men,²² and victimization experiences (e.g., childhood sexual abuse,²³ physical or sexual violence, battering by an intimate partner, marital and reproductive rape, and harassment²⁴⁻²⁶). Although considerable knowledge about the sex correlation of depression in the general population has been amassed,^{27,28} the applicability of this knowledge to lesbians is unknown.^{29,30}

LESBIANS AND DEPRESSION

Despite a paucity of data on depression among lesbians, this group generally is thought to be at greater risk for depression than are heterosexual women.³¹⁻³⁴ In addition to risk factors shared with heterosexual women (e.g., relationship status and childhood abuse or disclosure of an intimate relationship, perceived lack of or low social support from friends and family), lesbians are believed to be affected by additional unique risk factors, including the chronic and pervasive lack of disclosure of sexual orientation, dis-

Objectives. This study compared factor models of psychological distress among depressive symptomatology in a community sample of lesbians and heterosexual women.

Methods. Data were collected in a statewide survey of lesbian, gay, and bisexual youth.

Results. Findings confirmed earlier reports suggesting that heterosexual life events (such as physical and sexual abuse, and physical trauma and coping styles) are risk factors for depression among lesbians. However, findings of higher rates of social isolation and of several risk factors for depressive distress among lesbians suggest that risk for depression may differ among lesbians and heterosexual women.

Conclusions. Clinical interventions may represent an important but poorly understood risk factor for depression (distress) as well as a unique identifier and predictor of depression among lesbian youth. (*J Fam Psychol* 2004, 18:1-8.)

orientation experiences, and chronic and unrelieved pain being a marker of a unique developmental group.³⁵⁻³⁷

The aims of the present study were to (1) compare indicators of depressive distress among lesbians and a demographically matched sample of heterosexual women and (2) compare the relationships of several key predictors or known predictors with depressive distress in lesbians and heterosexual women. Such information is important in understanding risk factors for depression among lesbians and for identifying interventions that address these risks.

METHODS

Study Design and Data Collection

Data were collected as part of a study commissioned by the Chicago Lesbian Community Care Project (LCCP) in 1998. The study began in Chicago and was replicated in Minneapolis, St. Paul, MN, and New York City during 1998 through 1999. The goal was to gather information on the general health status as well as behavioral and environmental health risks of lesbians. The study was designed to obtain a diverse sample of women who relate socially or affectively to each other with women.

As a means of reaching the broadest possible range of women, the survey instrument

was distributed to a variety of formal and informal lesbian venues (e.g., public library discussion groups, bookstores, coffee and learning groups, coffee houses, college social support, therapists, medical and political groups) and organizations for lesbians. Lesbian participants were recruited through community-related social networks. Referral and group settings were used to collect survey data.

Each listing when completed the questionnaire was expected to give a second, randomized copy to a friends list, neighborhood, or colleague whose work role included non-staff, volunteer, or related work as similar as possible to their own. In the Chicago survey, we did not specify that the "second copy request" collected by heterosexual friends or heterosexual contacts be sample members of only about half as many heterosexual women as lesbians. Instructions provided in the Minnesota and New York surveys specified that the "second copy request" be a woman whose the listing knew or provided to be heterosexual.

Lesbian respondents at the other 2 sites (i.e., Minneapolis and New York City) were given a small incentive of \$15 for completing the survey and for returning a completed questionnaire. Heterosexual workrole contacts were given \$10 for completing the survey. In addition, representatives of health-related lesbian groups were invited to act as

TABLE 1.—Study Predictor Variables, by Sexual Orientation

	Lesbians (n = 157)	Homosexual men (n = 179)
Dependent variables (No. (%)		
Ever sought therapy	129 (82) ^a	157 (88)
Ever sought for depression	104 (66)	100 (56)
Seeked attention	100 (63) ^a	104 (58)
Seeked sympathy	94 (59) ^a	111 (62)
Predictor variables		
Additional social stress (No. (%))	101 (64) ^a	44 (24)
Worked alone (No. (%))	140 (89)	114 (63)
Duration of current illness/last (No. (%))	101 (64)	100 (56)
Insensitivity to requests to seek assistance or advice (No. (%))	107 (68)	107 (59)
Wanted more social support (No.)	81 (51)	17 (9)
Protein copying strategies used (No.)	111 (70)	111 (62)

Note. Numbers in which percentages were based vary because of missing data on some variables from the 100-page form (n = 14) with higher scores reflecting both greater length and severity of the interview. Protein copying strategies were used more often (n = 14) with higher scores representing more frequent use of a variety of protein copying strategies in response to stress.

^ap < .05, $\chi^2(1) = .004$.

had "sought therapy or counseling for an emotional or mental health problem" at some point in their life (Table 1). This rate was significantly higher than that among both recruited women (50%; $\chi^2(1) = 4.5, p = .033$). However, rates of treatment therapy or counseling did not differ for lesbians (82%) and heterosexual women (88%; $\chi^2(1) = 2.04$, not significant).

Treatment for depression (either psychotherapy or medication) was reported more often by lesbians (61%) and heterosexual women (57%) reported that they had sought therapy or counseling for depression. Thirty-one percent of lesbians and 30% of heterosexual women reported that they had been prescribed medication for a mental or emotional problem. Among those who had received medication, 60% of lesbians and 73% of heterosexual women reported taking an antidepressant medication at some point. The majority of women who reported seeking help for sadness or depression (80%) also reported receiving antidepressants. More than half of the total sample of lesbians (67%) and heterosexual women (67%) reported at least one of these 4 indicators of past treatment for depression.

Sexual advances and outside attempts. Significant differences were found between lesbians and heterosexual women in regard to reports of whether they had seriously considered

committing suicide and whether they had actually attempted suicide in the past. Fifty-one percent of lesbians and 40% of heterosexual women reported seriously considering suicide at some point in the past (4% 100%). Most suicide attempts among women in this study occurred between the ages of 15 and 24 years. More than twice as many lesbians as heterosexual women in this age group reported suicide attempts (7% 100%).

Predictors of Depressive Distress

Physical and social stress. Although lesbians and heterosexual women were equally likely to report that they had been victims of some form of physical violence (83% and 81%, respectively), significantly more lesbians (71%) than heterosexual women (40%) reported experiencing childhood sexual abuse (4% 100%). Because our analyses included only women who had experienced sexual violence before the age of 16 years (ages were 81% and 81%, respectively, of all lesbians and heterosexual women who reported any sexual violence), these rates probably underestimate the number of lesbians and heterosexual women who actually experienced childhood sexual abuse.

Child stress. Overall stress scores on the global stress index were in the lower range and did not differ according to sexual orientation from. Mean stress index scores were 17 (SD =

7.0) for heterosexual women and 16 (SD = 6.0) for lesbians ($t_{(222)} = 0.873$, NS).

Perceived stress. No differences were found between the lesbians and heterosexual women in terms of level of perceived stress. The majority of lesbians (67%) and heterosexual women (60%) reported moderate to extreme levels of perceived stress ($\chi^2(1) = 1.4$, NS). The only statistically significant differences in ratings of stress for lesbians and heterosexual women involved children ($\chi^2(1) = 9.6$, $p < .001$) and sexual activity ($\chi^2(1) = 7.0$, $p < .01$); more heterosexual women rated children as moderately or extremely stressful and more lesbians rated sexual activity as moderately or extremely stressful.

Perceived support. Differences were also noted between lesbians and heterosexual women in terms of perceived lack of support. More heterosexual women (70%) than lesbians (50%) reported an absence of social support ($\chi^2(1) = 5.5$, $p = .019$).

Coping strategies and responses to stress. Overall, use of positive coping strategies was low among both lesbians and heterosexual women (mean of 3.4 on the 14-point stress scale, SD = 1.5). Whereas women used relatively few percentages of lesbians (7%) and heterosexual women (1%) reported talking or counseling with friends during times of stress, lesbians were more likely to report never using talking as a coping strategy (41% vs 33%; $\chi^2(1) = 11.0$, $p < .001$).

Moreover, fewer lesbians (10%) than heterosexual women (20%) reported taking something like when they were stressed ($\chi^2(1) = 7.4$, $p = .006$) or using exercise as a coping strategy (6% vs 4.6%). Only 7% of lesbians and 8% of heterosexual reported encountering situations directly. A higher percentage of heterosexual women (7%) than lesbians (6%) reported becoming overly emotional in response to stress, but this difference was not statistically significant ($\chi^2(1) = 4.0$, $p = .046$).

Multivariate Predictor Models of Depressive Distress

Only variables significantly related to at least 1 of the indicators of depressive distress in the bivariate analysis were included in the multivariate analysis. Demographic characteristics entered included education level (3—

TABLE 3—Study Predictor Variables, by Sexual Orientation

	Lesbians (n = 553)	Heterosexuals (n = 278)
Expendent variables, No. (%)		
Ever received therapy	429 (78)**	157 (56)
Ever treated for depression	284 (50)	109 (39)
Suicidal ideation	280 (51)**	104 (38)
Suicide attempts	91 (16)*	22 (8)
Predictor variables		
Childhood sexual abuse, No. (%)	108 (20)**	45 (16)
Physical abuse, No. (%)	340 (61)	114 (41)
Watches or witnesses stress level, No. (%)	401 (73)	229 (83)
Emotionality in response to stress (anxiety or anger), No. (%)	267 (48%)	207 (75%)
Critical stress index, mean (SD)	26 (6.8)	17 (7.0)
Positive coping strategies, mean (SD)	3.3 (1.8)	3.6 (1.9)

Note. Numbers on which percentages were based vary because of missing data on some variables. Scores on the GSI range from 0–54, with higher scores reflecting both greater number and severity of life stressors. Positive coping strategies scores range from 0–12, with higher scores representing more frequent use of a variety of positive coping strategies in response to stress.

* $P < .05$; ** $P < .001$.

The Question

Table 3 indicates that the mean Global Stress Index for Lesbians is 16 with $SD = 6.8$. Suppose that previous work in this area had indicated that the SD for the population was about $\sigma = 10$. Hence, we would be interested in testing whether or not $\sigma^2 = 100$.

1. *The hypothesis:* $H_0: \sigma^2 = 100$, vs $H_1: \sigma^2 \neq 100$
2. *The assumptions:* Independence, normal distribution
3. *The α -level:* $\alpha = 0.05$
4. *The test statistic:*
$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$
5. *The critical region:* Reject $H_0: \sigma^2 = 100$ if the value calculated for χ^2 is not between $\chi^2_{0.025}(449) = 392.2$, and $\chi^2_{0.975}(449) = 509.5$
6. *The Result:*
$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{449(46.24)}{100} = 207.62$$
7. *The conclusion:* Reject $H_0: \sigma^2 = 100$.

Module 25: Confidence Intervals and Hypothesis Tests for Variances for One Sample

This module discusses confidence intervals and hypothesis tests for variances for the one sample situation.

The Situation

Earlier we selected from the population of weights numerous samples of sizes $n = 5, 10,$ and 20 where we assumed we knew that the population parameters were:

$$\mu = 150 \text{ lbs,}$$

$$\sigma^2 = 100 \text{ lbs}^2,$$

$$\sigma = 10 \text{ lbs.}$$

For the population mean μ , point estimates, confidence intervals and hypothesis tests were based on the sample mean \bar{x} and the normal or t distributions.

For the population variance σ^2 , point estimates, confidence intervals and hypothesis tests are based on the sample variance s^2 and the chi-squared distribution for

$$\frac{(n-1)s^2}{\sigma^2} = \frac{SS(x)}{\sigma^2} = \chi^2$$

For a 95% confidence interval, or $\alpha = 0.05$, we use

$$C \left[\frac{(n-1)s^2}{\chi^2_{1-\alpha/2}} < \sigma^2 < \frac{(n-1)s^2}{\chi^2_{\alpha/2}} \right] = 0.95$$

For hypothesis tests we calculate

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

and compare the results to the χ^2 tables.

Population of Weights Example

$n = 5$, $\bar{x} = 153.0$, $s = 12.9$, $s^2 = 166.41$

$s^2 = 166.41$ is sample estimate of $\sigma^2 = 100$

$s = 12.9$ is sample estimate of $\sigma = 10$

For a 95% confidence interval, we use

$$C \left[\frac{(n-1)s^2}{\chi_{0.975}^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_{0.025}^2} \right] = 0.95$$

$$\chi_{0.975(4)}^2 = 11.143$$

$$\chi_{0.025(4)}^2 = 0.484$$

$$df = n - 1 = 4$$

$$P \left[\frac{(n-1)s^2}{\chi_{0.975}^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_{0.025}^2} \right] = 0.95$$

$$P \left[\frac{(5-1)(166.41)}{11.143} < \sigma^2 < \frac{(5-1)(166.41)}{0.484} \right] = 0.95$$

$$P \left[\frac{665.64}{11.143} < \sigma^2 < \frac{665.64}{0.484} \right] = 0.95$$

$$P \left[59.74 < \sigma^2 < 1,375.29 \right] = 0.95$$

$$\text{Length} = 1,315.55 \text{ lbs}^2$$

Other Samples

From the Population of weights, for $n = 5$, we had

$$\bar{x}_2 = 146.4 \quad s_2 = 5.4 \quad s_2^2 = \mathbf{29.16}$$

$$\bar{x}_3 = 153.2 \quad s_3 = 18.6 \quad s_3^2 = \mathbf{345.96}$$

$$\bar{x}_4 = 149.0 \quad s_4 = 8.1 \quad s_4^2 = \mathbf{65.61}$$

$$\bar{x}_5 = 153.6 \quad s_5 = 7.7 \quad s_5^2 = \mathbf{59.29}$$

95% CI for σ^2 , $n = 5$, $df = 4$

$$S_2^2 \quad C \left[\frac{4(29.16)}{11.143} < \sigma^2 < \frac{4(29.16)}{0.484} \right] = C [10.47 < \sigma^2 < 240.99] = 0.95$$

$$\text{Length} = 230.52 \text{ lbs}^2$$

$$S_3^2 \quad C \left[\frac{4(34596)}{11.143} < \sigma^2 < \frac{4(34596)}{0.484} \right] = C [124.19 < \sigma^2 < 2,859.17] = 0.95$$

$$\text{Length} = 2,734.98 \text{ lbs}^2$$

$$S_4^2 \quad C \left[\frac{4(65.61)}{11.143} < \sigma^2 < \frac{4(65.61)}{0.484} \right] = C [23.55 < \sigma^2 < 542.23] = 0.95$$

$$\text{Length} = 518.68 \text{ lbs}^2$$

$$S_5^2 \quad C \left[\frac{4(59.29)}{11.143} < \sigma^2 < \frac{4(59.29)}{0.484} \right] = C [21.28 < \sigma^2 < 490.00] = 0.95$$

$$\text{Length} = 468.72 \text{ lbs}^2$$

For $n = 20$, we had

$$\bar{x}_1 = 151.6 \quad s_1 = 10.2 \quad s_1^2 = 104.04$$

$$\bar{x}_2 = 151.3 \quad s_2 = 8.4 \quad s_2^2 = 70.55$$

$$\bar{x}_3 = 150.4 \quad s_3 = 11.4 \quad s_3^2 = 129.96$$

$$\bar{x}_4 = 151.4 \quad s_4 = 11.5 \quad s_4^2 = 132.25$$

$$\bar{x}_5 = 150.1 \quad s_5 = 8.4 \quad s_5^2 = 70.56$$

95% CIs for σ^2 , $n = 20$, $df = 19$

$$C\left[\frac{(n-1)s^2}{\chi_{0.975}^2 = 32.852} < \sigma^2 < \frac{(n-1)s^2}{\chi_{0.025}^2 = 8.907}\right] = 0.95$$

$$\zeta_1^2 \quad C\left[\frac{19(104.04)}{32.852} < \sigma^2 < \frac{19(104.04)}{8.907}\right] = C[60.17 < \sigma^2 < 221.93] = 0.95$$

$$\text{Length} = 161.76 \text{ lbs}^2$$

$$\zeta_2^2 \quad C\left[\frac{19(70.55)}{32.852} < \sigma^2 < \frac{19(70.55)}{8.907}\right] = C[40.80 < \sigma^2 < 149.44] = 0.95$$

$$\zeta_3^2 \quad C\left[\frac{19(129.96)}{32.852} < \sigma^2 < \frac{19(129.96)}{8.907}\right] = C[75.16 < \sigma^2 < 277.22] = 0.95$$