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 $\alpha$-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 \( \chi^2 \) is not between \( \chi^2_{0.025}(4) = 0.484 \), and \( \chi^2_{0.005}(4) = 11.143 \)

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

Studies have consistently shown that rates of depression among women are twice as high as those among men. Reported rates of lifetime major depression for women in the general US population range between 20% and 25%, with point prevalence rates in community samples ranging from 6% to 9%. Risk factors for depression include genetic, biochemical, and hormonal factors, family history, premature depressive episodes, chronic general medical conditions, personality style or coping strategies, negative life events associated with poverty, psychiatric symptoms or trauma, and substance dependence.

Numerous studies suggest that risk factors unique to women contribute substantially to sex differences in depression. These factors include women's roles and status, female sex role socialization, presence of depressive childhood, less socioeconomic status relative to men, and victimization and abuse (e.g., childhood sexual abuse, physical or sexual violence, experiences of rape, sexual harassment). Although considerable knowledge about the sex correlates of depression in the general population has been amassed, the applicability of this knowledge to lesbians is unknown.

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 heterosexual women. In addition, high levels of lifetime sexual orientation, disorder, or dissociation have been reported by lesbians. The risk factors for depression among lesbians include both biological and social factors, such as chronic stress, social isolation, social acceptance, and social support. Lesbians are at a higher risk for depression than heterosexual women because they are more likely to experience social isolation, social rejection, and lack of access to support from friends and family. Lesbians are also more likely to experience social isolation and discrimination, which can lead to increased stress and decreased social support. Additionally, lesbians are more likely to experience physical and sexual violence, which can lead to increased stress and decreased social support. Finally, lesbians are more likely to experience discrimination and harassment, which can lead to increased stress and decreased social support.

METHODS

Study Design and Data Collection

Data were collected as part of a study conducted by the Chicago Lesbian Community Cancer Project (CLCPC) in 1992. The study was designed to obtain a diverse sample of women who were sexually or asexually oriented and who were at risk for depression. The study was designed to obtain a diverse sample of women who were sexually or asexually oriented and who were at risk for depression. The study was designed to obtain a diverse sample of women who were sexually or asexually oriented and who were at risk for depression. The study was designed to obtain a diverse sample of women who were sexually or asexually oriented and who were at risk for depression. The study was designed to obtain a diverse sample of women who were sexually or asexually oriented and who were at risk for depression.
had "stress-reducing therapy or counseling for emotional or mental health problems" at some point in their life (Table 3). This rate was significantly higher than that among heterosexual women (32.0%, χ² = 9.83, p = .008). Similarly, rates of current or previous therapy or counseling did not differ for lesbians (20.0%) and heterosexual women (18.0%, χ² = 0.47, p = .093), though significant differences were noted in the frequency of medication use (Table 3).

Table 3: Study Predictor Variables, by Sexual Orientation

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Lesbian (n=235)</th>
<th>Heterosexual (n=1175)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress-reducing therapy or counseling</td>
<td>40 (17.1%)</td>
<td>10 (0.9%)</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>39 (17.1%)</td>
<td>9 (0.8%)</td>
</tr>
<tr>
<td>Social support</td>
<td>39 (17.1%)</td>
<td>9 (0.8%)</td>
</tr>
<tr>
<td>Emotional support</td>
<td>39 (17.1%)</td>
<td>9 (0.8%)</td>
</tr>
<tr>
<td>Supportive social network</td>
<td>39 (17.1%)</td>
<td>9 (0.8%)</td>
</tr>
<tr>
<td>Cognitive coping strategies</td>
<td>39 (17.1%)</td>
<td>9 (0.8%)</td>
</tr>
<tr>
<td>Coping strategies</td>
<td>39 (17.1%)</td>
<td>9 (0.8%)</td>
</tr>
</tbody>
</table>

Note: Numbers on which percentages are based can be found in the raw data on the 12-item scale for each variable. The percentages were calculated using the total number of respondents for each variable.

Predictors of Depressive Disorders

Physical and sexual abuse. Although lesbians and heterosexual women were equally likely to report that they had been victims of non-physical abuse, 64.9% of lesbians (χ² = 9.83, p = .008) reported experiencing childhood or adolescent abuse (60.0%). In contrast, only 20.0% of heterosexual women reported any sexual or emotional abuse (χ² = 0.47, p = .093). These differences are likely due to the fact that lesbians tend to experience more or longer-lasting forms of harassment, including verbal and interpersonal harassment.

Multivariate Predictive Models of Depressive Disorders

Only variables significantly related to at least 1 of the indicators of depressive disorders in the hierarchical analysis were included in the multivariate analyses. Demographic characteristics included marriage status, income level, education level, and employment status.
<table>
<thead>
<tr>
<th>TABLE 3—Study Predictor Variables, by Sexual Orientation</th>
<th>Lesbian (n = 550)</th>
<th>Heterosexuals (n = 279)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable, No. (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever received therapy</td>
<td>429 (78)**</td>
<td>152 (54)</td>
</tr>
<tr>
<td>Ever treated for depression</td>
<td>264 (48)</td>
<td>100 (37)</td>
</tr>
<tr>
<td>Suicidal ideation</td>
<td>280 (51)**</td>
<td>104 (38)</td>
</tr>
<tr>
<td>Suicide attempts</td>
<td>91 (22)*</td>
<td>22 (13)</td>
</tr>
<tr>
<td><strong>Predictor variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childhood sexual abuse, No. (%)</td>
<td>106 (30)**</td>
<td>45 (16)</td>
</tr>
<tr>
<td>Physical abuse, No. (%)</td>
<td>246 (45)</td>
<td>114 (41)</td>
</tr>
<tr>
<td>Moderate or extreme stress level, No. (%)</td>
<td>461 (85)</td>
<td>229 (83)</td>
</tr>
<tr>
<td>Emotionality in response to stress (sometimes or rarely), No. (%)</td>
<td>207 (38%)</td>
<td>207 (38%)</td>
</tr>
<tr>
<td>Global stress index, mean (SD)</td>
<td>16 (6.8)</td>
<td>17 (7.0)</td>
</tr>
<tr>
<td>Positive coping strategies, mean (SD)</td>
<td>3.3 (1.8)</td>
<td>3.5 (1.9)</td>
</tr>
</tbody>
</table>

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 $\alpha$-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 $\chi^2$ is not between

$$\chi^2_{0.025}(449) = 392.2, \text{ and } \chi^2_{0.975}(449) = 509.5$$

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 $\mu$, 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 $\sigma^2$, 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

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

For hypothesis tests we calculate

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

and compare the results to the $\chi^2$ 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

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

\[\chi^2_{0.975(4)} = 11.143\]

\[\chi^2_{0.025(4)} = 0.484\]

\( df = n - 1 = 4 \)
\[ C \left[ \frac{(n-1)s^3}{X_{0.5773}} < \sigma^3 < \frac{(n-1)s^3}{X_{0.0233}} \right] = 0.95 \]

\[ C \left[ \frac{(5-1)(166.41)}{11.143} < \sigma^3 < \frac{(5-1)(166.41)}{0.484} \right] = 0.95 \]

\[ C \left[ \frac{665.64}{11.143} < \sigma^3 < \frac{665.64}{0.484} \right] = 0.95 \]

\[ C \left[ 59.74 < \sigma^3 < 1,375.29 \right] = 0.95 \]

\textit{Length} = 1,315.55\text{lbs}^3
Other Samples

From the Population of weights, for \( n = 5 \), we had

\[
\begin{align*}
\bar{x}_2 &= 146.4 & s_2 &= 5.4 & s_2^2 &= 29.16 \\
\bar{x}_3 &= 153.2 & s_3 &= 18.6 & s_3^2 &= 345.96 \\
\bar{x}_4 &= 149.0 & s_4 &= 8.1 & s_4^2 &= 65.61 \\
\bar{x}_5 &= 153.6 & s_5 &= 7.7 & s_5^2 &= 59.29
\end{align*}
\]
95% CI for $\sigma^2$, $n = 5$, df = 4

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

Length = 230.52 lbs$^2$

$S_3^2 \ C \left[ \frac{4(345.96)}{11.143} < \sigma^2 < \frac{4(345.96)}{0.484} \right] = C \left[ 124.19 < \sigma^2 < 2,859.17 \right] = 0.95$

Length = 2,734.98 lbs$^2$
\[ S_4^2 \quad C \left[ \frac{4(65.61)}{11.143} < \sigma^2 < \frac{4(65.61)}{0.484} \right] = C \left[ 23.55 < \sigma^2 < 542.23 \right] = 0.95 \]

Length = 518.68 \text{ lbs}^2

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

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 $\sigma^2$, $n = 20$, df = 19

\[ C \left[ \frac{(n-1)s^2}{\chi^2_{0.95 \, 19}} = 32.852 \ < \sigma^2 < \frac{(n-1)s^2}{\chi^2_{0.05 \, 19}} = 8.907 \right] = 0.95 \]

\[ s_1^2 \quad C \left[ \frac{19(104.04)}{32.852} < \sigma^2 < \frac{19(104.04)}{8.907} \right] = C \left[ 60.17 < \sigma^2 < 221.93 \right] = 0.95 \]

Length = 161.76 lbs$^2$

\[ s_2^2 \quad C \left[ \frac{19(70.55)}{32.852} < \sigma^2 < \frac{19(70.55)}{8.907} \right] = C \left[ 40.80 < \sigma^2 < 149.44 \right] = 0.95 \]

\[ s_3^2 \quad C \left[ \frac{19(129.96)}{32.852} < \sigma^2 < \frac{19(129.96)}{8.907} \right] = C \left[ 75.16 < \sigma^2 < 277.22 \right] = 0.95 \]