The covariate associations with the sleep disorder of waking up too early and unable to go back to sleep indicated that education (p=0.006), lifetime alcohol history (p=0.001), current alcohol use (p=0.050), and PTSD (p=0.001) were significant. A higher percentage of the high school-educated participants reported having experienced this sleep disorder than college-educated participants (12.8% vs. 9.1%). The prevalence rate increased with alcohol consumption based on both lifetime alcohol history and current alcohol use. Based on lifetime alcohol history, the percentage of participants reporting this sleep disorder was 7.8 for nondrinkers, 9.9 for moderate drinkers, and 15.5 for heavy drinkers. Similarly for current alcohol use, the percentage of the light drinkers was 10.2, as compared to 13.6 percent of the moderate drinkers and 16.2 percent of the heavy drinkers. Of the participants with PTSD, 62.5 percent reported that they wake up too early and are unable to go back to sleep, whereas only 10.5 percent of the participants without PTSD reported having this sleep disorder.

In the adjusted analysis there were four significant interactions, all of which involved PTSD: group (p=0.042), education (p=0.001), lifetime alcohol history (p=0.015), and current alcohol use (p=0.030). Investigating the group-by-PTSD interaction revealed that a greater percentage of Comparisons with PTSD reported having this sleep disorder than Ranch Hands with PTSD and a greater percentage of Ranch Hands without PTSD reported having this sleep disorder than Comparisons without PTSD; however, these differences were not significant (p=0.999 and p=0.804, respectively). Without the group-by-PTSD interaction in the model, no difference between the two groups was found (p=0.911).

**Waking Up Unrefreshed**

No difference between the Ranch Hands and the Comparisons was identified in the unadjusted analysis of the percentage of participants who reported that they woke up unrefreshed (p=0.402).

Using pooled group data, age, education, and PTSD were significantly associated with the percentage of participants who reported that they wake up unrefreshed (p=0.004, p=0.009, and p=0.001, respectively). The association with lifetime alcohol history was borderline significant (p=0.066). The highest percentage of participants who reported waking up unrefreshed was among those born in or after 1942 (11.7%), followed by those born between 1923 and 1941 (8.0%) and those born in or before 1922 (4.8%). A higher percentage of the high school-educated participants reported this sleep disorder than college-educated participants (11.0% vs. 7.7%). The prevalence rate increased with alcohol consumption based on lifetime alcohol history (6.3% for nondrinkers, 9.0% for moderate drinkers, and 11.6% for heavy drinkers). Only 8.7 percent of the participants without PTSD reported this sleep disorder, as contrasted with 87.5 percent of those with PTSD.

The results of the adjusted analysis revealed no significant difference between the Ranch Hands and the Comparisons (p=0.663). Lifetime alcohol history and PTSD were significant covariates (p<0.001 for both), and age-by-current alcohol use was a significant interaction (p=0.001).
Involuntarily Falling Asleep During the Day

The percentage of Ranch Hands and Comparisons who reported that they involuntarily fall asleep during the day was not found to be significantly different in the unadjusted analysis (p=0.658).

Of the six covariate tests of association, the only significant association detected was for PTSD (p<0.001). Of the participants with PTSD, 31.3 percent reported that they involuntarily fall asleep during the day, as compared to 3.8 percent of the participants without PTSD.

No difference between the two groups was detected in the adjusted analysis (p=0.722). Lifetime alcohol history (p<0.001), race-by-education (p=0.011), race-by-PTSD (p=0.010), and current alcohol use-by-PTSD (p=0.003) were significant terms in the model.

Great or Disabling Fatigue During the Day

Significantly more Ranch Hands than Comparisons reported that they experienced great or disabling fatigue during the day based on the unadjusted analysis (3.8% vs. 2.2%; Est. RR: 1.80, 95% C.I.: [1.10,2.96], p<0.026).

The results of the tests of association with great or disabling fatigue during the day showed that education and PTSD were significant (p<0.001 for both). The association with lifetime alcohol history was borderline significant (p=0.083). The prevalence rate was higher for the participants who were high school educated (4.3% for high school educated vs. 1.4% for college educated). The prevalence rate increased with alcohol consumption based on lifetime alcohol history (2.0% for nondrinkers, 2.5% for moderate drinkers, and 4.3% for heavy drinkers). Of the participants with PTSD, 37.5 percent reported having this sleep disorder, as compared to 2.7 percent of the participants without PTSD.

After adjusting for covariates, the difference between the two groups was borderline significant (Adj. RR: 1.65, 95% C.I.: [0.97,2.81], p=0.065). Education and PTSD were significant covariates in the model (p=0.003 and p<0.001, respectively). The significant interactions were race-by-lifetime alcohol history and race-by-current alcohol use (p=0.040 and p=0.029, respectively).

Frightening Dreams

Based on the unadjusted analysis, no group difference was detected (p=0.282) in experiencing frightening dreams.

The covariate tests showed that the associations with education, lifetime alcohol history, and PTSD were significant (p=0.038, p<0.001, and p=0.001, respectively). The association with current alcohol was borderline significant (p=0.095). Of the participants with a high school education, 5.3 percent reported that they have frightening dreams, as compared to 3.5 percent of those with a college education. The prevalence rate increased with alcohol consumption for lifetime alcohol history and current alcohol use. Based on
lifetime alcohol history, 3.4 percent of the nondrinkers, 3.5 percent of the moderate drinkers, and 7.9 percent of heavy drinkers reported that they had frightening dreams. Similarly for current alcohol use, the percentages reporting frightening dreams were 4.0, 5.8, and 8.1 for light drinkers, moderate drinkers, and heavy drinkers, respectively. Only 3.9 percent of the participants without PTSD reported that they had frightening dreams, as compared with 66.7 percent of those with PTSD.

No difference between the Ranch Hands and Comparisons was detected in the adjusted analysis (p=0.346). Lifetime alcohol use, PTSD, and age-by-race were significant terms in the model (p<0.001, p<0.001, and p=0.012, respectively).

Talking in Sleep

The results of the unadjusted analysis revealed that significantly more Ranch Hands reported that they talked in their sleep than Comparisons (4.8% vs. 3.1%, p=0.041). The estimated relative risk was 1.60 (95% C.I.: [1.04, 2.45]).

Using combined Ranch Hand and Comparison data, the covariate tests revealed significant associations for age, education, and PTSD (p=0.001, p<0.001, and p=0.005, respectively). The talking in sleep-lifetime alcohol history test of association was borderline significant (p=0.090). The prevalence rate was highest for those born in or after 1942 (5.5%), followed by those born in or before 1922 (3.6%) and those born between 1923 and 1941 (2.6%). More participants with a high school education reported talking in their sleep than those with a college education (5.2% vs. 2.5%). The prevalence rate was increased with alcohol consumption based on lifetime alcohol history (2.9% for nondrinkers, 3.4% for moderate drinkers, and 5.4% for heavy drinkers). For PTSD, 25.0 percent of the participants with PTSD reported that they talked in their sleep, compared to 3.7 percent of those without PTSD.

The adjusted analysis of talking in sleep identified a significant group-by-PTSD interaction (p=0.009). Education was a significant covariate (p=0.006), and age and lifetime alcohol history interactions with PTSD were also significant terms in the model (p=0.001 and p=0.002, respectively). Investigating the group-by-PTSD interaction revealed no significant difference between the Ranch Hands with PTSD and the Comparisons with PTSD (p=0.999). The difference between the Ranch Hands and Comparisons without PTSD was borderline significant (p=0.089). Of the participants without PTSD, 4.5 percent of the Ranch Hands and 3.1 percent of the Comparisons reported that they talk in their sleep (Adj. RR: 1.48, 95% C.I.: [0.94, 2.34]).

Sleepwalking

No significant difference was detected between the two groups based on the unadjusted analysis of sleepwalking (p=0.232).

Of the six covariate tests of association with sleepwalking, only the association with age was significant (p=0.001). The participants born in or after 1942 had the highest prevalence rate (3.1%). Of the participants born between 1923 and 1941, 1.0 percent reported that they walk in their sleep. No
(0.0%) participants born in or before 1922 reported having this sleep disorder.

In the adjusted analysis of sleepwalking, no significant difference between the Ranch Hands and Comparisons was identified (p=0.234). The age-by-lifetime alcohol history and education-by-lifetime alcohol history interactions were significant terms in the model (p=0.034 and p=0.033, respectively).

**Abnormal Movement/Activity During the Night**

Based on the number of Ranch Hands and Comparisons who reported abnormal movement/activity during the night, no significant difference between the two groups was found in the unadjusted analysis (p=0.604).

The results of the covariate tests identified three significant dependent variable-covariate associations: age (p=0.020), education (p=0.005), and PTSD (p<0.001). The prevalence rate of abnormal movement or activity during the night decreased with age (4.7% for those born in or after 1942, 2.6% for those born between 1923 and 1941, and 2.4% for those born in or before 1922). A higher percentage of the high school-educated participants reported having this sleep disorder than the college-educated participants (4.5% vs. 2.3%). Half (50.0%) of the participants with PTSD reported that they have abnormal movement or activity during the night, as compared to 3.1% of the participants without PTSD.

In the adjusted analysis, the interaction between group and education was significant (p=0.039). Age and PTSD were significant covariates (p=0.003 and p<0.001, respectively). No significant differences were found after stratifying by education (p=0.106 for high school and p=0.177 for college). Without the interaction in the model, no difference between the two groups was detected (p=0.558).

**Sleep Problems Requiring Medication**

In the unadjusted analysis of sleep problems requiring medication, no significant difference between the Ranch Hands and Comparisons was identified (p=0.272).

The covariate tests revealed four significant associations: education (p=0.010), lifetime alcohol history (p<0.001), current alcohol use (p=0.018), and PTSD (p<0.001). The prevalence rate was higher for the high school-educated participants than those with a college education (3.0% vs. 1.3%). Based on lifetime alcohol history, the highest percentage of participants who reported having sleep problems that required medication was among the heavy drinkers (4.4%), followed by the nondrinkers (2.0%) and the moderate drinkers (1.5%). The prevalence rate increased with current alcohol use (1.9% for light drinkers, 2.5% for moderate drinkers, and 6.8% for heavy drinkers). For PTSD, 1.8 percent of the participants without PTSD and 56.3 percent of the participants with PTSD reported having sleep problems that required medication.
Based on the adjusted analysis, no significant difference between the two groups was detected (p=0.955). The significant covariates in the model were education, lifetime alcohol history, and PTSD (p=0.026, p=0.024, and p<0.001, respectively).

**Snore Loudly in All Sleeping Positions**

No significant difference in loud snoring was detected between the two groups based on the unadjusted analysis (p=0.520).

This sleep disorder was found to be significantly associated with lifetime alcohol history and PTSD (p=0.035 and p=0.009, respectively). The prevalence rate increased with alcohol consumption based on lifetime alcohol history (4.9% for nondrinkers, 6.5% for moderate drinkers, and 9.5% for heavy drinkers). A higher percentage of participants with PTSD reported that they snore loudly in all sleeping positions than those without PTSD (31.3% vs. 7.1%).

The results of the adjusted analysis found no significant difference between the two groups (p=0.766). There were two significant interactions in the model: education-by-lifetime alcohol history and current alcohol use-by-PTSD (p<0.001 and p=0.016, respectively).

**Insomnia**

No difference between the Ranch Hands and Comparisons was found based on the unadjusted analysis of participants classified as having insomnia (a composite variable based on reports of trouble falling asleep, waking up during the night, or waking up early and being unable to go back to sleep; p=0.786).

The results of the covariate tests identified significant associations for education (p=0.005), lifetime alcohol history (p<0.001), and PTSD (p<0.001), and a borderline significant association for current alcohol use (p=0.083). A higher percentage of the high school-educated participants were classified as having insomnia than those with a college education (26.3% vs. 21.2%). The prevalence rate increased with alcohol consumption based on lifetime alcohol history and current alcohol use. For lifetime alcohol history, the percentages of participants classified as having insomnia were 17.1, 22.0, and 32.1 for nondrinkers, moderate drinkers, and heavy drinkers, respectively. For the light, moderate, and heavy drinkers based on current alcohol use, the percentages were 22.9, 27.6, and 28.4, respectively. A higher percentage of participants with PTSD was classified as having insomnia than participants without PTSD (87.5% vs. 23.5%).

The results of the adjusted analysis showed that there was a significant group-by-age interaction (p=0.027). PTSD (p<0.001), age-by-education (p=0.004), and lifetime alcohol history-by-current alcohol use (p=0.034) were significant terms in the model. Stratifying by age found that significantly more Comparisons born in or before 1922 were classified as having insomnia than Ranch Hands of the same age category (41.7% vs. 17.1%; Adj. RR: 0.25, 95% C.I.: [0.08, 0.74], p=0.012). No differences were detected in the other
two age categories (p=0.547 for those born in or after 1942 and p=0.813 for those born between 1923 and 1941). Without the group-by-age interaction in the model, the two groups were not found to be significantly different (p=0.711).

**Overall Sleep Disorder Index**

Based on the unadjusted analysis of the overall sleep disorder index, a composite variable of the 12 individual sleep disorders, no significant difference between the two groups was detected (p=0.510).

In the covariate tests, education, lifetime alcohol history, and PTSD were found to have significant associations with the overall sleep disorder index (p<0.001 for all). The association with age was borderline significant (p=0.076). The highest percentage of participants who reported having a sleep disorder was among the participants born in or after 1942 (37.0%), followed by those born in or before 1922 (36.9%) and those born between 1923 and 1941 (32.4%). A higher percentage of the high school-educated participants reported having a sleep disorder than those with a college education (38.3% vs. 30.4%). The prevalence rate of reported sleep disorders was found to be increasing with alcohol consumption based on both the lifetime alcohol history and current alcohol use. The percentages for lifetime alcohol history were 26.3 for nondrinkers, 32.4 for moderate drinkers, and 43.8 for heavy drinkers. All (100.0%) of the participants with PTSD reported having one or more of the 12 sleep disorders. The prevalence rate for the participants without PTSD was 34.2 percent.

In the adjusted analysis of the overall sleep disorder index, there was a significant group-by-lifetime alcohol history interaction (p=0.011). Age (P=0.049) and PTSD (p<0.001) were significant covariates. Two other interactions involving lifetime alcohol history, education-by-lifetime alcohol history and lifetime alcohol history-by-current alcohol use, were also significant (p=0.024 and p=0.027, respectively). Further investigation of the group-by-lifetime alcohol history revealed no significant group differences (p=0.249 for nondrinkers, p=0.241 for moderate drinkers, and p=0.168 for heavy drinkers). Without the interaction involving group in the model, no difference between the Ranch Hands and the Comparisons was found (p=0.534).

**Average Sleep Each Night**

Based on the unadjusted analysis of the average number of hours of sleep each night, there was no significant difference between the Ranch Hands and Comparisons (p=0.421). Of participants with some type of sleep disorder, there was no significant difference between the group means (Ranch Hands: 6.63 hours, Comparisons: 6.72 hours; p=0.345).

The results of the covariate tests showed that the average sleep each night was significantly associated with age, race, and education (p<0.001, p<0.001, and p=0.001, respectively). Age was positively correlated with the average sleep each night (r=0.090). The nonblack participants had a higher mean than the Black participants (6.96 hours vs. 6.41 hours). The participants with a college education had a mean of 7.00 hours, as compared to a mean of 6.86 hours for the participants with a high school education.
No significant difference was found between the two groups on the average sleep each night based on the adjusted analysis (p=0.509). The significant terms in the adjusted model were age (p<0.001), race (p<0.001), education (p=0.014), and current alcohol use-by-PTSD (p=0.018).

Physical Examination Variables: SCL-90-R

The results of the unadjusted analyses of the 12 variables of the SCL-90-R are presented in Table 12-6. Table 12-7 contains the results of the adjusted analyses. The covariate associations and group-by-covariate interactions are summarized in Tables 1-1 and I-2, respectively, of Appendix I.

Anxiety

No significant difference was detected between the two groups based on the unadjusted analysis of the SCL-90-R anxiety variable (p=0.149).

Based on combined Ranch Hand and Comparison data, the covariate tests with anxiety showed that age (p=0.027), education (p<0.001), lifetime alcohol history (p=0.008), current alcohol use (p=0.016), and PTSD (p<0.001) were significant. For age, 8.3 percent of those born in or after 1942 were classified as abnormal, as compared to 5.3 percent of those born between 1923 and 1941 and 6.9 percent of those born in or before 1922. The high school-educated participants had a higher percentage of abnormalities than those with a college education (9.1% vs. 4.0%). For lifetime alcohol history, the highest percentage of abnormalities was among the heavy drinkers (9.8%), followed by the nondrinkers (6.2%) and the moderate drinkers (5.7%). The percentage of abnormalities increased with current alcohol use (5.9% for light drinkers, 9.0% for moderate drinkers, and 12.5% for heavy drinkers). Of the participants with PTSD, 93.8 percent were classified as abnormal, as compared to 5.9 percent of the participants without PTSD.

Based on the adjusted analysis of anxiety, no difference between the Ranch Hands and Comparisons was found (p=0.361). Education, PTSD, and age-by-current alcohol use were significant terms in the model (p<0.001, p<0.001, and p=0.020, respectively).

Depression

The results of the unadjusted analysis of depression from the SCL-90-R revealed a borderline significant difference between the two groups, with 9.8 percent abnormalities in the Ranch Hands, as compared to 7.6 percent abnormalities in the Comparisons (Est. RR: 1.33, 95% C.I.: [0.97, 1.81], p=0.090).

Depression-covariate analyses revealed that age (p=0.028), education (p<0.001), lifetime alcohol history (p=0.007), and PTSD (p<0.001) were significantly associated with the dependent variable. The lowest percentage of abnormalities was for those born between 1923 and 1941 (7.0%). The percentages of abnormalities were 8.3 and 10.4 for those born in or before 1922 and for those born in or after 1942, respectively. The college-educated
TABLE 12-6.
Unadjusted Analysis for SCL-90-R Psychological Variables by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic</th>
<th>Group</th>
<th>Est. Relative Risk (95% C.I.)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ranch Band</td>
<td>Comparison</td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>n</td>
<td>880</td>
<td>1,152</td>
<td></td>
</tr>
<tr>
<td>Number/%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>67</td>
<td>7.6%</td>
<td>68</td>
<td>5.9%</td>
</tr>
<tr>
<td>Normal</td>
<td>813</td>
<td>92.4%</td>
<td>1,084</td>
<td>94.1%</td>
</tr>
<tr>
<td>Depression</td>
<td>n</td>
<td>880</td>
<td>1,152</td>
<td></td>
</tr>
<tr>
<td>Number/%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>86</td>
<td>9.8%</td>
<td>87</td>
<td>7.6%</td>
</tr>
<tr>
<td>Normal</td>
<td>794</td>
<td>90.2%</td>
<td>1,065</td>
<td>92.4%</td>
</tr>
<tr>
<td>Hostility</td>
<td>n</td>
<td>880</td>
<td>1,152</td>
<td></td>
</tr>
<tr>
<td>Number/%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>46</td>
<td>5.2%</td>
<td>53</td>
<td>4.6%</td>
</tr>
<tr>
<td>Normal</td>
<td>834</td>
<td>94.8%</td>
<td>1,099</td>
<td>95.4%</td>
</tr>
<tr>
<td>Interpersonal Sensitivity</td>
<td>n</td>
<td>880</td>
<td>1,152</td>
<td></td>
</tr>
<tr>
<td>Number/%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>58</td>
<td>6.6%</td>
<td>74</td>
<td>6.4%</td>
</tr>
<tr>
<td>Normal</td>
<td>822</td>
<td>93.4%</td>
<td>1,078</td>
<td>93.6%</td>
</tr>
<tr>
<td>Obsessive-Compulsive</td>
<td>n</td>
<td>880</td>
<td>1,152</td>
<td></td>
</tr>
<tr>
<td>Behavior</td>
<td>Number/%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>74</td>
<td>8.4%</td>
<td>88</td>
<td>7.6%</td>
</tr>
<tr>
<td>Normal</td>
<td>806</td>
<td>91.6%</td>
<td>1,064</td>
<td>92.4%</td>
</tr>
<tr>
<td>Paranoid Ideation</td>
<td>n</td>
<td>880</td>
<td>1,152</td>
<td></td>
</tr>
<tr>
<td>Number/%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>40</td>
<td>4.5%</td>
<td>43</td>
<td>3.7%</td>
</tr>
<tr>
<td>Normal</td>
<td>840</td>
<td>95.5%</td>
<td>1,109</td>
<td>96.3%</td>
</tr>
</tbody>
</table>